

ORIGINAL ARTICLE

Suboptimal care was frequent in severe child physical abuse cases and was mainly related to delayed diagnoses and ineffective secondary prevention

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Abstract

Aim: Our aim was to assess suboptimal care before a diagnosis of severe child physical abuse in western France.

Methods: A confidential inquiry was carried out, based on children under 6 years of age who were hospitalised in the Nantes regional university hospital from 2016 to 2018. Two researchers retrospectively reviewed the medical records of all the children who were reported to the authorities for suspected severe child physical abuse. Two experts determined the optimality of care and identified the main categories of suboptimal care.

Results: The median age of the 94 children included in the study was 8 months. A fifth of them had intra-cranial injuries and a quarter had fractures. One child died and a third had severe sequelae at hospital discharge. Included children frequently (37%) received suboptimal care before the diagnosis of severe CPA and this fell into two categories: delayed diagnosis was experienced by 17% and ineffective secondary prevention by 22%.

Conclusion: Suboptimal care for severe child physical abuse was frequent and fell into two categories: delayed diagnosis and ineffective secondary prevention. These results can help us to design corrective actions.

KEYWORDS

child physical abuse, confidential inquiry, delayed diagnosis, secondary prevention, suboptimal care

1 | INTRODUCTION

It has been estimated that 4%–16% of children under the age of 18 are physically abused in high-income countries.¹ In addition to the immediate consequences for child health, physical abuse is

responsible for high morbidity later in childhood and adulthood.^{1–4} The sequelae among survivors fall into three main categories. The first is neuro-developmental impairment, such as microcephaly, motor and visual deficiencies, intellectual disability and behavioural abnormalities.² Then there are psychiatric diseases, including

Abbreviations: CPA, child physical abuse; IQR, interquartile range.

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attention deficit disorders, post-traumatic stress disorder, schizophrenia and suicidal and/or addictive behaviour.³ Finally there are somatic diseases like obesity, diabetes, cancer and cardiovascular diseases.⁴ Child physical abuse (CPA) recurrence is frequently reported, in 5%–53% of cases,^{5–8} and has been associated with more severe outcomes.^{3,4}

Primary prevention programmes and optimal care before a diagnosis of CPA are of paramount importance. Studies that have evaluated the impact of early engagement by hospital-based child protection teams suggest an increase in diagnostic testing and reports to the authorities.^{9,10} However, these studies did not evaluate pre-hospital care. A better understanding of the major types of suboptimal care before a CPA diagnosis, including pre-hospital care, would allow us to develop targeted action plans. These could optimise the care children receive, reduce the risk of recurrence and optimise outcomes. The main studies that focussed on missed opportunities to diagnose CPA reported that 21–75% of cases featured at least one previous medical visit with symptoms or signs, also called sentinel injuries, which suggested CPA. The average time between the first visit for a sentinel injury to diagnosis was 7–24 days.^{11–14} However, these studies focused on a specific type of CPA, namely fractures and abusive head trauma and were mostly based on administrative data. There were limited details on the care the children received before they were diagnosed with CPA. Furthermore, no study has quantitatively evaluated the suboptimal care a child received before a diagnosis of CPA, in terms of lack of prevention among their siblings or intimate partner violence between their parents. More generally, no study has evaluated the optimal care before a diagnosis of severe CPA by using a confidential inquiry. This method has helped to identify the major types of suboptimal care in various fields, such as maternal deaths,¹⁵ infant deaths¹⁶ and severe bacterial infections in children.¹⁷ It allows experts to analyse anonymous templates that reconstruct the care of study participants, in order to identify suboptimal care in health and care services and suggest actions to correct them. Experts are usually masked to the final diagnosis and participants' outcomes, which allows them to maximise their objectivity when they judge optimal care.¹⁵

Herein, we report what we believe to be the first study to explore how a confidential inquiry could assess what constituted optimal care before a diagnosis of severe CPA, by evaluating the frequency and identifying the main types of suboptimal care.

2 | METHODS

2.1 | Study design and participants

We conducted a retrospective confidential inquiry using the medical records of children under 6 years old who were hospitalised in the Nantes regional university paediatric hospital from 1 January 2016 to 31 December 2018. The study comprised all children who were reported to the authorities by the Nantes regional university hospital's child protection team for suspected severe CPA. The team, who

Key Notes

- We used the confidential inquiry method to assess whether 94 children under 6 years of age received suboptimal care before a diagnosis of severe child physical abuse.
- More than a third (37%) received suboptimal care: in 17% of the cases this was delayed diagnosis and in 22% it was ineffective secondary prevention.
- Prospective studies are needed to confirm this alarming result, decipher the determinants of suboptimality and design corrective actions.

are one of the most experienced child protection teams in France, alerted child protective services or made a judicial report to the public prosecutor. This team consisted of paediatric experts in CPA, forensic paediatricians, psychologists, a nurse and a social worker. Its main mission was to conduct paediatric and forensic consultations and examinations when CPA and neglect were suspected. They made joint reports to the authorities with other paediatrics departments, namely the emergency and general paediatrics departments and intensive care unit. They did this despite the fact that this action is not mandatory for hospital or office-based physicians in France. The database included all children who presented to the hospital or were admitted for suspected CPA. Severe CPA was defined as CPA leading to immediate hospitalisation, because of the severity of the injuries or high social adversity and/or death.

The protocol for this observational study was approved by the ethics committee of the hospital (reference number 21–12–006). Information for parents was placed on billboards in all the hospital's public areas, indicating that data collected for routine medical care could be reused for observational studies unless the parents objected. We followed the Strengthening the Reporting of Observational Studies in Epidemiology guidelines¹⁸ to report the findings of this study (Appendix S1).

2.2 | Data extraction and analysis

Two researchers (PR and DM) retrospectively reviewed the children's medical records and extracted the sociodemographic and medical characteristics. They also checked for any previous reports to the authorities about suspected CPA related to the child or any siblings and for any previous visits for symptoms or signs that usually alert healthcare professionals to the need to initiate diagnostic procedures for CPA.¹⁹ Any clinical findings associated with a diagnosis of CPA, and the outcomes in terms of death or length of hospitalisation and sequelae for survivors, were also extracted. We defined the symptoms or signs that should have triggered CPA diagnosis workup as the following sentinel injuries: skin lesions, in particular bruises, haematomas or burns, lesions of

the ear-nose-throat sphere, frenulum tear and fractures in premobile children.^{19–21} We added to this list symptoms or signs suggestive of abusive head trauma: repeated vomiting without fever and diarrhoea, poor feeding, abnormally increased head circumference, sudden loss of consciousness, clonic seizures and hypotonia and severe apnoea.^{14,21,22}

Two experts used the confidential inquiry method to determine the suboptimal character of the care:²³ one (GP) was a paediatric hospitalist and CPA expert and the other (RS) was a general practitioner. They independently analysed the anonymous templates that were used to reconstruct the care that each child received, with times and dates of medical observations, the symptoms and signs presented and the actions taken. These templates had been completed by two other researchers (PR and DM) from the data available in the medical records, but they did not include data from clinical team interviews. This last point was in contrast to the original confidential inquiry method.²³ The two experts were specifically asked to assess whether the care that was provided before CPA was diagnosed was optimal or suboptimal or whether it was not possible to evaluate it using the current clinical guidelines for detecting CPA^{19–21} and their own clinical experience. They were also asked to support their assessment by identifying types of suboptimal care.²⁴ If there was a disagreement, a third expert, a paediatric hospitalist (EL), was asked to assess the care. None of the three experts had been involved in the care of the children who were included and they were masked to the outcome (Appendix S2).

We described the patients' characteristics, the injuries inflicted on them and their consequences. In addition, we calculated the frequency of suboptimal care and analysed the only two categories that were identified by the experts, which were delayed diagnosis and ineffective secondary prevention. Delayed diagnosis was defined as a previous medical visit or visits when signs or symptoms of CPA were already present, but did not lead to a report to the authorities or an adequate referral (Figure 1). Ineffective secondary prevention was when a previous report had been made to the authorities about suspected CPA or other types of abuse or neglect related to the child or their sibling but did not prevent the recurrence of abuse. When it came to delayed diagnosis, we calculated the number of missed opportunities: medical visits when the child's signs and symptoms

should have raised suspicions about CPA before the actual diagnosis. We also looked at the time to diagnosis, which was the difference between when suspicions could have been raised at the first medical visit and when the diagnosis took place (Figure 1). Optimal care before a diagnosis of severe CPA was when the first medical contact led to an immediate consultation with the child protection team of the referral hospital and hospitalisation. The data are reported as numbers and percentages and medians and interquartile ranges (IQR). We used R v4.1.1 for analyses (R Foundation for Statistical Computing, Vienna, Austria).

3 | RESULTS

3.1 | Patient characteristics

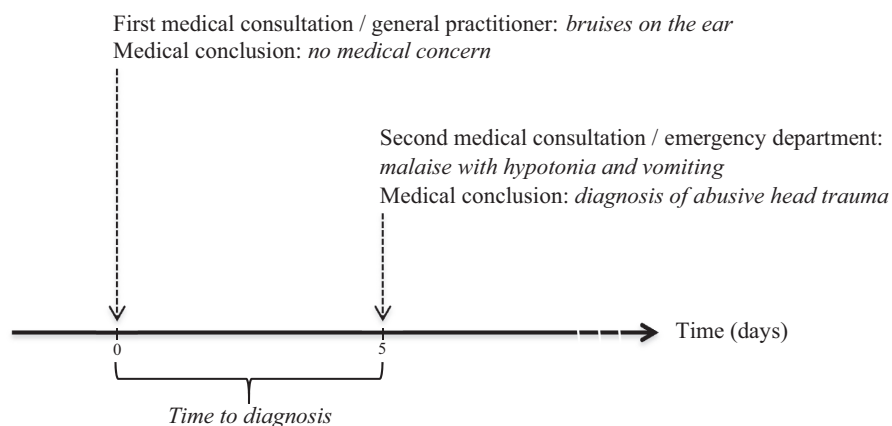
During the study period, 94 children (52% boys) under 6 years of age were hospitalised and reported to the authorities for suspected severe CPA: 65% to the public prosecutor and 35% to child protective services. Their median age was 8 months (IQR 4–28) and the majority (72%) were ≤2 years old. Most children (72%) lived with both parents and had one (46%) or two siblings (36%).

The main clinical features that led to a report to the authorities for severe CPA were bruises or haematomas (63%), intra-cranial injuries (21%), including subdural haematomas (17%) and/or fractures (24%). The median hospital stay was 6 days (IQR 3–12). We found that 19% of the children were hospitalised in the intensive care unit and one died from severe cerebral damage. Information was available for 48 of the 94 children at 6 months of age and 35% had severe sequelae at this age. The most common issue (35%) was neurodevelopmental issues.

3.2 | Suboptimal care before a diagnosis of severe CPA

In 37% of the cases the experts judged the care that the children had received before their diagnosis of severe CPA as suboptimal care. Two non-exclusive categories were identified, delayed diagnosis

FIGURE 1 Fictional example of a 3-month-old girl with sentinel injuries and a delayed diagnosis related to one missed opportunity that resulted in time to diagnosis of 5 days. Adapted from Launay et al.²⁴



and ineffective secondary prevention, and two of the children had experienced both types.

The experts found that 17% of the 94 children had a delayed diagnosis (Table 1). The median number of previous medical visits with missed opportunities was one (IQR 1–3, range 1–7), with a time to diagnosis ranging from 0.5 to 330 days (median 10 days, IQR 1–49). We found that 10 of the 16 children with a delayed diagnosis presented additional lesions that were found during the CPA diagnostic workup and six of these were subdural haematomas.

We also found ineffective secondary prevention in 22% of the 94 children. A previous report had been made to the authorities about suspected CPA or other types of abuse or neglect for about 12% of the 94 children in the study. The siblings of a further 5% of the cases with suspected CPA had already been the subject of reports. In 1% of cases there had been a complete lack of medical follow up since birth. Finally, 4% of cases with suspected CPA had not been reported to the authorities, even though it was known that their mothers had experienced intimate partner violence.

4 | DISCUSSION

This study comprised 94 children who were hospitalised and reported to the authorities for suspected severe CPA from 2016–2018 in western France. The injuries inflicted on the children were severe, with intra-cranial injuries in a fifth and fractures in a quarter. The consequences of the injuries were also severe, as one child died and a third had severe sequelae at 6 months of age. These results confirm the importance of designing effective programmes to prevent and detect CPA early to avoid the abuse being repeated and escalating.

In this confidential inquiry on the optimality of care before a diagnosis of severe CPA, we found a high proportion of suboptimal care (37%). This result is consistent with studies that used other methodological approaches.^{11–14} The term suboptimal is commonly used in papers on this type of study. We believe that this provides a less negative and derogatory approach during care assessments than terms such as medical error. A number of papers that have been developed using improvement models have used this more positive term, which focuses less on blame and more on improving care systems through encouragement and engagement.

Moreover, we identified two categories of suboptimal care: delayed diagnosis was identified in 17% of the children and ineffective secondary prevention affected 22%. Identifying these two types of suboptimal care can help us to target programmes that aim to improve the care children receive before they are diagnosed with severe CPA.

Firstly, the time between the onset of signs and the diagnosis of CPA could be decreased by better knowledge of sentinel injuries, which is a new and crucial concept for the early detection of CPA.^{22,25} We also need better implementation and dissemination of existing tools to help clinicians to detect CPA. These include the TEN-4 rule for skin lesions²⁶ and using a natural language processing

algorithm that identifies high-risk injuries in electronic health records. For example, the combination of key words like fracture or bruise in a child under 12 months of age could trigger a pop-up message in the electronic health records.²⁷ These tools are lacking in many countries, including France. Furthermore, the establishment of additional child protection teams could contribute to reducing delayed diagnosis and improving the secondary prevention of CPA.

Secondly, care could be improved by focusing secondary prevention on at-risk families, notably those with parental conflict or intimate partner violence.²⁸ For example, no reports were made to the authorities about four children in our study who were known to be from at-risk families with intimate partner violence. Such reports could have prevented CPA occurring.²⁹ The lack of natural language processing algorithms in electronic health records, to identify issues such as intimate partner violence, may partly explain the suboptimal prevention we identified in our study.

Finally, the care provided before severe CPA was diagnosed was optimal for two-thirds of the children. Therefore, primary prevention at the general population level, namely all efforts and measures to prevent the occurrence of CPA, are essential.

4.1 | Strengths and limitations

To the best of our knowledge, this was the first confidential inquiry that evaluated the optimality of care that was provided before a diagnosis of severe CPA. As previously recommended,^{15,23} this was independently evaluated by two experts who were masked to the children's outcome.

Our study had several limitations related to this methodology. First, there was selection bias, because we only included children who were hospitalised and reported to the authorities for suspected severe CPA. Severe CPA may be easier to diagnose over time due to recurring and increasingly severe events^{3,4} and this may have led to delayed diagnosis being underestimated. Moreover, the small sample meant we were unable to identify variables related to children, parents, socioecological environment or the healthcare system that were associated with increased frequency of suboptimal care. This limitation precludes the design and implementation of targeted corrective actions. Also, using the confidential inquiry method meant that this study was retrospective and based on data collected in medical files during day-to-day practice. This was sometimes limited. The social and judicial records were mostly inaccessible, although they may have contained data that could have influenced the experts' judgement. This meant that when it came to the ineffective secondary prevention category, the experts did not know whether the previous protective measures were not applied, were not effective or had not been recorded. This could have distorted the experts' judgement by underestimating any optimal character of the social and judicial measures that were implemented. Although conducting clinical team interviews is recommended by the confidential inquiry method, we could not do this because the records have been anonymised. These interviews could have provided information about the barriers to the

TABLE 1 Details of the 16/94 cases of CPA with a delayed diagnosis.

Age range at diagnosis of CPA (months)	Signs or symptoms not investigated for CPA during a previous medical visit	Time between first medical visit and diagnosis of CPA (days)	Number of missed opportunities ^a for diagnosis of CPA	Signs or symptoms that triggered an investigation for CPA	Additional lesions found during CPA diagnostic workup
0-6	Loss of consciousness	40	5	Altered consciousness	Drug poisoning
0-6	Bruise on cheek	12	1	Vomiting and loss of consciousness	Subdural haematoma
0-6	Multiple bruises	80	1	Multiple bruises	-
0-6	Bruise on ear	7	3	Multiple bruises	-
6-12	Crying and superficial arm injury	76	2	Fracture	Subdural haematoma
6-12	Decreased function in one arm	2	1	Fracture	-
6-12	Loss of consciousness and clonic seizures	1	1	Loss of consciousness and burns	Subdural haematoma and fractures
6-12	Hypotonia and vomiting	1	2	Hypotonia	Subdural haematoma
6-12	Bruise on forehead and vomiting	1	1	Hypotonia and vomiting	Subdural haematoma
6-12	Crying and hypotonia	1	1	Hypotonia and vomiting	Subdural haematoma
≥24	Bruise on inner thigh	3	1	Multiple bruises	-
≥24	Multiple bruises	36	1	Multiple bruises	Fracture
≥24	Decreased function in one leg	0.5	1	Fracture	-
≥24	Clavicle fracture with vague explanations	330	7	Multiple burns	-
≥24	Multiple burns	101	3	Multiple burns and bruises	Fractures, thoraco-abdominal injuries
≥24	Walking deficit and decreased function in one leg	25	3	Prolonged growth faltering	Severe nutritional deficiency, including scurvy

^aMedical visit or visits for the same signs and symptoms during the time between the first visit that should have led to suspected CPA and the actual diagnosis of CPA.

early detection and diagnosis of CPA and its effective secondary prevention. The time between any prior reports to the authorities and the CPA diagnosis was also missing, which precluded a detailed characterisation of the ineffectiveness of secondary prevention. Finally, we did not include the complete hospital diagnostic CPA workup in the study. It would have been interesting to have investigated whether these diagnostic imaging and biological tests were optimal and how specific and warranted the reports to the authorities were. An ongoing prospective multicentre study conducted by our team in western France (NCT05168540) will overcome these limitations.

5 | CONCLUSIONS

Children frequently received suboptimal care before a diagnosis of severe CPA and this fell into two categories: delayed diagnosis was experienced by 17% of the 94 children and ineffective secondary prevention by 22%. Prospective multicentre studies are needed to confirm these alarming results, decipher what determines suboptimal care and design effective programmes to tackle these issues.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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Appendix 1.

Table S1. STROBE checklist

	Item No	Recommendation	Reported on paragraph #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Title
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Introduction # 1, 2
Objectives	3	State specific objectives, including any prespecified hypotheses	Introduction # 3
Methods			
Study design	4	Present key elements of study design early in the paper	Methods # 1
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Methods # 1
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	Methods # 1
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Methods # 5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Methods # 4
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	-
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	-
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	Methods # 5
		(b) Describe any methods used to examine subgroups and interactions	-
		(c) Explain how missing data were addressed	-
		(d) If applicable, describe analytical methods taking account of sampling strategy	-
		(e) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Results # 1
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Results # 1, 2
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	Results # 3, 4, 5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	Discussion # 1
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Discussion # 7, 8
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Discussion # 2 to 6
Generalisability	21	Discuss the generalisability (external validity) of the study results	Discussion # 7, 8
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Funding information section

Appendix 2. Confidential inquiry process

Table S2. Templates filled for each child, example (fictive) of a 3-month-old girl with sentinel injuries and a diagnosis delay

Age (months)	3		
Sex	Girl		
Past medical history	None		
Previous socio-educational measures	None		
Date	Events	Medical consultation	Medical conclusion
Day 0	Bruises on the ear	General practitioner	No concerns
Day 5	Malaise with hypotonia and vomiting	Paediatric emergency department	Hospitalisation for suspected subdural hematoma Diagnosis of abusive head trauma

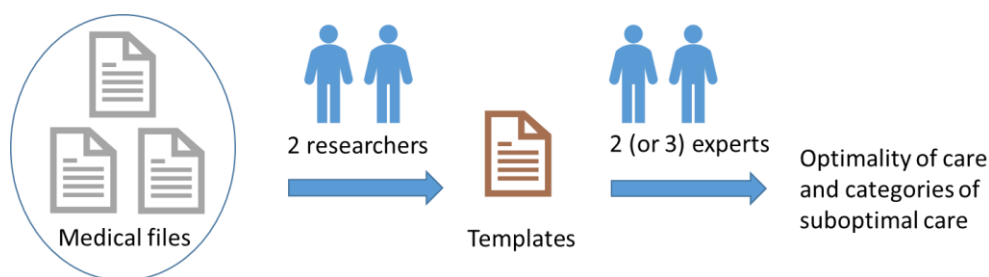


Figure S2. Confidential inquiry process

The two experts assessed the care based on the templates. For each included child, experts had to check boxes in a grid according to whether the care before the diagnosis of CPA was optimal, suboptimal or not evaluable. Elements present in the templates (including the medical history of the child and the history of any previous reporting to the authorities for the child or a sibling) allowed them to evaluate the optimality of the care. From these assessments, 2 categories of suboptimality were identified.