Factors influencing child protection professionals' decision-making and multidisciplinary collaboration in suspected abusive head trauma cases: A qualitative study

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Abstract

Clinicians face unique challenges when assessing suspected child abuse cases. The majority of the literature exploring diagnostic decision-making in this field is anecdotal or survey-based and there is a lack of studies exploring decision-making around suspected abusive head trauma (AHT). We aimed to determine factors influencing decision-making and multidisciplinary collaboration in suspected AHT cases, amongst 56 child protection professionals. Semi-structured interviews were conducted with clinicians (25), child protection social workers (10), legal practitioners (9, including 4 judges), police officers (8), and pathologists (4), purposively sampled across southwest United Kingdom. Interviews were recorded, transcribed and imported into NVivo for thematic analysis (38% double-coded). We identified six themes influencing decision-making: 'professional', 'medical', 'circumstantial', 'family', 'psychological' and 'legal' factors. Participants diagnose AHT based on clinical features, the history, and the social history, after excluding potential differential diagnoses. Participants find these cases emotionally challenging but are aware of potential biases in their evaluations and strive to overcome these. Barriers to decision-making include lack of experience, uncertainty, the impact on the family, the pressure of making the correct diagnosis, and disagreements between professionals. Legal barriers include alternative theories of causation proposed in court. Facilitators include support from colleagues and knowledge of the evidence-base. Participants' experiences with multidisciplinary collaboration are generally positive, however child protection social workers and police officers are heavily reliant on clinicians to guide their decision-making, suggesting the need for training on the medical aspects of physical abuse for these professionals and multidisciplinary training that provides knowledge about the roles of each agency.

Keywords: Child physical abuse, Abusive head trauma, Qualitative research, Child protection

Introduction

Abusive head trauma (AHT) is the primary cause of fatal child abuse, and the majority of fatal head injuries in children aged less than two years are due to physical abuse (Gill et al., 2009). Morbidity for children who survive AHT is significant; a recent extended follow-up study of children who suffered severe AHT found that 40% presented with serious neurological impairment (Lind et al., 2016). AHT may go unrecognized in up to 30% of cases (Jenny, Hymel, Ritzen, Reinert, & Hay, 1999; Letson et al., 2016; Sheets et al., 2013) yet early detection of AHT can save lives; a seminal study indicated that 80% of deaths could have been prevented if AHT was recognized during a prior medical evaluation (Jenny et al., 1999).

Clinicians face unique diagnostic challenges in suspected child physical abuse cases (Leventhal, Asnes, Pavlovic, & Moles, 2014). In common with many areas of medicine, there is no gold-standard diagnostic test for AHT, and the history provided by the caregiver may be inaccurate or deliberately misleading. The stakes are high; if abuse is not identified, children may be re-injured, possibly fatally. Conversely, a wrongful diagnosis of abuse has profound emotional, societal and legal consequences for the families involved. Due to the complex nature of suspected abuse cases, clinicians must work with colleagues from other clinical sub-specialties (e.g. trauma surgeons, neuroradiologists and skeletal radiologists, ophthalmologists), child protection social workers (CPSWs), and professionals from law enforcement. These professionals must work together as a multidisciplinary team, to jointly determine the likelihood of AHT.

Despite this, studies have found that clinicians may lack the confidence to identify abuse (Flaherty et al., 2006), differ in their views of what constitutes a ‘reasonable suspicion’ or ‘reasonable medical certainty’ of abuse (Dias, Boehmer, Johnston-Walsh, & Levi, 2015; Levi & Brown, 2005), exhibit biases in their evaluations of AHT related to the family’s

socioeconomic status and race (Wood et al., 2010), and demonstrate inconsistencies in their investigations and diagnoses of suspected abuse (Anderst, Nielsen-Parker, Moffatt, Frazier, & Kennedy, 2016; Wood et al., 2012). In addition, the validity of AHT/shaken baby syndrome (SBS) as a medical diagnosis is constantly questioned, often falsely predicated on the premise that a "diagnostic triad" of subdural hemorrhages, retinal hemorrhages and encephalopathy defines AHT, and forms the basis of a clinical AHT diagnosis (Squier, 2011; Rorke-Adams, 2011; Elinder et al., 2016; Lynøe et al., 2017).

Much of the evidence regarding the barriers or facilitators to multidisciplinary working or the perceptions of professionals working in multidisciplinary teams in suspected abuse cases has been anecdotal, or has relied on case studies or surveys (e.g. Inkilä, Flinck, Luukkaala, Åstedt-Kurki, & Paavilainen, 2013**;** Sedlak et al., 2006). Furthermore, while surveys have been used to assess the factors affecting clinicians' decisions to *report* suspected abuse (e.g. Flaherty et al., 2006; Flaherty et al., 2008; Gunn, Hickson, & Cooper, 2005), these were all conducted in North America, and do not address decision-making processes in suspected AHT specifically. The primary aim of this study was to explore factors influencing decision-making in suspected AHT cases, amongst a variety of professionals involved. The secondary aim was to explore the working relationships between the different professional groups.

Methods

This was a qualitative semi-structured interview study. The study methods have been published previously (Cowley et al., 2018). The study received ethical approval from the Cardiff University School of Medicine Research Ethics Committee (Ref: 15/35). This study is reported in accordance with the Consolidated Criteria for Reporting Qualitative

Research (COREQ) guidelines (Tong, Sainsbury & Craig, 2007); a checklist is included in Appendix 1.

Participant recruitment

Purposive sampling and snowball sampling were used to recruit participants for this study. We targeted clinicians, CPSWs, legal practitioners, police officers and pathologists involved in suspected AHT cases across south west United Kingdom (UK). A list of potential participants was identified through personal contacts of the research team and organizational websites. Personal contacts and organizations were sent an information sheet to explain the study and were asked to suggest suitable participants for interview. A random selection of individuals from each professional group were then invited to take part. We recruited participants with different levels of child protection experience and seniority (Figure 1). Individuals were contacted via email, with the exception of judges who were sent formal letters of invitation. In this study the term "clinician" refers to medical doctors and specialist nurses, who were sampled from three teaching hospitals and two district general hospitals across a range of specialties including pediatrics, radiology and neurosurgery. Most participating clinicians were consultants, with the exception of two associate specialists, two trainee doctors and one nurse. Judges had more child protection experience than barristers or solicitors, while forensic pathologists had more child protection experience than the pediatric pathologist. Senior CPSWs and police officers had more child protection experience than their junior counterparts.

Interview schedule development

The interview schedule was developed by two of the authors (LC and MF), discussed within the research team and revised accordingly (Appendix 2). Questions were derived from

the existing research literature on the identification of AHT. The schedule was piloted with a police officer and a clinician, regarding the length, appropriateness, and content, and amended accordingly. The schedule comprised core open-ended questions, prompts and clarifying questions. Interviews explored participants' usual practice and decision-making in head-injury cases where AHT is suspected, and their experiences of multidisciplinary working. It was a guide rather than a definitive list, to allow exploration of additional topic areas that might be raised by participants. Early interview responses influenced questions asked in later interviews; the schedule was updated as data collection and analysis progressed and new topic areas were raised. We also explored the participants' attitudes towards the Predicting Abusive Head Trauma (PredAHT) clinical prediction rule; these results are reported elsewhere (Cowley et al., 2018).

Data collection

Interviews were conducted by LC, a PhD student with training in qualitative research methods and qualitative interview techniques. No relationship was established between the interviewer and participants prior to the study. Informed consent was obtained, including permission for audio recording for verbatim transcription. When two participants declined to be audio recorded the interviewer made detailed notes of their responses. These were sent to the participants to check that they were a fair reflection of their views. The schedule was delivered to individuals or at two small group interviews (of three and five participants from the same professional group) where personal interaction between the participants was minimized, to maximize individual contributions. Interviews lasted 45 minutes, and took place at the participants' workplace between June 2015 and September 2016. MF was also present to record relevant field notes such as participant non-verbal behavior and response to the interview, and critical reflections about the interview. No repeat interviews were

conducted. In the interests of reflexivity, the interviewer considered how her own values and assumptions as a student researching decision-making in suspected AHT cases might influence the interviews or the interpretation of the findings. A reflective journal was kept in an attempt to minimize potential bias. In early interviews with clinicians, the interviewer was acutely aware of her status as a non-medical student with no medical training but nevertheless conducting PhD research in a medical topic, and how this may affect the power relationship between the researcher and the participant. Subsequently, to break down power imbalances, every effort was made to build a rapport with the participants and ensure that the interview was guided by them, while also staying on-topic. The researcher also made sure not to ask any leading questions or impose their own views on the participants.

Data analysis

Data analysis began shortly after the first interview using thematic analysis (Braun & Clarke, 2006). Data categories were arranged under overarching themes. A general inductive approach enabled the results to be guided by the aims and objectives of the research, and the raw data (Bryman & Burgess, 1994; Dey, 1993). The Framework Method was used to manage, summarize, display, and synthesize the data and to facilitate analysis (Gale, Heath, Cameron, Rashid, & Redwood, 2013). Analysis followed seven phases: transcription, familiarization, coding, developing an analytic framework, applying the analytic framework, charting data into framework matrices, and interpretation (Gale et al., 2013). Initial codes were generated independently by LC, MF and HQS. These were jointly grouped into clearly defined categories that were further arranged under themes. Discrepancies between coders were resolved by discussion and consensus. This process was undertaken in an attempt to minimize individual biases; 38% of the transcripts were independently double-coded. The joint analysis enabled the development of a preliminary analytic framework. Transcripts were

imported into NVivo (QSR International Pty Ltd. Version 10, 2014), to organize and manage the data and assist with data analysis. Quotes pertaining to each category were retrieved and 'charted' into thematic framework matrices. Interviews ceased when thematic saturation was achieved within each group of participants (clinicians, CPSWs, police officers, legal practitioners and pathologists), which was verified using the constant comparative method (Glaser & Strauss, 1967). The final phase of the analysis involved abstraction and interpretation of the data. Participants were not asked to provide feedback on the study findings. Analysis focused on identifying factors that were perceived to influence decision-making in cases of suspected AHT. Six major themes were identified: 'professional factors', 'medical factors', 'circumstantial factors', 'family factors', 'psychological factors', and 'legal factors'. Categories and their definitions are detailed in the final analytic framework (Table 1). The systematic synthesis of the data excerpts into thematic matrices enabled a review of the categories across cases, to identify barriers and facilitators to decision-making.

Results

Participant demographics and response rates are shown in Table 2 and Figure 1. Data are presented using quotations, selected as examples of the themes and categories that emerged from the data. Within the quotations, square brackets represent text inserted for clarification. Word repetitions and irrelevant sections were removed and denoted by '…'.

Professional factors

Participants' **perceived role in the decision-making process** differed by professional group. All community and general pediatricians agreed that it is within their remit to come to a decision as to the likelihood that a child has suffered AHT, as part of a multidisciplinary team. Emergency medicine specialists, radiologists, the neurosurgeon and the pediatric

pathologist would raise concerns with other colleagues, but not make the final diagnosis. Two forensic pathologists would provide a steer to other professionals, while one stated that it was not their job to make decisions about abuse. Barristers and solicitors, the neurosurgeon and one forensic pathologist emphasized that it is the **role of the court** and ultimately the judge to decide whether a child has suffered AHT.

"I suppose in every case you wonder whether that's happened, but it's not for us to ultimately make that decision, we just have to present the evidence and it's for the judge to make the decision at the end of the day." Legal Practitioner 2

The self-perceived role of CPSWs and judges in suspected AHT cases is to **protect the child from future harm**, rather than to determine whether AHT has occurred *per se*.

"What the [family] court has to decide is…has this child suffered significant harm? Or, does the evidence disclose, based on facts that you can find that there is a real possibility of significant harm in the future…so in terms of us deciding was this a non-accidental injury or an accidental injury, in some cases it won't make any difference to a decision that we have to make because you can have a very serious accident that will occur as the result of an inappropriate care-giver, or an unsafe care-giver, or a lack of supervision." Judge 3

CPSWs and police officers **are heavily reliant on medical professionals** to come to a decision as to whether AHT has occurred, and to guide their decision-making. This is due to their own lack of medical training and knowledge. The more experience these participants had investigating suspected AHT, the more knowledge they had.

"To support my decision-making I would rely heavily on what consultants are telling us, what the experts are telling us about those injuries and what the likely cause is, and what's acute, what's not, what's explained, what could potentially cause this. So yeah, major, major reliance on that clinical information, I can't emphasize that enough…I would rely quite

heavily on that expert view, and the views of those medical professionals with child protection experience." Police Officer 7

"We're not trained medically to know whether something's accidental or non-accidental. We can have an opinion on it, but it won't be based on research and training." CPSW 9

"I'm not a doctor, I'm not a medical expert, I'd want some clear guidance from the doctors about what they think, but having some experience now, no training, but some experience of dealing with these cases, I'm able to ask some relevant questions of the doctors." Police Officer 6

Judges rely on medical professionals to conduct a **timely and high quality clinical investigation** in suspected AHT cases, to facilitate the decision-making process in a court environment. In addition there is an expectation from legal practitioners and CPSWs that medical professionals are able to categorically determine the cause of the child's injuries by the clinical features alone.

"We have experience of saying to the medics to pin down to an absolute, 'this is the way it happened'...and they will always say...'I can't tell you that'." Legal Practitioner 1

However, clinicians and pathologists highlighted that other professional groups shouldn't be **relying solely on them** to come to a decision about suspected AHT.

"What I do with the police with these cases is actually say to them look, you shouldn't be relying on me. A case depends on lots of different bits of evidence." Pathologist 3

Many CPSWs, police officers and legal practitioners, including judges, said that decision-making is more difficult when medical professionals are unable to provide them with a **clear answer** as to whether AHT has occurred or not, or when they will not commit to a view either way.

"Often if there are clear injuries and the medics are actually saying that it is non-accidental then there is a clear process for us to follow. That makes it easier, it makes it a lot harder when health professionals are sitting on a fence." CPSW 3

However, CPSWs and police officers explained that the majority of the time medical professionals will **express their suspicions** to other agencies, which facilitates the investigative process, and if clinicians remain unsure, they would continue their investigations regardless.

"I mean, 9 times out of 10 it's fairly self-evident. I was able to have generally an open and honest discussion with the pediatrician, that pediatrician would say, 'In my opinion, this is what you've got. Either it's non-accidental or I'm concerned its non-accidental'. In which case they're both dealt with in pretty much the same way and investigated appropriately. It's fairly straight forward…But if they say, 'I'm unsure'. Then we still run with it anyway." Police Officer 3

"We usually get perhaps an initial medical report to say it's felt that these injuries are non-accidental…so initially you do get a concern that it is non-accidental." CPSW 6

Although clinicians do rely on other agencies to assist them in making decisions in suspected AHT cases, they seek **support and advice** from clinical colleagues to a greater extent.

"We can always speak to colleagues and we're never in it by ourselves…we're always in discussion with colleagues. I have never been in the situation where I've said, 'Right, I'm the only one making that call.' You're always discussing it with other people and so that certainly lessens the burden on you when you have to make those decisions. Even though you may be the person who is called to go to a strategy meeting or the case conference or actually to court you will have had those discussions with colleagues as well…you become confident because we reassure each other that that's the diagnosis." Clinician 5

CPSWs and police officers overall have had positive experiences of **multidisciplinary collaboration**.

"We had, and we still do have, very good working relationships with health professionals, with pediatricians in particular." Police Officer 3

"Generally I find it's quite positive working with other agencies around safeguarding children." CPSW 2

"I think we've generally got a great relationship with the forensic pathology team." Police Officer 7

However, a handful of participants identified multidisciplinary working as a barrier to decision-making due to competing interests and disagreements between professionals both within and across agencies.

"Working with other agencies [is difficult] really, sometimes coming from competing backgrounds and also from here even you know, decision-making by managers is not always the same it can be varied." CPSW 3

CPSWs and police officers noted that **delays** can occur while the other agencies are carrying out their own assessments, which impacts on the overall investigation.

"We're guided a lot by medical staff; waiting for their statements to come through…It can take a long time. It can take months sometimes, you get an initial report but it's very much really not until towards the end where you really know what you've got." Police Officer 5

One influential factor for police officers was the amount of **resources** they are able to put into an investigation, reporting that more severe cases are better resourced.

"Do you say, 'This is definitely non-accidental'? In which case you're going to put a lot more resources in it. Or is it one of those really difficult ones to gauge and you know you're not going to have the budget to do absolutely everything." Police Officer 2

For some participants, coming to a decision about whether AHT has occurred is **extremely difficult**, while for others it is not.

"I think it is probably the most stressful and difficult set of decisions that one has to make in medicine. Partly due to the difficulty of coming to conclusions." Pathologist 3

"It's not that it's difficult, I think it just needs a lot of consideration and a lot of thought and weighing of the evidence rather than the actual decision being difficult. If the evidence is strong enough, I think the decision to be made is not that difficult." Clinician 6

Their **confidence** when investigating suspected AHT cases is strongly related to the amount of **experience** they have.

"I'm confident in dealing with the family, knowing my role, knowing the role of other professionals, but that might just be because I've been doing this for such a long time." Police Officer 5

"I'd say I was not very confident working on these cases, without a doubt, because I haven't worked on many physical abuse cases." CPSW 9

In terms of professional decision-making strategies, participants' discussed the importance of 'seeing the bigger picture' in suspected AHT cases, and **piecing together the evidence** from various different sources.

"It's a bit like a jigsaw puzzle to put together a number of different pieces of evidence to see if you can get any closer to the truth." Judge 3

Medical factors

Clinicians and pathologists **refer to the literature and evidence-base** on the different types of injury seen in abusive and non-abusive trauma when investigating suspected AHT cases, which gives them more confidence in their decisions.

"I've been through a lot a lot of the literature about it…so that has helped me in feeling maybe more confident about these cases." Clinician 7

"First of all I see whether there is any injury and decide what sort of injury it is, whether it's a blunt force injury or sharp force injury etcetera and then the distribution of the injuries on the body, and then relate the distribution that I find with what I know about the literature on different patterns of injury for assault or accident, falls." Pathologist 1

Participants mentioned a range of **clinical features** they understood to be concerning for abuse, including intracranial injuries, encephalopathy, retinal hemorrhages, fractures, apnea, seizures, spinal injury, and evidence of external injury such as bruising, bites or burns. They also recognized that **specific patterns of injury** are suspicious for abuse, including posterior rib fractures, metaphyseal fractures, patterned bruising and certain distributions of intracranial and retinal hemorrhages. Some also mentioned that fractures or intracranial bleeds of **different ages** are indicative of previous abuse or multiple incidents of abuse.

"If we are beginning to be concerned about abusive head trauma we would get an eye examination, so the presence of any retinal hemorrhages would be corroborative evidence, but particularly multi-layer widespread dot, blot and flare hemorrhages, other evidence of intraocular bleeding…I would be expecting or might see multiple focal thin layer subdural hemorrhages in different brain compartments." Clinician 10

Some participants, particularly police officers, have a high suspicion of AHT when the **"triad"** of subdural hemorrhages, encephalopathy and retinal hemorrhages is present. However, importantly, these were not the only features that these participants considered when coming to a decision about AHT.

"Once you get the triad of injuries and everything else, if you've got some attending injuries that appear to be evidence of abuse, in my view that would fuel the theory that there has been abusive head trauma. So for example if I had a child present in hospital with a head injury

and they had bruising elsewhere on their body, that would make me more concerned about the head injury because of the evidence of abuse elsewhere." Police Officer 3

One CPSW alluded to the **"triad"** of injuries, demonstrating a **lack of training** on the clinical indicators of AHT, an outdated view of the features of the "triad" as diagnostic for AHT, and a lack of knowledge of the potential differential diagnoses of retinal hemorrhages.

"We haven't had proper training on this...I had training when I was studying my degree, but I had it drummed into me that if there's subdural hemorrhaging, retinal hemorrhage, it's abuse. Am I right in thinking that there can be no other organic cause for retinal hemorrhage?" CPSW 1

Participants emphasized the importance of ruling out organic medical conditions in children with suspected AHT, listing a variety of **differential diagnoses** they would consider, including blood clotting disorders, birth trauma, and glutaric aciduria among others.

"We would need the bloods, we would want to be screening for a significant coagulation disorder you know these kids often have a coagulation disorder after the event, so you need to confirm whether the coagulation disorder returns to normal after the child has been resuscitated. You would probably want to go back and re-examine the child looking for evidence of connective tissue disorders, you would want to review the family history, is there anybody in the family with a coagulation or connective tissue disorder." Clinician 10

One pathologist pointed out that **abuse can still occur** even when a child has an organic condition.

"I think that sometimes it is forgotten that even with natural pathology, it doesn't preclude there being something deliberate to go with it." Pathologist 2

Similarly, participants' often **link the injuries to the mechanism** purported by the care-givers, and deliberate over the plausibility of this.

"If I saw a head injury where there was not obviously impact, I would be looking for corroboration of the application of force somewhere, because as soon as you find a bruise or a fracture, or a graze or a split at whatever level in the body skin, soft tissues, the skeleton, you have what is undeniably the application of force and that helps you…the pattern of rib fractures indicates that there has been compression of the chest…the head injury may indicate impact or deceleration." Pathologist 3

"They could be toddling couldn't they, if they fell down the stairs from the top floor to the bottom they could have a brain injury couldn't they depending on the floor downstairs, they might have got a stone floor…but you wouldn't expect to have the other stuff there." CPSW 8

A clear factor influencing participants' decision-making is the **severity of the injuries** sustained. An intracranial bleed or rib fracture in a young child are viewed as serious injuries, and the more clinical features a child has, or the more impaired they are, the more likely participants' are to suspect AHT.

"My decision really would be based on the fact that I think you're talking about trauma here, a brain injury, if that's where we're looking at it, it's a really serious condition isn't it? So you've got to do everything you can to make sure that that child is safe, and there's no risk that this could happen again." CPSW 9

Participants discussed dealing with the inherent **uncertainty in medicine**, and in the child protection arena in particular, stating that so-called 'gray' cases, where there is considerable uncertainty surrounding a diagnosis of AHT, are the most difficult.

"Medicine is rarely black and white, there are shades of gray in the middle of it, and often these are quite dark gray. You're pretty certain, there was a while where I felt slightly less sure, but most of them I felt reasonably confident, given if there's that constellation of injury, in the absence of an adequate explanation." Clinician 17

"Regularly in child protection we find ourselves in a situation where it's not 100% clear the person's guilty or the offence has happened, neither is it 100% clear that there is an innocent explanation, and left this gray area in between. Well there's still a risk, something possibly, or probably happened, but we can't prove it, can't rule it out, so where do we go with that…you know the gray area ones." Police Officer 6

It is hard for clinicians to convey to other agencies that a case **may not be clear-cut**.

"We are often trying to explain things to people who don't necessarily understand the uncertainty in medicine like police and social workers." Clinician 11

Circumstantial factors

Participants discussed the specific **circumstances surrounding the incident** in suspected AHT cases, including the explanation given for the child's injuries and details of their presentation to the hospital.

"What I'd be looking to do is looking at the accounts that have been given to the attending officers, the accounts given to the paramedics, what's been said on the 999 call [emergency number], what's been said when they first attend, usually they speak to the Accident & Emergency pediatrician, what they then say to the community pediatrician and my officer when they get there." Police Officer 1

The single most important factor that influences professionals' decision-making when AHT is suspected is the **history**, in particular whether the **mechanism of injury** is consistent with the type and severity of the injuries or the developmental stage of the child.

"Probably the single most important thing, is the detailed history. And the features of that, the description of what's happened, how possible and plausible that is, is it compatible with the injuries, is the child capable of what's described in terms of their developmental stage? So I think the detail of the history is really, really important." Clinician 12

However, participants find decision-making difficult when the history is consistent with the injuries, but the mechanism could nevertheless be **either abusive or accidental**.

"The difficult ones are where they come in and say 'I've fallen down the stairs with my baby' because you think if somebody has just lost it with a baby and smacked them against a wall, and is switched on and intelligent and actually quite manipulative, they probably would come up with a story of 'I've just dropped my baby'. So those ones are always a bit more difficult because you think it might be true, on the other hand it might not be." Clinician 13

When there is **no history of a traumatic event** whatsoever, participants have a very high index of suspicion for AHT.

"The lack of disclosure is a biggie, you know the child who presents with collapse and then you subsequently find that they have subdural hemorrhages or a fracture or broken ribs, that makes you very concerned that it's not the whole story being told to you." Clinician 24

Another influential factor is whether **the history is consistent** over time/between caregivers.

"I might be wanting to speak to a nurse, so 'You spoke to the parents when they first arrived, now you and the pediatrician have spoken to the parents here', is there any discrepancy between the two stories, or are they consistent, or is mum saying one thing and dad saying another thing?" Police Officer 6

A **delay in presentation** to hospital is an important risk factor for some participants.

"The other thing we always worry about is a delay. So we have had the odd few children that have presented a few days later because of a significant swelling and while that is possible that would raise a flag in your head." Clinician 16

Participants discussed the **behavior and appropriateness of the parents** and the interactions between the parent and the child throughout the investigation.

"We look at exploring the family dynamics, the response of the parents during the immediate child protection enquiry, the interview." CPSW 1

Family factors

Participants discussed the importance of the families' **social history** when investigating suspected AHT cases. They talked about a wide range of issues including parental drug and alcohol use; parental mental health; domestic violence; previous involvement with social services; parent-child interactions; level of supervision of the child; neglect; socioeconomic status; and parental criminal history.

"I would be concerned if there was also then a family history of family violence, if I was getting background social history that there was known abuse in the past, or I guess if this baby had been more vulnerable for whatever reason, was maybe a pre-term or indeed if this was a mother who's quite young, not supported, new partner, and partner's not the biological father of this baby. They are things that I would actually…they'd be helping with the diagnosis. It wouldn't necessarily tip it but they would obviously add to my concern that my feeling is this is likely to be the case." Clinician 2

"Obviously if there's domestic violence, substance abuse, a history of neglect, that's obviously going to shoot up in terms of our assessment." CPSW 1

CPSWs and police officers place more emphasis on the **family setup** than the clinical factors.

"I would probably have a better understanding of the context in terms of the family scenario, levels of supervision and what it's actually like within the household." CPSW 5

However one police officer mentioned that he would give **less weight** to the social history of the family during his investigation.

"The social background is less important, because if we're investigating if there's been abuse

or not, it's determined principally by the injuries, by an explanation, by the evidence, not by whether the parents are employed, whether the parents are smokers, or if the dad is an alcoholic, whether there has been domestic violence in the house, those are interesting background features, perhaps more likely to be prevalent in some cases than others, but it's not going to tell me abuse has happened or hasn't happened." Police Officer 6

Similarly, participants pointed out that a **lack of history with social services** or a lack of a criminal record does not rule out AHT.

"It's not always families that come revolving door, we have families that have not been known to us for years, or never been known and they've harmed a child." CPSW 4

A major factor influencing participants' decision-making in suspected AHT cases is the **impact on the family**. They discussed the impact of removing a child from the family home, and how intervening in a child's home life could be damaging for the child and family, particularly where a head injury is found to be non-abusive. The decision to remove a child from their parents is not taken lightly, as it may not be the best thing for the child.

"I know accidents happen with babies and children with the best will in the world and what you don't want to do is if a family is already traumatized by something that the child has experienced and they're doing the best for them, to add in the trauma of querying the abuse factor could just tear the family apart." CPSW 9

Clinicians, CPSWs and police officers find it difficult **working with the family** and having to treat parents as potential suspects or perpetrators when they are grieving or coping with a seriously unwell child. Participants talked about the need for sensitivity and the potential repercussions of falsely accusing a family of abuse.

"It's not so much the clinical diagnosis it's managing it and being the one who talks to the parents and is having to deal with their anxieties, their uncertainties and all their anger." Clinician 10

Psychological factors

Participants' decision-making in suspected AHT cases is influenced by their own **personal biases**, such as a disbelief that parents or care-givers from 'nice, middle-class families' are capable of inflicting injuries on their children.

"Well they shouldn't but if it looks like a really nice family that you couldn't imagine doing anything like that and that shouldn't influence you but it makes you think. People say 'Oh I've seen a case like this before' or they say 'No, no the family is too nice'. And other people will be saying 'But don't be fooled by it', all this goes on, I hear it all the time." Clinician 9

However, most participants **acknowledge these biases** and attempt to remain objective in their assessments.

"We always keep an open mind, we always continue to gather information and if there is new information, it will change our decisions." Clinician 10

CPSWs and judges find cases difficult when they only have medical evidence to rely on, and there are **no other risk factors** that they are able to identify within the family.

"There have been cases where we've removed children begrudgingly because of medical evidence and genuinely from the way the parents are with the child, their backgrounds you just don't think they did it. So that's very difficult ethically having to remove a child on the basis of a medical decision where there's nothing else to substantiate that." CPSW 1

However this CPSW also stressed that even in the **absence of other risk factors,** she would remain suspicious and continue with her investigations.

"I would be led very much by medical evidence and even if there was no other risk factors identified for that child, I would not be willing to take any risk on a case like that." CPSW 1

Clinicians, CPSWs, and particularly police officers are influenced by their "**gut instincts**" when conducting their investigations and assessments.

"I'd probably rely on my professional suspicion…my gut feeling…If I had an inkling something was not right then we would be doing more." Police Officer 3

Investigating suspected AHT is **emotionally demanding** and can be a barrier to remaining objective in these cases.

"There is emotion attached to them, so seeing children who are injured whether it is accidentally or deliberately, there's an emotional component to that. I find it difficult because I am intrinsically a relatively trusting and non-suspicious person and I've had to train myself to just take the emotion out of it, and deal with whatever facts are available." Clinician 12

Legal factors

Police officers and legal practitioners disclosed that **identifying the perpetrator** in suspected AHT cases is particularly difficult.

"The difficulty in my experience isn't identifying it, it's in establishing who's done it." Police Officer 3

Legal practitioners and especially judges, rely on **expert witnesses** to provide an interpretation of the clinical features, but noted that there are often disagreements and conflicting opinions between expert witnesses coming from different disciplines.

"There will sometimes be subtleties, particularly in the expert evidence that we get and you will have two extremely eminent experts sometimes from different disciplines, sometimes the neurosurgeon has a different view from the radiologist. I can remember doing a case in which they'd looked at the same scan and said I don't think we can agree what's there…So those are the difficulties that you have to encounter when you get a range of opinion on the interpretation of the medical evidence." Judge 3

Judges and police officers referred to the **various theories** that are put forward by the parents or the defense in an attempt to disprove cases of suspected AHT.

"Something needs to be looked at because this hasn't happened because the child has got gastro-esophageal reflux, which was one theory which used to be propagated at one stage because if a child had gastro-esophageal reflux it might stop breathing and that would lead to a rise in intracranial pressure which would then give rise to the bleed and we had that theory at one stage, not from the medics but that was one that was often propagated." Judge 3

Discussion

The findings from this study suggest that child protection professionals diagnose AHT based on knowledge of a wide range of clinical features described in the literature, features in the history, and risk factors within the family, after exclusion of potential differential diagnoses and discussion with colleagues from other specialties and disciplines. Barriers to identifying AHT included lack of experience, uncertainty, emotional factors, personal biases, the impact on the family and the fear of making an incorrect diagnosis, disagreements between professionals including expert witnesses, and alternative theories of causation proposed in court. Participants' experiences with multidisciplinary collaboration were reported as generally positive, however CPSWs and police officers reported being heavily reliant on clinicians to guide their decision-making, due to their own lack of medical training and knowledge. Facilitators to identifying AHT include support from colleagues, multidisciplinary working, knowledge of the literature and evidence-base, and "gut instinct". The strengths of this study lie in the wide range of professionals interviewed, the detail and depth of the data, and the robustness of the data analysis. Survey-based methods do not allow for such a detailed exploration of participants views (Fontana & Frey, 1994).

The results are consistent with barriers and facilitators influencing detection of physical abuse generally, and clinicians' decisions to report suspected abuse identified in

previous studies. Flaherty and colleagues (2008) found that the decision to report suspected abuse was primarily influenced by the child's clinical and social history and physical examination findings, particularly if their injuries were inconsistent with the history or their developmental stage. Barriers to detecting (Regnaut, Jeu-Steenhouwer, Manaouil, & Gignon, 2015) and reporting (Gunn et al., 2005) abuse described previously include personal biases, the fear of being wrong and the subsequent impact on the family, uncertainty about the level of suspicion and the difficulty of establishing a diagnosis, while facilitators include support from colleagues and other agencies.

If a comprehensive evaluation reveals no other medical explanation for the child's injuries, clinicians must decide whether the injuries are accidental or abusive (Leventhal et al., 2014; Narang, 2011). In determining this, participants reported that one of the most important factors influencing their decision-making is whether the history of the mechanism of injury is consistent with the type and severity of the injuries seen, or the developmental stage of the child. This approach has been deemed both medically and legally valid (Narang, 2011), having been first described in a landmark article on the diagnosis of "battered child syndrome" (Kempe, Silverman, Steele, Droegemueller, & Silver, 1962).

Our findings clearly refute the claims of some recent literature that AHT is diagnosed based on the "triad" alone (Elinder et al., 2016; Lynøe et al., 2017) and echo the categorical statements made by experienced clinicians who do not diagnose AHT solely on the presence of the "triad" (Saunders et al., 2017; Narang & Greeley, 2017; Lucas et al., 2017; Ludvigsson, 2017; Levin, 2017). The misconception was the subject of a meeting convened by the Royal College of Pathologists in 2009 to consider the issues appertaining to the "triad" and the "unified hypothesis" in non-accidental head injury cases, following which legal guidance was issued from the UK Crown Prosecution Service (2011) on the prosecution approach to non-accidental head injury. This states that "the expert evidence finding of

typical triad pathological features might **not be considered as diagnostic in itself** but simply as **strong evidence** that the injuries were non-accidental" (emphasis added). This view was reflected by clinicians and police officers in the current study. However, one senior CPSW described being taught at undergraduate level that the features of the "triad" are diagnostic for AHT. Although this may have been some time ago, this highlights how misconceptions become established, the differences between agencies and training gaps for social worker education in the clinical indicators and differential diagnoses of AHT, and suggests that their training should be regularly updated in line with the evolving evidence-base.

An important issue influencing child protection professionals' decision-making in suspected AHT cases is the proposal of scientifically unsupported alternative theories of causation for AHT in court. Judges and police officers alluded both to genuine diagnoses that lack scientific evidence to explain the injuries associated with AHT (e.g. Vitamin D deficiency) and unproven speculative hypotheses with no scientific evidence-base (e.g. that gastro-esophageal reflux causes intracranial pressure leading to intracranial hemorrhage). The use of these flawed theories has created controversy in the courtroom and the media regarding the diagnosis of AHT, and has serious consequences for the upholding of justice and the protection of children (Leventhal & Edwards, 2017). Several authors have suggested potential remedies for ensuring responsible expert medical testimony in AHT cases (Leventhal & Edwards, 2017; Holmgren, 2013; Albert, Blanchard & Knox, 2012). Albert et al. (2012) recommended a comprehensive authoritative study of the strength of the medical evidence for AHT and the accuracy of AHT testimony, as well as tailored certification programs for medical professionals called upon to testify in court. Recently a consensus statement on AHT based on a thorough and comprehensive review of the literature and evidence-base was published, supported by nine pediatric and radiology international organizations, with the intention of helping jurors and judges to distinguish between "genuine

evidence-based opinions of the relevant medical community from legal arguments or etiological speculations that are unwarranted by the clinical findings, medical evidence and evidence-based literature" (Choudhary et al., 2018). Leventhal and Edwards (2017) urge academic medical centers and professional societies to set standards for medical testimony in AHT cases, while Holmgren (2013) recommends peer review and quality control by responsible experts and disciplinary action against irresponsible and unethical experts.

Some participants stated that they are sometimes influenced by their "gut feeling" when investigating suspected AHT cases. "Gut feeling" has been defined as an intuition that something is wrong even in the absence of specific clinical indicators, or a sense of reassurance about a patient's condition and management in the absence of a definitive diagnosis (Stolper et al., 2011). The evidence-based medicine literature generally advises doctors against the use of intuitive reasoning, in order to avoid errors resulting from cognitive biases (Croskerry, 2003), and instead promotes the use of analytical models, clinical guidelines and decision tools (Sackett, 1997). A recent study demonstrated that child abuse pediatricians who had met the family and therefore had access to social intuition or "gut feelings" associated with a face-to-face encounter, were significantly less likely to perform adequate abuse evaluations for neuro-trauma and long-bone fracture compared to those who had not met the family (Keenan, Cook, Olson, Bardsley, & Campbell, 2017). However, studies have shown that intuition can outperform analytical reasoning in diagnostic decision-making (Dhaliwal, 2011), and that "gut feelings" may trigger the process of diagnostic reasoning, prompting clinicians to perform further investigations (Stolper et al, 2009). One qualitative study exploring the identification and management of child abuse found that Dutch healthcare professionals' intuitive "gut feelings" often formed the basis of a more objective investigation and triggered a systematic process of evidence gathering (Schols, de Ruiter, & Öry, 2013). Dhaliwal (2011) recommends that clinicians adhere to the principles of

evidence-based medicine while also understanding when it is appropriate to "go with their gut".

The participants in this study did report that their decision-making in suspected AHT cases is influenced by their personal biases and emotions. However, that they are aware of these biases and their potential pitfalls is encouraging, as it provides opportunities for monitoring, reflection and deliberative efforts to minimize their negative effects (Laskey, 2014). Participants described the application of strategies recommended in the literature to avoid errors resulting from bias, including attempting to remain objective, consciously considering differential diagnoses, and collaborating with multidisciplinary colleagues (Laskey, 2014).

While many studies have evaluated the relationship between law enforcement and child protective services in suspected child abuse cases (e.g. Cross, Finkelhor, & Ormrod, 2005; Sedlak et al., 2006; Newman & Dannenfelser, 2005), comparatively few studies have assessed health professionals' perceptions of multidisciplinary working. Previous studies have described a hostile relationship between police officers and CPSWs, due to conflicting priorities and agendas, assumptions regarding the other's role, and time delays (Newman & Dannenfelser, 2005). Clinicians have also criticized social workers, describing them as unresponsive or inconsistent (Regnaut et al., 2015). In contrast, the majority of the participants in the current study described positive relationships and experiences with other agencies. Only a very small number of participants felt that multidisciplinary working is difficult due to competing interests and disagreements, while a handful of participants brought up time delays as significant barriers to the investigation. Overall, participants' views of multidisciplinary working indicated that police officers and CPSWs consider AHT to be a medical diagnosis, and are heavily reliant on clinicians decisions; many believe that medics can determine the cause of injures by clinical features alone, and it is difficult for other

agencies when clinicians "sit on the fence". Conversely, clinicians find it difficult to convey medical uncertainty to other agencies. This finding echoes the results of a recent study exploring collaboration between pediatricians and CPSWs, which demonstrated that CPSWs rely on pediatricians' opinions regarding accidental and abusive bruising, but that pediatricians felt CPSWs harbored unrealistic expectations about the diagnostic value of a child protection medical examination to identify abusive bruising (Matthews, Kemp, & Maguire, 2017). Indeed, in some suspected AHT cases, the diagnosis may remain uncertain even after a thorough clinical and forensic investigation (Leventhal et al., 2014; Kelly, John, Vincent, & Reed, 2015). Clearly, joint training that provides knowledge about the individual roles and limitations of each agency would be valuable. In addition, clinicians should be prepared to provide a clear opinion about the likelihood of AHT to their non-medical colleagues and ensure that they have the necessary skills and experience required for the evaluation of children with suspected AHT (Christian & Committee on Child Abuse & Neglect, 2015). Interestingly, the current study found that pathologists defer to pediatricians to diagnose AHT; this may differ in the United States, where pathologists occupy a critical role in the medicolegal evaluation of AHT (Holmgren, 2013).

Participants discussed a range of social risk factors within the families, usually regarded as facilitators to reaching a decision about AHT. However, some felt that these factors impeded their decision-making, since a family without risk factors could be abusive, while a family with multiple risk factors may never harm their child. Previous research identified the presence of risk factors as a complicating factor in detecting child abuse for some clinicians (Schols et al., 2013), although a recent study found that children referred for abuse evaluations without certain risk factors were just as likely to be diagnosed with AHT as those with risk factors (Kelly et al., 2015).

Participants are more likely to suspect AHT and put greater resources into a case when the child's injuries are severe. However, it is well known that children can suffer repeated and escalated instances of abuse that eventually result in severe injury, and can sustain comparatively minor "sentinel" injuries such as isolated bruising or intra-oral injuries prior to a catastrophic injury (King, Kiesel, & Simon, 2006; Oral, Yagmur, Nashelsky, Turkmen, & Kirby, 2008; Petska, Sheets, & Knox, 2013; Sheets et al., 2013). Sheets and colleagues (2013) found that 30% of children diagnosed with AHT had previous sentinel injuries; where clinicians were aware of these injuries, either abuse was not suspected or was suspected but unsubstantiated, and their significance also went unrecognized by clinicians during the subsequent abuse evaluation.

Limitations

Most clinical participants were consultants based in teaching hospitals with considerable child protection experience; since participation was voluntary, these participants may have had a particular interest in the identification and investigation of AHT compared to other professionals who did not take part. The factors influencing decision-making and multidisciplinary working may be different for trainees or those with less experience. Similarly, results may have differed amongst other clinical subspecialties e.g. neurologists, intensivists, staff nurses or ophthalmologists, and only small numbers of specialists in radiology, neurosurgery and emergency medicine participated. In addition, the majority of the police officers had less than ten years child protection experience, while the majority of the legal practitioners had ten years or more child protection experience. However, qualitative research does not aim to make probabilistic generalizations to a population, but to arrive at logical, contextualized generalizations regarding the phenomenon under study (Polit & Beck, 2010). Further exploration of the factors influencing pathologists' decision-making in

suspected AHT cases may be justified since only four pathologists participated and data saturation may not have been achieved with this group (Cowley et al., 2018). Our data represent the views and attitudes of professionals as recounted to the interviewer rather than observations of their practice, and participants may have felt obliged to give socially acceptable answers. Qualitative research inevitably relies on the researcher's interpretations, however we attempted to minimize subjective bias by using three trained qualitative researchers to double-code the data and resolve disagreements through discussion and consensus.

Conclusions

By directly seeking the views and practices of a wide range of child protection professionals investigating children with suspected AHT, we have contributed a deeper understanding of how these professionals make decisions and work together in these challenging cases. The findings contradict recent literature claiming that AHT is diagnosed based on the "triad" alone (Elinder et al., 2016; Lynøe et al., 2017). Rather, decision-making in AHT cases is complex and nuanced, and a diagnosis is arrived at only when all potential variables are carefully explored and considered, including clinical, historical, forensic and social features and potential differential diagnoses. The findings suggest that CPSWs and police officers may benefit from additional training in the medical aspects of physical abuse, and that joint training might provide a better understanding of the roles, expectations and limitations of each agency, thereby facilitating more effective collaboration.

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Table 1. Analytic Framework

Theme	Categories & Definitions
Professional factors	**Participants' perceived role in the decision-making process:** discussions regarding the participants' role in making a decision as to whether children in suspected abuse cases have suffered AHT; whether they feel it is within their remit to make such decisions and why; whether they form an opinion about the likelihood of AHT having taken place **Reliance on other professionals:** any comments relating to a reliance on others to identify AHT or direct participants' decision-making; any reasons why participants may rely on others such as medical professionals, e.g. due to a lack of medical knowledge, for information sharing or for a high quality clinical investigation; any difficulties associated with having to rely on others for information or guidance **Multidisciplinary collaboration:** any comments about the positive or negative aspects of working with other agencies e.g. discussions about the quality of the relationships between the professional groups; organizational barriers; delays; competing interests; disagreements between professionals **Resources:** any remarks regarding the availability of resources to support an investigation such as an adequate budget or staff with expertise in child protection work **Difficulty making the diagnosis:** any remarks about the ease or difficulty in making a diagnosis in suspected AHT cases; any reasons why a diagnosis of AHT may be easy or difficult to make **Confidence:** discussions regarding how confident the participants' feel working on AHT cases or making decisions regarding AHT; any reasons why participants' may feel confident or not i.e. the amount of experience or training they have had **Seeing 'the bigger picture':** any comments about having to piece together a 'jigsaw puzzle' of different types of evidence in order to understand the 'bigger picture'; any references to analyzing the different components of the investigation or considering a combination of different factors in order to reach a conclusion
Medical factors	**Clinical features:** any references to the clinical features that may influence decision-making such as bruising, fractures, burns or bites; any references to the 'triad' of injuries i.e. subdural hemorrhages, retinal hemorrhages and encephalopathy, any references to the medical literature or evidence-base around abuse-related injuries **Differential diagnoses:** any comments about differential diagnoses of AHT, or alternative explanations for injuries, e.g. accidental injury, or medical/genetic conditions such as bleeding disorders, osteogenesis imperfecta, glutaric aciduria etc. **Mechanisms of injury:** considerations of the manner or circumstance in which injuries may have occurred and how these considerations contribute to decision-making; any comments linking specific clinical features to possible injury mechanisms e.g. bruising associated with impact injuries, rib/chest injuries associated with compression forces

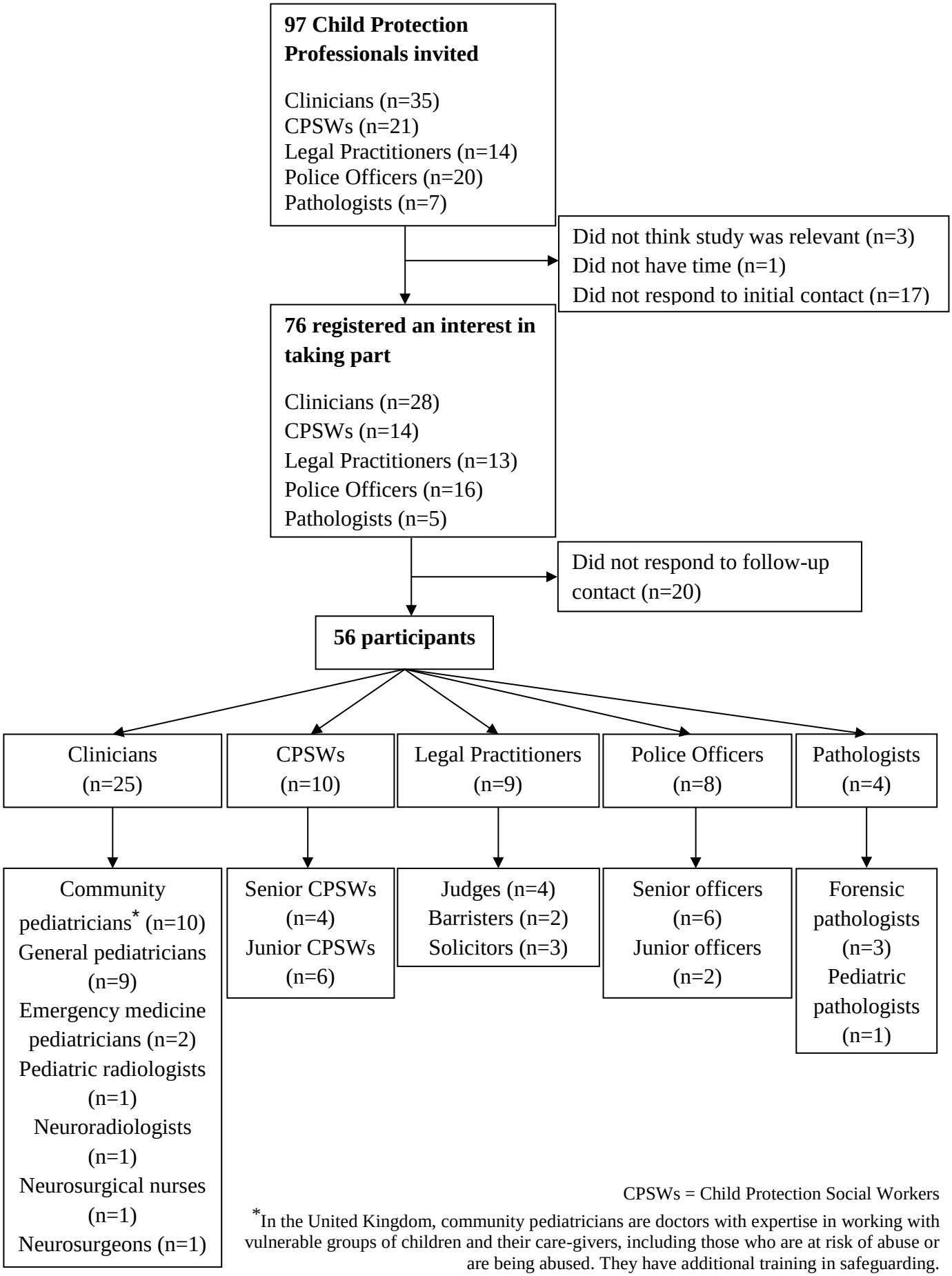
	Severity of injuries: comments regarding the severity of the injuries suffered by children as a factor affecting decision-making or the investigative process; perceptions of the seriousness of intracranial injuries in young children **Dealing with uncertainty:** any remarks about managing uncertainty in suspected AHT cases and how the degree of certainty impacts upon decision-making or the investigative/assessment process; discussions about so-called 'grey' cases where there is considerable uncertainty surrounding the diagnosis
Circumstantial factors	**Circumstances surrounding the incident:** discussions about the specific circumstances associated with the incident, including any witnesses to the event; details regarding the initial 999 call; examinations of the scene or surface where the incident purportedly occurred; comments about time to presentation at hospital including a delay in presentation; the behavior of the parents at the hospital or the scene and the parent-child interaction **History:** any discussions about the explanation for the child's injuries provided by the parents or carer, including whether the history given is consistent with the level of injury or the developmental stage of the child; or consistent across time and between caregivers
Family factors	**Social history:** any discussions regarding the social history of the family, including parental drug and alcohol use; parental mental health issues; domestic violence; previous involvement with social services; level of supervision of the child or previous history of neglect; socioeconomic status; and criminal history **Impact on the child/family:** any discussions regarding the impact that removing a child from the home or accusing a parent of AHT would have on the child and family **Working with the family:** anything relating to the challenges of working with the family during a suspected AHT case, and the need to act sensitively
Psychological factors	**Personal biases:** any remarks relating to disbelief or doubt that parents or carers are capable of inflicting injuries on their children; discussions of biases relating to the education level of the parents, socioeconomic or employment status, family structure or whether the family appears 'troubled' **Instinct:** any allusions to 'professional instincts' with regard to whether AHT has occurred, or instincts about a possible perpetrator, often referred to as a 'gut feeling' **Emotional factors:** any comments about the emotional or psychological impact of working on suspected AHT cases and how this may affect decision-making
Legal factors	**Identifying the perpetrator:** any comments about identifying a potential perpetrator in suspected AHT cases **Expert witnesses:** any discussions about working with or relying on expert witnesses; comments about disagreements between experts; remarks or interpretations about theories put forward by defense expert witnesses in an attempt to disprove cases

Table 2
Demographics of child protection professionals participating in a qualitative study of decision-making in suspected abusive head trauma cases

	Clinicians (N=25)		CPSWs (N=10)		Legal Practitioners (N=9)		Police Officers (N=8)		Pathologists (N=4)	
	n	%	n	%	n	%	n	%	n	%
Gender										
Female	16	64	7	70	7	78	3	37.5	0	0
Male	9	36	3	30	2	22	5	62.5	4	100
Age group										
25–34	2	8	2	20	2	22	0	0	1	25
35–44	11	44	5	50	1	11	5	62.5	1	25
45–54	8	32	1	10	4	45	3	37.5	1	25
55–64	4	16	2	20	2	22	0	0	1	25
Ethnicity										
White British	19	76	10	100	8	89	8	100	4	100
White Other	4	16	0	0	1	11	0	0	0	0
Indian	2	8	0	0	0	0	0	0	0	0
Years in CP										
<5	0	0	2	20	1	11	3	37.5	0	0
5–9	6	24	3	30	1	11	2	25	2	50
10–20	7	28	4	40	4	45	3	37.5	0	0
>20	12	48	1	10	3	33	0	0	2	50
CP training										
Yes	25	100	10	100	3	33	7	87.5	4	100
No	0	0	0	0	6	66	1	12.5	0	0
Pediatric HI training										
Yes	18	72	1	10	3	33	4	50	3	75
No	7	28	9	90	6	66	4	50	1	25

CPSWs = child protection social workers, CP = child protection, HI = head injuries.

Figure 1. Flowchart of child protection professionals participating in a qualitative study of decision-making in suspected abusive head trauma cases



CPSWs = Child Protection Social Workers

*In the United Kingdom, community pediatricians are doctors with expertise in working with vulnerable groups of children and their care-givers, including those who are at risk of abuse or are being abused. They have additional training in safeguarding.

Appendix 1.

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from:

Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Item number	Guide questions/description	Reported in
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	Laura Cowley Methods – Data Collection
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	MSc Neuropsychology BSc (Hons) Psychology
3. Occupation	What was their occupation at the time of study?	PhD student Methods – Data Collection
4. Gender	Was the researcher male or female?	Female
5. Experience and training	What experience or training did the researcher have?	The researcher received substantial experience with qualitative research methods in her undergraduate and postgraduate degrees, and undertook a number of qualitative research projects as part of these. This experience was supplemented with the following recent training courses: "Interviewing in Social Science Research" (2015), "Qualitative Analysis Software" (2015), "Qualitative Data Analysis" (2016) and "Interpreting and

		writing up your Qualitative findings" (2016) Methods – Data Collection
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	No Methods – Data Collection
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Participants were informed that the research study was being conducted as part of the researcher's PhD project via the Information Sheet
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. bias, assumptions, reasons and interests in the research topic	The interviewer is a PhD student researching abusive head trauma and considered how her assumptions may influence the interviews and findings Methods – Data Collection
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Thematic analysis based on a general inductive approach Methods – Data Analysis
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Purposive and snowball sampling to identify professionals involved in suspected AHT cases Methods – Participant recruitment

11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	Email, or letters to judges Methods – Participant recruitment
12. Sample size	How many participants were in the study?	56 Table 1 and Figure 1
13. Non-participation	How many people refused to participate or dropped out? Reasons?	97 invited 76 registered 56 took part Figure 1
Setting		
14. Setting of data collection	Where was the data collected? E.g. home, clinic, workplace	Participants' workplace Methods – Data Collection
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	Yes MF to record field notes Methods – Data Collection
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Table 1
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The schedule included open-ended questions, prompts and clarifying questions and was piloted with two people Methods – Interview Schedule Development
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	No Methods – Data Collection
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Audio recording Methods – Data Collection

20. Field notes	Were field notes made during and/or after the interview or focus group?	Yes Methods – Data Collection
21. Duration	What was the duration of the interview or focus group?	45 minutes Methods – Data Collection
22. Data saturation	Was data saturation discussed?	Yes data saturation was verified using the constant comparative method Methods – Data Analysis
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Only for two people who declined to be audio recorded Methods – Data Collection
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	Three Methods – Data Analysis
25. Description of the coding tree	Did authors provide a description of the coding tree?	The analytic framework is provided in Table 1
26. Derivation of themes	Were themes identified in advance or derived from the data?	Derived inductively from the data Methods – Data Analysis
27. Software	What software, if applicable, was used to manage the data?	NVivo 10 Methods – Data Analysis
28. Participant checking	Did participants provide feedback on the findings?	No Methods – Data Analysis
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Quotations were presented and each participant was identified according to their professional group and participant number Results

30. Data and findings consistent	Was there consistency between the data presented and the findings?	The use of the constant comparative method ensured that quotations under each theme and category were reviewed for consistency and coherence Results
31. Clarity of major themes	Were major themes clearly presented in the findings?	All themes and categories identified during data analysis were presented in the results Results
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Yes, discrepant cases and minor themes are discussed throughout the results Results

Appendix 2. Semi-structured Interview Schedule

Introduction

Hello my name is Laura and I will be interviewing you today. Thank you for being willing to take part in this project. Firstly, I would like to ask you for permission to audio record this interview. The main reasons for this are to ensure that the data collected is detailed and accurate and to facilitate data analysis. I would like to assure you that everything you say will remain completely confidential and only the immediate study team will have access to the audio recording and transcript.

I am going to be asking you some questions about the factors influencing your decision-making in suspected abusive head trauma cases. Do you have any questions before we proceed?

Participants' perceived role in the decision-making process

Have you ever been involved in a case concerning a child less than three years old with a head injury where abuse was suspected? *(explain what is meant by head injury – intracranial injury identified on neuroimaging)*

- Can you explain a little bit about what your role is in these cases?
- Is it your job to come to a decision as to whether the child has suffered abusive or accidental injury? **If no:** do you form an opinion about this regardless?

Factors influencing decision-making/multidisciplinary working in suspected AHT cases

What factors usually influence your decision-making in a child head injury case where abuse is suspected?

- Clinical factors? History given by caregiver? (*no history of trauma at all? Inconsistent history?*) Proposed mechanism of injury? (*consistent with developmental stage of child/severity of injuries?*) Family history? Child previously known to social services/previously attended hospital for injuries?
- Opinions of social services/police? Opinions of clinicians? Opinions of child abuse paediatricians? Advice from colleagues?
- Can you tell me more about why these particular factors influence your decision making?
- Can you tell me specifically how these factors influence your decision making?

How confident are you making a decision as to whether a head injury has been caused by abuse or an accident?

- Do you find these cases difficult?
- What are the challenges?

What information do you receive from other agencies when you are involved in a case?

- Results of clinical investigations? History given by caregiver? Proposed mechanism of injury? Family history? Child previously known to social services/previously attended hospital for injuries?
- How does this information help you with your decision-making?
- Can you describe your experiences with multidisciplinary working?

Closure

We seem to have covered a great deal of ground and you have been very patient. However do you think there is anything that we have missed out that might be relevant or important? Do you have any other comments about what we've discussed or about the research as a whole?