

# Traumatic head injury in children and young people: a national overview

A review of 6 months data from 2009-2010, collected from England, Wales, Northern Ireland, Channel Islands and the Isle of Man



**HQIP**

Healthcare Quality  
Improvement Partnership

**Report prepared by:**

Professor Alison M Kemp, Professor of Child Health, Cardiff University,  
Dr Laszlo Trefan, Research Associate and Statistician, Cardiff University  
Ms Amanda Summers, Research Administrator, Cardiff University

**Independent Advisory Group (IAG):**

Dr Ian Maconochie: Chair of (IAG), Imperial College NHS Healthcare Trust, London  
Ms Rosie Houston: Research fellow CMACE (at the time of the project).  
Dr Gale Pearson: Director of CMACE (at the time of the project) University of Birmingham  
Dr Phillip Hyde: Paediatric Intensivist, Southampton Children's Hospital  
Dr Richard Edwards: Neurosurgeon Bristol Hospital for Children,  
Dr Roger Parslow: Senior Lecturer in Epidemiology, University of Leeds,  
Dr Jacqueline Cornish: National Clinical Director for Children, Young People and Transition, NHS England  
Ms Heather Livingston: Northern Ireland, Department of Health  
Dr Heather Payne: Senior Medical Officer for Maternal and Child Health, Wales Assembly Government  
Ms Jenny Mooney, Healthcare Quality Improvement Partnership HQIP

**Additional Members of original CMACE External advisory group Head Injury project:**

Professor Robert Tasker, Paediatrics, University of Cambridge, Dr Rosemary Arthur Consultant Paediatric Radiologist Leeds (British Society Paediatric Radiology), Dr Fiona Lecky: Research Director TARN, Senior Lecturer, Honorary Consultant Emergency Medicine Manchester, Dr Fiona Moore: Medical Director London Ambulance Service, Dr Kevin Morris: Director PICU Birmingham Children's Hospital

Lisa Turan : Chief Executive Child Brain Injury Trust, Girkamal Virdi: Assistant Head of Clinical and Audit Research London Ambulance Service, Mark Woolcock: Emergency Medical Practitioner and Emergency Specialist Service South Western Ambulance Service NHS Foundation Trust, UK

The Child Head Injury Project was commissioned by The Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England, DHSSPS Northern Ireland, and the Health Department of the Welsh Government. The Healthcare Quality Improvement Partnership (HQIP) is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. HQIP is a not for profit limited company established in April 2008 to promote quality in healthcare, and in particular to increase the impact that clinical audit has on healthcare quality in England and Wales. The work programme, which also encompasses confidential enquiries, is designed to help assess the quality of healthcare, and stimulate improvement in safety and effectiveness by systematically enabling clinicians, managers and policy makers to learn from audit data and patient safety adverse events. More details can be found at: [www.hqip.org.uk](http://www.hqip.org.uk)

# Contents

---

Executive Summary	page 4
Recommendations	page 4
Introduction	page 13
Methodology of data collection and analysis	page 14
Epidemiology of children and young people with THI	page 15
The causes of traumatic head injuries	page 19
The early management of THI: pre-hospital setting	page 26
The early management of THI: Hospital management	page 34
CT scanning and compliance with NICE head injury guidance	page 43
The recognition and investigation of children with suspected maltreatment and abusive head trauma	page 47
Bibliography	page 52
List of abbreviations	page 54
Appendices	page 55

---

# Executive Summary

This report is an analysis of data on 5700 children with mild, moderate and severe traumatic head injury (THI) from 2009 to 2010. The inclusion criterion for entry into the study was that the child had been in receipt of treatment or observation in an inpatient area for at least 4 hours. Therefore it is important to note that this dataset includes many children with minor head injury who would have been sent home shortly after this time and relatively few children with severe traumatic head injury. In addition there have been significant changes in trauma care management in England (and parts of Wales) since the date of this data collection and analysis which came into being in April 2012.<sup>1</sup> This included the development of structured networks of care, based on a hub and spoke model, the spokes being Trauma Units (TU) and the hub being the Regional Major Trauma Centre (MTC). Other aspects of clinical practice have also changed since the time that the study was conducted, for example, NICE 2007 guidelines on the management of head injury in children and young people were revised in 2014, and new guidance on imaging produced by the Royal College of Radiology in 2014 have come into play.

The importance of the data in this report is that it acts as a comprehensive benchmark of service delivery prior to the re-organisation services and introduction of new guidance.

Six specific areas were considered in the analysis of this data:

- The epidemiological features of traumatic head injury in children and young people.

- The causes of traumatic head injury.
- The assessment and management of traumatic head injury in prehospital and in hospital settings.
- The use of CT head scanning and compliance with NICE head injury guidance (2007).
- How children with suspected maltreatment and abusive head trauma were investigated and managed.

Importantly, the data have also been incorporated into a series of forthcoming peer-reviewed publications, which benchmark activity prior to the advent of the trauma system in operation in England and parts of Wales.

Based on the detailed analysis of this dataset, together with the clinical and academic input and consensus of the Independent Advisory Group for this project a number of recommendations have been produced which are summarised below. Where the recommendation has been met due to changes in service provision since this data collection or where guidance exists this has been noted in bold beneath the recommendation. Full details of the analysis that led to these conclusions and recommendations follow in the subsequent report chapters.

## Recommendation 1

There is currently no system for the collection of data on all forms of head injury in children.\* A future standardised data gathering exercise is recommended to fully understand the ongoing determinants of childhood head injury and to evaluate the benefits of the changes to the national trauma system and national head injury guidelines that have been introduced since the data collection time period for this study. These data could be used as baseline figures to inform such an evaluation.

\*The Trauma Audit Research Network (TARN) is a national dataset and collects data on severely injured children who stay in hospital longer than 72 hours. However the data collection will only cover a small proportion of hospital admissions for traumatic head injury in children.

1. Three of the London MTCs began treating patients from April 2010 with the fourth London MTC starting in April 2011

## Recommendation 2

These data would support the organisation of services such that health care professionals with the skills to assess and manage very young children with traumatic head injury are available at the peak times that they present to health care services, namely afternoon and early evening.

Since these data were collected, standards for staff training and competencies have been set by a. the Intercollegiate Committee for Standards for Children and Young People in Emergency Care Settings (2012), and b. The Royal College of Paediatrics and Child Health, Facing the future (2010 updated 2015).

‘A consultant paediatrician or equivalent staff, associate specialist or specialty doctor who is trained and assessed as competent to work on the paediatric consultant rota is present and readily available in the hospital during periods of peak activity, seven days a week’

- a. [Click here to go to Royal College of Paediatrics and Child Health PDF](#)
- b. [Click here to go to Facing the Future PDF](#)

## Recommendation 3

Falls must be a clear priority in accident prevention interventions for infants and toddlers. These could be delivered by Health Visitors, Family Nurses in Children Centres, Flying Start programmes and through other mediums that have the capacity to reach parents of young children. A focus on falls from a parent or carer’s arms, particularly when they are being carried upstairs can be justified.

In June 2014 Public Health England launched a program of work to reduce unintentional injuries in and around the home among children under five years. Falls were identified as one of five priority areas.

[Click here to go to Reducing unintentional injuries in and around the home PDF](#)

## Recommendation 4

Preventative interventions that rely upon safe sports surfaces, cycle-helmets, in-car safety and road traffic calming must be maintained. The study was not powered sufficiently to be able to comment on the effect of wearing a cycle helmet but further evaluation of the efficacy and benefits of helmet wearing would be valuable.

In June 2014 Public Health England launched a program of work to decrease unintentional injuries on the roads among children and young people under 12 years.

[Click here to go to Reducing unintentional injuries on the roads PDF](#)

## Recommendation 5

Clinicians who evaluate children with traumatic head injury must avoid a simplistic interpretation of falls and take a detailed history using a standardised proforma at the time of presentation to determine the likely risk of serious head injury and ensure that the explanation provided is plausible to exclude concerns about physical abuse or neglect.

The history must include items such as the item fallen from, the time of the injury and chronology of signs and symptoms. Other items not covered in this data set would include the estimated height of the fall, the position and activity of the child before they fell, nature of surface of impact, point of impact to the head.

These recommendations are partially incorporated in Children Protection Companion 2nd edition RCPCH 2013 and NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to RCPCH Child Protection Publications](#)

[Click here to go to NICE Head Injury Guidance](#)

## Recommendation 6

It is essential that all ambulance crews and clinicians who first see a child with a traumatic head injury are trained to recognise children who have potentially serious head injury early to ensure that they are managed in centres that can provide the appropriate level of care to optimise outcome.

In 2015: All Major Trauma Networks have triage and by pass criteria to enable rapid and safe transfer of children to the most appropriate hospital.

[Click here to go to NHS Major Trauma PDF](#)

Standards of practice are set out Joint Royal Colleges Ambulance Liaison Committee.

[Click here to go to JRCALC Guidelines](#)

and NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance](#)

### Recommendation 7

All ambulance staff should be trained and ambulances fully equipped with age appropriate equipment to assess and manage young children with traumatic head injury. This would include age specific blood pressure, oxygen saturation monitoring equipment and face-masks to administer oxygen to small children.

### Recommendation 8

Ambulance teams require further training in the importance of administering oxygen to children with traumatic head injury and impaired levels of consciousness.

[Click here to go to JRCALC Guidelines](#)

‘Oxygen should be administered routinely whatever the oxygen saturation in patients (children) sustaining major trauma’.

### Recommendation 9

All children with traumatic head injury and impaired consciousness should be transported to hospital quickly and by ambulance to optimise their early management. Members of the public, especially parents and youth workers should be alerted to the signs of serious head injury and the importance of calling an ambulance. This requires targeted explicit education to avoid flooding the system with unnecessary calls. Effective triage of emergency calls to identify serious head injury should be reinforced.

NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance \(Section 1.1\)](#)

### Recommendation 10

Ambulances transporting children with serious head injury must adhere to triage and by-pass criteria that are now in place for all Major Trauma Networks. Children should be transported to the appropriate Children’s Major Trauma Centre or nearest Trauma Unit (accounting for the geography of the ‘Network’) to optimise prompt health care and reduce the time taken for children to reach appropriate services.

This recommendation has been reinforced by the changes to the organisation of trauma services in England and North Wales. The announcement of the major trauma centres by the government, 6th April 2012.

[Click here to go to NHS Major Trauma PDF](#)

### **Recommendation 11**

Retrieval teams for children with traumatic head injury should be established to ensure children get to the appropriate hospital for their level of need according to the severity of their head injury. Specific provision must be made for rapid transfer in rural areas where the time to get the child to a specialist unit would exceed an hour. This is likely to involve air ambulance retrieval.

This recommendation is reinforced in the changes to the organisation of trauma services in England and North Wales.

[Click here to go to NHS Major Trauma PDF](#)

### **Recommendation 12**

All children with a traumatic head injury should be assessed by a health care professional who has been trained in the assessment and management of childhood trauma. Many of these children are very young and the assessment of neurological impairment differs considerably from that in adults.

NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance](#)

### **Recommendation 13**

When hospital transfer to a Major Trauma Centre is required, the proportion of Inter-hospital transfers undertaken by PICU retrieval teams should be improved.

[Click here to go to UK PICS Standards \(2010\)](#)

### **Recommendation 14**

Children with impaired levels of consciousness should be safely transferred to Children's Major Trauma Centre by appropriately trained staff utilising the Network transfer criteria and transport system.

This recommendation is embedded in changes to the organization of trauma services in England and N Wales.

[Click here to go to NHS Major Trauma PDF](#)

### Recommendation 15

A small proportion of children re-attended hospital post following traumatic head injury. This reiterates the need for all parents to receive information about the risk factors that mean patients need to return to the emergency department.

Guidance on information to be provided to parents is available in NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance \(Section 1.9.11\)](#)

### Recommendation 16

Clinical pathways and clinical training needs to ensure that the following standards are improved in ED for children with traumatic head injury with all levels of neurological impairment.

- Quicker time taken to assess children in ED with head injury.
- Recording of Glasgow Coma Score (GCS) with details of component scores in all cases.
- Early intubation of children with GCS  $\leq$  8.

This recommendation is reiterated by the changes to the organization of trauma services in England and N Wales, in managing injured patients.

[Click here to go to NHS Major Trauma PDF](#)

These standards are set within the NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head injury Guidance \(Sections 1.2, 1.3, 1.7.13\)](#)

### Recommendation 17

In patients with a GCS less than or equal to 8, there should be early involvement of an anaesthetist or critical care physician to ensure that early, appropriate intubation and ventilation or oxygen are instigated when appropriate.

This recommendation is embedded in the NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance \(Section 1.3.5\)](#)

### **Recommendation 18**

All children with impaired consciousness should have an early assessment by a consultant grade doctor, a consultant with paediatric training should be involved in their care and there should be access to a neurosurgical team.

This recommendation is embedded in the changes to the organization of trauma services in England and North Wales. Trained trauma teams are now based in the major trauma centres.

[Click here to go to NHS Major Trauma PDF](#)

### **Recommendation 19**

It is increasingly recognised that children with minor traumatic brain injury can suffer from post-concussion syndrome and long term behavioural and emotional consequences. Provision for this must be made within the ongoing management of the majority of children who present with head injury.

This is referred to in the NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance \(Section 1.9.12\)](#)

### **Recommendation 20**

In view of the low percentage of children with indicators for CT who actually have a CT, there should be a national review of the facilitators and barriers to CT scanning, (especially for the infants and toddler age group) and an on-going national audit of the implementation of NICE head injury guidelines in General hospitals.

### **Recommendation 21**

The practice of admitting young children for observation versus early CT scanning should be evaluated according to short and long term clinical outcome. The potential benefits of low-dose CT scanning should be considered to reduce the risks of irradiation against the benefits of early detection of traumatic brain injury.

### Recommendation 22

A large scale prospective evaluation of the indicators for CT head scan within NICE head injury guidelines is needed to determine their accuracy and efficacy in practice.

### Recommendation 23

ED staff and hospital paediatricians must receive appropriate levels of safeguarding training that includes guidance on the recognition of abusive head trauma (AHT). For frontline staff who are assessing young children with head injury, training must be provided in a manner that accounts for the rapid turnover of staff in ED, many of whom are adult specialists or locums.

**The Royal College of Emergency Medicine, clinical standards document (click here to access the document)** published in August 2014 recommends that 'All ED medical and nursing staff should, as a minimum, have level 2 Child Protection training. All senior Emergency Medicine doctors (ST4 or equivalent and above) should have level 3 Child Protection training'.

Safeguarding children and young people: roles and competences for health care staff published 2014.

**[Click here to go to RCPCH Safeguarding Children and Young People PDF](#)**

### Recommendation 24

Paediatricians must improve their adherence to national guidance when physical abuse is suspected in young children with head injury.

Recommended investigations: CT scan, skeletal survey (RCR/RCPCH radiology guidelines 2008), ophthalmology (RCOPH/RCPCH guidelines) examination should be conducted for all infants and children who have a head injury where physical abuse is suspected. All children must be assessed on an individual basis and if recommended investigations are not performed the reasons why must be clearly documented.

Children Protection Companion 2nd edition RCPCH 2013

**[Click here to go to RCPCH Child Protection Publications](#)**

### Recommendation 25

NICE head injury guidelines 2007 and 2014 recommend that head CT scan should be performed if non-accidental head injury is suspected, yet they give no explanation as to when this suspicion should be raised. This should be considered in the next revision of the guidelines. There are several detailed evidence based publications around this topic ([www.core-info.cf.ac.uk](http://www.core-info.cf.ac.uk)). All health care professionals involved with these children must be made aware that AHT is a condition that is prevalent in infants and toddlers and be familiar with the guidelines where AHT is suspected.

# Introduction

Paediatric traumatic brain injury is one of major causes of death and long-term disability in the UK. The injury's impact is not only to the child and the loss of that individual's potential development, in terms of their physical, educational, psychologically, and social outcomes, but there are often significant effects on their carers and family. Families of children and young people who suffer chronic disability often experience economic hardship and there are effects on immediate relatives, e.g. the educational performance of siblings may be disturbed and have long-term detrimental effects.

To reduce the morbidity and mortality associated with injury, public health strategies traditionally run in three different streams of care: primary, secondary and tertiary prevention schemes. The first two for traumatic head injury (THI) include public health awareness campaigns, legislation, altering the environmental factors (e.g. safe play surfaces), changing behaviour where needed, and promoting effective educational schemes. Combinations of these risk reduction strategies may have played a part in the decline in the trauma mortality over the last 30 years, but nonetheless paediatric THI still occurs.

Tertiary prevention strategies then come into play once injury has occurred. These act to reduce mortality and morbidity by minimising the consequent effects of the injury, putting in place resources, expertise and remodelling old systems of care. Currently, this is by means of a network of trauma care, modelled on a hub and spoke basis, with the Major Trauma Centres (MTC) dealing with the most severely injured patients. This trauma system came into place in England and N Wales in April 2012, after the period of data collection by Centre for Maternal and Child Enquiries (CMACE). Within this system, starting in the pre-hospital environment and continued into secondary and tertiary settings, there is co-ordinated access to expert care so that life and limb saving procedures can be undertaken safely and in a timely fashion. Examples of these procedures include emergency intubation, CT head scanning to determine the extent of THI and inform the management of any intracranial pathology, and the use of intensive care facilities to support the patient and decrease the likelihood of any complications.

The CMACE dataset comprises information on 5700 children and young people with head injury, admitted to hospital for four hours or longer over 6 months, from September 2009 to February 2010. The National Confidential enquiry collected data on discrete points of care that are presented in this report.

The clinical management of head injuries at the time of CMACE data collection was subject to the NICE head injury clinical guidelines 2007 and those of the Joint Royal Colleges Ambulance Liaison Committee (JRCALC). Since the data collection, both have been updated (NICE GUIDELINES 2014, JRCALC 2013) and, as mentioned previously, the care pathway for trauma patients was revised when the Major Trauma Networks were introduced across England and N Wales.

## Commissioning of the report

The Centre for Maternal and Child Enquiries (CMACE) was commissioned by the Department of Health and the funding bodies of Wales, Northern Ireland, the Channel Islands and the Isle of Man to review morbidity and mortality in childhood as part of the Child Health Confidential Enquiry programme. The Confidential Enquiry into Head Injury in Childhood was the principal project within the CMACE national child health enquiry from 2009. The enquiry was timetabled to run from 2009-2012.

In March 2011, Department of Health funding to CMACE ended further to a tender process for the Child Health Confidential Enquiry programmes, where CMACE were unsuccessful in their bid. Following an independent review of the project and data collection, Child Health specialists at Cardiff University were commissioned by HQIP on behalf of NHS England to continue the task of data analysis.

The results of the data collected by CMACE and its subsequent analysis by Cardiff University are presented here. Input from the external advisory group to CMACE head injury project contributed significantly to the initial design of the study.

The data have been used to explore key components of trauma management and a series of peer-reviewed publications have arisen from this body of work.

# Methodology of data collection and analysis

## Aims of the report

The aims are to:

- Describe the epidemiological features of 5700 children and young people admitted to hospital with THI.
- Delineate the causes of THI and make recommendations for prevention.
- Consider the early pre-hospital management of THI.
- To describe the care delivered in hospital settings and explore the potential to improve health outcomes.
- Determine the use of CT head scanning and compliance with NICE head injury guidance (2007).
- Investigate extent of recognition and subsequent investigation of children with suspected maltreatment and abusive head injury (AHT).

## Methods

### Collection and analysis of data

**Inclusion criteria:** Data on all children (up to 15 years old) with an isolated head injury (or a head injury as part of a pattern of injuries) and were admitted to hospital were collected prospectively between September 2009 and February 2010 from 90% of hospitals in England, Wales, Northern Ireland and the Channel Islands (Appendix 1). An admission was defined as occurring when the patient was in receipt of treatment or observation in an inpatient area for at least four hours. Cases of suspected physical abuse were included.

**Exclusion criteria:** Data from children admitted with superficial or facial injuries that were unlikely to be associated with a head +/- or brain injury (e.g. isolated or trivial facial, scalp or auricular injuries) were not included.

**Data collection:** A local head injury enquiry coordinator in each hospital was responsible for the collecting the data and returning it to CMACE at the end of each study month.

The data collection forms (Appendix 2-4) were developed following a review of the literature which included peer

reviewed journals, surveys, standards and guidelines, and discussions with experienced professionals. They were designed to follow children's and young people's pathway of care. Questions were designed to elicit objective/factual responses routinely available from the clinical records or from hospital electronic systems. The forms were piloted and reviewed by the external advisory group, prior to national distribution. The forms consisted of seven sections covering: demographic information; incident events; transfer to hospital details; pre-hospital care information; assessment in the emergency department; imaging; admission, and outcome at 72 hours post arrival at the first hospital.

CMACE obtained Section 251 approval to gather patient information without consent. Research and Development or clinical governance forms were obtained from all participating hospitals. Ethical approval and section 251 approvals were renewed when the project was transferred to Cardiff University for analysis by the Central Manchester Research Ethics Committee and updated in July 2012 (Ref 09/H1008/74).

**Data analysis:** On return to CMACE, data from completed forms were entered onto a secure database and placed in SPSS Statistics 19 for analysis. These datasets were transferred to research team at Cardiff University in early 2013 for analysis. Statistical analysis used 2 tests of categorical data. The Kolmogorov-Smirnoff test was used for comparative analysis where data were not normally distributed. For all tests,  $p < 0.05$  was used to denote the cut off level for statistical significance.

All the children entered into this CMACE dataset were admitted to hospital (for four hours or longer) with a head injury, of varying degrees of severity, so reflecting a broad range of patient data. The dataset does not include those children and young people who were discharged from the emergency department (ED) but nonetheless, CMACE data provide useful insights into the epidemiological profile of a significant disease, THI in the UK.

**Recommendations:** Recommendations were drawn up by consensus agreement of the Independent Advisory Group, based upon the key findings from the data analysis.

# Epidemiology of Children and Young People with THI

## Key findings

- One third of admissions to hospital with head injury were to children younger than two years of age.
- The majority of children were admitted to hospital in the early afternoon or evening.
- Ninety percent of these injuries are minor and fifty six percent of children were admitted for one night or less.
- More children from socially deprived families were admitted to hospital with head injury than for families with no social deprivation.
- 9.4% of children had an abnormality on CT scan (skull fracture and/or intracranial injury).
- The mortality rate from childhood head injury was 0.4%.

## Recommendation 1

There is currently no system for the collection of data on all forms of head injury in children.\* A future standardised data gathering exercise is recommended to fully understand the ongoing determinants of childhood head injury and to evaluate the benefits of the changes to the national trauma system and national head injury guidelines that have been introduced since the data collection time period for this study. These data could be used as baseline figures to inform such an evaluation.

\*The Trauma Audit Research Network (TARN) is a national dataset and collects data on severely injured children who stay in hospital longer than 72 hours. However the data collection will only cover a small proportion of hospital admissions for traumatic head injury in children.

## Recommendation 2

These data would support the organisation of services such that health care professionals with the skills to assess and manage very young children with traumatic head injury are available at the peak times that they present to health care services, namely afternoon and early evening.

Since these data were collected, standards for staff training and competencies have been set by a. the Intercollegiate Committee for Standards for Children and Young People in Emergency Care Settings (2012), and b. The Royal College of Paediatrics and Child Health, Facing the future (2010 updated 2015)

'A consultant paediatrician or equivalent staff, associate specialist or specialty doctor who is trained and assessed as competent to work on the paediatric consultant rota is present and readily available in the hospital during periods of peak activity, seven days a week'

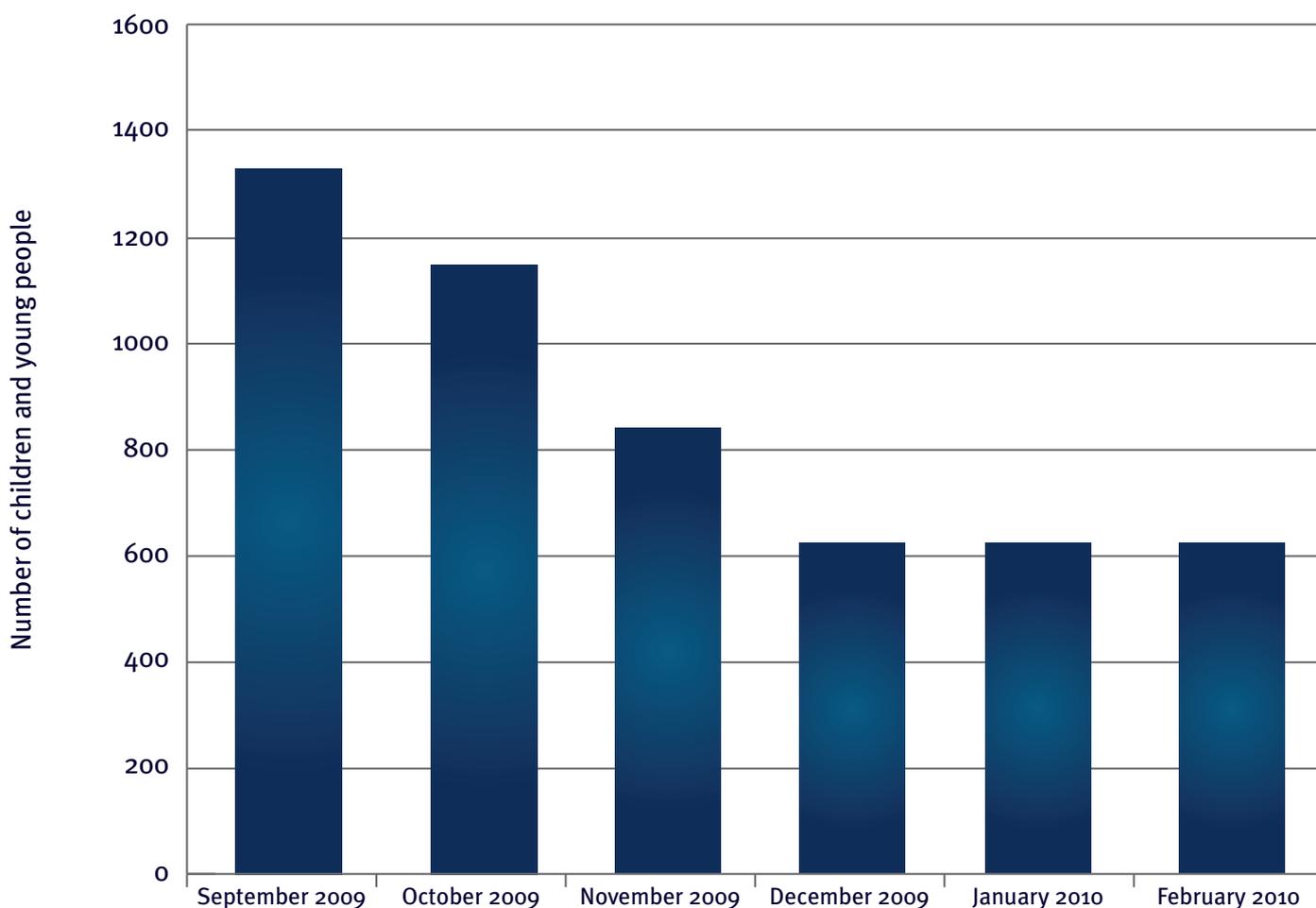
- a. [Click here to go to Royal College of Paediatrics and Child Health PDF](#)
- b. [Click here to go to Facing the Future PDF](#)

Head injury is a leading cause of hospital attendance at emergency departments for children; paediatric head injuries comprise between 33 to 50% of all head injuries seen. However, there are relatively few publications that describe the causes of head injury in children and young people across the UK, the age groups involved or document their clinical outcomes. This section provides the demographic details of the dataset. It is noteworthy that there is no national collection of data on minor or moderate head injury in the UK.

## Results

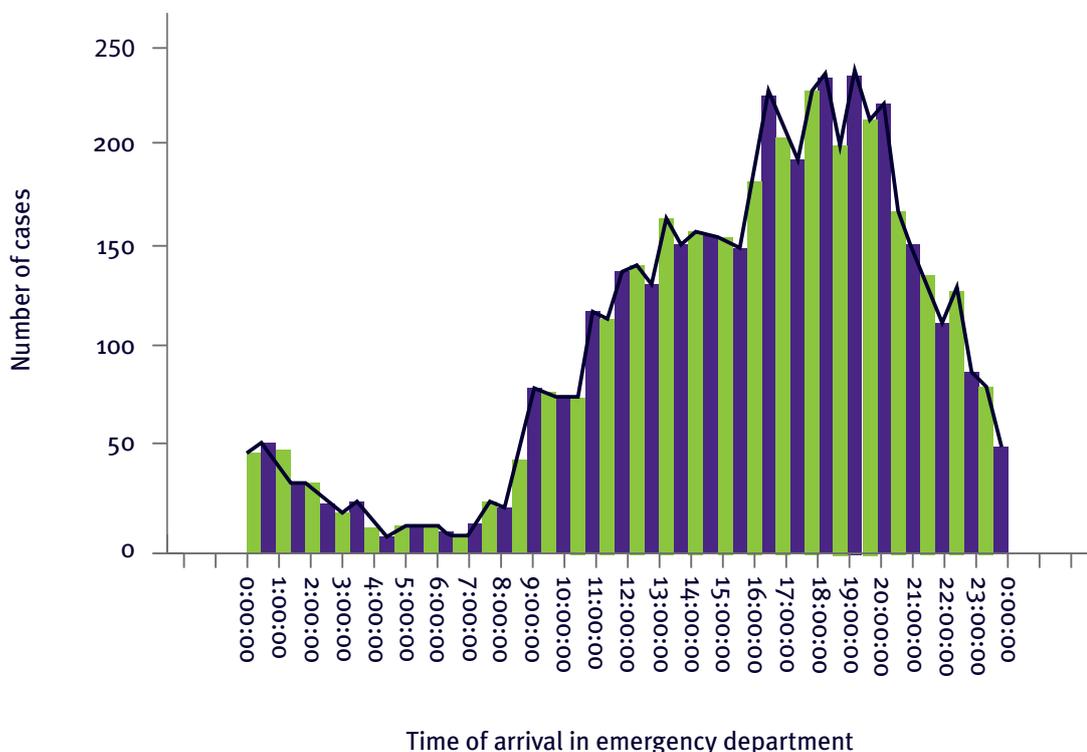
There were 5700 children admitted to hospital with a head injury during the six month study period (September 2009 - February 2010), 90% attended a hospital in England, 3% in Northern Ireland and 7% in Wales. The data collection occurred over the autumn and winter months, the number of admissions decreased over the study period (Figure 1).

**Figure 1** Number of children and young people with THI admitted by month



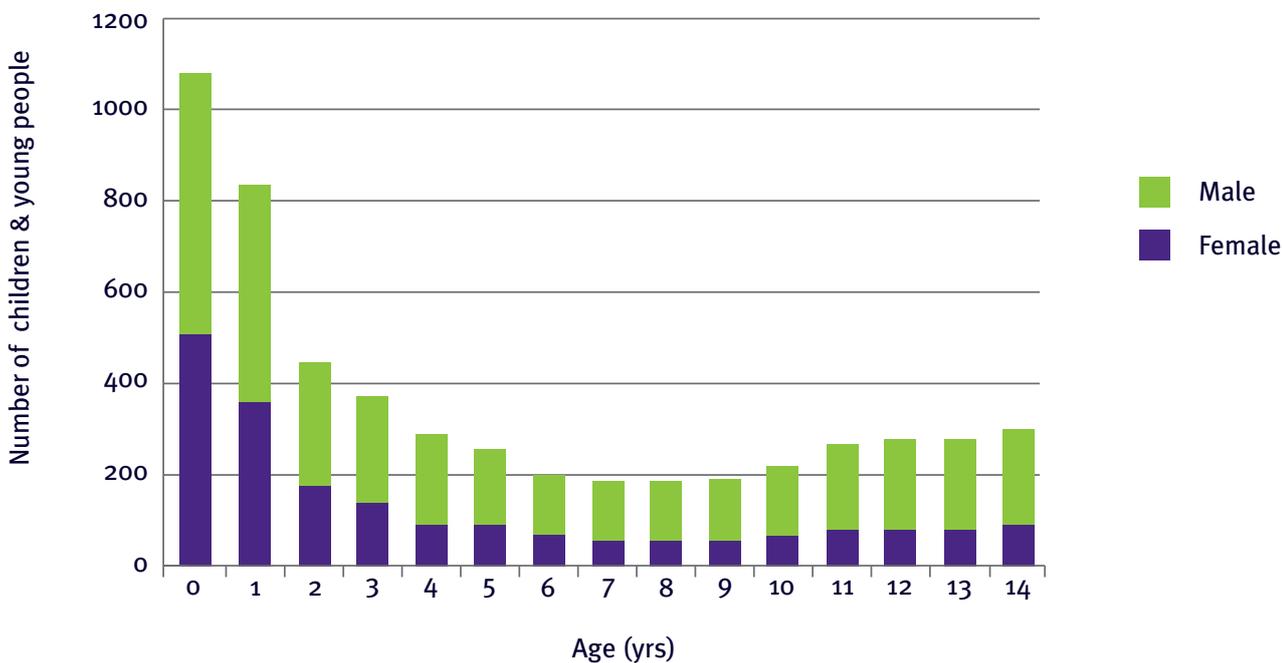
The decrease in trauma admissions in the late autumn and winter is a common feature as there is a tendency for older children and young adults to be indoors during this time and so less likely to take part in activities associated with traumatic injury. Data collected in Spring or Summer months usually reflect increasing numbers of admissions from March onwards.

**Figure 2 Time of arrival of children and young people to the emergency department**



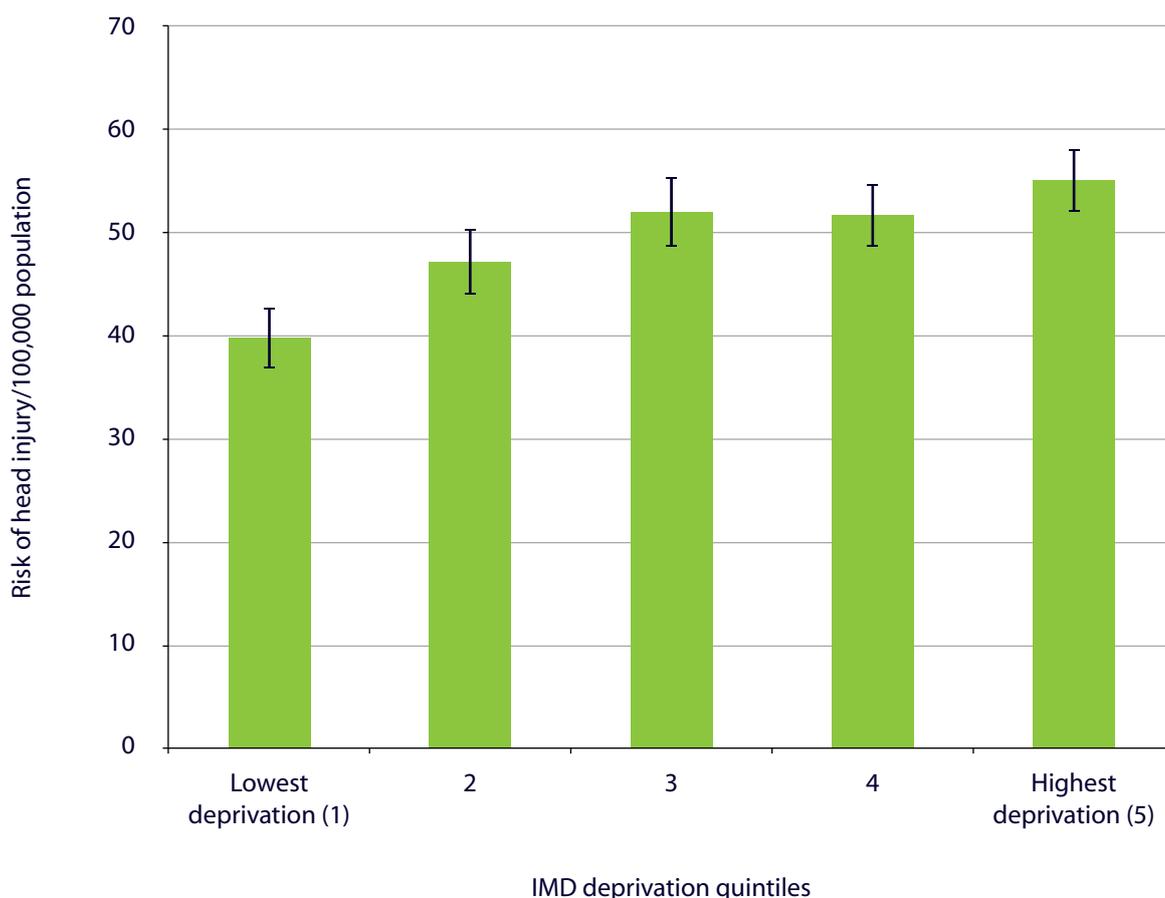
The majority of incidents leading to THI took place in the afternoon. The peak time of arrival at hospital was between 16:00-20:00 (Figure 2). This was the same for weekdays and for weekends.

**Figure 3 Age and gender of the children and young people with THI**



Children younger than 3 years old accounted for 34% of admissions. There was a male predominance (61.4%). As age increased, so did the M:F ratio (Figure 3).

**Figure 4 Index of Multiple Deprivation for children and young people with THI living in England and risk of head injury per 100,000 population.**



The impact of socioeconomic status was recorded as the index of multiple deprivation (IMD) scores which were available for 95.1% (4882) of children and young people in England. The risk of head injury increased with social deprivation (Figure 4). There were significantly fewer children with head injury in the least deprived quintile than in the rest of the population.

Whilst the majority of children and young people in CMACE data were admitted to hospital with minor head injuries, 9.4% had skull fractures or intracranial injury identified on neuroimaging. Using the length of hospital stay as a marker of severity, the majority of children and young people, 56.0%, were admitted for one night or less, and at 72 hours, only 241 (4.2%) were still inpatients.

Twenty four children and young people died, giving a mortality rate of 0.4% for this dataset. Of those deaths, five died at the scene of injury or on route to hospital, six in ED and thirteen during hospital admission. The status of 85 (1.5%) children and young people were unknown.

# The causes of traumatic head injuries (THI)

## Key findings

- Falls in the home were the most common cause of head injury amongst pre-school children.
- Infants who fall or are dropped from parent's or carer's arms are seven times as likely to sustain skull fracture or intra cranial injury than a child who falls from standing.
- Head injuries from sports, recreational activities or MVA were prevalent in older children of young persons.
- Child abuse was suspected in 4.5% of cases overall.

## Recommendation 3

Falls must be a clear priority in accident prevention interventions for infants and toddlers. These could be delivered by Health Visitors, Family Nurses in Children Centres, Flying Start programmes and through other mediums that have the capacity to reach parents of young children. A focus on falls from a parent or carer's arms, particularly when they are being carried upstairs can be justified.

In June 2014 Public Health England launched a program of work to reduce unintentional injuries in and around the home among children under five years. Falls were identified as one of five priority areas.

[Click here to go to Reducing unintentional injuries in and around the home PDF](#)

## Recommendation 4

Preventative interventions that rely upon safe sports surfaces, cycle-helmets, in-car safety and road traffic calming must be maintained. The study was not powered sufficiently to be able to comment on the effect of wearing a cycle helmet but further evaluation of the efficacy and benefits of helmet wearing would be valuable.

In June 2014 Public Health England launched a program of work to decrease unintentional injuries on the roads among children and young people under 12 years.

[Click here to go to Reducing unintentional injuries on the roads PDF](#)

## Recommendation 5

Clinicians who evaluate children with traumatic head injury must avoid a simplistic interpretation of falls and take a detailed history using a standardised proforma at the time of presentation to determine the likely risk of serious head injury and ensure that the explanation provided is plausible to exclude concerns about physical abuse or neglect.

The history must include items such as the item fallen from, the time of the injury and chronology of signs and symptoms. Other items not covered in this data set would include the estimated height of the fall, the position and activity of the child before they fell, nature of surface of impact, point of impact to the head.

These recommendations are partially incorporated in Children Protection Companion 2nd edition RCPCH 2013 and NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to RCPCH Child Protection Publications](#)

[Click here to go to NICE Head Injury Guidance](#)

Understanding the causes of THI is key to develop effective public health policies, aimed at reducing the burden of the disease entity. The following factors were examined in THI cases, as they could be amenable to primary prevention strategies: location, age of the children /young people, mechanism of injury and extent of cranial and intra cranial injury.

## Results

The greatest proportion of head injuries, 50.6%, happened at home or at a private address, 15.3% in school/nursery and 13.7% on road/street/motorway. Other locations e.g. park, swimming pool, supermarket, church etc. accounted for 11.3% of THI whilst 9.1% of the data were missing.

The causes of head injury varied by age (Figure 5). Falls were the frequent cause of THI, mostly in younger children whereas head injuries from sports and recreation activities and motor vehicle accidents (MVA) were seen more frequently in older children and young people (Table 1).

The common causes of the 361 sports-related THI were:

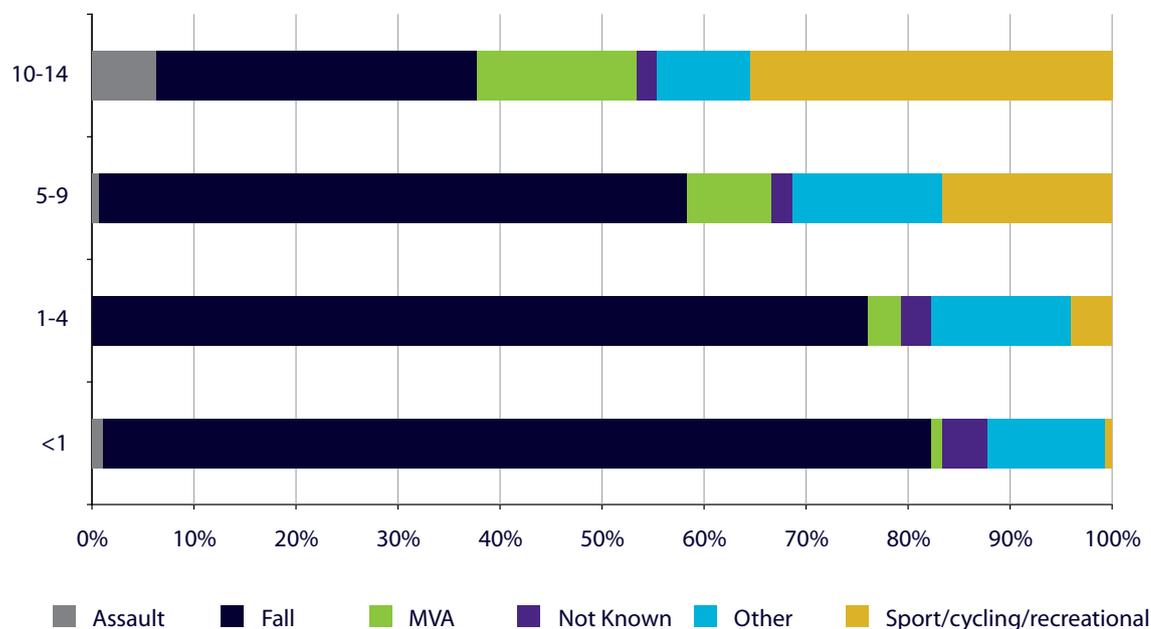
- Rugby (39.6%)
- Football (31.9%)
- Horse riding (17.2%)
- Hockey (13.1%)
- Trampolining (7.8%)

**Table 1 Causes of children & young people's THI, numbers, male: female ratio, ages with ranges in years, percentage of suspected non-accidental injury compared with the total number and the percentage of abnormal head CT scans**

Cause of injury	Number of cases (% of total cases)	Male: female ratio	Mean age (range) in years	Percentage of each cause where physical abuse suspected (number affected)	Percentage of each cause with abnormal CT head scans (number affected)
<b>Fall from height</b>					
Fall from <1m or <5 stairs	1830 32.1%	1.3:1	3.6 (0-14.9)	4.20% (77/1830)	6.20% (114/1830)
Fall from >1m or >5 stairs	1004 17.6%	1.2:1	3.9 (0-14.8)	2.70% (27/1004)	10% (100/1004)
Fall, height unknown	703 12.3%	1.5:1	5.4 (0-14.9)	3.00% (21/703)	7.80% (55/703)
<b>Motor vehicle accident (MVA)</b>					
MVA (child was not a pedestrian)	89 1.6%	1.5:1	7.2 (0-14.9)	1.10% (1/89)	21.40% (19/89)
Struck by car (child was a cyclist)	35 0.6%	3.4:1	11 (1-14.9)	0% (0/35)	28.60% (10/35)
Struck by car (child was a pedestrian)	277 4.9%	1.6:1	9.8 (0-14.9)	0% (0/277)	25.60% (71/277)
<b>Sport and recreational</b>					
Cycling	268 4.7%	4.6:1	10.5 (0.8-14.8)	0% (0/268)	12.30% (33/268)
Sport	361 6.3%	6.4:1	11.4 (0-14.9)	0% (0/361)	7.80% (28/361)
Other recreational	154 2.7%	2:1	8.3 (0.4-14.9)	0% (0/154)	13.60% (21/154)
Assault	119 2.1%	3:1	11 (0-14.9)	41.20% (49/119)	13.50% (16/119)
Other impact	703 12.3%	1.6:1	5.1 (0-14.9)	4.80% (34/703)	6% (42/703)
Missing	51 0.9%	1.4:1	6.39 (0-14.8)	0% (0/51)	2% (1/51)
Not known	106 1.9%	2.6:1	3.17 (0-14.7)	45.30% (48/106)	24.50% (26/106)
<b>Total</b>	<b>5700 100%</b>	<b>1.6:1</b>	<b>5.6 (0-14.9)</b>	<b>4.50% (257/5700)</b>	<b>9.40% (536/5700)</b>

Physical abuse was suspected in 257(4.5%) cases (with a mean age 35.5 months). They accounted for 41.2% of cases in the assault category, 45.3% of cases where the cause of injury was unknown and in 3.5% of THI that were said to have resulted from falls (Table 1).

**Figure 5 Mechanisms for THI in children and young people at different ages**



### Falls in preschool children

Falls were the most common cause of THI occurring more often in the younger children. Of 3423 children less than six years old, 76.9% sustained THI from a fall, 54.7% were boys. A detailed analysis of 1775 of these children where information about the cause and outcome were available is in Table 2 and 3.

**Table 2 : Number and proportion of 1775 children (< 6 years) who had a CT scan and CT findings by age (ICI: intracranial injury)**

Children Age	No. Children who had CT scan	Minor HI	Isolated skull fracture	ICI with/without skull fracture	Abnormal CT scan no results/	Total
<1 yr.	100/603	545	36	20	2	603
	16.4%	90.4%	6.0%	3.3%	0.3%	100.0%
1 yr.	69/429	409	14	5	1	429
	16.1%	95.3%	3.3%	1.2%	0.2%	100.0%
2 yrs.	42/250	239	3	7	1	250
	16.8%	95.6%	1.2%	2.8%	0.4%	100.0%
3 yrs.	50/199	192	2	5	0	199
	25.1%	96.5%	1.0%	2.5%	0.0%	100.0%
4 yrs.	41/152	145	3	3	1	152
	27.0%	95.4%	2.0%	2.0%	0.7%	100.0%
5 yrs.	40/142	135	0	7	0	142
	28.2%	95.1%	0.0%	4.9%	0.0%	100.0%
<b>Total</b>	<b>342/1775</b>	<b>1665</b>	<b>58</b>	<b>47</b>	<b>5</b>	<b>1775</b>
	<b>19.3%</b>	<b>93.8%</b>	<b>3.3%</b>	<b>2.6%</b>	<b>0.3%</b>	<b>100.0%</b>

The majority 1316 (74.1%) of falls occurred at home and were recorded in infants and toddlers younger than two years (Table 2).

A total of 94% of falls resulted in non-severe head injuries. Infants were at greatest risk of sustaining a skull fracture or intracranial injury (Table 2).

**Table 3 CT head scan outcome by circumstances of the fall in children younger than six years and the odds ratio OR (95% Confidence Interval) of sustaining a skull fracture or ICI from each mechanism compared to a fall from sitting or standing**

Mechanism of the fall	Mean age (SD) in years	Minor head injury (CT normal or deemed unnecessary) (%)	Skull fracture (% of total)	ICI with / without skull fracture (% of total)	Abnormal CT head scan (results not available) (% of total)	Total	Odds ratio of skull fracture or ICI compared to falls from standing or sitting	p-value
Building, building component, or related fitting	3.2 (1.6)	43 (84.3)	2 (3.9)	5 (9.8)	1 (2)	51	6.84 (2.65-17.6)	<0.001
Furniture	1.8 (1.4)	388 (95.8)	8 (2)	7 (1.7)	2 (0.5)	405	1.61 (0.76-3.41)	0.214
Infant or child product	1.8 (1.8)	334 (93)	17 (4.7)	8 (2.2)	0	359	2.75 (1.36-5.56)	0.005
Other e.g. shopping trolley, tree etc.	3.3 (1.6)	52 (92.9)	2 (3.6)	1 (1.8)	1 (1.8)	56	2.83 (0.89-9.09)	0.081
From a person's arms	1.0 (1.4)	196 (84.1)	21 (9)	15 (6.4)	1 (0.4)	233	6.94 (3.54-13.6)	<0.001
Stairs	1.9 (1.2)	211 (96.8)	2 (0.9)	5 (2.3)	0	218	1.22 (0.47-3.14)	0.682
Standing/ sitting	2.7 (1.6)	441 (97.4)	6 (1.3)	6 (1.3)	0	453	1	-
<b>Total</b>		<b>1665 (93.8)</b>	<b>58 (3.3)</b>	<b>47 (2.6)</b>	<b>5 (0.3)</b>	<b>1775</b>		

There was a relationship between the age of the children and the circumstances of their fall. Older children tended to fall from building components such as windows and attics whereas those who fell from a person's arms were the younger children, being largely under 2 years of age (Table 3).

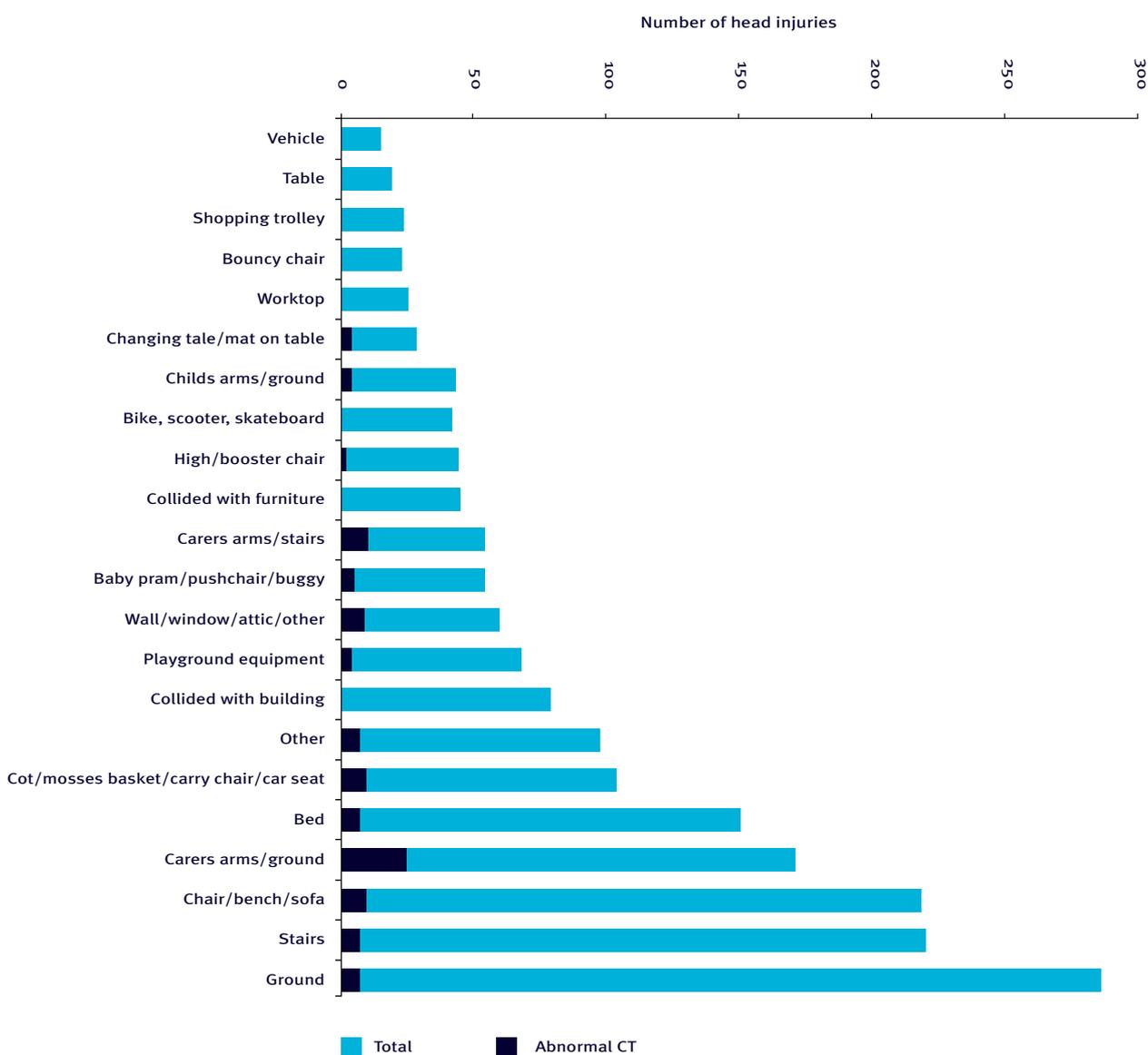
The three mechanisms with the largest proportions of abnormal CT were falls from:

1. A person's arms
2. A building or building component e.g. wall, window, stairs
3. An infant or child product such as from a changing mat, buggy, pushchair.

A child who was dropped or fell from a person's arms had a seven times greater risk of sustaining a skull fracture or ICI than a child who fell from standing.

The proportion of children who sustained skull fracture or ICI was even greater if the child was dropped from a person's arms when being carried on the stairs 23.3% (95% CI 13.2-37.8%) (10/43) vs. 14.2% (95% CI 10-20%) (27/190). Falls from parents arms, particularly when they are being carried upstairs are complex injuries. The infant head may impact the floor at an angle exerting rotational forces on the head and subsequently result in a skull fracture or intra cranial injury. These are important factors for preventative advice that can be given by health visitors and other healthcare workers.

**Figure 6 The objects from which children and young people fell (noting abnormal head CT scan results)**



Falls downstairs were responsible for a significant number of hospital admissions, (Figure 6) however, these patients were no more likely to have a skull fracture or ICI than if they fell from standing (Table 3).

These factors can be useful as an educational tool in preventative schemes aimed at reducing injury in children and young people, as the relative risk of different situations can be considered.

## Motor Vehicle Accidents

The proportion of children who suffered MVA was lower than previous studies; pedestrian related injuries continue to predominate. Whilst these figures would fit with the general reduction in MVAs (Arbogast 2013) caution is needed when interpreting them due to the study taking place during autumn and winter months. MVAs continue to have the greatest associated morbidity. Of the children with abnormal CT scans 18.6% had suffered an MVA.

# The early management of THI: pre-hospital setting

## Key findings

- Nearly a third of children with head injury were transported to hospital by ambulance. A small proportion (2.7%) were taken by air ambulance.
- 73.4% of children taken to hospital by ambulance had an apparent non-serious head injury (GCS 15 or Alert on AVPU).
- 39% of children with impaired levels of consciousness did not arrive at hospital by ambulance (e.g. travelled by private car) and have the potential to deteriorate on the journey without early care by ambulance staff or paramedics.
- Half of the children taken to hospital by ambulance were younger than five years of age.

## Ambulance call out and transfer times

- Ambulance arrival times at the scene fell well below national targets. For the most seriously injured children (GCS $\leq$ 12) less than half of the ambulances arrived at the scene within eight minutes. Overall 89% arrived within 19 minutes.
- The overall median time from ambulance call to arrival at hospital ED for road ambulance was 48 minutes and for air ambulance was 67 minutes. This time exceeded an hour for one in four cases. Children with lower GCS scores were transported from the scene of injury more quickly than those with a GCS of 15.
- Whilst travel time by air ambulance was significantly longer than by road ambulance, the children transported by air were more likely to be taken to a neurotrauma centre or children's hospital.

## Facilities in admitting Hospitals

- Overall one in five of the children taken to hospital by ambulance were managed in a neurotrauma centre.
- Of children with impaired consciousness (GCS $\leq$ 12), 34% were taken to, and managed in a general hospital with no PICU. 29% were taken to a neurotrauma centre and 36.5% reached the neurotrauma centre after a hospital transfer.

## Admission times for hospital transfers

- The median time between admission to the first hospital and arrival at a second hospital; (most frequently a neurotrauma centre) was 7.9 hours.
- Inter-hospital transfers were undertaken by specialist PICU teams in a minority of cases which would not comply with current standards.

## Clinical monitoring:

- Whilst GCS, airway status, respiratory rate, heart rate and capillary reaction were recorded in more than 75% of cases during ambulance journeys, equipment dependent measures of blood pressure and oxygen saturation were recorded in fewer than 40%.
- Oxygen was not administered to all children with impaired levels of consciousness (78.4% if GCS  $\leq$ 8, 61.8% GCS (9-12), 34.5% GCS (13-14)).
- Four of 55 children with GCS  $\leq$  12 who were intubated when they reached the hospital had been intubated by ambulance staff.

## Recommendation 6

It is essential that ALL ambulance crews and clinicians who first see a child with a traumatic head injury are trained to recognise children who have potentially serious head injury early to ensure that they are managed in centres that can provide the appropriate level of care to optimise outcome.

In 2015: All Major Trauma Networks have triage and by pass criteria to enable rapid and safe transfer of children to the most appropriate hospital.

[Click here to go to NHS Major Trauma PDF](#)

[Click here to go to JRCALC Guidelines](#)

and NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance](#)

## Recommendation 7

All ambulance staff should be trained and ambulances fully equipped with age appropriate equipment to assess and manage young children with traumatic head injury. This would include age specific blood pressure, oxygen saturation monitoring equipment and face-masks to administer oxygen to small children.

## Recommendation 8

Ambulance teams require further training in the importance of administering oxygen to children with traumatic head injury and impaired levels of consciousness.

[Click here to go to JRCALC Guidelines](#)

‘Oxygen should be administered routinely whatever the oxygen saturation in patients (children) sustaining major trauma’.

### **Recommendation 9**

All children with traumatic head injury and impaired consciousness should be transported to hospital quickly and by ambulance to optimise their early management. Members of the public, especially parents and youth workers should be alerted to the signs of serious head injury and the importance of calling an ambulance. This requires targeted explicit education to avoid flooding the system with unnecessary calls. Effective triage of emergency calls to identify serious head injury should be reinforced.

NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance \(Section 1.1\)](#)

### **Recommendation 10**

Ambulances transporting children with serious head injury must adhere to triage and by-pass criteria that are now in place for all Major Trauma Networks. Children should be transported to the appropriate Children's Major Trauma Centre or nearest Trauma Unit (accounting for the geography of the 'Network') to optimise prompt health care and reduce the time taken for children to reach appropriate services.

This recommendation has been reinforced by the changes to the organisation of trauma services in England and North Wales. The announcement of the major trauma centres by the government, 6th April 2012

[Click here to go to NHS Major Trauma PDF](#)

### **Recommendation 11**

Retrieval teams for children with traumatic head injury must be established to ensure children get to the appropriate hospital for their level of need according to the severity of their head injury. Specific provision must be made for rapid transfer in rural areas where the time to get the child to a specialist unit would exceed an hour. This is likely to involve air ambulance retrieval.

This recommendation is reinforced in the changes to the organisation of trauma services in England and North Wales.

[Click here to go to NHS Major Trauma PDF](#)

For tertiary prevention to be most effective, optimum care must start in the pre-hospital phase. This means that children or young people with head injury receive the most appropriate to ensure, maintenance of satisfactory tissue oxygenation and perfusion to minimise any subsequent effects of the traumatic episode. The accurate assessment of the severity of their injury will determine how seriously affected they are and where the best place for their ongoing management should be. These are important processes that are useful in determining the quality of the service delivered and can serve as benchmarks against which current practice can be assessed.

## Results

Of the 5700 children admitted to hospital, 31.6% (1801), were transported to hospital by ambulance. Air ambulance accounted for 2.7% (49) of these cases.

Of the 93 children with a GCS of  $\leq 8$  recorded in the ED, 81.7% were taken to hospital by ambulance versus 60.5% of the 507 children with GCS=9-14 and 29.5% of the 3582 children with GCS=15. A greater proportion of air ambulance cases had GCS<15, 43.9% (21/49), vs. 23% (406/1752) of road ambulance cases.

Of the 1801 children, 43.7% were recovered from the home and 28% from the roadside or a motorway. The age profile of ambulance cases followed that of the overall study population, where a significant proportion, (47%), of the children and young people were less than five years of age; 63.2% were boys.

Transportation: Most emergency calls to the Ambulance service were made in the afternoon and early evening, the peak time being at 16.00 hours. There was no relationship between the timing of the emergency call with the age of the child, the day of the week or the GCS at initial assessment (i.e. at the scene)

## First professional on the scene and time of arrival of Ambulance

The first professionals on the scene were described in 654 cases:

- 34.5%, ambulance crewed by paramedics.
- 25.8% paramedic and emergency medical technician ambulance crew.
- 11.7%, emergency medical technician ambulance crew.

- 1.2%, healthcare professional.
- 8.6% rapid response vehicle with paramedic.
- 0.5%. St John's Ambulance responder.

“The standards required that all Ambulance Services would be expected to reach 75% of immediately life-threatening calls within 8 minutes irrespective of location and that all incidents that require a fully equipped Ambulance vehicle (car or Ambulances) must have a vehicle, able to transport the PATIENT in a clinically safe manner (Emergency Ambulance), arrive within 19 minutes of the TRANSPORT REQUEST being made in 95% of cases)” (Ambulance service dataset)

With respect to the most serious head injuries, GCS $\leq 8$  as subsequently assessed at scene, 44.4% of ambulances arrived within 8 minutes. A GCS score of less than 8 would trigger concerns about the patient being able to protect his or her own airway. This figure was 48.6%, if GCS was 9-12.

The median time for road ambulances to arrive at the scene was 9 minutes (range 0-70) whilst for air ambulance services, this was 11 minutes (range 4-31). Overall, 88.7% of ambulances arrived at the scene within 19 minutes of the call being received by the dispatcher. Ambulance arrival times at the scene fell well below national targets.

These findings are consistent with the trend of decreasing matching of targets for emergency vehicles to reach their destination with the standard 8 minute period. Reported by Health Foundation/Nuffield Trust Foundation, for the period April 2011-June 2014. (Quality watch) ‘There has been a steady decline in the number of Category A calls attended within eight minutes over the past three years. In particular, there has been a substantial decrease in performance since March of this year, although most of this change has been driven by London Ambulance Service. The national target of reaching 75% of Category A calls within eight minutes has been breached in six out of seven months this year.’ At the same time the number of ambulance calls had increased significantly

There are multiple factors involved in the failure of the timely arrival of an emergency response vehicle but what precisely they are is unclear (Quality watch: Ambulance response times).

## Glasgow coma score and its influence on the mode of transport

The GCS was recorded at the scene for 89.6% of the 1801 cases. The majority of children (73.4%) taken to hospital by ambulance had a potentially non-severe head injury (i.e. with GCS of 15).

The detailed data collection proforma C (Appendix) was completed for 798 (44%) of the ambulance transfers and a detailed analysis of the data is provided (Table 4).

**Table 4 The times of; arrival, duration of remaining on scene, transportation to the ED and overall time spent with NHS prehospital services for children and young people with head injury according to GCS, regional ambulance service and Health Region.**

	n	Time to arrive Mean (SD) Median	n	Time at the scene Mean (SD) Median	n	Time to ED Mean (SD) Median	n	Overall time Mean (SD) Median
GCS ≤ 8	36	10.42 (7.6) 8	36	19.83 (13.5) 16	35	18.51 (9.0) 16	33	48.36 (20.9) 44
GCS 9-12	37	8.51 (3.9) 8	35	17.49 (9.5) 15	34	17.29 (9.04) 17.5	37	43.59 (14.5) 43
GCS 13-14	83	10.07 (7.7) 9	85	18.72 (10.2) 17	91	27.69 (37.3) 23	86	56.45 (40.9) 48.5
GCS 15	458	11.01 (8.8) 9	496	18.17 (12.1) 15	468	23.29 (13.6) 21	448	52.26 (20.3) 49
<b>Health Regions</b>								
Midlands and East England	127	9.28 (7.77) 7	127	22.55 (12.9) 21	126	26.0 (32.5) 23	124	58.29 (35.3) 52
Wales	49	13.86 (10.92) 10	88	15.02 (9.7) 12.5	82	23.37 (18.8) 20	48	54.69 (26.34) 47.5
London	162	12.4 (8.26) 10	155	21.74 (13.5) 18	146	21.66 (10.9) 19.5	153	54.92 (19.34) 53
North England	274	10.21(8.4) 8	151	14.15 (8.4) 12	148	22.57 (12.2) 21	153	47.56 (20) 44
South England	37	10.68 (6.92) 9	37	22.14 (14.0) 21	32	24.66 (15.1) 21.5	37	52 (21.76) 53
N Ireland	28	9.86 (7.39) 9.5	26	15.08 (7.98) 13.5	25	24.96 (13.8) 21	26	49.38 (18.18) 43
<b>Ambulance services</b>								
Welsh	57	13.89 (11.3) 11	92	14.89 (9.3) 12	88	25.86 (19.3) 21.5	56	57.59 (26.18) 51
South East Coast (NHS)	23	11.2 (7.3) 10	22	24.5 (16.1) 22.5	17	22 (15) 18	23	50.39 (21.24) 51
Yorkshire (NHS)	58	10.64 (7.7) 9	60	15.03 (7.1) 15	60	22 (9.2) 22	60	47.4 (14.56) 46
North West (NHS Trust)	134	10.4 (9.4) 8	132	12.94 (7.7) 11	129	22.76 (12.5) 21	136	46.21 (19.58) 41
East Midlands (NHS Trust)	15	10.7 (7.1) 10	24	13.83 (9.3) 11.5	23	24.26 (11.3) 22	14	44.7 (18.43) 41
N Ireland (NHS Trust)	28	9.86 (7.4) 9.5	26	15.08 (8) 13.5	25	24.96 (13.8) 21	26	49.38 (18.18) 43
West Midlands	101	7.92 (5.7) 6	96	22.98 (13.2) 21	93	21.47 (10.7) 22	99	52.79 (17.9) 51
South Central (NHS Trust)	8	7.88 (5.0) 5.5	9	17.2 (11.6) 17	9	21.67 (18.2) 19	8	43.25 (21.93) 41
North East	47	7.77 (6.4) 6	51	15.69 (10.1) 12	52	19.56 (13.2) 17	48	44 (17.46) 42.5
Lancashire	1	7	1	22	1	5	1	34
London NHS ambulance	151	12.43(8.1) 10	142	21.63 (13.55) 17.5	134	21.8 (10.8) 19.5	143	55 (18.7) 54
East of England	4	24.25 (16.9) 21	7	14.86 (6.2) 13	6	38.83 (17.6) 35	4	82.5 (33.59) 82.5
Great North air	1	23	1	43	1	21	1	87

The median time spent at the scene for road ambulance was 15 minutes (range 0-91 minutes), and for air ambulance, it was 28 minutes (5-63 minutes). These times did not vary significantly with respect to GCS severity, but the length of time spent at the scene was longer (median 19 minutes) if the children or young people had associated major injuries over and above the head injury.

The median time between air or road ambulance leaving the scene and arriving in ED was 21.0 minutes. The time to get to ED from the scene was shorter for children and young people with serious THI with  $GCS \leq 12$  than for those with  $GCS > 12$  (Table 4, Figure 8).

The overall median time from ambulance call to arrival in ED at hospital for road ambulance was 48 minutes and air ambulance was 67 minutes (28-121 minutes).

The overall times of each leg of the ambulance transfer varied between ambulance authorities (Table 4). However, the numbers were small for some regions, and it was not possible to account for distances travelled.

In 27.7% (185/668) of cases, the time from ambulance call to arrival in ED time exceeded 60 minutes. There may be a variety of reasons for this, e.g. if children or young people are trapped in a vehicle, it may take time to extract them so that they can be safely removed. Throughout this time, the children and young people should be receiving care from pre-hospital healthcare staff. There may have been other causes such as delay in dispatch, ambulances not being able to approach the scene because of hazards or that access was difficult as a consequence of the emergency.

## To what type of hospital were the 798 children and young people taken to?

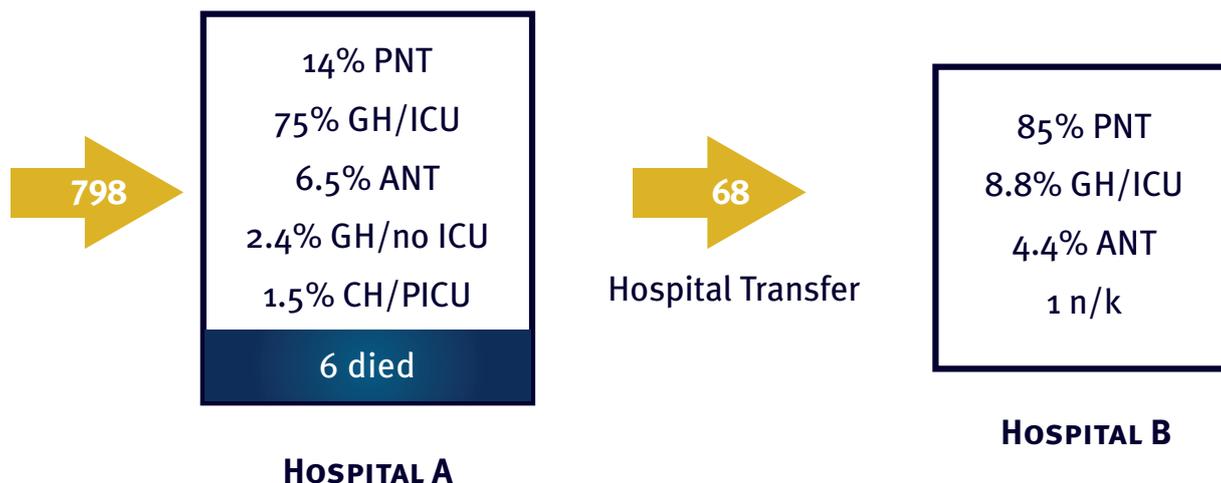
**'Isolated severely head injured patients (GCS 8 or less) should ideally be transferred to a neurosciences centre to receive treatment irrespective of any need for neurosurgical operation instead of receiving treatment at an acute care centre for initial assessment' (NICE 2007)**

Proportionately more children and young people, 67.5% (95%CI 53.4-78.8), (33/49) were taken to a neurosurgical centre or designated children's hospitals by air ambulance than those conveyed by road ambulance, 29% (95%CI 26.9-31.2), (508/1752). The standard operating procedure for most air ambulance services was to co-ordinate with these major hospitals and many therefore took patients there based on the initial pre-hospital assessment and discussion with local services.

## Subsequent management of 798 of children and young people

- 91.5% (730) remained in the first hospital to which they were admitted.
- 66% (530) were taken to, and were completely managed in a general hospital.
- 21.3% (170) children were ultimately managed at a hospital with paediatric neurosurgery facilities, 34% (58) of these reached the neurosurgical centre after an inter hospital transfer.
- 6.9% (55) were managed at a hospital which had adult neurosurgery services.
- Of 85 children with  $GCS \leq 12$  assessed by the ambulance team, 34.1% (29) were taken to and managed in a general hospital without PICU or neurosurgery facilities, the 56 remaining cases were ultimately managed in a neurosurgical centre. 36.5% (95%CI 27-47) 31/85 of these children experienced a hospital transfer compared to 5.5% (95%CI 4-7) of those with  $GCS > 12$ .

**Figure 7: Health care facilities at hospitals where children and young people (transported by ambulance) were admitted. General hospital with intensive care unit facilities (GH/ICU), General hospital without ICU (GH/no ICU), Hospital with adult neurotrauma (ANT), hospital with paediatric neurotrauma facilities (PNT), Children Hospital or Unit with PICU (CH/PICU). Hospital were classified according to the children's, neurosurgery or intensive care facilities available.**

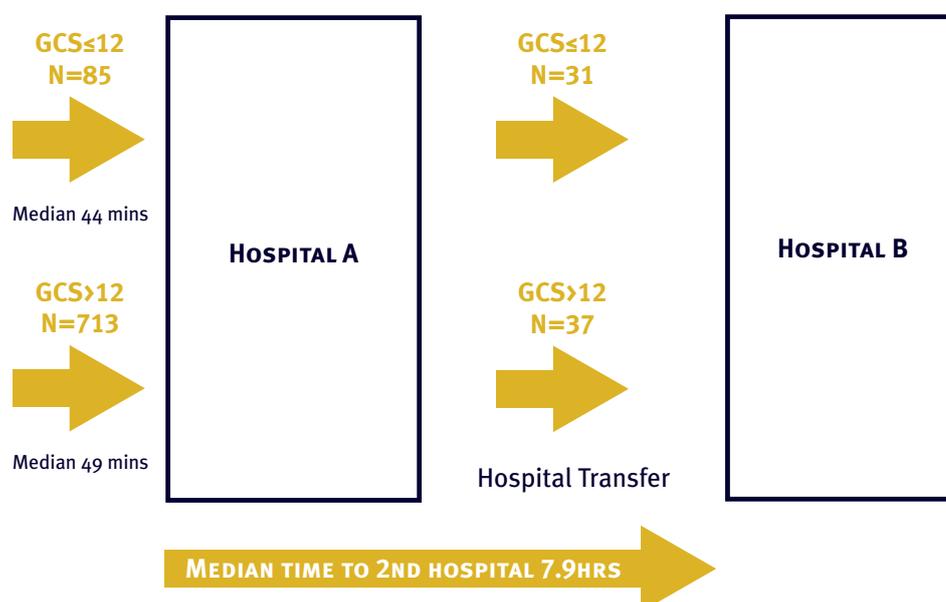


### Inter-hospital transfers

The median time for the 68 children between leaving the first hospital and arriving at the specialist centre in another hospital was 70 minutes (range 0.25-4.75 hours).

The median time between the original call for emergency ambulance services and arrival at the second hospital for definitive care was 7.9 hours (range 3.26-31 hours).

**Figure 8 Median times of arrival to the first hospital by ambulance and time taken for transfer to the second hospital according to GCS of greater or lesser than 12**



Inter-hospital transfers were undertaken by a specialist PICU team in 16 (23.5%) cases, by paramedics with road ambulance for 32 children and young people (47%), and 14 (20.6%) by local ambulance crew or non-paramedic. The details of who accompanied the children and young people were not stated in 6 cases.

Figure 8 shows that children and young people with a lower GCS did arrive at hospital by ambulance more quickly than those with a higher GCS (GCS > 12), 36.5% of children with GCS ≤ 12 were involved in a secondary transfer.

## Clinical monitoring and management in the pre-hospital setting

The frequency of the following clinical measures were recorded in children and young people with THI:

- Glasgow Coma Score 90%
- Airway status, respiratory rate, heart rate and pupillary reaction 75%
- Capillary refill time 62%
- Blood pressure and peripheral oxygen saturation 42%

**‘High concentration oxygen should be administered routinely whatever the oxygen saturation in patients (children) sustaining major trauma’ (guidance produced by the JRCALC at the time).**

Oxygen administration was recorded in 86% (686/798) of all children and young people with THI.

According to the GCS, oxygen was given to:

- GCS ≤ 8 78.4% (29/37)
- GCS (9-12) 61.8% (21/34)
- GCS (13-14) 34.5% (29/84)
- GCS=15 12.6% (59/469)

Four children and young people with GCS ≤ 12 were intubated by ambulance staff and 55 children and young people were intubated when they reached the hospital, 32 of whom were transferred to a second hospital; 15 by PICU specialist team, eight by paramedic transfer and eight by local team (in one case this information was not recorded).

# The early management of THI:

## Hospital management

### Key findings

- All children were assessed at the first hospital they were taken to and 6.8% were transferred to a second hospital.
- 4.6% of children re-attended hospital after discharge with ongoing concern about the head injury, the majority within a day of first attendance.
- The majority (84%) of children were admitted to a general hospital.
- Overall 13.4% were admitted to hospitals with paediatric neurotrauma facilities. One third of these children were admitted to the neurotrauma centre after a hospital transfer.
- 50% of children with GCS $\leq$ 8 required hospital transfer to reach a specialist centre, 22.6% of children with GCS $\leq$ 8 were managed in a general hospital.
- The majority (73.5%) of children were first assessed by a member of ED staff.
- The median time between arrival in ED and the child's first clinical assessment was 43 minutes (IQR 18-78 minutes).
- The median time for first assessment of children with GCS $<$  14 was 15.0 minutes (range 0-219 minutes).
- 75% of clinicians who first saw the child were trainee doctors 7.7% were consultants.
- The proportion of children seen by consultant increased with increasing level of impaired consciousness, 52% of children with GCS  $\leq$  8 were first assessed by consultant.
- The designated lead team was General paediatrician in 71.5%, an adult clinician in 11.4% and specialty paediatric, emergency, surgery or intensive care teams in 9.3%.
- In ED at the first hospital attended GCS was recorded for 73.4% of the cases. (Individual component GCS scores were not recorded for 26% of these cases).
  - GCS and AVPU for 30.5%
  - AVPU only for 17.3%
  - No formal recording of conscious level in 9%
- In ED at the first hospital attended GCS was recorded for 4182 (73.4%) of the cases.
  - 87.5% (3582) had a GCS=15,
  - 9.4% (393) had a GCS=13-14,
  - 2.7% (114) a GCS=9-12
  - 2.2% (93) had GCS $\leq$  8.
- 60% of children with GCS  $\leq$  8 were intubated, half of whom were intubated post hospital transfer.
- Hospital transfers: 35% of transfers were by non-paramedic, 40% by paramedic ambulances and 13.2 % by specialist PICU retrieval teams. Only 27% of children with impaired levels of consciousness (GCS $<$ 15) were transferred by specialist retrieval teams.

### **Recommendation 12**

All children with a traumatic head injury should be assessed by a health care professional who has been trained in the assessment and management of childhood trauma. Many of these children are very young and the assessment of neurological impairment differs considerably from that in adults.

NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head Injury Guidance](#)

### **Recommendation 13**

When hospital transfer to a Major Trauma Centre is required, the proportion of Inter-hospital transfers undertaken by PICU retrieval teams should be improved.

[Click here to go to UK PICS Standards \(2010\)](#)

### **Recommendation 14**

Children with impaired levels of consciousness should be safely transferred to Children's Major Trauma Centre by appropriately trained staff utilising the Network transfer criteria and transport system.

This recommendation is embedded in changes to the organization of trauma services in England and N Wales.

[Click here to go to NHS Major Trauma PDF](#)

### **Recommendation 15**

A small proportion of children re-attended hospital post following traumatic head injury. This reiterates the need for all parents to receive information about the risk factors that mean patients need to return to the emergency department.

Guidance on information to be provided to parents is available in NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Head injury Guidance \(Section 1.9.11\)](#)

### Recommendation 16

Clinical pathways and clinical training needs to ensure that the following standards are improved in ED for children with traumatic head injury with all levels of neurological impairment.

- Quicker time taken to assess children in ED with head injury.
- Recording of Glasgow Coma Score (GCS) with details of component scores in all cases.
- Early intubation of children with GCS  $\leq$  8.

This recommendation is reiterated by the changes to the organization of trauma services in England and N Wales, in managing injured patients.

[Click here to go to NHS Major Trauma PDF](#)

These standards are set within the NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go to NICE Guidance \(Sections 1.2, 1.3, 1.7.13\)](#)

### Recommendation 17

In patients with a GCS less than or equal to 8, there should be early involvement of an anaesthetist or critical care physician to ensure that early, appropriate intubation and ventilation or oxygen is instigated when appropriate.

This recommendation is embedded in the NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

### Recommendation 18

All children with impaired consciousness should have an early assessment by a consultant grade doctor, a consultant with paediatric training should be involved in their care and there should be access to a neurosurgical team.

This recommendation is embedded in the changes to the organization of trauma services in England and North Wales. Trained trauma teams are now based in the major trauma centres.

[Click here to go to NHS Major Trauma PDF](#)

### Recommendation 19

It is increasingly recognised that children with minor traumatic brain injury can suffer from post-concussion syndrome and long term behavioural and emotional consequences. Provision for this must be made within the ongoing management of the majority of children who present with head injury.

This is referred to in the NICE Head Injury Guidelines CG176 published 2014: Triage, assessment, investigation and early management of head injury in children, young people and adults.

[Click here to go NICE Head Injury Guidance \(Section 1.9.12\)](#)

NICE guidelines in 2007 set several standards for the management of children with head injury once admitted to hospital. Where possible this report describes the extent to which these standards were met.

### Hospital facilities where the children were admitted

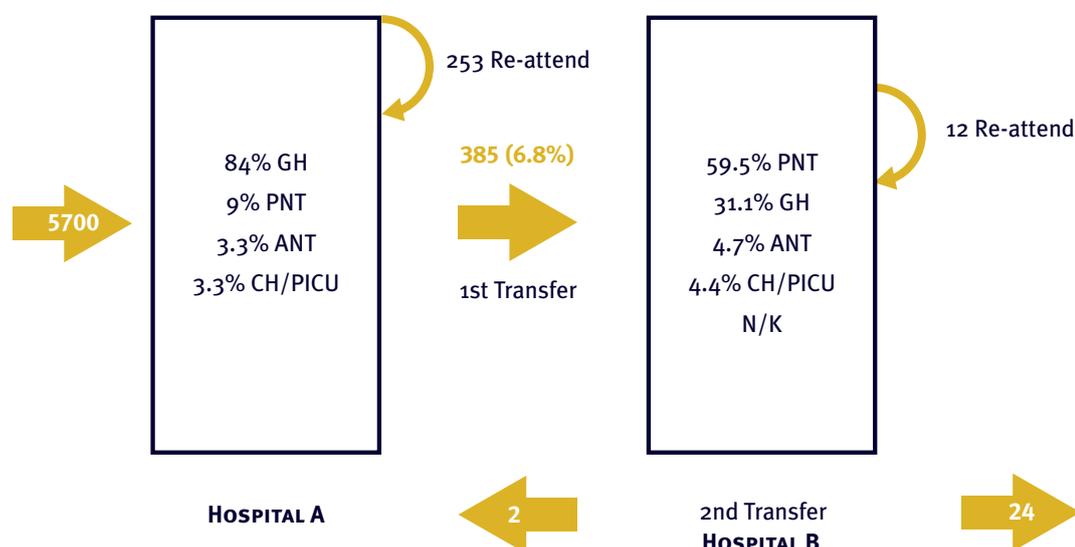
“Patients who have sustained a head injury should be transported directly to a facility that has been identified as having the resources necessary to expeditiously assess and intervene to optimise outcome. It is expected that all acute hospitals accepting patients who have sustained a head injury

should have these resources, and that these resources should be appropriate for the patient’s age” (NICE 2007)

The majority of the 5700 children and young people were admitted to the first hospital that they were taken to for one night or less, 84% were general hospitals, whilst 6.8% of children and young people were transferred to a second hospital to access specialist neurosurgery services. (Figure 9) The majority of interhospital transfers, 80% (308/385), were made directly from the ED. The remaining transfers were 42 children and young people transferred within 24 hours whilst 35 who were transferred more than 24 hours later.

**Figure 9 Hospital type (according to facilities available) where children were admitted Hospital A (first hospital) hospital B second hospital transfers**

General hospital (GH), Paediatric neurotrauma facilities (PNT), Adult neurotrauma (ANT), Children hospital with paediatric intensive care (CH/PICU)



Overall, 20.6% (1176) children and young people were treated in a specialist centre (paediatric or adult neurosurgical centre, or hospital with PICU).

- Paediatric neurosurgical centre 13.4% (766)

(Over a third, 34% (229), of whom were patients transferred in from their first hospital of admission).

- Hospitals with PICU 9.8% (206)
- Hospitals with adult neurosurgical centres 5.6% (204).

Of 93 children and young people with GCS $\leq$ 8, 26.9% (25) were treated in a specialist neurosurgical centre or hospital with PICU where they were first taken, 50% (47) were transferred to a second hospital, with 22.6% (21) being managed in a general hospital.

A small (4.6%), but significant, proportion of children and young people re-attended hospital after discharge owing to concern about the head injury. The majority re-attended within a day of first attendance.

## Assessment and management of children and young people

### How quickly were children and young persons assessed?

“All patients presenting to A&E with a head injury should be assessed by triage by a trained member of staff within a maximum of 15 minutes of arrival at hospital.” (NICE 2007)

The median time between arrival in ED and the child’s first clinical assessment was 43 minutes (IQR 18-78 minutes) (Figure 10). Only 18.5% of the cases (n=2988) fulfilled the standard whereby children should be assessed within 15 minutes. For children and young people with GCS of 15, it was 46.0 minutes (range: 0-12 hours).

“Patients presenting to A&E with impaired consciousness (GCS less than 15) should be assessed immediately by a trained member of staff (for example, triage nurse).” (NICE 2007)

The median time for first assessment of those with GCS<14 was 15.0 minutes (range 0-219 minutes). Thus few were seen immediately.

### Clinician who first saw the child or young person with THI

The designation of the clinician who first saw the patient with THI was available for 75% of reported cases.

The clinician grade first seeing the children and young people was a consultant in 7.7% of cases and 49.6% were seen by foundation or trainee doctors. The majority (73.5%) were assessed by a member of the ED staff (Table 5). In a few cases, anaesthetists or critical care physicians were listed as the first attending clinician.

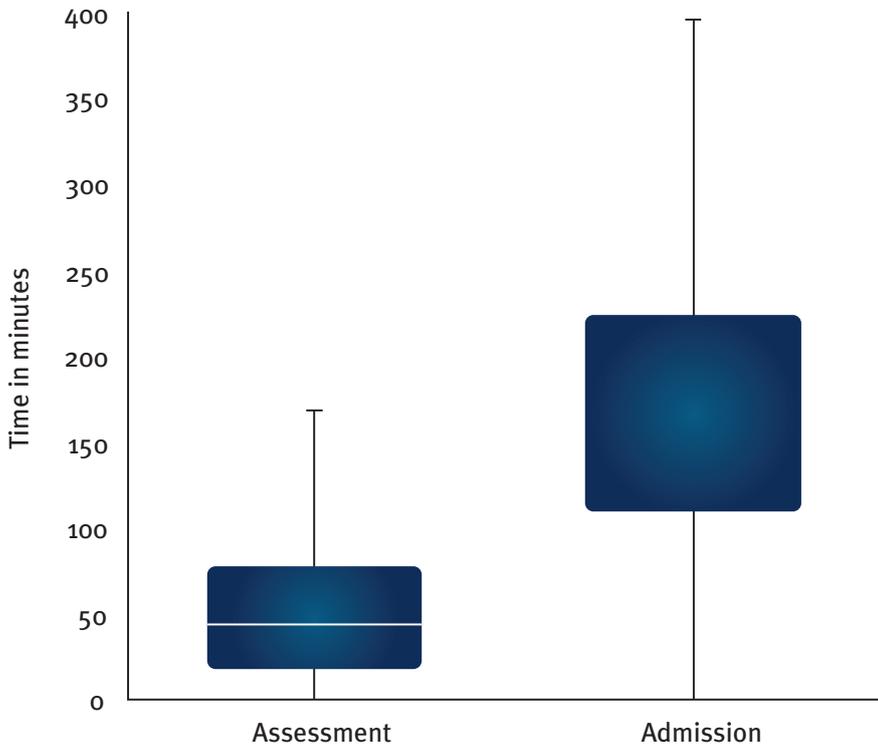
The proportion of children and young people seen by a consultant for the first assessment increased as the degree of neurological impairment worsened. However, the first assessment was not undertaken by a consultant for 48% of the children and young people with a GCS $\leq$ 8 in the ED.

Following the first assessment, 1846 (32.4%) of all patients were referred to a more senior member of medical team and 3845 (67.5%) to another speciality.

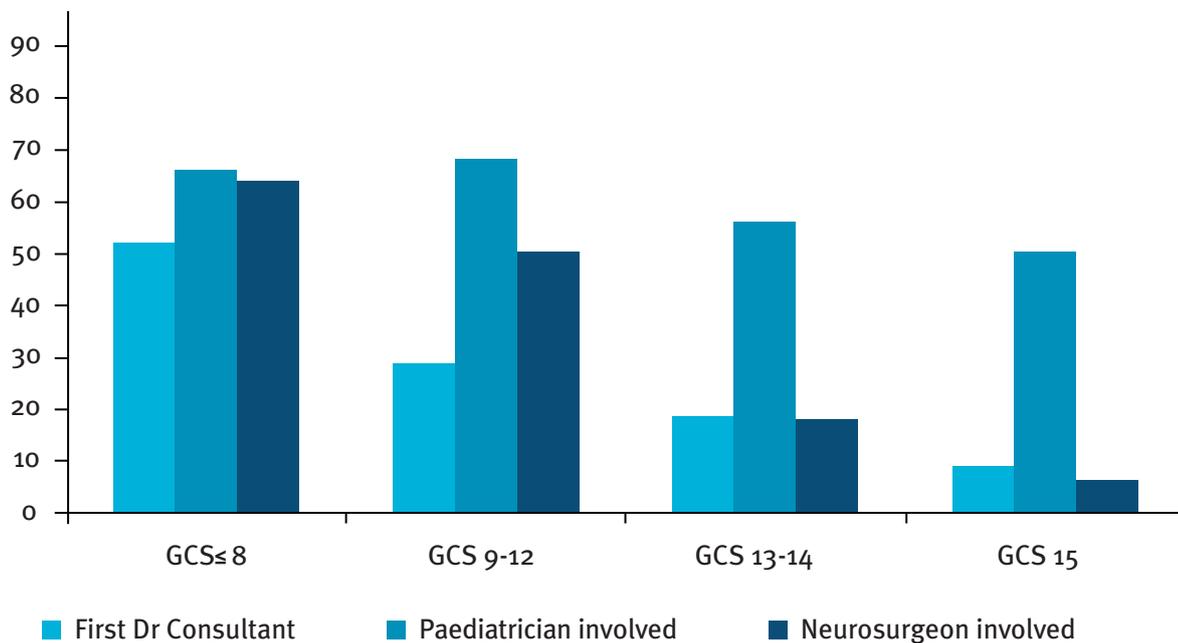
**Table 5 Designation and specialty of the first clinician to see the children and young people with THI**

Clinician grade performing the first assessment	Number of children and young people	Percentage of the total number of children and young people with THI
Clinical Fellow/Associate specialist	227	4.0
Consultant	439	7.7
Foundation training	1049	18.4
GP	45	.8
Locum	7	.1
Nurse (other)	50	.9
Nurse practitioner	123	2.2
Speciality training/ specialist registrar	1781	31.2
Staff grade	527	9.2
Missing	1452	25.5
Total	5700	100.0
<b>Clinician Specialty</b>		
Anaesthetics	8	.1
Critical care medicine	2	.0
Paediatric intensive care	6	.1
Emergency medicine	4191	73.5
General medicine	104	1.8
Paediatrics	690	12.1
Other medical specialty	16	.3
Surgical specialties	54	1.0
Neurosurgery	3	.1
ENT	3	.1
Missing	626	11.0
Total	5700	100.0

**Figure 10: Tukey box plot showing median, interquartile range and 1.5 IQR for the time to assessment and time to admission for children and young children**



**Figure 11 Designations of clinicians involved in the care of children and young with THI (when recorded) together with GCS: (First assessment undertaken by consultant, paediatrician or neurosurgeon involved in overall care)**



Paediatricians were involved in 51.7% (1978/3828) of cases and the neurosurgery team in 10% (401/3985) (Figure 11).

The designated lead team was recorded in 5308 cases. In most of the cases, 3795 (71.5%), this was the general paediatric team. For 11.4% (608), adult clinicians were the nominated lead clinicians; specialty paediatric, emergency, surgery or intensive care teams were the leads in 9.3% (488) of cases. Multiple teams were listed in 6.2% (330).

**Table 6 Locations to which children and young people with THI were admitted.**

General Children's ward	4391 (77%)
Specialist children's ward	179 (3.1%)
PICU/ paediatric HDU	77 (1.4%)
Paediatric neurosurgical	101 (1.8%)
Observation or Short stay	628 (11%)
General adult ICU/HDU or neurosurgery unit	15
Theatre	13

## Assessment

NICE guidelines 2007 recommended that all children and young people with head injury have a GCS score with its constituent values recorded on arrival at the ED. Methods of recording the levels of consciousness varied in the ED at the first hospital attended:

GCS was recorded for 4182 (73.4%) of the cases.

- 87.5% (3582) had GCS=15.
- 9.4% (393) had GCS=13-14.
- 2.7% (114) had GCS=9-12.
- 2.2% (93) had GCS≤ 8.

Individual component scores were not recorded for 26% (1096) of these cases.

In ED, 47.8% (2725) children and young people had an AVPU recorded whilst 30.5% (1739) had both GCS and AVPU scores.

- 94.3% (2569) were Alert.
- 3.3% (90) responded to Voice.
- 1.1% (29) responded to Pain.
- 1.4% (37) were Unconscious.

## Admission to the ward from ED

The median time between arrival in ED and admission to a ward was 165 minutes (IQR range 110-224 minutes) (Figure 10). The majority of children were admitted to a general children's ward (Table 6).

When GCS was not recorded 986 (17.3%) but an AVPU assessment was, the results were as follows:

- Alert 940 (95.3%)
- Verbal 28 (2.8%)
- Pain response 9 (0.9%)
- Unconscious 9 (0.9%)

There was no formal level of consciousness recorded in the notes for 9% (532) of children and young people.

## Intubation and ventilation

**"Intubate and ventilate all patients with GCS≤ 8 requiring transfer to neuroscience unit."** (NICE 2007)

Maintenance of the airway is essential as at this level of impaired consciousness, the protective airway reflexes are lost and aspiration into the lungs can occur.

Of the children and young people with GCS $\leq$  8, 60% (56/93) were intubated. Twelve were intubated at the scene of injury, 17 in ED and 27 when transferred to second hospital. The intubation status of 14 children was not recorded and 23 were not intubated.

### Length of stay in the first hospital

The majority, 89.1% (4725), of the children and young people spent up to one night in the first hospital, 420 (7.9%) between

2 to 4 nights and 73 (1.4%) stayed more than five nights. For 86 (1.6%) children and young people, the number of nights spent in hospital is unknown.

### Interhospital transfers and admission to the second hospital

There were 385 interhospital transfers, 79.5% were by ambulance, and 13.2% by specialist PICU retrieval teams (Table 7).

**Table 7 Mode of transport to second hospital**

	Number of children and young people (%)
Ambulance (non-paramedic)	97 (35.2%)
Air ambulance (paramedic/medic)	3 (0.8%)
Other land-hospital car	1 (0.3%)
Paramedic ambulance	153 (39.7%)
Private/public transport	28 (7.3%)
Specialist PICU transport	52 (13.5%)
Not known/not recorded	51 (13.2%)
Total	385

There were 119 children and young people with GCS < 15. Specialist retrieval teams transferred 26.9% (32/119) cases and 34.4% (41) were carried by paramedic ambulances.

These 385 children and young people transferred to a second hospital were generally more serious cases with a large proportion having impaired levels of consciousness (Table 7).

- 51.4% (198) had GCS=15 (n=157) or Alert on AVPU (n=41).
- 5.1% (37) had GCS=13-14.
- 7.8% (30) had GCS=9-12 (n=27) or had AVPU responding to voice (n= 3).
- 13.5% (52) had GCS= $\leq$ 8 (n=47) or had AVPU responding to pain or who were unconscious (n=5).

# CT scanning and compliance with NICE head injury guidance

## Key findings

- One third (30.4%) of the 5700 children had a head CT scan.
- A greater proportion of older children had a CT scan than younger age groups.
- The CT scans were performed at a median time of 1.5 hours (range 0-35.8hrs). The time to CT scan was shorter in those with GCS<15 but the median still exceeded one hour.
- The rate of abnormal CT scan was greater in infants than older children.
- Of 2437 children with a recognised indicator for CT (NICE 2007) only 40% of children received a CT scan.
- Children younger than three years old, with indications for a CT were less likely to have CT than older children.
- Children admitted to general hospitals with indications for CT were less likely to have a CT than those admitted to hospitals with specialist paediatric units or neurotrauma centres.
- For the children admitted to a general hospital, there was variation of CT scanning rates across Commissioning Boards and health regions.

## Recommendation 20

In view of the low percentage of children with indicators for CT who actually have a CT, there should be a national review of the facilitators and barriers to CT scanning, (especially for the infants and toddler age group) and an on-going national audit of the implementation of NICE head injury guidelines in General hospitals.

## Recommendation 21

The practice of admitting young children for observation versus early CT scanning should be evaluated according to short and long term clinical outcome. The potential benefits of low-dose CT scanning should be considered to reduce the risks of irradiation against the benefits of early detection of traumatic brain injury.

## Recommendation 22

A large scale prospective evaluation of the indicators for CT head scan within NICE head injury guidelines is needed to determine their accuracy and efficacy in practice.

## NICE head injury guidelines for CT imaging

The criteria for CT scanning according to NICE guidelines in 2007 are given in figure 12 for children and young people less than 16 years old. In 2009-10 children and young people with THI were subject to these recommendations. The study data were matched against these criteria to see the degree of compliance with the guideline.

**Figure 12: NICE head injury guideline 2007 with clinical indicators for head CT scan in children and young people with THI**

### NICE recommendations for when to request a head scan CT immediately (if <16y)

- Witnessed loss of consciousness lasting >5 minutes
- Amnesia (antegrade or retrograde) lasting >5 minutes
- Abnormal drowsiness
- 3 or more discrete episodes of vomiting
- Clinical suspicion of non-accidental injury
- Post-traumatic seizure but no history of epilepsy
- Age > 1 year: GCS<14 on assessment in the ED
- Age < 1 year: GCS (paediatric) <15 on assessment in the ED
- Suspicion of open or depressed skull injury or tense fontanelle
- Any sign of basal skull fracture
- Focal neurological deficit
- Age < 1 year: presence of bruise, swelling or laceration >5cm on head
- Dangerous mechanism of injury (high-speed road traffic accident either as pedestrian, cyclist or vehicle occupant, fall from > 3m, high-speed injury from a projectile or an object)

### Compliance with NICE guidelines 2007 for neuroimaging in children & young people with THI

Overall, 30% (1734) children and young people admitted with THI had head CT scan performed at a median time of 1.5 hours (range 0-35.8hrs) after their arrival at the ED. Cervical spine CT was also performed in 292 (5.1%).

Proportionately more of the older children had head CT scan than younger age groups, 22% (95% CI 20.6-23.5) of children < 5 year vs. 41% (95% CI 38.8-42.6) for those aged 5-14 years old. There were more abnormal CT head scans in those less than five years 37% (95% CI 33.4-40.6) than children and young persons aged 5-14 years, 26.8% (95% CI 24-29.6).

Head CT scan should be undertaken within an hour of admission, according to NICE 2007. In this study, head CT scans were performed at a median time of 1.5 hours (range 0-35.8hrs), 33% (297) of which occurred within an hour. The time to head CT scan was shorter in those with GCS<15, (median time: GCS 15 = 100 minutes, GCS 13-14= 69 minutes, GCS 9-12=72 minutes, GCS </=8 =65 minutes).

### GCS/AVPU

The GCS/AVPU score was available in the emergency department for 5168 (90.6%) (Table 8).

**Table 8 The numbers and proportion of head CT scans in children and young people according to their GCS/AVPU assessment in the ED and their age**

	Age (years) number of children (%)					Total number of children (% of total no. of patients)
	<1	1-Apr	5-Sep	Oct-14	Missing age	
GCS<=8 AVPU= U OR P	13/18 (72%)	25/38 (66%)	15/16 (94%)	37/39 (95%)		90/111 (80%)
GCS 9-12 AVPU =V	6/13 (46%)	26/42 (62%)	28/34 (82%)	42/52 (81%)	1/1	102/142 (72%)
GCS 13-14	16/39 (41%)	39/93 (42%)	64/87 (74%)	139/174 (80%)		258/393 (66%)
GCS=15 AVPU=A	181/876 (20.7%)	316/1652 (19%)	261/891 (29%)	403/1096 (37%)	2/7	1161/4522 (26%)
Missing GCS/AVPU	39/147	29/217	18/82	34/86		120/532
Total	255/1093 23% (21-26)	435/2042 21% (20-23)	386/1110 35% (32-37.6)	655/1447 45% (42.7-47.8)	3/8	1734/5700* 30.4%

An abnormality was identified on head CT scan in (Table 9)

- 52.5% of infants with a GCS of 15/Alert.
- 71.4% of infants with GCS < 15 (AVPU=V,P/U).
- 28% of children (older than a year) with a GCS of 14-15/Alert.
- 46.9% of children with GCS 14 (AVPU-V,P/U).

**Table 9 Comparison of the CT outcome according to GCS/AVPU for < 1 year olds where CT recommended if GCS < 15 and older children where CT recommended if GCS < 14.**

CT category	GCS/AVPU in < 1 year				GCS/AVPU in > 1 year		
	15/ 'Alert'	<15:V/P/U	GCS/AVPU not recorded	14-15: 'Alert'	<14:V/P/U	GCS/AVPU not recorded	Total
Normal	78 (43.1%)	7 (20%)	14 (35.9%)	844 (72.1%)	113 (50.2%)	52 (64.2)	1108 (+1*) (64%)
Ici and/or depressed #	37 (20.4%)	19 (54.3%)	14 (35.9%)	124 (10.6%)	64 (28.4%)	10 (12.4%)	268 (+1*) (15.5%)
Simple #	40 (22.1%)	2 (5.7%)	8 (20.5%)	67 (5.7%)	21 (9.3%)	9 (11.1%)	147 (+1*) (8.5%)
Other	9 (5%)	1 (2.9%)	0	33 (2.8%)	4 (1.8%)	1	48 (2.8%)
Abnormality but not described	10 (5.5%)	3 (8.6%)	1	40 (3.4%)	17 (7.6%)	1	72 (4.2%)
Result not recorded	7 (3.9%)	3 (8.6%)	2	62 (5.3%)	6 (2.7%)	8 (10%)	88 (5.1%)
Total	181	35	39	1170	225	81	1731 (3*)

\*The age of three children was not recorded

## Loss of Consciousness

Loss of consciousness at the time of the incident was reported in 17.7% (1010 /5700) children. However, the duration of loss of consciousness was not recorded. 46.9% (474/1010) of these children had head CT scan, 33% of whom sustained ICI or a depressed fracture, 20% a simple fracture, and 25% other findings such as structural anomalies.

## Multiple indicators as per NICE head injury imaging guidance

2437 children had at least one of the following indicators for head CT scan.

- GCS <15 for a child <1yr or <14 for an older child
- Loss of consciousness
- A dangerous mechanism of injury
- A suspicion of non-accidental injury

Overall only 40% (984) of these children had head CT scan.

Children and young people admitted to a general hospital, or who were less than three years old, were less likely to have a head CT scan despite NICE 2007 indicators being present. There appears to be a leaning towards the admission of young children to general hospitals for observation rather than doing head CT scan. This may be due to a reluctance to sedate these children or to expose them to irradiation. A lack of anaesthetic facilities or the facilities to report head CT scans out of hours may have contributed to this problem.

There was considerable regional variation in the number of children who had a head CT scan.

Children and young people who had normal head CT scan spent an average of 24 hours in hospital, those who were discharged without a scan were there for a mean time of 15 hours. Children and young people with ICI or depressed skull fracture spent a mean period of 89 hours, those with a simple fracture, 45 hours.

# The recognition and investigation of children with suspected maltreatment and abusive head trauma

## Key findings

- For children younger than two years with head injury, physical abuse was suspected at the point of admission in 9.3% children and for a further 4.3% during hospital admission.
- Only a third of children with suspected physical abuse and head injury received the full extent of recommended investigations to exclude AHT. Investigation rates were better for infants although still poor.
- A paediatrician with level 3 training was involved in the assessment of children with suspected child abuse.
- At discharge 11.5% of children (< 2 years old) were referred to social services with child protection concerns, 4.7% fulfilled the criteria for Abusive head trauma with skull fracture and or intra cranial injury identified on CT imaging.
- Features that distinguished suspected physical abuse from accidental head injury included children with unexplained head trauma, closed head injury and subdural haemorrhages that were more likely to be interhemispheric or multiple.

## Recommendation 23

ED staff and hospital paediatricians must receive appropriate levels of safeguarding training that includes guidance on the recognition of abusive head trauma (AHT). For frontline staff who are assessing young children with head injury, training must be provided in a manner that accounts for the rapid turnover of staff in ED, many of whom are adult specialists or locums.

**The Royal College of Emergency Medicine, clinical standards document (click here to access the document)** published in August 2014 recommends that 'All ED medical and nursing staff should, as a minimum, have level 2 Child Protection training. All senior Emergency Medicine doctors (ST4 or equivalent and above) should have level 3 Child Protection training'.

Safeguarding children and young people: roles and competences for health care staff published 2014

[Click here to go to RCPCH Safeguarding Children and Young People PDF](#)

## Recommendation 24

Paediatricians must improve their adherence to national guidance when physical abuse is suspected in young children with head injury.

Recommended investigations: CT scan, skeletal survey (RCR/RCPCCH radiology guidelines 2008), ophthalmology (RCOPH/RCPCCH guidelines) examination should be conducted for all infants and children who have a head injury where physical abuse is suspected. All children must be assessed on an individual basis and if recommended investigations are not performed the reasons why must be clearly documented.

Children Protection Companion 2nd edition RCPCCH 2013

[Click here to go to RCPCCH Child Protection Publications](#)

## Recommendation 25

NICE head injury guidelines 2007 and 2014 recommend that head CT scan should be performed if non-accidental head injury is suspected, yet they give no explanation as to when this suspicion should be raised. This should be considered in the next revision of the guidelines. There are several detailed evidence based publications around this topic ([www.core-info.cf.ac.uk](http://www.core-info.cf.ac.uk)). All health care professionals involved with these children must be made aware that AHT is a condition that is prevalent in infants and toddlers and be familiar with the guidelines where AHT is suspected.

Abusive head trauma (AHT) is seen mostly in children younger than two years of age with a peak at 5-6 months of age. It is defined as 'an injury to the skull or intracranial contents of an infant or young child (< 5 years of age) due to inflicted blunt impact and/or violent shaking' (American Association Paediatrics).

The Companion for Child Protection was first published in 2006 by the Royal College of Paediatrics and Child Health and revised in 2013 (Companion Child Protection RCPCCH 2006, 2013). It set out the standard criteria for the investigation of children with suspected physical abuse. These investigations are used to identify or exclude the diagnosis and to delineate the full extent of any injuries sustained by these children.

The standards include:

- An examination by a clinician with level 3 child protection training.
- A skeletal survey in children younger than two years old.
- A head CT scan in children younger than a year or if AHT is suspected.

- An ophthalmology examination.

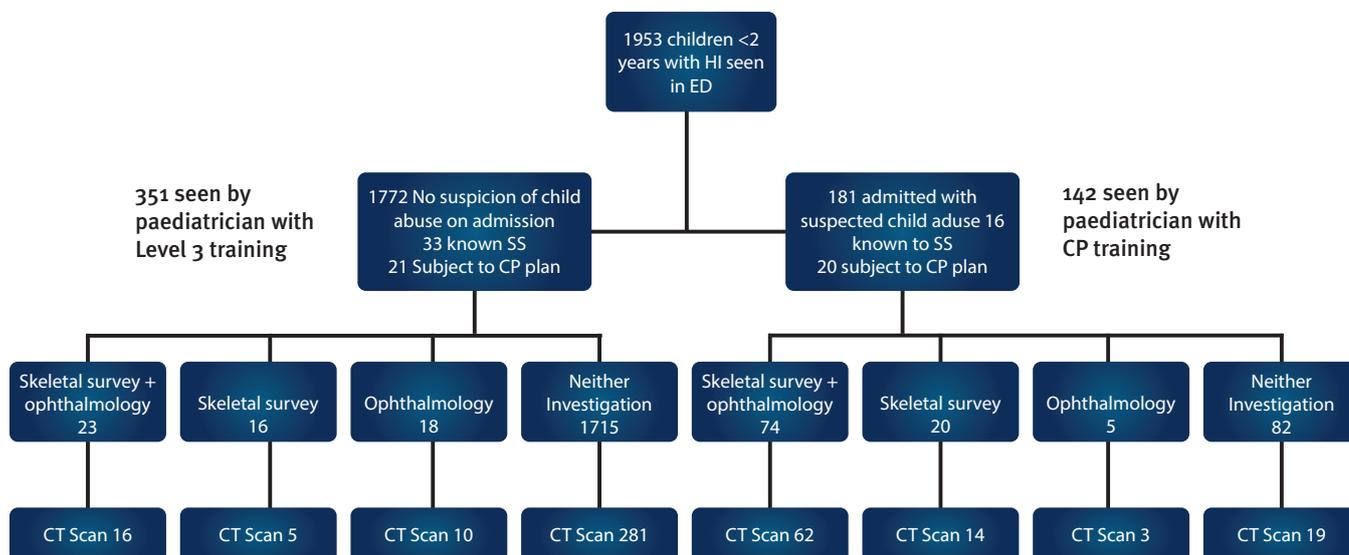
In addition, NICE head injury guidelines 2007 stated that head CT scan should be performed in children where AHT is a possibility.

## How many children with suspected physical abuse were investigated?

Physical abuse was suspected in 16.4% (320) of 1953 children younger than two years during the hospital admission. Only a quarter of children younger than two years with suspected physical abuse received all of the recommended investigations to identify or exclude AHT (Figure 13).

At discharge 11.5% (225) of children were referred to social services with child safeguarding concerns, whilst 4.7% fulfilled the criteria for AHT with skull fracture and/or intracranial injury on head CT scanning. A paediatrician with level 3 training was involved in the assessment of 79% of these children.

**Figure 13** Flow chart of the investigations taken in the 1953 children less than two years old. This flow chart shows the range of investigations performed including those to exclude AHT.



### How many children were referred to social services at hospital discharge with safeguarding concerns?

Overall, 225 (11.5%) of children (< 2 years old) were referred to social services for child abuse concerns, 16% of infants and 6% of children aged one –two years.

The extent of investigation of these children discharged with suspected child abuse varied. Infants were more likely to receive all three recommended investigations that those aged one year, nonetheless the recommended investigations were only completed in 44% of cases (Table 10).

Eighty eight children had an abnormal CT scan and fulfilled a diagnosis of suspected AHT, equivalent to 4.5% (88/1953) of all the <2 year olds with THI. Of note however the prevalence of suspected AHT was 48% (88/183) amongst children < two years old who had an abnormal CT scan.

**Table 10 The degree of completion of the recommended investigations for non-accidental injury for infants and children aged up to 2 years of age with THI who were referred on to social services at hospital discharge.**

<b>Age 12 months or less (n=174)</b>			
Number of children (% of total population)	Head CT scan	Skeletal survey	Ophthalmology review
77 (44.3%)	●	●	●
10 (5.7%)	●	●	-
8 (4.6%)	-	●	●
4 (2.3%)	●	-	●
17 (2.9%)	●	-	-
5 (2.9%)	-	●	-
4 (2.3%)	-	-	●
49 (28.2%)	-	-	-
<b>Age 13-23 months (n=51)</b>			
Number of children (% of total population)	Head CT scan	Skeletal survey	Ophthalmology
9 (17.6%)	●	●	●
1 (2%)	●	●	-
2 (4%)	-	●	●
3 (6%)	●	-	●
9 (17.6%)	●	-	-
4 (8%)	-	●	-
0	-	-	●
23 (45%)	-	-	-
	130	116	107

## Characteristics of AHT

Comparing 88 children (< two years old) with abnormal head CT scans and a discharge diagnosis of suspected AHT, and 95 children with abnormal head CT scan and a diagnosis of accidental head injury confirmed the following findings:

- Significantly more children with accidental head injury had a history of a fall from a height whilst significantly more of those with AHT had no history of trauma or one of assault.
- Subdural haemorrhage that were more likely to be inter-hemispheric or multiple was significantly more common in AHT than accidental injury.
- Isolated skull fractures were significantly more common in accidental injury.
- Closed head injury was significantly more common in AHT than accidental head injury.

**Table 11 Comparison of the stated mechanism of injury and abnormalities seen in 95 children with accidental head injury and 88 children with suspected AHT**

	Accidental THI (n=95) n (%: 95% CI)	Suspected AHT (n=88) n (% : 95%CI)
<b>History at presentation</b>		
Fall from a height	68 (71.6%: 61.8-79.7)*	37 (42%: 32.3-52.5)
Fall (height unknown)	0	7 (7.9% : 3.9-15)
Fall from standing	8 (8.4% : 4.3-15.7)	2 (2.3%: 0.6-7.9)
Motor Vehicle Accident	3 (3.2%: 1.1-8.9%)	0
No trauma explanation	12 (12.6%: 7.4-20.8)	36 (40.9% 31.2-51.4)**
Assault	0	3 (3.4%: 1.2-9.5%)
Impact with object/person	4 (4.2%: 1.6-10.3)	3 (3.4%: 1.2-9.5%)
<b>Characteristics of head injury</b>		
ICI and skull fracture	21 (22.1%: 14.9-31.5)	25 (28.4% :38.6)
Closed head injury (ICI)	13 (13.7% :8.2-22.0)	26 (29.5% :21.0-39.8)*
Isolated fracture	55 (57.9% 47.8-67.3)**	31 (35.2% 26.1-45.6)*
Contusion	4 (4.2%: 1.6-10.3)	0
Abnormal CT details unspecified	2	6 (6.8%: 3.2-14.1)

\* p< 0.05, \*\* p< 0.01, ICI ( defined as extra axial haemorrhage and or intracerebral injury)

# Bibliography

**Anderson T, Heitger M, Macleod AD.** Concussion and mild head injury. *Practical Neurology* 2006;6(6):342-57

Ambulance Service Dataset : available from [http://www.datadictionary.nhs.uk/data\\_dictionary/messages/central\\_return\\_data\\_sets/data\\_sets/ambulance\\_services\\_data\\_set\\_\(ka34\)\\_fr.asp?shownav=1](http://www.datadictionary.nhs.uk/data_dictionary/messages/central_return_data_sets/data_sets/ambulance_services_data_set_(ka34)_fr.asp?shownav=1)

**Arbogast KB, Durbin DR.** Epidemiology of child motor vehicle crash injuries and fatalities. *Pediatric Injury Biomechanics*. 2013.33-86.

**Burrows P, Trefan L, Houston R, Hughes J, Pearson G, Edwards RJ, Hyde P, Maconochie I, Parslow RC, Kemp AM**  
Head injury from falls in children younger than six years of age. <http://adc.bmj.com/content/early/2015/08/21/archdischild-2014-307119.full>

Centre for disease Control and prevention: CDC (<http://www.cdc.gov/violenceprevention/pdf/pedheadtrauma-a.pdf>)

College of Emergency Medicine <http://www.rcem.ac.uk/ShopFloor/Service%20Design%20&%20Delivery/System%20integration%20and%20service%20configuration/Children%20and%20Young%20People%20in%20Emergency%20Care%20Settings>

Companion to Child Protection - Children Protection Companion 2nd edition RCPCH 2013  
[www.rcpch.ac.uk/child-protection-publications](http://www.rcpch.ac.uk/child-protection-publications)

Core Info: [www.core-info.cardiff.ac.uk](http://www.core-info.cardiff.ac.uk)

Facing the Future: [www.rcpch.ac.uk/facingthefuture](http://www.rcpch.ac.uk/facingthefuture) #Facing the Future: Standards for Paediatric Services

Hospital Episode Statistics: available from [www.hscic.gov.uk/hes](http://www.hscic.gov.uk/hes)

Joint Royal Colleges Ambulance Liaison Committee guidelines available from <http://www.jrcalc.org.uk/guidelines.html>

**Kemp A, Nickerson L, Trefan L, Houston R, Hyde P, Pearson G, Edwards R, Maconochie I, Parslow RC.**  
The selection of children for head Computerised Tomography following head injury (In Press)

**Kirkwood MW, Yeates KO, Taylor HG, et al.** Management of pediatric mild traumatic brain injury: A neuropsychological review from injury through recovery. *The Clinical Neuropsychologist* 2008;22(5):769-800.

NHS STANDARD CONTRACT FOR MAJOR TRAUMA SERVICE (ALL AGES)  
<http://www.england.nhs.uk/wp-content/uploads/2014/04/d15-major-trauma-0414.pdf>

NICE Head Injury guidelines 2007, 2014 available from <http://www.nice.org.uk/guidance/cg176>

Public Health England Report 2014:  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/322210/Reducing\\_unintentional\\_injuries\\_in\\_and\\_around\\_the\\_home\\_among\\_children\\_under\\_five\\_years.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322210/Reducing_unintentional_injuries_in_and_around_the_home_among_children_under_five_years.pdf)

Public Health England Report 2014:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/322212/Reducing\\_unintentional\\_injuries\\_on\\_the\\_roads\\_among\\_children\\_and\\_young\\_people\\_under\\_25\\_years.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322212/Reducing_unintentional_injuries_on_the_roads_among_children_and_young_people_under_25_years.pdf)

Quality watch : Ambulance response times available from <http://www.qualitywatch.org.uk/indicator/ambulance-response-times>

RCPCH safeguarding competencies available from. <http://www.rcpch.ac.uk/system/files/protected/page/Safeguarding%20children%20and%20young%20people%20-%20%20roles%20and%20competencies%20for%20health%20care%20staff%20-%20Intercollegiate%20document%20March%202014.pdf>

Royal College of Paediatrics and Child Health and The Royal College of Ophthalmologists. Abusive Head Trauma and the Eye in Infancy June 2013

Royal College of Radiology /RCPCH: Radiology guidelines for investigation of children with suspected NAI  
[https://www.rcr.ac.uk/docs/radiology/pdf/RCPCH\\_RCR\\_final.pdf](https://www.rcr.ac.uk/docs/radiology/pdf/RCPCH_RCR_final.pdf)

Trauma Audit Research Network available from <https://www.tarn.ac.uk>

**Trefan L, Houston R, Pearson G, Edwards R, McChonachie I, Parslow R, Kemp A.**

Epidemiology of children with head injury: a national overview. In Press

**Yeates KO, Taylor HG.** Neurobehavioural outcomes of mild head injury in children and adolescents. Pediatric rehabilitation 2005;8(1):5.

# List of Abbreviations

Abbreviation	Meaning
AHT	Abusive Head Trauma
ANT	Adult Neurotrauma Centre
AVPU	(Coma Score) Alert, Voice, Pain, Unconscious
CDC	Centre for Disease Control and Prevention
CI	Confidence Interval
CMACE	Centre for Maternal and Child Enquiries
CT	Computerised Tomography
ED	Emergency Department
EM	Emergency Medicine
GCS	Glasgow Coma Score
GH	General Hospital
HDU	High Dependency Unit
HQIP	Healthcare Quality Improvement Partnership
IAG	Independent Advisory Group
ICI	Inter Cranial Injury
ICU	Intensive Care Unit
IMD	Index of Multiple Deprivation
IQR	Inter Quartile Range
JRCALC	Joint Royal Colleges Ambulance Liaison Committee
MTC	Major Trauma Centre
MVA	Motor Vehicle Accident
NAI	Non Accidental Injury
NCD	National Clinical Director
NHS	National Health Service
NICE	National Institute of Clinical Excellence
OR	Odds Ratio
PICU	Paediatric Intensive Care Unit
PNT	Paediatric Neurotrauma Centre
RCR	Royal College of Radiology
RCOPH	Royal College of Ophthalmology
RCPCH	Royal College of Paediatrics and Child Health
R&D	Research and Development
SD	Standard Deviation
SPSS	Statistical Packages for Social Sciences
SS	Social Services
TARN	The Trauma Audit & Research Unit
THI	Traumatic Head Injury



# HEAD INJURY IN CHILDREN

## NOTIFICATION FORM (A)

Please complete this form for a child or young person up to 15 years old (*14 yrs + 365 days*) who as a result of a head injury\* or a head injury as part of a pattern of injuries meets ONE of the following criteria between 1<sup>st</sup> SEPTEMBER 2009 and 28<sup>th</sup> FEBRUARY 2010 inclusive:

**Please tick type of case: (Select one option only)**

- Seen in your Emergency Department and admitted\* to your hospital for secondary or tertiary care **OR**
- Seen in your Emergency Department but transferred for admission\* to secondary or tertiary care at another hospital (within or out of your trust) **OR**
- Seen in your Emergency Department but died before admission\* or transfer\* to secondary care **OR**
- Died at the scene or died between the scene and attendance at the first hospital.

### Instructions for completing and returning the notification form

1. Certain sections may not be applicable to all children. Please read the guidance manual before completing.
2. Please complete the form using the information available in the child's notes. Complete all dates in the format DD/MM/YY and times using the 24hr clock e.g. 18:50.
3. **Please keep a copy of this form for your records. Return hardcopies of completed forms to your local CMACE regional office. See back of form for local contact details.**
4. If you have any queries about completing or returning this form please contact your CMACE regional office.

Date form completed:

/   /

Date form returned:

/   /

### DETAILS OF PERSON COMPLETING FORM

Name:	Trust:
Job title/Role:	Telephone:
Unit:	Email:
Hospital:	

**Head injury:** Examples of head injuries to include or exclude can be found on the back of this form.

**Admission:** Hospital admission is defined as occurring when the patient is in receipt of treatment or observation in an inpatient area. This includes short term assessment units associated with wards or emergency departments, short stay units, general or specialist wards, PICUs, Neurosurgical unit, or other inpatient unit. This may only be for a matter of hours beyond the first four hours from arrival at hospital.

**Transfer:** Refers to the transport of a patient by ambulance (land or air) from one hospital to another hospital facility. Also referred to as an 'inter-hospital transfer' between two hospitals either within or out of the same trust.

Is this the first hospital the child attended following the incident?

Yes  No

→ If no, hospital child transferred from \_\_\_\_\_

## SECTION 1: DETAILS OF CHILD

(Affix patient label if preferred)

1.1 Hospital Number

1.2 NHS Number/Healthcare Number

 /  / 

1.3 Surname/family name

1.4 First name

1.5 Sex

Male  Female  Not known

1.6 Date of birth and/or estimated age

If no full date of birth is known enter month and year. If no full or short DOB, enter their estimated age.

/ / 

Not known

 years  months

1.7 Address of patient's normal residence

 / 

Not known

Postcode of patient's normal residence

1.8 Ethnic group

Not known

### White

- English  
 Other British  
 Irish  
 Any other white background

### Mixed:

- White & Black Caribbean  
 White & Black African  
 White & Asian  
 Any other Mixed background

### Asian or Asian British

- Indian  
 Pakistani  
 Bangladeshi  
 Chinese  
 Any other Asian background

### Black or Black British:

- Caribbean  
 African  
 Other Black background

### Other ethnic groups:

- Arab  
 Gypsy/ Romany/ Irish Traveller  
 Other ethnic group

If other, please specify \_\_\_\_\_

1.9 Child known to Social Services

Yes  No  Not known

If answering this question is not indicated as part of the admission process and you are unaware of whether the child is or is not known to Social Services, tick 'Not known'. i.e. you are not required to call Social Services to answer this question.

1.10 Child subject of existing child protection plan

Yes  No  Not known

## SECTION 2: DETAILS OF INCIDENT

2.1 Date of incident

/ / 

Not recorded

2.2 Time of incident

:  (24 hr clock)

Not recorded

2.3 Postcode of incident location

 / 

Not known

If postcode is not known indicate area/first line of address

Not known

2.4 Place of incident

Home/private address  Road/Street/Motorway  School/Nursery  Other, specify \_\_\_\_\_  Not known

2.5 Cause of injury

- Struck by car (i.e. child was pedestrian)  
 Motor vehicle accident (not pedestrian)  
 Cycling  
 Fall from > 1m or > 5 stairs  
 Fall < 1m or < 5 stairs  
 Fall, height unknown

- Sport, please specify \_\_\_\_\_  
 Other recreational (e.g. skateboard) specify \_\_\_\_\_  
 Assault  
 Other, please specify \_\_\_\_\_  
 Not known

2.6 Additional incident details, if known (e.g. Fall from trampoline, speed, not in age appropriate car seat, etc)

Please use the additional space provided on page 7 if there is not enough room to complete your answer

2.7 Suspicion of Non Accidental Injury (NAI)

Yes  No  Not known

2.8 Seatbelt worn

Yes  No  Not known  N/A

2.9 Helmet worn

Yes  No  Not known  N/A





**IMAGING continued***(At any time following attendance)*

- 4.9 Complete cervical spine CT performed**  Yes → *Go to 4.9.1.*  No → *Go to 4.9.2*  Not known → *Go to 4.10*
- 4.9.1 Was the first spine CT scan reported as normal on provisional report?**  Yes → *Go to 4.10*  No → *Specify abnormality:*  Not known → *Go to 4.10*
- 4.9.2 If no spine CT scan performed please indicate reason/reasons why: (tick all that apply)**
- CT scan already done at first hospital  Child not stable  Other, please specify \_\_\_\_\_
- Not considered to be clinically indicated  No CT available  Not known

- 4.10 Was the child 'admitted' to your hospital?**  Yes → *Go to 5.1*  No → *Go to 4.10.1*  
*(see cover for definition of admission)*

**4.10.1 If no, where did child go following discharge from the Emergency Department**

- Transferred to another hospital → *Go to 6.2*
- Deceased → *Go to 6.4*
- Other, please specify \_\_\_\_\_ → *Go to 6.1*

**SECTION 5: ADMISSION****5.1 Area child first admitted to:**

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> General children's ward                   | <input type="checkbox"/> General/Adult ICU                | <input type="checkbox"/> Theatre          |
| <input type="checkbox"/> Paediatric Intensive Care Unit (PICU)     | <input type="checkbox"/> Adult Neurosurgical unit         | <input type="checkbox"/> Short stay Unit  |
| <input type="checkbox"/> Paediatric Neurosurgical unit             | <input type="checkbox"/> Adult High Dependency Unit (HDU) | <input type="checkbox"/> Observation unit |
| <input type="checkbox"/> Paediatric High Dependency Unit (PHDU)    | <input type="checkbox"/> Other, specify _____             | <input type="checkbox"/> Not known        |
| <input type="checkbox"/> Specialist children's ward, specify _____ |   |   |

**5.2 Date admitted to area**

DD/MM/YY

 Not recorded**5.3 Time admitted to area**

HH:MM (24 hr clock)

 Not recorded**5.4 Designated lead team for this admission** *(If joint care tick all that apply)*

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> General Paediatrics           | <input type="checkbox"/> General/Adult Emergency Medicine | <input type="checkbox"/> Not known            |
| <input type="checkbox"/> Paediatric Emergency Medicine | <input type="checkbox"/> General/Adult Intensive Care     | <input type="checkbox"/> Other, specify _____ |
| <input type="checkbox"/> Paediatric Intensive Care     | <input type="checkbox"/> Adult Neurosurgery               |   |
| <input type="checkbox"/> Paediatric Neurosurgery       | <input type="checkbox"/> General/Adult Surgery            |   |
| <input type="checkbox"/> Paediatric Surgery            | <input type="checkbox"/> Orthopaedic Surgery              |   |

**5.5 Indication for admission***(Please tick all that apply)*

- |   |   |
|---|---|
| <input type="checkbox"/> Severity of the head injury                          | <input type="checkbox"/> Recovery from GA or sedation used for CT scan  |
| <input type="checkbox"/> Severity of other injuries                           | <input type="checkbox"/> Child fulfils criteria for CT scanning but this cannot be done within the appropriate period |
| <input type="checkbox"/> Severity of mechanism of injury                      | <input type="checkbox"/> Not sufficiently cooperative to allow scanning   |
| <input type="checkbox"/> Continuing worrying signs in relation to head injury | <input type="checkbox"/> Admitted for GA to have a CT scan  |
| <input type="checkbox"/> Abnormality identified on CT scan                    | <input type="checkbox"/> Shock  |
| <input type="checkbox"/> Base of skull fracture                               | <input type="checkbox"/> Suspected Non Accidental Injury (NAI)  |
| <input type="checkbox"/> Meningism  | <input type="checkbox"/> Other, please specify (e.g. not related to head injury, gastroenteritis)                     |
| <input type="checkbox"/> CSF leak   |   |
| <input type="checkbox"/> Drug or Alcohol intoxication                         |   |

**5.6 Consultant paediatrician involved in care of child**  
*(i.e. Discussed with at time of care delivered)* Yes  No  Not known**5.7 Neurosurgeon involved in care of child**  
*(This includes liaison over telephone, or other means)* Yes  No  Not known**5.8 Specialist in Child Protection with level 3 training or above involved** *(i.e. Discussed with at time of care delivered)* Yes  No  Not known**5.9 Child Protection referral made to external body**  
*(e.g. Social Services or Police)* Yes  No  Not known**5.10 Skeletal survey undertaken**  
*(i.e. as part of a child protection assessment)* Yes  No  Not known**5.11 Review by ophthalmology undertaken**  
*(i.e. as part of a child protection assessment)* Yes  No  Not known

## SECTION 5: ADMISSION *continued*

5.12 IN ADDITION to the first area of admission, was the child *at any time during the first 72 hours post injury* admitted to any of the following areas?

Area	Yes	No	Date admitted	Time admitted (24 hr clock)	Date discharged	Time discharged (24 hr clock)
a. PICU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
b. PHDU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
c. General ICU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
d. General HDU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
e. Neurosurgical unit	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
f. Ward	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
g. Theatre	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
h. Other, <i>specify</i> _____	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM

## SECTION 6: CHILD'S OUTCOME - Complete at *whichever occurs first*: at transfer, at death in hospital, or at the end of the first 72 hours post injury.

6.1 Please indicate the status or location of the child at *whichever occurs first* (i.e. at transfer, at death in hospital, or at the end of the first 72 hours post injury)

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Transferred → <i>Go to 6.2</i>                   | <input type="checkbox"/> Paediatric Intensive Care Unit (PICU)  | <input type="checkbox"/> Adult/General HDU           |
| <input type="checkbox"/> Discharged → <i>Go to 6.3</i>                    | <input type="checkbox"/> Paediatric High Dependency Unit (PHDU) | <input type="checkbox"/> Not known                   |
| <input type="checkbox"/> Deceased → <i>Go to 6.4</i>                      | <input type="checkbox"/> Paediatric Neurosurgical unit          | <input type="checkbox"/> Other, <i>specify</i> _____ |
| <input type="checkbox"/> General children's ward                          | <input type="checkbox"/> General/Adult ICU                      |  |
| <input type="checkbox"/> Specialist children's ward, <i>specify</i> _____ | <input type="checkbox"/> Adult Neurosurgical unit               |  |

### 6.2 Transferred

- 6.2.1 Was this a transfer or retrieval?  Transfer  Retrieval  Not known
- 6.2.2 Name of hospital and trust child transferred to (Hospital) \_\_\_\_\_  
(Trust) \_\_\_\_\_
- 6.2.3 Date and time first referral made for transfer DD/MM/YY HH:MM (24 hr clock)  Not recorded
- 6.2.4 First referral request for transfer accepted  Yes  No
- 6.2.5 Date and time departure for transfer DD/MM/YY HH:MM (24 hr clock)  Not recorded
- 6.2.6 Reason for transfer *(please tick all that apply)*
- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> No paediatric facilities                 | <input type="checkbox"/> Access to paediatric neuroscience facilities | <input type="checkbox"/> Not recorded |
| <input type="checkbox"/> No ICU facilities in hospital            | <input type="checkbox"/> Paediatric surgery                           | <input type="checkbox"/> Not known    |
| <input type="checkbox"/> No PICU bed available in hospital        | <input type="checkbox"/> Receiving hospital close to child's home     |                                       |
| <input type="checkbox"/> No general ICU bed available in hospital | <input type="checkbox"/> Other, <i>please specify</i> _____           |                                       |
- 6.2.7 Means of transfer
- |   |  |                                       |
|---|--|---------------------------------------|
| <input type="checkbox"/> Specialist PICU transport team | <input type="checkbox"/> Private/public transport                    | <input type="checkbox"/> Not recorded |
| <input type="checkbox"/> Local team                     | <input type="checkbox"/> Other land, <i>please specify</i> _____     | <input type="checkbox"/> Not known    |
| <input type="checkbox"/> Paramedic Ambulance            | <input type="checkbox"/> Helicopter (Paramedic/medic)                |                                       |
| <input type="checkbox"/> Ambulance (Non paramedic)      | <input type="checkbox"/> Other airborne, <i>please specify</i> _____ |                                       |
- 6.2.8 Additional transfer information (e.g. reason for delay)

Please use the additional sheet provided on page 7 if there is not enough room to complete your answer

## SECTION 6: CHILD'S OUTCOME *continued*

### 6.3 Discharged

- 6.3.1 Place child discharged to  Home  Rehab centre  
 Other, specify \_\_\_\_\_  Not known
- 6.3.2 Date of discharge DD/MM/YY  Not recorded
- 6.3.3 Time of discharge HH:MM (24 hr clock)  Not recorded
- 6.3.4 Diagnosis on discharge \_\_\_\_\_

### 6.4 Death *(if a diagnosis of brain stem death is made then the date and time of this diagnosis equals the date and time of death)*

- 6.4.1 Date of death DD/MM/YY  Not recorded
- 6.4.2 Time of death HH:MM (24 hr clock)  Not recorded
- 6.4.3 Place of death
- |  |   |   |
|--|---|---|
| <input type="checkbox"/> General children's ward                   | <input type="checkbox"/> General/Adult ICU                | <input type="checkbox"/> Theatre          |
| <input type="checkbox"/> Paediatric Intensive Care Unit (PICU)     | <input type="checkbox"/> Adult Neurosurgical unit         | <input type="checkbox"/> Short stay Unit  |
| <input type="checkbox"/> Paediatric Neurosurgical unit             | <input type="checkbox"/> Adult High Dependency Unit (HDU) | <input type="checkbox"/> Observation unit |
| <input type="checkbox"/> Paediatric High Dependency Unit (PHDU)    | <input type="checkbox"/> Emergency Department             | <input type="checkbox"/> Home             |
| <input type="checkbox"/> Specialist children's ward, specify _____ | <input type="checkbox"/> Other, specify _____             | <input type="checkbox"/> Not known        |
- 6.4.4 Death certificate issued  Yes  No  Not known
- 6.4.5 Coroner's referral made  Yes  No  Not known
- 6.4.6 Cause of death *(as stated on death certificate. If no certificate issued state cause of death as in notes)*
- |  |   |
|--|---|
| <b>For children who died &lt;28 days old</b> | <b>For deaths of a child (&gt; 28 days old)</b> |
| 1 _____                                      | 1a. _____                                       |
| 2a. _____                                    | 1b. _____                                       |
| 2b. _____                                    | 1c. _____                                       |
| 2c. _____                                    | 2. _____  |
| 2d. _____                                    |   |

**Additional space for further information** *(please indicate question number you are referring to)*

**PLEASE PHOTOCOPY THIS FORM AND KEEP A COPY FOR YOUR RECORDS BEFORE RETURNING TO YOUR CMACE REGIONAL OFFICE**

### Speciality & Clinician Codes

CODE	SPECIALITY	CODE	SPECIALITY	CODE	CLINICIAN
100	General Surgery	302	Endocrinology	CONS	Consultant
110	Trauma & Orthopaedics	303	Clinical Haematology	SG	Staff Grade
120	Ear Nose Throat (ENT)	400	Neurology	CF	Clinical Fellow
145	Oral & Maxillo Facial Surgery	401	Clinical Neuro-Physiology	AS	Associate Specialist
150	Neurosurgery	420	Paediatrics	ST + 1-8	Single Training e.g. ST4
170	Cardiothoracic Surgery	421	Paediatric Neurology	SpR + year	Specialist Registrar e.g. SpR2
171	Paediatric Surgery	450	Dental Medicine Specialities	FY + year	Foundation year e.g. if year 1, enter FY1
180	Emergency Medicine	460	Medical Ophthalmology	ENP	Emergency Nurse Practitioner
190	Anaesthetics	600	General Medical Practice	APNP	Advanced Paediatric Nurse Practitioner
192	Critical Care Medicine	601	General Dental Practice	ATNC	Nurse - Advance Trauma Cert
193	Paediatric Intensive Care	810	Radiology	RSCN	Nurse - RSCN
300	General Medicine	823	Haematology	NURS	Nurse - General
301	Gastroenterology	000	Other (Surgical or Medical)	GP	General Practitioner

## Inclusion & exclusion criteria

**Please include:**

- Children up to 15 years old (14 years and 364 days) who between 00:00 on the 1<sup>st</sup> September 09 and 23:59 on the 28<sup>th</sup> February 2010 have a brain or skull injury (trauma to the head) as a result of blunt or penetrating trauma or acceleration or deceleration force (e.g. road traffic accident, fall, shaking) **OR** who have experienced a head injury as part of a pattern of injuries or multi trauma **AND** fulfill the following length of stay criteria:

- ⇒ Admitted to an area of inpatient care (regardless of length of stay) **OR**
  - ⇒ Died in the hospital, including the Emergency Department **OR**
  - ⇒ Transferred to other hospital for specialist care or for an ICU/HDU bed **OR**
  - ⇒ Died at the scene or en route to the receiving hospital **OR**
  - ⇒ Transferred in to your hospital (regardless of length of stay)
- Definition of 'admission' can be found on the front of this form

**Please exclude:**

- Children who have experienced primarily superficial or facial injuries which are *unlikely to be associated with a brain injury* (e.g. isolated or trivial facial (nose, ear, lip etc), scalp or auricular injuries)
- Children who do not meet the above inclusion criteria (i.e. children who do not die that are not admitted; children who have reached their 15<sup>th</sup> birthday at the time of injury).

Examples of types of head injuries to be INCLUDED		Examples of types of head injuries to be EXCLUDED	
<b>S02</b>	<b>Fracture of skull and facial bones, e.g.</b>	<b>S00</b>	<b>Superficial Injuries, e.g.</b>
	Fracture of vault of skull		Superficial injury of scalp
	Fracture of base of skull		Contusion of eyelid and periocular area
	Multiple fractures involving skull and facial bones		Other superficial injuries of eyelid and periocular area
	Fractures of other skull and facial bones		Superficial injury of nose, ear, lip, or oral cavity
<b>S04</b>	<b>Injury of cranial nerves, e.g.</b>	<b>S01</b>	<b>Open wound of head, e.g.</b>
	Injury of optic nerve and pathways		Scalp, eyelid and periocular area, nose, ear, cheek & temporomandibular area, lip & oral cavity.
	Injury of oculomotor nerve	<b>S02</b>	<b>Fracture of skull and facial bones, e.g.</b>
<b>S06</b>	<b>Intracranial injury, e.g.</b>		Fracture of tooth, mandible, nasal bones, orbital floor, malar & maxillary bones.
	Concussion	<b>S03</b>	<b>Dislocation, sprain &amp; strain of joints &amp; ligaments of head,</b>
	Traumatic cerebral oedema		Dislocation of jaw, septal cartilage of nose, septal cartilage of nose, or tooth. Sprain and strain of jaw.
	Diffuse brain injury	<b>S04</b>	<b>Injury of cranial nerves, e.g.</b>
	Focal brain injury		Injury of trochlear nerve, trigeminal nerve, abducent nerve, facial nerve
	EDH (Extra Dural Haematoma)	<b>S05</b>	<b>Injury of eye and orbit, e.g.</b>
	Traumatic subdural/subarachnoid haemorrhage		Injury of conjunctiva and corneal abrasion
	Intracranial injury with prolonged coma		Contusion of eyeball and orbital tissues
	Other intracranial injuries		Ocular laceration and rupture with prolapse
	Intracranial injuries - unspecified		Penetrating wound of orbit, or eyeball
<b>S07</b>	<b>Crushing injury of head, e.g.</b>		Avulsion of eye
	Crushing injury of the face	<b>S08</b>	<b>Traumatic amputation of part of head, e.g.</b>
	Crushing injury of the skull		Avulsion of scalp
<b>S08</b>	<b>Traumatic amputation of part of head, e.g.</b>		Traumatic amputation of ear
	Traumatic amputations		
	Multiple injuries of head		

### If you have any queries regarding the inclusion/exclusion criteria, please contact your CMACE regional office.

**CMACE East of England Office**

Carol Hay, Regional Manager  
Box 111, Room 414, Clinical School  
Addenbrooke's Hospital, Hills Road  
Cambridge, CB2 0SP

T: 01223 330 356 or 351      E: [carol.hay@cmace.org.uk](mailto:carol.hay@cmace.org.uk)

**CMACE East Midlands and Yorkshire and The Humber Office**

Daniel Beever, Administrative Assistant  
Heeley Suite, Blades Enterprise Centre  
John Street, Sheffield  
S2 4SW

T: 0114 292 2492      E: [daniel.beever@cmace.org.uk](mailto:daniel.beever@cmace.org.uk)

**CMACE London and South East Office**

Dave Kimani, Administrative Assistant  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD

T: 020 7467 3224      E: [dave.kimani@cmace.org.uk](mailto:dave.kimani@cmace.org.uk)

**CMACE North East Office (FAO Marjorie Renwick)**

C/O CMACE Central Office  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD

T: 020 7467 3224      E: [headinjury@cmace.org.uk](mailto:headinjury@cmace.org.uk)

**CMACE Northern Ireland Office**

Terry Falconer, Project Manager  
The Health Promotion Agency  
18 Ormeau Avenue, Belfast  
BT2 8HS

T: 028 9027 9397      E: [terry.falconer@cmace.org.uk](mailto:terry.falconer@cmace.org.uk)

**CMACE North West, West Midlands & Wales Office**

Pamela Norris, Project Midwife  
Research Floor (5th Floor), St Mary's Hospital  
Oxford Road, Manchester  
M13 9WL

T: 0161 7016915      E: [pamela.norris@cmace.org.uk](mailto:pamela.norris@cmace.org.uk)

**CMACE South West and Wessex Office**

Jo Coffee, Regional CMACE Assistant  
Institute of Child Life & Health, Level D  
St Michaels Hospital, Southwell Street  
Bristol, BS2 8EG

T: 0117 928 5141 or 5143      E: [jo.coffee@cmace.org.uk](mailto:jo.coffee@cmace.org.uk)

**CMACE Central Office**

Rachael Davey, Projects Research Assistant  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD

T: 020 7467 3224      E: [rachael.davey@cmace.org.uk](mailto:rachael.davey@cmace.org.uk)



# HEAD INJURY IN CHILDREN

## TRANSFER INFORMATION FORM (B)

Please complete this form for a child or young person up to 15 years old (14 yrs + 365 days) who as a result of a head injury\* or a head injury as part of a pattern of injuries was transferred\* to your hospital within the first 72 hours post injury for secondary or tertiary care between 1<sup>st</sup> SEPTEMBER 2009 and 28<sup>th</sup> FEBRUARY 2010 inclusive:

Please tick type of case: (Select one option only)

- Child arrives in your Emergency Department following transfer\* from another hospital and admitted\* for secondary or tertiary care in the same hospital **OR**
- Child admitted directly to a unit in your hospital for secondary or tertiary care following transfer or retrieval from another hospital (e.g. direct to PICU)

### Instructions for completing and returning the notification form

1. This form should be completed by the hospital receiving the child.
2. Certain sections may not be applicable to all children. Please read the guidance manual before completing.
3. One form should be completed per child, per transfer.
4. Please complete the form using the information available in the child's notes. Complete all dates in the format DD/MM/YY and times using the 24hr clock e.g. 18:50.
5. Please keep a copy of this form for your records. Return hardcopies of completed forms to your local CMACE regional office. See back of form for local contact details.
6. If you have any queries about completing or returning this form please contact your CMACE regional office.

Date form completed:

/   /

Date form returned:

/   /

### DETAILS OF PERSON COMPLETING FORM

Name:	Trust:
Job title/Role:	Telephone:
Unit:	Email:
Hospital:	

**Head injury:** Examples of head injuries to include or exclude can be found on the back of this form.

**Admission:** Hospital admission is defined as occurring when the patient is in receipt of treatment or observation in an inpatient area. This includes short term assessment units associated with wards or emergency departments, short stay units, general or specialist wards, PICUs, Neurosurgical unit, or other inpatient unit. This may only be for a matter of hours beyond the first four hours from arrival at hospital.

**Transfer:** Refers to the transport of a patient by ambulance (land or air) from one hospital to another hospital facility. Also referred to as an 'inter-hospital transfer' between two hospitals either within or out of the same trust.

**SECTION 1: DETAILS OF CHILD***(Affix patient label if preferred)*

- 1.1 Hospital Number
- 1.2 NHS Number/Healthcare Number    /    /
- 1.3 Surname/family name \_\_\_\_\_
- 1.4 First name \_\_\_\_\_
- 1.5 Sex  Male  Female  Not known
- 1.6 Date of birth and/or estimated age   /   /    Not known  
*If no full date of birth is known enter month and year. If no full or short DOB, enter their estimated age.*  
  years   months
- 1.7 Postcode of patient's normal residence     /      Not known

**SECTION 2: DETAILS OF TRANSFER TO SECONDARY/TERTIARY CARE**

- 2.1 Was this a transfer or retrieval?  Transfer  Retrieval  Not known
- 2.2 Name of hospital and trust child transferred FROM  
 (Hospital) \_\_\_\_\_  
 (Trust) \_\_\_\_\_
- 2.3 Name of hospital and trust child transferred TO  
 (Hospital) \_\_\_\_\_  
 (Trust) \_\_\_\_\_
- 2.4 Date and time first **referral** made for transfer   /   /     :    Not recorded  
 (24 hr clock)
- 2.5 First referral request for transfer accepted  Yes  No  Not recorded
- 2.6 Date and time **departure** for transfer   /   /     :    Not recorded  
 (24 hr clock)
- 2.7 Date and time **arrival** at secondary/tertiary care   /   /     :    Not recorded  
 (24 hr clock)
- 2.8 Reason for transfer *(please tick all that apply)*
- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> No paediatric facilities                 | <input type="checkbox"/> Access to paediatric neuroscience facilities | <input type="checkbox"/> Not recorded |
| <input type="checkbox"/> No ICU facilities in hospital            | <input type="checkbox"/> Paediatric surgery                           | <input type="checkbox"/> Not known    |
| <input type="checkbox"/> No PICU bed available in hospital        | <input type="checkbox"/> Receiving hospital close to child's home     |                                       |
| <input type="checkbox"/> No general ICU bed available in hospital | <input type="checkbox"/> Other, <i>please specify</i> _____           |                                       |
- 2.9 Means of transfer
- |   |  |                                       |
|---|--|---------------------------------------|
| <input type="checkbox"/> Specialist PICU transport team | <input type="checkbox"/> Private/public transport                    | <input type="checkbox"/> Not recorded |
| <input type="checkbox"/> Local team                     | <input type="checkbox"/> Other land, <i>please specify</i> _____     | <input type="checkbox"/> Not known    |
| <input type="checkbox"/> Paramedic Ambulance            | <input type="checkbox"/> Helicopter (Paramedic/medic)                |                                       |
| <input type="checkbox"/> Ambulance (Non paramedic)      | <input type="checkbox"/> Other airborne, <i>please specify</i> _____ |                                       |
- 2.10 Additional transfer information (e.g. reason for delay)

- 2.11 Was the child 'admitted' to receiving hospital for secondary or tertiary care (see cover for definition of admission)  Yes → Go to 3.1  No → Go to 2.11.1

**2.11.1 If no, where did child go:**

- Transferred to another hospital → Go to 4.2
- Deceased → Go to 4.4
- Other, *please specify* \_\_\_\_\_ → Go to 4.1

## SECTION 3: ADMISSION AT SECONDARY/TERTIARY CARE

**3.1 Date admitted to area**   /   /    Not recorded

**3.2 Time admitted to area**   :   (24 hr clock)  Not recorded

**3.3 Area child first admitted to:**

<input type="checkbox"/> General children's ward	<input type="checkbox"/> General/Adult ICU	<input type="checkbox"/> Theatre
<input type="checkbox"/> Paediatric Intensive Care Unit (PICU)	<input type="checkbox"/> Adult Neurosurgical unit	<input type="checkbox"/> Short stay Unit
<input type="checkbox"/> Paediatric Neurosurgical unit	<input type="checkbox"/> Adult High Dependency Unit (HDU)	<input type="checkbox"/> Observation unit
<input type="checkbox"/> Paediatric High Dependency Unit (PHDU)	<input type="checkbox"/> Other, <i>specify</i> _____	<input type="checkbox"/> Not known
<input type="checkbox"/> Specialist children's ward, <i>specify</i> _____		

**3.4 Designated lead team for this admission** *(If joint care tick all that apply)*

<input type="checkbox"/> General Paediatrics	<input type="checkbox"/> General/Adult Emergency Medicine	<input type="checkbox"/> Not known
<input type="checkbox"/> Paediatric Emergency Medicine	<input type="checkbox"/> General/Adult Intensive Care	<input type="checkbox"/> Other, <i>specify</i> _____
<input type="checkbox"/> Paediatric Intensive Care	<input type="checkbox"/> Adult Neurosurgery	
<input type="checkbox"/> Paediatric Neurosurgery	<input type="checkbox"/> General/Adult Surgery	
<input type="checkbox"/> Paediatric Surgery	<input type="checkbox"/> Orthopaedic Surgery	

**3.5 Indication for admission** *(Please tick all that apply)*

<input type="checkbox"/> Severity of the head injury	<input type="checkbox"/> Recovery from GA or sedation used for CT scan
<input type="checkbox"/> Severity of other injuries	<input type="checkbox"/> Child fulfils criteria for CT scanning but this cannot be done within the appropriate period
<input type="checkbox"/> Severity of mechanism of injury	<input type="checkbox"/> Not sufficiently cooperative to allow scanning
<input type="checkbox"/> Continuing worrying signs in relation to head injury	<input type="checkbox"/> Admitted for GA to have a CT scan
<input type="checkbox"/> Abnormality identified on CT scan	<input type="checkbox"/> Shock
<input type="checkbox"/> Base of skull fracture	<input type="checkbox"/> Suspected Non Accidental Injury (NAI)
<input type="checkbox"/> Meningism	<input type="checkbox"/> Other, <i>please specify (e.g. not related to head injury, gastroenteritis)</i>
<input type="checkbox"/> CSF leak	_____
<input type="checkbox"/> Drug or Alcohol intoxication	

**3.6 Child's neurological status at admission to secondary/tertiary care**  
*Document the worst score before intubation/intervention on arrival. If no intubation/intervention occurred, document the worst score.*

<b>3.6.1 Glasgow Coma Scale Score</b> <input type="checkbox"/> Not recorded	<b>3.6.2 AVPU Score</b> <input type="checkbox"/> Not recorded
---	---

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;"><i>Eye opening</i></td><td style="width: 50px;"></td></tr> <tr><td style="padding: 2px;"><i>Verbal response</i></td><td></td></tr> <tr><td style="padding: 2px;"><i>Motor response</i></td><td></td></tr> <tr><td style="padding: 2px;"><i>TOTAL (out of 15)</i></td><td></td></tr> </table>	<i>Eye opening</i>		<i>Verbal response</i>		<i>Motor response</i>		<i>TOTAL (out of 15)</i>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;"><i>Alert</i></td><td style="width: 50px;"></td></tr> <tr><td style="padding: 2px;"><i>Respond to Voice</i></td><td></td></tr> <tr><td style="padding: 2px;"><i>Respond to Pain</i></td><td></td></tr> <tr><td style="padding: 2px;"><i>Unresponsive</i></td><td></td></tr> </table>	<i>Alert</i>		<i>Respond to Voice</i>		<i>Respond to Pain</i>		<i>Unresponsive</i>	
<i>Eye opening</i>																	
<i>Verbal response</i>																	
<i>Motor response</i>																	
<i>TOTAL (out of 15)</i>																	
<i>Alert</i>																	
<i>Respond to Voice</i>																	
<i>Respond to Pain</i>																	
<i>Unresponsive</i>																	

**Time GCS recorded:**   :   (24 hr clock)  Not recorded

**Time AVPU recorded:**   :   (24 hr clock)  Not recorded

**3.7 Child intubated following arrival at centre**  Yes  No  Not known

**3.8 Consultant paediatrician involved in care of child**  
*(i.e. Discussed with at time of care delivered)*  Yes  No  Not known

**3.9 Neurosurgeon involved in care of child**  
*(This includes liaison over telephone, or other means)*  Yes  No  Not known

**3.10 Specialist in Child Protection with level 3 training or above involved** *(i.e. Discussed with at time of care delivered)*  Yes  No  Not known

**3.11 Child Protection referral made to external body**  
*(e.g. Social Services or Police)*  Yes  No  Not known

**3.12 Skeletal survey undertaken**  
*(i.e. as part of a child protection assessment)*  Yes  No  Not known

**3.13 Review by ophthalmology undertaken**  
*(i.e. as part of a child protection assessment)*  Yes  No  Not known

## SECTION 3: ADMISSION AT SECONDARY/TERTIARY CARE *continued*

**3.14** IN ADDITION to the first area of admission was the child *at any time during the first 72 hours post injury* admitted to any of the following areas?

Area	Yes	No	Date admitted	Time admitted (24 hr clock)	Date discharged	Time discharged (24 hr clock)
a. PICU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
b. PHDU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
c. General ICU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
d. General HDU	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
e. Neurosurgical unit	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
f. Ward	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
g. Theatre	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM
h. Other, <i>specify</i>	<input type="checkbox"/>	<input type="checkbox"/>	DD/MM/YY	HH:MM	DD/MM/YY	HH:MM

## IMAGING (At any time following transfer)

- 3.15** Head CT scan performed  Yes → *Go to 3.15.1*  No → *Go to 3.15.4*  Not known → *Go to 3.16*
- 3.15.1** Date first head CT scan performed DD/MM/YY  Not recorded
- 3.15.2** Time first head CT scan performed HH:MM (24 hr clock)  Not recorded
- 3.15.3** Was the first head CT scan reported as normal on provisional report?  Yes → *Go to 3.16*  No → *Specify abnormality:*  Not known → *Go to 3.16*
- 3.15.4** If no head CT performed, please indicate reason/reasons why: *(tick all that apply)*
- CT scan already done at first hospital       Child not stable       Other, please specify \_\_\_\_\_  
 Not considered to be clinically indicated       No CT available       Not known
- 3.16** Complete cervical spine CT performed  Yes → *Go to 3.16.1*  No → *Go to 3.16.2*  Not known → *Go to 3.17*
- 3.16.1** Was the first spine CT scan reported as normal on provisional report?  Yes → *Go to 3.17*  No → *Specify abnormality:*  Not known → *Go to 3.17*
- 3.16.2** If no spine CT scan performed please indicate reason/reasons why: *(tick all that apply)*
- CT scan already done at first hospital       Child not stable       Other, please specify \_\_\_\_\_  
 Not considered to be clinically indicated       No CT available       Not known
- 3.17** Additional CT information (e.g. reason for delay)

## SECTION 4: CHILD'S OUTCOME - Complete at whichever occurs first: at transfer, at death in hospital, or at the end of the first 72 hours post injury.

- 4.1** Please indicate the status or location of the child at whichever occurs first (i.e. at transfer, at death in hospital, or at the end of the first 72 hours post injury)
- Transferred → *Go to 4.2*       Paediatric Intensive Care Unit (PICU)       Adult/General HDU  
 Discharged → *Go to 4.3*       Paediatric High Dependency Unit (PHDU)       Not known  
 Deceased → *Go to 4.4*       Paediatric Neurosurgical unit       Other, specify \_\_\_\_\_  
 General children's ward       General/Adult ICU  
 Specialist children's ward, *specify* \_\_\_\_\_       Adult Neurosurgical unit

## SECTION 4: CHILD'S OUTCOME *continued*

### 4.2 Transferred

- 4.2.1 Was this a transfer or retrieval?  Transfer  Retrieval  Not known
- 4.2.2 Name of hospital and trust child transferred to (Hospital) \_\_\_\_\_  
(Trust) \_\_\_\_\_
- 4.2.3 Date and time first referral made for transfer DD/MM/YYYY HH:MM  Not recorded  
(24 hr clock)
- 4.2.4 First referral request for transfer accepted  Yes  No
- 4.2.5 Date and time departure for transfer DD/MM/YYYY HH:MM  Not recorded  
(24 hr clock)
- 4.2.6 Reason for transfer (please tick all that apply)
- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> No paediatric facilities                 | <input type="checkbox"/> Access to paediatric neuroscience facilities | <input type="checkbox"/> Not recorded |
| <input type="checkbox"/> No ICU facilities in hospital            | <input type="checkbox"/> Paediatric surgery                           | <input type="checkbox"/> Not known    |
| <input type="checkbox"/> No PICU bed available in hospital        | <input type="checkbox"/> Receiving hospital close to child's home     |                                       |
| <input type="checkbox"/> No general ICU bed available in hospital | <input type="checkbox"/> Other, please specify _____                  |                                       |
- 4.2.7 Means of transfer
- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> Specialist PICU transport team | <input type="checkbox"/> Private/public transport             | <input type="checkbox"/> Not recorded |
| <input type="checkbox"/> Local team                     | <input type="checkbox"/> Other land, please specify _____     | <input type="checkbox"/> Not known    |
| <input type="checkbox"/> Paramedic Ambulance            | <input type="checkbox"/> Helicopter (Paramedic/medic)         |                                       |
| <input type="checkbox"/> Ambulance (Non paramedic)      | <input type="checkbox"/> Other airborne, please specify _____ |                                       |
- 4.2.8 Additional transfer information (e.g. reason for delay)

### 4.3 Discharged

- 4.3.1 Place child discharged to  Home  Rehab centre  
 Other, specify \_\_\_\_\_  Not known
- 4.3.2 Date of discharge DD/MM/YYYY  Not recorded
- 4.3.3 Time of discharge HH:MM (24 hr clock)  Not recorded
- 4.3.4 Diagnosis on discharge \_\_\_\_\_

### 4.4 Death (if a diagnosis of brain stem death is made then the date and time of this diagnosis equals the date and time of death)

- 4.4.1 Date of death DD/MM/YYYY  Not recorded
- 4.4.2 Time of death HH:MM (24 hr clock)  Not recorded
- 4.4.3 Place of death
- |  |   |   |
|--|---|---|
| <input type="checkbox"/> General children's ward                   | <input type="checkbox"/> General/Adult ICU                | <input type="checkbox"/> Theatre          |
| <input type="checkbox"/> Paediatric Intensive Care Unit (PICU)     | <input type="checkbox"/> Adult Neurosurgical unit         | <input type="checkbox"/> Short stay Unit  |
| <input type="checkbox"/> Paediatric Neurosurgical unit             | <input type="checkbox"/> Adult High Dependency Unit (HDU) | <input type="checkbox"/> Observation unit |
| <input type="checkbox"/> Paediatric High Dependency Unit (PHDU)    | <input type="checkbox"/> Emergency Department             | <input type="checkbox"/> Home             |
| <input type="checkbox"/> Specialist children's ward, specify _____ | <input type="checkbox"/> Other, specify _____             | <input type="checkbox"/> Not known        |
- 4.4.4 Death certificate issued  Yes  No  Not known
- 4.4.5 Coroner's referral made  Yes  No  Not known
- 4.4.6 Cause of death (as stated on death certificate. If no certificate issued state cause of death as in notes)
- |  |   |
|--|---|
| <b>For children who died &lt;28 days old</b> | <b>For deaths of a child (&gt; 28 days old)</b> |
| 1 _____                                      | 1a. _____                                       |
| 2a. _____                                    | 1b. _____                                       |
| 2b. _____                                    | 1c. _____                                       |
| 2c. _____                                    | 2. _____  |
| 2d. _____                                    |   |

## Inclusion & exclusion criteria

### Please include:

- Children up to 15 years old (14 years and 364 days) who between 00:00 on the 1<sup>st</sup> September 09 and 23:59 on the 28<sup>th</sup> February 2010 have a brain or skull injury (trauma to the head) as a result of blunt or penetrating trauma or acceleration or deceleration force (e.g. road traffic accident, fall, shaking) **OR** who have experienced a head injury as part of a pattern of injuries or multi trauma **AND** fulfill the following length of stay criteria:

- ⇒ Admitted to an area of inpatient care (regardless of length of stay) **OR**
  - ⇒ Died in the hospital, including the Emergency Department **OR**
  - ⇒ Transferred to other hospital for specialist care or for an ICU/HDU bed **OR**
  - ⇒ Died at the scene or en route to the receiving hospital **OR**
  - ⇒ Transferred in to your hospital (regardless of length of stay)
- Definition of 'admission' can be found on the front of this form

### Please exclude:

- Children who have experienced primarily superficial or facial injuries which are *unlikely to be associated with a brain injury* (e.g. isolated or trivial facial (nose, ear, lip etc), scalp or auricular injuries)
- Children who do not meet the above inclusion criteria (i.e. children who do not die that are not admitted; children who have reached their 15<sup>th</sup> birthday at the time of injury).

Examples of types of head injuries to be INCLUDED		Examples of types of head injuries to be EXCLUDED	
<b>S02</b>	<b>Fracture of skull and facial bones, e.g.</b>	<b>S00</b>	<b>Superficial Injuries, e.g.</b>
	Fracture of vault of skull		Superficial injury of scalp
	Fracture of base of skull		Contusion of eyelid and periorcular area
	Multiple fractures involving skull and facial bones		Other superficial injuries of eyelid and periorcular area
	Fractures of other skull and facial bones		Superficial injury of nose, ear, lip, or oral cavity
<b>S04</b>	<b>Injury of cranial nerves, e.g.</b>	<b>S01</b>	<b>Open wound of head, e.g.</b>
	Injury of optic nerve and pathways		Scalp, eyelid and periorcular area, nose, ear, cheek & temporomandibular area, lip & oral cavity.
	Injury of oculomotor nerve	<b>S02</b>	<b>Fracture of skull and facial bones, e.g.</b>
<b>S06</b>	<b>Intracranial injury, e.g.</b>		Fracture of tooth, mandible, nasal bones, orbital floor, malar & maxillary bones.
	Concussion	<b>S03</b>	<b>Dislocation, sprain &amp; strain of joints &amp; ligaments of head,</b>
	Traumatic cerebral oedema		Dislocation of jaw, septal cartilage of nose, septal cartilage of nose, or tooth. Sprain and strain of jaw.
	Diffuse brain injury	<b>S04</b>	<b>Injury of cranial nerves, e.g.</b>
	Focal brain injury		Injury of trochlear nerve, trigeminal nerve, abducent nerve, facial nerve
	EDH (Extra Dural Haematoma)	<b>S05</b>	<b>Injury of eye and orbit, e.g.</b>
	Traumatic subdural/subarachnoid haemorrhage		Injury of conjunctiva and corneal abrasion
	Intracranial injury with prolonged coma		Contusion of eyeball and orbital tissues
	Other intracranial injuries		Ocular laceration and rupture with prolapse
	Intracranial injuries - unspecified		Penetrating wound of orbit, or eyeball
<b>S07</b>	<b>Crushing injury of head, e.g.</b>		Avulsion of eye
	Crushing injury of the face	<b>S08</b>	<b>Traumatic amputation of part of head, e.g.</b>
	Crushing injury of the skull		Avulsion of scalp
<b>S08</b>	<b>Traumatic amputation of part of head, e.g.</b>		Traumatic amputation of ear
	Traumatic amputations		
	Multiple injuries of head		

**If you have any queries regarding the inclusion/exclusion criteria, please contact your CMACE regional office.**

#### CMACE East of England Office

Carol Hay, Regional Manager  
Box 111, Room 414, Clinical School  
Addenbrooke's Hospital, Hills Road  
Cambridge, CB2 0SP

T: 01223 330 356 or 351 E: [carol.hay@cmace.org.uk](mailto:carol.hay@cmace.org.uk)

#### CMACE East Midlands and Yorkshire and The Humber Office

Daniel Beever, Administrative Assistant  
Heeley Suite, Blades Enterprise Centre  
John Street, Sheffield  
S2 4SW

T: 0114 292 2492 E: [daniel.beever@cmace.org.uk](mailto:daniel.beever@cmace.org.uk)

#### CMACE London and South East Office

Dave Kimani, Administrative Assistant  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD

T: 020 7467 3224 E: [dave.kimani@cmace.org.uk](mailto:dave.kimani@cmace.org.uk)

#### CMACE North East Office (FAO Marjorie Renwick)

C/O CMACE Central Office  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD

T: 020 7467 3224 E: [headinjury@cmace.org.uk](mailto:headinjury@cmace.org.uk)

#### CMACE Northern Ireland Office

Terry Falconer, Project Manager  
The Health Promotion Agency  
18 Ormeau Avenue, Belfast  
BT2 8HS

T: 028 9027 9397 E: [terry.falconer@cmace.org.uk](mailto:terry.falconer@cmace.org.uk)

#### CMACE North West, West Midlands & Wales Office

Pamela Norris, Project Midwife  
Research Floor (5th Floor), St Mary's Hospital  
Oxford Road, Manchester  
M13 9WL

T: 0161 7016915 E: [pamela.norris@cmace.org.uk](mailto:pamela.norris@cmace.org.uk)

#### CMACE South West and Wessex Office

Jo Coffee, Regional CMACE Assistant  
Institute of Child Life & Health, Level D  
St Michaels Hospital, Southwell Street  
Bristol, BS2 8EG

T: 0117 928 5141 or 5143 E: [jo.coffee@cmace.org.uk](mailto:jo.coffee@cmace.org.uk)

#### CMACE Central Office

Rachael Davey, Projects Research Assistant  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD

T: 020 7467 3224 E: [rachael.davey@cmace.org.uk](mailto:rachael.davey@cmace.org.uk)



# HEAD INJURY IN CHILDREN

## PREHOSPITAL CARE (C)

### Instructions for completing and returning the form

1. This form should be completed by the ambulance service who responded to the child.
2. Certain sections may not be applicable to all children.
3. One form should be completed per child, per response made.
4. Please complete all dates in the format DD/MM/YY and times using the 24hr clock e.g. 18:50.
5. Please keep a copy of this form for your records. Return hardcopies of completed forms to your local CMACE regional office. See back of form for local contact details.
6. If you have any queries about completing or returning this form please contact your CMACE regional office.

Date form completed:    /    /   Date form returned:    /    /

### DETAILS OF PERSON COMPLETING FORM

Name:	Telephone:
Job title/Role:	Email:

### 1. DETAILS PROVIDED BY CMACE (for matching)

1.1 Ambulance Service \_\_\_\_\_

1.2 Surname/family name \_\_\_\_\_

1.3 Sex  Male  Female  Not known

1.4 Date of birth and/or estimated age  
*If no full date of birth is known enter month and year. If no full or short DOB, enter their estimated age.*  
  /     /    Not known  
  years   months

1.5 Patient Report Form (or equivalent) number            Not known

1.6 Incident number/CAD number (or equivalent)            Not known

1.7 Date and time of incident   /     /   :    Not recorded  
(24 hr clock)

1.8 Name of hospital and trust child transported to  
(Hospital) \_\_\_\_\_  
(Trust) \_\_\_\_\_

1.9 Date and time of arrival at this hospital   /     /   :    Not recorded  
(24 hr clock)

## SECTION 2: EMERGENCY RESPONSE DETAILS

- 2.1 **Blue call time**  
(A pre alert call placed to receiving hospital)  (24 hr clock)  Not recorded
- 2.2 **Date and time of call to emergency services**   (24 hr clock)  Not recorded
- 2.3 **Data and time ambulance service arrived at scene**   (24 hr clock)  Not recorded
- 2.4 **Date and time ambulance service left scene**   (24 hr clock)  Not recorded
- 2.5 **Were pre arrival instructions given (e.g. resuscitation)**  Yes  No  Not known
- 2.6 **Attendant Grade (e.g. paramedic/technician etc)**  
(see codes on back of form)     Not known
- 2.7 **Driver Grade (e.g. paramedic/technician etc)**  
(see codes on back of form)     Not known
- 2.8 **Who from a health related service was first to attend the site of injury?**
- Paramedic crewed land ambulance  Air ambulance  Lone responder  
 Paramedic + EMT crewed land ambulance  Doctor, BASICS  Other, specify \_\_\_\_\_  
 EMT crewed land ambulance  Doctor, other, specify \_\_\_\_\_
- 2.9 **Other emergency services or crew present at the scene: (please tick all that apply)**
- Paramedic  Police  Not known  
 Emergency Medical Technician (EMT)  Fire  
 Doctor, BASICS  Air ambulance  
 Doctor, other, specify \_\_\_\_\_  Other, specify \_\_\_\_\_
- 2.10 **On arrival of emergency services at the scene child was found to be:**  Alive  Dead

## SECTION 3: INCIDENT DETAILS

- 3.1 **Presenting complaint** \_\_\_\_\_  Not known
- 3.2 **Postcode of incident location (first part only)**      Not known  
*Only the first part of the postcode is required*  
 If postcode is not known indicate area/first line of address \_\_\_\_\_  Not known
- 3.3 **Place of incident**
- Home/private address  Road/Street/Motorway  School/Nursery  Other, specify \_\_\_\_\_  Not known
- 3.4 **Cause of injury**
- Motor vehicle accident/road traffic accident  Sport, please specify \_\_\_\_\_  
 Cycling  Other recreational (e.g. skateboard) specify \_\_\_\_\_  
 Fall from > 1m or > 5 stairs  Assault  
 Fall < 1m or < 5 stairs  Other, please specify \_\_\_\_\_  
 Fall, height unknown  Not known
- 3.5 **If motor vehicle accident or road traffic accident (RTA)**  N/A → Go to 3.6
- Vehicle occupant – Driver  Vehicle occupant – Position unknown  Pedestrian  
 Vehicle occupant – Passenger (front)  Cycling  Not known  
 Vehicle occupant – Passenger (rear)  Motorcyclist  Other, specify \_\_\_\_\_
- 3.5.1 **Helmet worn**  Yes  No  Not known  N/A
- 3.5.2 **Seatbelt worn**  Yes  No  Not known  N/A
- 3.5.3 **Child restraint**  Yes  No  Not known  N/A
- 3.5.4 **Airbag**  Yes  No  Not known  N/A
- 3.5.5 **Child ejected**  Yes  No  Not known  N/A
- 3.5.6 **Fatality in the same vehicle**  Yes  No  Not known  N/A
- 3.5.7 **Child trapped**  Yes  No  Not known  N/A
- 3.6 **Additional incident details, if known (e.g. Fall from trampoline, speed, not in age appropriate car seat, etc)**



## SECTION 5: MANAGEMENT Continued

5.13 Intravenous (IV) cannulation attempted	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
If yes,			
5.13.1 Was this successful	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
5.13.2 Who was the attempt made by	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> Not recorded
5.14 Intraosseous cannulation attempted	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
If yes,			
5.14.1 Was this successful	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
5.14.2 Who was the attempt made by	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> Not recorded
5.15 Fluid therapy given	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
5.16 Cervical spine and/or whole spine immobilised	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
5.17 Drugs administered	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
5.18 C-Collar	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded
5.19 Resuscitation (CPR) required prehospital	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not recorded

## CODES

CODE	SPECIALITY	CODE	SPECIALITY
PAR	Paramedic	DRB	BASICS Doctor
EMT	Emergency Medical Technician	DRO	Doctor - other
ECA	Emergency Care Assistant	OTH	Other
ECP	Emergency Care Practitioner		
CCP	Critical Care Practitioner		

## CMACE REGIONAL OFFICE CONTACT DETAILS

### CMACE East of England Office

Carol Hay, Regional Manager  
Box 111, Room 414, Clinical School  
Addenbrooke's Hospital, Hills Road  
Cambridge, CB2 0SP  
T: 01223 330 356 or 351 E: [carol.hay@cmace.org.uk](mailto:carol.hay@cmace.org.uk)

### CMACE East Midlands and Yorkshire and The Humber Office

Daniel Beever, Administrative Assistant  
Heeley Suite, Blades Enterprise Centre  
John Street, Sheffield  
S2 4SW  
T: 0114 292 2492 E: [daniel.beever@cmace.org.uk](mailto:daniel.beever@cmace.org.uk)

### CMACE London and South East Office

Dave Kimani, Administrative Assistant  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD  
T: 020 7467 3224 E: [dave.kimani@cmace.org.uk](mailto:dave.kimani@cmace.org.uk)

### CMACE North East Office (FAO Dr Claire Bradford)

C/O CMACE Central Office  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD  
T: 020 7467 3224 E: [headinjury@cmace.org.uk](mailto:headinjury@cmace.org.uk)

### CMACE Northern Ireland Office

Terry Falconer, Project Manager  
The Health Promotion Agency  
18 Ormeau Avenue, Belfast  
BT2 8HS  
T: 028 9027 9397 E: [terry.falconer@cmace.org.uk](mailto:terry.falconer@cmace.org.uk)

### CMACE North West, West Midlands & Wales Office

Pamela Norris, Project Midwife  
Research Floor (5th Floor), St Mary's Hospital  
Oxford Road, Manchester  
M13 9WL  
T: 0161 7016915 E: [pamela.norris@cmace.org.uk](mailto:pamela.norris@cmace.org.uk)

### CMACE South West and Wessex Office

Jo Coffee, Regional CMACE Assistant  
Institute of Child Life & Health, Level D  
St Michaels Hospital, Southwell Street  
Bristol, BS2 8EG  
T: 0117 928 5141 or 5143 E: [jo.coffee@cmace.org.uk](mailto:jo.coffee@cmace.org.uk)

### CMACE Central Office

Rachael Davey, Projects Research Assistant  
Lower ground floor, Chiltern Court  
188 Baker Street, London  
NW1 5SD  
T: 020 7467 3224 E: [rachael.davey@cmace.org.uk](mailto:rachael.davey@cmace.org.uk)

## INCLUSION and EXCLUSION CRITERIA

**Inclusions:** Children up to 15 years old (14 years and 364 days) who between 00:00 on the 1<sup>st</sup> September 09 and 23:59 on the 28<sup>th</sup> February 2010 have a brain or skull injury (trauma to the head) as a result of blunt or penetrating trauma or acceleration or deceleration force (e.g. road traffic accident, fall, shaking) **OR** who have experienced a head injury as part of a pattern of injuries or multi trauma **AND** fulfill the following length of stay criteria:

- |   |           |  |
|---|-----------|--|
| ⇒ Admitted to an area of inpatient care ( <i>regardless of length of stay</i> ) | <b>OR</b> |  |
| ⇒ Died in the hospital, including the Emergency Department                      | <b>OR</b> | Definition of 'admission' can be found on the front of this form |
| ⇒ Transferred to other hospital for specialist care or for an ICU/HDU bed       | <b>OR</b> |  |
| ⇒ Died at the scene or en route to the receiving hospital                       | <b>OR</b> |  |
| ⇒ Transferred in to a hospital ( <i>regardless of length of stay</i> )          | <b>OR</b> |  |

### Exclusions:

- Children who have experienced primarily superficial or facial injuries which are *unlikely to be associated with a brain injury* (e.g. isolated or trivial facial (nose, ear, lip etc), scalp or auricular injuries)
- Children who do not meet the above inclusion criteria (*i.e. children who do not die that are not admitted; children who have reached their 15<sup>th</sup> birthday at the time of injury*).



Further information is available at: [www.hqip.org.uk](http://www.hqip.org.uk)

ISBN NO 978-1-907561-06-1

6th Floor, 45 Moorfields, London, EC2Y 9AE

T 0207 997 7370 F 0207 997 7398

E [communications@hqip.org.uk](mailto:communications@hqip.org.uk)

[www.hqip.org.uk](http://www.hqip.org.uk)

Registered Office: 70 Wimpole Street, London W1G 8AX

Registration No. 6498947

Registered Charity Number: 1127049

© 2015 Healthcare Quality Improvement Partnership Ltd. (HQIP)

All rights reserved

September 2015