Ashford and St. Peter's Hospitals
NHS Foundation Trust

Guideline for performing a skeletal survey on a child with suspicion of non-accidental injury.

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Guideline History		
Date	**Comments**	**Approved By**
01/06/2022	Updated and amended. Added section on thermoregulation in babies. Added blood test requirements	Ratified in paediatric Guidelines meeting 14/11/2022

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1.Skeletal survey for suspected non-accidental injury (NAI)

a) Introduction

This guideline is based on guidance from Royal College of *Radiologist "The Radiological investigation of Suspected Physical Abuse in Children 2017"* and guidance in the RCPCH Child Protection Companion.

b) Decisions about suspected physical abuse.

A skeletal survey is required if there are concerns that a child has been subjected to physical abuse. The skeletal survey must be requested by a senior clinician (usually paediatric consultant).

Most children requiring Skeletal Survey for investigation of physical abuse will be under the age of two, but older children may require this investigation.

Guidance to assist with decisions concerning physical abuse can be found in the RCPCH Child Protection Companion.
https://childprotection.rcpch.ac.uk/child-protection-companion-content/chapter-9-recognition-of-physical-abuse/

c) Requesting Imaging

Skeletal surveys are undertaken as a planned event in the main X-ray department, at the request of a Consultant Paediatrician. They will normally be completed in working hours Monday- Friday.

The skeletal survey should be acquired and reported within 24 hours and no later than 72 hours from the request being made.

The referring clinician should provide a clear explanation to the person with parental responsibility of the reasons for the imaging request, including the risks.

A computer request form and paper request form, signed by the responsible consultant, is required to book the examination.

Written consent from a person with parental responsibility should be obtained by the referring consultant. This is completed on a standard hospital consent form with a signature from the requesting consultant and person with parental responsibility. If consent is declined this should be discussed with Children's services and the paediatric safeguarding team.

Parents and carers must be fully informed of the implications of the examination and be given an opportunity to discuss and ask questions about the procedure before they arrive in the X-Ray Department.

Parents should be provided with ASPH written information leaflet "*Skeletal survey examination – information for parents and carers"* by the medical or safeguarding team.

d) Blood tests for infants and children undergoing skeletal survey.

All children undergoing skeletal survey for suspected physical abuse should have the following blood tests. The British Paediatric and Adolescent Bone Group (BPABG) have recommended the following should be measured when the initial blood tests are taken close to the time of the initial skeletal survey.

Calcium and phosphate, alkaline phosphatase
Serum 25-hydroxyvitamin D
Parathyroid hormone

e) Nursing care prior to and during the procedure

The patient must be accompanied for the skeletal survey by a registered paediatric nurse or a statutorily registered health or care practitioner, preferably someone who is familiar with the child and parents. Health care assistants are not suitable.

The accompanying nurse must ensure that the child is kept covered up and warm as much as possible during the examination, as the ambient temperature in the X-ray department can be cool. They must also ensure that smaller infants do not miss feeds while they are away from the ward.

The immobilisation required for young children can appear extreme to the untrained eye and it is important that there is an independent witness to the examination.

The accompanying nurse or health care professional also provide re-assurance for the child independently of the radiographers involved with the imaging.

Sedation may be required for older infants and children. This should be considered and prescribed by the paediatric medical team, following local policies, if required.

If the child is sedated, then they should have continuous Saturation monitoring. A portable oxygen cylinder and the “Red” post-operative equipment bag which contains emergency equipment should be taken with the child to the x ray department.

Parents and carers may accompany the child but there is a limit to the number of individuals who can be present in the X-ray room and IRMER regulations apply.

The radiographer has the right to exclude individuals from the room.

f) Radiographic Requirements

Effective immobilisation is essential to obtain good quality images. This usually involves the child being held by an adult. Parents/carers should not routinely be asked to hold the baby still for the radiographic exposures, because of their emotional involvement with the child it is unlikely that they will be able to position and immobilize the baby satisfactorily and therefore should not be asked to do so.

Anyone who holds the child should be informed how they assist. Records must be kept for all those who assist during exposures.

2 qualified radiographers should work together, one of whom must be a Superintendent. If no Superintendent is available a Senior 1 should take charge of the examination.

The examinations are not usually performed outside of normal working hours.

Images must be of the highest quality with careful attention to side marking.

Correct and visible patient identification is essential.

Both radiographers must annotate each image saved to PACS with their initials.

Both radiographers must sign the paper request form to confirm that all images have been saved to PACS and scan the signed request form as permanent record that this has taken place. It is essential that this is carried out since the records may be required in future for court proceedings

g) Minimum Projections Required for a Skeletal Survey are as follows:

Head, chest, spine, and pelvis:

- AP and lateral skull.
- AP chest (to include shoulders)
- Oblique views of ribs both sides (to include all ribs, 1-12)
- AP abdomen and pelvis
- Lateral whole spine (on one view is possible. For larger children separate views will be required)

Upper limbs:

- AP of the whole arm (centred at the elbow)
- Coned lateral elbow
- Coned lateral wrist
- PA hand and wrist

In larger children where a single whole arm view is not possible:

- AP humerus (including the shoulder and elbow)
- AP forearm (including the elbow and wrist)
- Coned lateral elbow
- Coned lateral wrist
- DP hand and wrist

Lower limbs:

- Whole AP lower limb, hip to ankle
- Coned lateral knee and ankle

- Coned AP ankle (mortise view)
- DP foot

For larger children:

- AP femur
- AP tibia and fibula
- AP knee
- AP ankle
- Coned lateral knee
- Coned lateral ankle
- DP foot

The Radiologist may request supplementary views, including coned views of the metaphyses and lateral views of any suspected fracture.

SERIES ORDER ON PACS:

- Skull AP and lateral.
- AP chest
- Oblique ribs R and L
- AP abdomen and pelvis
- Lateral whole spine
- R arm including coned lateral views
- L arm including coned lateral views
- Both hands
- R leg including coned lateral views and additional views in larger children
- L leg including coned lateral views and additional views in larger children
- Both feet

h) CT Head Imaging:

Brain CT should be conducted **for all children under the age of 1 year in whom NAI is suspected.**

CT Brain scan should also be considered in older children with who present with injuries where there is a high association with abusive head trauma.

When the examination is completed, images should be shown to a Consultant Radiologist (preferably Dr Niewiarowski or Dr K Khadtare). If not available, the images should be shown to the Consultant Radiologist covering hot seat. If this is not possible at the time of the examination, the child should be returned to the ward but may have to come back for subsequent projections.

i) MRI Brain Imaging:

MRI of the head and spine should be performed at day 2-5 for all children when CT has demonstrated intracranial haemorrhage and/or parenchymal brain injury and /or skull fracture.

MRI head and whole spine should also be performed for children in who there are ongoing abnormal neurological symptoms or signs irrespective of an apparently normal CT.

If a clinical decision is made not to perform an MRI Brain and Spine scan following initial safeguarding investigations the reasons for this must be clearly documented in the child's medical record by the named consultant Paediatrician.

j) Follow up imaging:

Follow-up imaging 11- 14 days after the initial skeletal survey and no later than 28 days after the initial skeletal survey. If the follow-up skeletal survey is delayed, beyond 11-14 days, for any reason this should be discussed with the Consultant Paediatric Radiologist.

Even if the initial skeletal survey is normal all children should have follow-up imaging to identify fractures which only become visible with healing.

Follow-up radiographs should be performed of any abnormal or suspicious areas on the initial skeletal survey plus the following views:

- Chest AP (to include shoulders)
- Oblique ribs (left and right to include all ribs)
- AP whole arm (centred at the elbow). In larger children, AP humerus and AP forearm separately to include both joints.
- AP whole lower limb. For larger children AP femur and AP tibia and fibula separately to include both joints.

An appointment will be booked at the time of the initial skeletal survey for follow-up imaging.

Parent's, Children's services and the safeguarding team will be informed of the date and time of the follow-up skeletal survey prior to discharge from hospital.

If the child needs sedation the follow-up will be booked at St Peters Hospital, if not the follow-up will be booked at Ashford Hospital

A nurse or member of the paediatric safeguarding team will accompany the child and parent/carer to radiology. The nurse is expected to act as a chaperone and assist with the procedure to ensure the child is positioned correctly for the follow-up x rays.

Following the x-rays, the child and parent/carers can leave the hospital.

Parents/Carers should be informed they will be contacted with the results either by phone or by letter. Parents should be informed they may be asked to return if any new concerns are identified.

The nurse should document attendance, who accompanied the child and whether or not there were any concerns. If any concerns are raised on the day the Children's Safeguarding team should be contacted for advice.

The Code 5 Co-ordinator in Radiology will alert the named consultant if the patient fails to attend.

k) Radiation Safety and Risk

All radiation exposure carries a risk of inducing cancer.

Due to associated uncertainties, it is generally considered inappropriate to quantify the risk from a diagnostic X-ray exposure on an individual basis.

However, based on typical risk factors published by the UK's former Health Protection Agency (HPA) the range of total lifetime cancer risks in terms of effective doses arising from diagnostic X-ray examinations can be expressed for specific groups (of both genders and of a specific age range).

A skeletal survey, which involves several X-ray exposures equates to approximately 3 weeks of natural background radiation in a child under the age of 1, 4 weeks for a 1–2-year-old and 5 weeks in a child of 5 years of age. (For comparison a chest X-ray represents an exposure equivalent to 3 days).

Based on exposure factors used at this Trust the calculated risk of developing cancer from a skeletal survey is very low (1 in 10,000 to 1 in 100,000).

A CT brain scan involves a higher radiation dose and is equivalent to 1-4.4 years of background radiation in a new-born infant, 1-2 years in a 5-month-old and 1 year in an 11 month old.

For the general population, the following risks apply:

Risk of fatal cancer in childhood 1: 500
Risk of fatal cancer during any
person's whole lifetime 1:3
Risk of developing cancer from a
skeletal survey 1:10000 – 1:100000 (very low)

The average risk of developing cancer from a CT Brain scan (male:female)
- newborn 1:1000 – 1:1200 (low)
- 5 month old 1:1200 – 1:1700 (low)
- 11 month old 1:2500 – 1:3400 (low)

To put this into perspective below is a table comparing the different levels of risk of cancer from radiation to the probability of developing cancer in the general population.

Risk qualification	Approx level of additional risk of cancer incidence	Probability of developing cancer in the general population (% LBR	Probability of developing cancer in the general population if adding this extra level of risk (% LBR + % LAR)
Neglible	<1 in 500 000	42	42.00
Minimal	Between 1 in 500 000 and 1 in 50 000	42	42.00
Very low	Between 1 in 50 000 and 1 in 5 000	42	42.02
Low	Between 1 in 5000 and 1 in 500	42	42.25
Moderate	Between 1 in 5000 and 1 in 500 and 1 in 250	42	42.50

Communicating Radiation Risks in Paediatric Imaging; WHO (LBR - Lifetime baseline risk, LAR - lifetime attributable risk)

Although the CT brain scan represents a very small increased risk, it is important that this risk is balanced against the clinical indication for imaging. Where the safety of the child is at risk, the potential benefits of establishing a diagnosis will outweigh the excess risk attributable to the radiation.

All X-Ray procedures carried out at Ashford and St Peter's Trust conform to the strict guidelines laid down by the legislative framework of IR(ME)R 2000 for the use of ionising radiation in diagnosis.

l) Reporting of Skeletal Surveys

A report by a Consultant Radiologist will be available on PACS within 24 hours of the examination being carried out.

A second report will be issued by one of the Paediatric Radiologists (Dr Niewiarowski or Dr Khadtare) as soon as possible after this. This allows for the images to have been reviewed by at least 2 separate Radiologists and will improve diagnostic accuracy.

m) Communicating results of the skeletal survey

The named consultant paediatrician should explain the results and of the initial skeletal survey to the parents. In some cases, it may be necessary to discuss the results with childrens services or the police prior to speaking to the parents. It is advisable to have another member of staff, or member of the safeguarding team present when discussing skeletal survey results.

Results of the follow up skeletal survey should be sent in writing to the named social worker, parents and GP.

2 References:

1) https://www.rcr.ac.uk/publication/radiological-investigation-suspected-physical-abuse-children

2) https://childprotection.rcpch.ac.uk/child-protection-companion-content/chapter-9-recognition-of-physical-abuse

3. Supporting relevant trust guidelines

Fractures in children guideline

4. Guideline Governance

a. Scope

This guideline is relevant to all staff caring for all children from 0-18 years old across the emergency department, inpatient ward and outpatient department.

b. Purpose

i. This guideline aims to facilitate a common approach to the management of children. At times deviation from the guideline may be necessary, this should be documented and is the responsibility of the attending consultant.

ii. This guideline is subject to regular review to ensure ongoing evidence-based practice.

c. Duties and Responsibilities

All healthcare professionals responsible for the care of all children 0-18years should be aware of practice according to this guideline.

d. Approval and Ratification

This guideline will be approved and ratified by the Paediatric Guidelines Group.

e. Dissemination and Implementation

i. This guideline will be uploaded to the trust intranet 'Paediatric Guidelines' page and thus available for common use.
ii. This guideline will be shared as part of ongoing education within the Paediatric Department for both medical and nursing staff.
iii. All members of staff are invited to attend and give comments on the guideline as part of the ratification process.

f. Review and Revision Arrangements

a. This policy will be reviewed on a 3 yearly basis by the appropriate persons.
b. If new information comes to light prior to the review date, an earlier review will be prompted.
c. Amendments to the document shall be clearly marked on the document control sheet and the updated version uploaded to the intranet. Minor amendments will be ratified through the Paediatric Guidelines Group. A minor amendment would consist of no major change in process, and includes but is not limited to, amendments to documents within the appendices.

Equality Impact Assessment

Background • Who was involved in the Equality Impact Assessment
Author and the supervising consultants.
Methodology • A brief account of how the likely effects of the policy was assessed (to include race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age) • The data sources and any other information used. • The consultation that was carried out (who, why and how?)
All groups of staff and patients were taken into consideration and there is no bias towards or against any particular group.
Key Findings • Describe the results of the assessment. • Identify if there is adverse or a potentially adverse impacts for any equalities groups.
There is no evidence of discrimination.
Conclusion • Provide a summary of the overall conclusions.
There is no evidence of discrimination.
Recommendations • State recommended changes to the proposed policy as a result of the impact assessment.

• Where it has not been possible to amend the policy, provide the detail of any actions that have been identified. • Describe the plans for reviewing the assessment
This guideline is appropriate for use.

Document Checklist

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document:

Guideline for performing a skeletal survey on a child with suspicion of non-accidental injury.

Policy (document) Author: Dr Clare Hill

Executive Director:

		Yes/No/ Unsure/NA	Comments
1.	**Title**		
	Is the title clear and unambiguous?	**YES**	
	Is it clear whether the document is a guideline, policy, protocol or standard?	**YES**	
2.	**Scope/Purpose**		
	Is the target population clear and unambiguous?	**YES**	
	Is the purpose of the document clear?	**YES**	
	Are the intended outcomes described?	**YES**	
	Are the statements clear and unambiguous?	**YES**	
3.	**Development Process**		
	Is there evidence of engagement with stakeholders and users?	**YES**	

		Yes/No/ Unsure/NA	Comments
	Who was engaged in a review of the document (list committees/ individuals)?	**YES**	**Paediatric Radiologists** **Designated Doctor for Safeguarding Children – Surrey** **Paediatric Matron & Paediatric Consultants**
	Has the policy template been followed (i.e. is the format correct)?	**YES**	
4.	**Evidence Base**		
	Is the type of evidence to support the document identified explicitly?	**YES**	
	Are local/organisational supporting documents referenced?	**YES**	
5.	**Approval**		
	Does the document identify which committee/group will approve/ratify it?	**YES**	
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?	**YES**	
6.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	**YES**	**Paediatric Intranet**
	Does the plan include the necessary training/support to ensure compliance?	**YES**	
7.	**Process for Monitoring Compliance**		
	Are there measurable standards or KPIs to support monitoring compliance of the document?	**YES**	
8.	**Review Date**		

		Yes/No/ Unsure/NA	Comments
	Is the review date identified and is this acceptable?	**YES**	
9.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?	**YES**	
10.	**Equality Impact Assessment (EIA)**		
	Has a suitable EIA been completed?	YES	

Committee Approval (Paediatric Guidelines Group)			
If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner			
Name of Chair	**Dr Claire Mitchell**	**Date**	**14/11/2022**
Ratification by Management Executive (if appropriate)			
If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner			
Date: n/a			