




PAEDIATRIC
FORENSIC MEDICINE
& PATHOLOGY

Edited by
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PAEDIATRIC FORENSIC MEDICINE AND PATHOLOGY

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PREFACE



The possibility that a child may have been injured, abused, neglected or otherwise ill treated rightly raises the indignation and anxiety of the caring professions and involves law enforcement agencies. However, in the interests of justice and fairness, a person accused of such injury or neglect is entitled to appropriate legal representation at any hearing and is deemed to be innocent until proven guilty. Quite frequently, dubiety and uncertainty linger about whether or not, in any specific situation, observations made, clinically or pathologically, can be interpreted solely as a manifestation of inflicted injury or neglect, or whether there is a possibility that the observed findings could have come about in other, non-criminal, circumstances. These matters necessitate advice from those with experience and expertise in this field.

The aim of this book is to furnish an authoritative, comprehensive text to assist practitioners of medicine and the law dealing with such cases in the appropriate interpretation of these matters and to enable clinical and pathological findings to be presented in an unbiased and dispassionate manner so that the courts are able to better evaluate the specialist evidence put before them.

The investigation and interpretation of findings of alleged ill treatment of infants and children requires a multidisciplinary approach, centred on the child, his or her well-being in both the short term and longer term, as well as that of any siblings within the same environment. All of the available information about any incident must be carefully collected, collated and evaluated. Laboratory data, both clinical and forensic, the results of radiological investigations and information from the examination of the scene where any incident took place should be carefully sought and evaluated against the clinical findings. A team approach is essential, with close collaboration of family physicians, paediatricians involved in both community and hospital practice, the clinical forensic medical examiner and specialist pathologists, together with police and social welfare services. No incident should be looked at in isolation but rather in the context of the child's development and interaction with his or her family, environment and peer group. The survivors of inflicted injury or neglect in childhood must be carefully followed up, protected and their family unit supported.

In this book, some of the topics covered here are relevant specifically to maltreatment in early life, beginning with the examination of an infant or child for whom abuse is suspected, incorporating the family environment and set against criteria for normal development. The difficult problem of suspected sexual abuse of children is considered separately. The extensive clinical experience of the authors of the opening chapters is readily apparent, highlighting, as they do, the pitfalls of incomplete investigation and ill-considered interpretation. The appropriate level of investigation of specific findings, interpretation of investigations and consideration of differential diagnoses are addressed in chapters contributed by a paediatric radiologist, a haematologist and a clinical pathologist, respectively. Those areas requiring specialist clinical expertise and experience – the eyes, mouth and central nervous system – are considered by specialists in those fields with extensive paediatric experience. The examination of the scene of death or injury is discussed as a background to post-mortem examination of the very young. The interpretation of cerebral pathology in the newborn, the investigation of sudden or suspicious perinatal death and sudden death in both infants and older children are addressed by experienced practitioners. Separate consideration is given to sudden or suspicious deaths that occur in hospital.

In subsequent chapters, more general areas of forensic pathology, including asphyxia and thermal injury, drowning, injury to road users and other accidents are addressed from a paediatric viewpoint. A similar approach is evident in the chapters covering toxicological investigation, DNA profiling and dental identification.

The book concludes with consideration of the role of the expert witness in criminal judicial cases and the provision of reports in the civil medicolegal context.

Although the majority of contributors to this text are UK based, the subject matter is presented, as far as possible, without national or geographic bias, so that the contents have international relevance.

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January 2008



ACKNOWLEDGEMENTS



We would like to thank our contributing authors for their hard work and for their patience and ready responses in the light of requests for updates and answers to specific queries. Colleagues in Edinburgh and elsewhere in the UK have read the Editors' contributions and made useful suggestions. JWK thanks Dr Roger Malcomson for his assistance

and expertise in the preparation of the illustrations for her chapters. We would like to thank the many staff at Hodder Arnold with whom we have been involved for their expertise and encouragement; in particular, Philip Shaw and our Project Editor Amy Mulick for their most helpful suggestions in the late stages of manuscript completion.

LIST OF ABBREVIATIONS USED

AA	amino acid	CPP	cerebral perfusion pressure
A&E	accident and emergency	CPR	cardiopulmonary resuscitation
AC	alternating current	CPT	cumulative pressure-time index
ACD	acid-citrate-dextrose	CPT II	carnitine palmitoyltransferase type II
ACTH	adrenocorticotrophic hormone	CPT1D	carnitine palmitoyltransferase type 1 deficiency
ADH	antidiuretic hormone	CPT2D	carnitine plamitoyltransferase type 2 deficiency
ADP	adenosine diphosphate	CSF	cerebrospinal fluid
ADPKD	autosomal dominant polycystic kidney disease	CSM	crime scene manager
AIDS	acquired immune deficiency syndrome	CT	computerized tomography
ALTE	apparent life-threatening events	CVP	central venous pressure
APOE	apolipoprotein E	CVR	cerebrovascular resistance
aPTT	activated partial thromboplastin time	CZE	capillary zone electrophoresis
ARDS	adult respiratory distress syndrome	DAB	DNA Advisory Board
ARVD	arrhythmogenic right ventricular dysplasia	DAI	diffuse axonal injury
ATP	adenosine triphosphate	DAVID	disaster and victim identification
AV	atrioventricular	DC	direct current
AvDO ₂	arteriovenous difference of oxygen	DIC	disseminated intravascular coagulation
βAPP	beta amyloid precursor protein	DMF	decayed, missing and filled teeth
BPA	British Paediatric Association	DNA	deoxyribonucleic acid
BPNA	British Paediatric Neurology Association	DRVVT	dilute Russell's viper venom time
BUN	blood urea nitrogen	DVD	digital versatile disc
CACTD	carnitine acylcarnitine translocase deficiency	ECF	extracellular fluid
CAP	common approach pathway	ECG	electrocardiogram
CAPMI	computer-assisted post-mortem identification	EDH	extradural haemorrhage
CASK	carer-associated serial killing	EDTA	ethylenediaminetetraacetic acid
CBF	cerebral blood flow	EEG	electroencephalography
CD	compact disc	EFE	endocardial fibroelastosis
CESDI	Confidential Enquiry into Stillbirth and Deaths in Infancy	ELISA	enzyme-linked immunosorbent assay
SUDI	Sudden Unexpected Death in Infancy	EM	electron microscopy
CFAM	cerebral function analysing monitor	EMIT	enzyme-multiplied immunoassay technique
CFTR	cystic fibrosis transmembrane conductance regulator	EPP	polypropylene
CHD	congenital heart disease	EPS	expanded polystyrene
CHIRPP	Canadian Hospital Injury Reporting and Prevention Program	EPU	expanded polyurethane
CI	confidence interval	ERG	electroretinography
CK1	cytokeratin 1	ESR	erythrocyte sedimentation rate
CMRO ₂	cerebral metabolic rate for oxygen	EVG	elastic van Geison stain
CMV	cytomegalovirus	FAO	fatty acid oxidation
CNS	central nervous system	FBI	Federal Bureau of Investigation
CNV	copy number variation	FDP	fibrinogen degradation product
COHB	carboxyhaemoglobin	FHM	familial hemiplegic migraine
CODIS	Combined DNA Index System	FII	fabricated or induced illness
CPI	combined paternity index	FLAIR	fluid-attenuated inversion recovery
		FPIA	fluorescent polarization immunoassay

FPP	fitness to practice panel	MDA	3,4-methylenedioxyamphetamine
GAS	group A streptococcal infection	MDMA	3,4-methylenedioxymethamphetamine
GC-MS	gas chromatography-mass spectrometry	MECC	micellar electrokinetic capillary chromatography
GCS	Glasgow Coma Scale	MELAS	mitochondrial encephalomyopathy
GDP	general dental practitioner	MERRF	myoclonic epilepsy with ragged red fibres
GI	gastrointestinal	MFV	mean flow volume
GMC	General Medical Council	MPS	mucopolysaccharide
GMD	genetic metabolic disorder	MRI	magnetic resonance imaging
GOS	Glasgow Outcome Score	mtDNA	mitochondrial DNA
GSD	glycogen storage disease	MS/MS	tandem mass spectrometry
HbF	fetal haemoglobin	MSUD	maple syrup urine disease
HCM	hypertrophic cardiomyopathy	MVC	motor vehicle collision
HDN	haemorrhagic disease of the newborn	MVF	mean flow volume
HE	haematoxylin and eosin (e.g. HE stain)	NAAT	nucleic acid amplification test
HELLP	haemolysis, elevated liver enzymes, low platelets	NAHI	non-accidental head injury
HIE	hypoxic-ischaemic encephalopathy	NAI	non-accidental injury
HII	hypoxic-ischaemic injury	NAIT	neonatal alloimmune thrombocytopenia
HIV	human immunodeficiency virus	NEC	necrotizing enterocolitis
HLH	haemophagocytic lymphohistiocytosis	NEQAS	National External Quality Assessment Scheme
HMWKS	high-molecular-weight kininogens	NICHD	National Institute of Child Health and Development
HPLC	high-performance liquid chromatography	NKH	non-ketotic hyperglycinaemia
HPV	human papillomavirus	NSPCC	National Society for the Prevention of Cruelty to Children
HSV	herpes simplex virus	OECD	Organisation for Economic Co-operation and Development
ICD	<i>International Classification of Diseases</i>	OI	osteogenesis imperfecta
ICH	intracranial haemorrhage	OR	odds ratio
ICP	intracranial pressure	OTS	ornithine transcarbamylase
ICU	intensive care unit	OXPHOS	oxidative phosphorylation
IDDM	insulin-dependent diabetes mellitus	Paco ₂	partial pressure of arterial carbon dioxide
IgA	immunoglobulin A	PAI-1	plasminogen activator inhibitor-1
IgE	immunoglobulin E	PBR	Perls' Prussian blue reaction
IPH	idiopathic pulmonary haemosiderosis	PCR	polymerase chain reaction
ISS	injury severity score	PDH	pyruvate dehydrogenase
ITP	idiopathic thrombocytopenic purpura	PET	positron emission tomography
ITU	intensive therapy unit	PICA	posterior inferior cerebellar artery
IUGR	intrauterine growth restriction	PICU	paediatric intensive care unit
IVF	<i>in vitro</i> fertilization	PK	prekallikrein
IVH	intraventricular haemorrhage	PL	phospholipid
LCAD	long-chain acyl-CoA deficiency	PM	post-mortem examination
LCN	low copy number	PMCTD	plasma membrane carnitine transporter deficiency
LCHAD	long-chain 3-hydroxyacyl-CoA dehydrogenase	PSA	phosphate-specific antigen
LQTS	long QT syndrome	PT	prothrombin time
LM	laser microdissection	PTA	post-traumatic amnesia
LoC	loss of consciousness	RBC	red blood cell
LSD	lysergic acid diethylamide	RIA	radioimmunoassay
MADD	multiple acyl-CoA dehydrogenase deficiency	RCPCH	Royal College of Paediatrics and Child Health
MAP	mean arterial pressure	RFLP	restriction fragment length polymorphism
MCA	middle cerebral artery		
MCAD	medium chain acyl CoA dehydrogenase deficiency		

RI	resistive index	TBI	traumatic brain injury
RiCoF	ristocetin cofactor	TBS	total body surface
RMP	random match probability	TCBD	Traumatic Coma Data Bank
RNA	ribonucleic acid	TCD	transcranial Doppler ultrasound
RPE	retinal pigment epithelium	T/E	testosterone-epitestosterone
RSV	respiratory syncytial virus	TF	tissue factor
		TFPD	trifunctional protein deficiency
SAH	subarachnoid haemorrhage	TFPI	tissue factor pathway inhibitor
SANDS	Stillbirth and Neonatal Death Society	TLC	thin-layer chromatography
SCAD	short-chain acyl-CoA dehydrogenase	TT	thrombin time
SCIWORA	spinal cord injury without radiographic abnormalities	TWGDAM	Technical Working Group on DNA Analysis Methods
SDH	subdural haemorrhage		
SIDS	sudden infant death syndrome	USFA	United States Fire Administration
SIO	senior investigating officer	UV	ultraviolet
SLR	single-lens reflex		
SNP	single nucleotide polymorphism	VEGF	vascular endothelial growth factor
SPD	storage pool disorder	VLCAD	very long-chain acyl-CoA dehydrogenase
SPECT	single photon emission computerized tomography	VLCFA	very long chain fatty acids
STI	sexually transmitted infection	VSA	volatile solvent abuse
STR	short tandem repeat	VWD	von Willebrand's disease
SUDEP	sudden unexpected death due to epilepsy	VWF	von Willebrand factor
SUDI	sudden, unexpected deaths in infancy	VWF:Ag	von Willebrand factor antigen
SWGDM	Scientific Working Group on DNA Analysis Methods	WARD	weak agonist response defect
		WHO	World Health Organization
TAFI	thrombin activatable fibrinolysis inhibitor	YHRD	Y-STR haplotype reference database
TAR	thrombocytopenia with absent radii	Y-STR	short tandem repeat on the Y chromosome

CLINICAL ASSESSMENT IN SUSPECTED CHILD ABUSE

Helen Hammond

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INTRODUCTION

The diagnosis of abuse in children is a difficult intellectual and emotional exercise. It has been described as one of the most demanding tasks in clinical practice requiring time, experience and emotional energy.¹ One of the biggest barriers to the diagnosis is the continuing existence of emotional blocks in the minds of professionals. Paediatricians are accustomed to working in partnership with parents in identifying and treating their child's illness or injury and find it very hard to make the cognitive shift to suspecting that they are the cause of their child's suffering.² In some fields, for example infants presenting with intracranial bleeds or multiple fractures, the differential diagnosis between an underlying medical condition and non-accidental injury is fraught with difficulty. These cases are frequently strongly contested when they reach the Courts, further discouraging paediatricians from becoming involved.

This chapter will describe the knowledge required and the methodical process that needs to be followed in order not only to establish the diagnosis, but also to present the medical evidence in the most effective way in order to protect the child.

Historical Background

Recent years have seen the enactment of new legislation, both in England and in Scotland, concerning the care of

children and further legislation, particularly relating to protecting children from unsuitable adults and effective sharing of information, is expected. Children Acts north and south of the border highlight the responsibilities of parents in safeguarding and promoting their child's health and development as well as their rights to make decision.³⁻⁵ These Acts build on previous legislation and incorporate the principles of the UN Convention on Human Rights, placing increasing emphasis on the rights of the child to a safe and nurturing upbringing.⁶ The accompanying regulations remind us of the overarching principles on which the legislation has been based; those that are most relevant to the area of child abuse are laid out in Table 1.1.

The Children Act lays particular emphasis on the principle of minimum intervention. This, in the experience of some paediatricians, has led to greater difficulties in

Table 1.1 *Children Acts³⁻⁵ – overarching principles*

Each child has a right to be treated as an individual
Each child has a right to protection from all forms of abuse, neglect or exploitation
Each child has a right to express his or her personal views
Parents should normally be responsible for the upbringing of their children
Any intervention by a public authority in the life of a child must be properly justified

protecting children from harm in situations when abuse is highly likely to have occurred but a degree of doubt exists.⁷

An understanding of the different standards of proof that relate to civil and criminal proceedings is important to the paediatrician or pathologist in contributing to the child protection process. To secure a criminal conviction it must be proved beyond reasonable doubt that the defendant has abused or neglected the child; whereas in civil proceedings, for example proof of grounds of referral to a children's hearing system in front of the sheriff in the Scottish courts, the standard of proof required is on a balance of probabilities that the child has been ill treated or that a lack of care is likely to impede the child's physical or emotional development. It is possible to proceed therefore to protect the child even in a situation when it cannot be established who ill treated the child or whether there was any deliberate intent to harm (Schedule 1 Offence) or neglect the child.

Guidance for the improvement of our Child Protection Services, health and multi-agency, within the context of recent legislation, has also been given by the government.^{8,9} These documents have been influenced by the recommendations of major enquiries into the handling of cases, for example in Orkney and Cleveland, and, more recently, Lord Laming's Inquiry into the death of Victoria Climbié.¹⁰ The Scottish Executive Health Department produced new guidance in 2000 to promote the development of effective health services for the protection of children.¹¹ More recently, the Child Protection Reform Programme within the Scottish Executive produced a Framework for Standards for protecting children and young people together with a Children's Charter.¹² All the reports, guidelines and legislation emphasize the importance of close interagency working in child protection.

Definition

Table 1.2 sets out an all-embracing definition of abuse, drawing attention to the very considerable amount of abuse that results from omission of physical and emotional care as well as through deliberate ill treatment. It also highlights the impact of that abuse, not only on the immediate well-being of the child, but also on the child's ability to fulfil his or her potential in the longer term. Henry Kempe states '*Child abuse is the difference between a hand on the bottom and a fist in the face.*'¹³ This is very relevant when trying to make the difficult distinction between 'acceptable' punishment and abuse.

Table 1.2 A comprehensive definition of child abuse⁵⁹

Abuse of children is human-originated acts of commission or omission, and human-created or tolerated conditions that inhibit or preclude unfolding and development of the inherent potential of children

Source: David Gil (1981)

It is also important to consider the cultural setting. Roy Meadow reminds us that '*a child is considered to be abused if he or she is treated in a way that is unacceptable in a given culture at a given time.*'¹ The last two clauses are important because not only are children treated differently in different countries, but also within a country; even within a city there are subcultures of behaviour and variations of opinion about what constitutes abuse of children. Standards have also changed over the years with corporal punishment, for example, much less acceptable in Britain now than 10 years ago.

Prevalence

Four per cent of children up to the age of 12 years are brought to the notice of professional agencies (Social Services, Police, National Society for the Prevention of Cruelty to Children [NSPCC]) because of suspected abuse. Studies have also shown that each year at least one child per 1000 under the age of 4 years suffers severe physical abuse (e.g. fractures, subdural haemorrhage, severe internal injury); at present minimum mortality is estimated as 1 in 10 000 but the real figure is almost certainly significantly higher as many cases are undetected.¹⁴

The prevalence of sexual abuse is much less easy to determine accurately because it is so dependent on the definition, ranging from indecent exposure or inappropriate fondling to full penetrative abuse. The resultant damage is also very varied depending on the family situation of the child and whether or not the perpetrator is a family member. A very small proportion of sexual abuse investigations lead to criminal prosecution because of the particular difficulties in corroboration and interpretation of findings in these cases. Determination of the prevalence of emotional abuse, even when it is the main category of abuse for an individual child, is even more problematic.

Prevalence figures are based on samples of adults or parents describing their own or their children's experiences. Based on research reported in 2000 by the National Commission of Inquiry into the Prevention of Child Abuse and Neglect¹⁵ it is estimated that:

- at least 150 000 annually suffer severe physical punishment;
- up to 100 000 each year have a potentially harmful sexual experience;
- 350 000–400 000 live in an environment low in emotional warmth and high in criticism.

ALERTING SIGNS

Health professionals, particularly those working directly with children, may become aware that a child has been abused or neglected in many different ways. They must be alert to this possibility in their everyday clinical practice.

Table 1.3 *Alerting signs*

Unexplained delay in presentation
Changes in detail as the history is repeated
Evasiveness/anger when detail sought
Inconsistency between history and clinical findings/ developmental stage

Children may present directly to the health service with clear evidence of injury or a clear allegation of abuse, either by being brought to the accident and emergency department/taken to their general practitioner or through attendance at the outpatient department with a vague symptom such as abdominal pain or recurrent urinary tract symptoms. In any young child presenting to casualty injured but without an apparently adequate explanation it is very important to consider abuse among the differential diagnoses. A number of alerting signs are clearly recognized and are shown in Table 1.3. Unexplained delay in presenting the child for medical treatment is a very important factor particularly in very young children, as most parents rapidly seek attention if their child sustains any injury and particularly an injury to the head. In children who are under 2 years of age for whom an accidental cause for the injuries is being offered by the parents or carers, it is important to consider carefully whether the findings are consistent with the explanation: for example, could all the injuries have been caused by a simple fall from a swing or does the presence of injuries in different planes and of different ages make this impossible? Is the child at a developmental stage at which such an accident is possible? For example, children are frequently brought in with a number of fractures and described as having 'climbed out of their cot'. In a child of less than seven months of age who is not yet pulling to stand this cannot of course be the correct explanation. Parents giving a false explanation for injury frequently change their story or the detail of their story when pressed and particularly if interviewed separately. It is therefore extremely important that all explanations given are noted in detail in the contemporaneous notes, which should be clearly signed and dated so that such discrepancies can be preserved. This may ultimately be crucial to the success of any subsequent legal proceedings and therefore to the long-term protection of the child.

TYPES OF ABUSE

Seven types of abuse are recognized and these are shown in Table 1.4, together with an eighth category of multiple abuse. It is very important to remember that in many instances a child has been subjected to more than one form of abuse, for example a physically abused child may also be being neglected or emotionally abused.

Table 1.4 *Types of abuse*

Physical abuse
Non-accidental head injury – 'shaken baby syndrome'
Physical neglect
Non-organic failure to thrive
Emotional abuse
Sexual abuse
Fabricated and induced illness

A sexually abused child is by definition also being emotionally abused. There are also some recognized associations in patterns of injury, for example sexual abuse may be accompanied by cigarette burns, particularly to the lower body, or injuries from restraining the child, bruising to the inner thighs or ligature marks to the ankles may be present (see Chapter 2). Non-organic failure to thrive has a category of its own separate from physical neglect. These conditions may of course coincide but a child who is physically well cared for may be failing to thrive for emotional reasons, while another child who is neglected in relation to cleanliness, clothing and social needs may maintain adequate rate of physical growth. Emotional abuse as the main cause of harm is extremely difficult to prove although studies increasingly suggest that emotional ill treatment is indeed a more potent cause of significant harm in terms of failure to fulfil potential for growth and development than physical ill treatment.¹⁶ The likelihood of associated emotional factors and overlapping forms of abuse is one of the main reasons why any clinical assessment of a child where abuse is suspected should be a comprehensive one, looking carefully at all aspects of the child's physical health, emotional well-being, growth and development in relation to that expected for his or her chronological age.

Fabricated or induced illness (FII) in a child by a carer (previously known as Munchausen's syndrome by proxy) is probably the most difficult form of abuse to diagnose and treat. There are three main forms, which are not mutually exclusive:

- Fabrication of signs and symptoms, for example the false description of seizures.
- Fabrication of signs and symptoms and falsification of hospital records/charts and specimens of bodily fluids, for example sugar or adult's blood in the child's urine.
- Induction of illness by a variety of means, for example adding salt to feeds or infusions.

International research suggests a very high incidence of death and morbidity in FII – up to 10 per cent of these children die and 50 per cent suffer long-term morbidity.¹⁷ The need for early multi-agency involvement in the identification and successful management of these cases has been emphasized in Government and RCPCH guidance.^{18,19}

THE NEED FOR COMPREHENSIVE ASSESSMENT

As in all other situations in medicine the diagnosis of child abuse is made on the basis of careful history-taking, including the birth history, past medical history, the developmental history and the family and social history as well as on thorough clinical examination and investigation. Serious mistakes may be made if examiners rush to examine a bruise, a burn or, worse still, the hymen or anus, without first taking a careful history not only of the alleged ill treatment or neglect, but also the child's previous history. Only if we approach the examination in this way will we be able to reach a conclusion not only regarding whether or not the child has been subjected to deliberate ill treatment, but also to whether or not the child has suffered or is likely to suffer significant harm. Figure 1.1 summarizes the factors relating to the child's overall health and development that need to be taken into consideration in determining harm. Consideration of this figure makes it clear that the conclusion is like putting together the pieces of a jigsaw, creating a picture of the child within his family and the local community. In order to do this all relevant background information needs to be gathered from the child's health visitor, general practitioner using parent-held records, primary care records and information from community child health and hospital records relating to previous health contacts. Information about the way in which the current incident presented from all those involved needs to be carefully documented, with, in particular, a verbatim account of the carer's description of the events and the symptomatology of the child at all stages. It is important to note that it is not necessary to explain all of the injuries on the basis of one incident. Active young children normally have some bruises on their body as a result of accidents, but several groups of injuries, particularly in locations not normally injured in accidents and particularly when a single accident is being offered as an explanation for all, would be very worrying.²⁰ It is

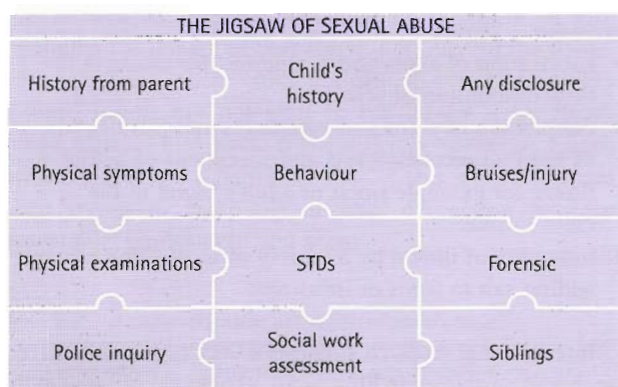


Figure 1.1 The 'jigsaw' in the diagnosis of sexual abuse. (From Hobbs CJ, Hanks HIG, Wynne JM. 1993 *Child Abuse and Neglect. A Clinician's Handbook*. Edinburgh: Churchill Livingstone, with permission.)



Figure 1.2 The shape of the bruise reflects that of the instrument used.

important to remember that the tiniest injury, which may be of no clinical significance, may be the one that confirms the diagnosis of non-accidental injury, for example a bruise with a clear imprint of the instrument used (Fig. 1.2).

Ultimately the case may be lost or won on the basis of the rigour of the clinical assessment. It is never possible to go back and look again, and it is important not to rely only on the quality of photographs that may not, for some reason, be available or may not show the injuries to be as extensive or worrying as apparent on clinical inspection.

SIGNIFICANT HARM

The term 'significant harm' was introduced into the legislation aimed at protecting children in the Children Act 1989 (England and Wales) and the Children (Scotland) Act 1995 in an attempt to distinguish those children for whom ill treatment and neglect have led or are likely to lead to significant morbidity, including long-term emotional and/or developmental impairment/disability or even death. Unfortunately, although it appears on almost every page of the Act, the term is never itself defined. Although at first sight it might be thought that establishing significant harm in terms of the medical findings and assessment would be much easier than from the legal or social perspectives, in practice it is rarely straightforward. Certainly when presented with a child looking like this (Fig. 1.3), there would seem little doubt; this little girl has a serious injury requiring hospitalization with a risk of long-term scarring. There would be little difficulty in concluding that not only has this child been seriously injured, but also that she has suffered significant harm and is at high risk of further injury if left in her present family situation. In contrast the assessment of a difficult teenager who admits to flouting his parents' authority, using bad language to upset them and returning the physical blows inflicted by his father is more difficult; significant bruising caused by, for example, a slap across the face and ear with full-thickness bruising



Figure 1.3 Inflicted burns on the lower leg of an infant.

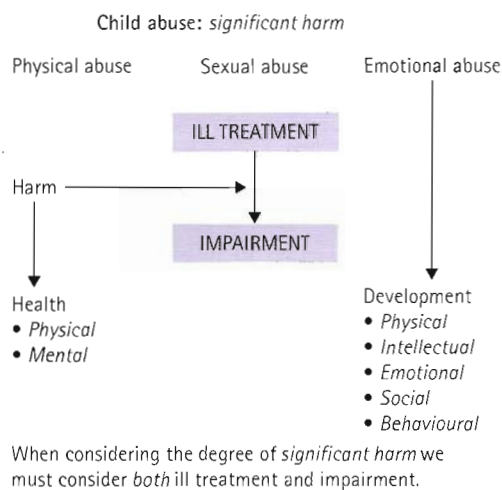


Figure 1.4 Considerations in the assessment of significant harm in the context of child abuse. (Courtesy of Dr MA Lynch, London.)

through the pinna suggests considerable force, but in the absence of previous concerns, physical, developmental or social within his family setting, the significant harm done appears slight and the level of ongoing risk low.

Therefore, as in many other situations in medicine, we are faced with a continuum of presenting signs and symptoms that requires a thoughtful and detailed approach to diagnosis and a clearly expressed opinion in order that we may contribute effectively to the protection of children who are indeed at risk of significant ongoing harm. Figure 1.4 reminds us that it is not only the immediate physical presentation of the child

that is important, but also the clues concerning the standard of care that the child has previously received that we gain from the rest of the physical and developmental assessment of the child, including evidence of long-term impairment from previous injuries or neglect. It reminds us that in many cases more than one kind of abuse is present and of the need to gather information from many sources to complete the picture.

THE INTERAGENCY CONTEXT (FLOW CHART OF PROCESS)

Years of experience and the results of a number of high-profile enquiries have confirmed that to be successful the medical assessment of the child must be an integrated part of the joint police/social work investigation. This ensures that the medical evaluation benefits from the availability of information from the early investigation and that it is timely both in the context of the health care of the child and the requirements of the police and social work processes. It also helps to ensure that the child is protected from unnecessary repeat examinations and the whole investigation is carried out in a child-friendly and sensitive way, ensuring not only appropriate immediate and ongoing health care but also that any medical evidence which is available is gathered effectively and can be used to protect the child whether through civil or criminal proceedings. In order to achieve this, clear and agreed interagency guidelines need to be in place to ensure discussion and meaningful collaboration from the earliest point of referral to the completion of criminal and care processes. Senior professionals in each of the agencies need to share information at the planning stage before any agency responds to the referral and at each subsequent stage thereafter. This process is depicted in Fig. 1.5 and starts with what is locally entitled the *initial (inter-agency) referral discussion* in which senior health, police and social work colleagues share the information relating to the child and family that is already available to their agency and plan the investigation (Fig. 1.6). This discussion usually takes place by phone and will agree the sequence, timing, venue and personnel to be involved in the interviewing and medical examination of the child, and the nature of that examination. In some situations a preliminary medical assessment of the child is required (by the general practitioner, accident and emergency doctor or general paediatrician) when information is vague and an accidental explanation or medical reason for the child's presenting symptomatology may be forthcoming on further enquiry.

In situations of disclosure of sexual abuse or serious physical injury the case should proceed immediately to specialist examination, bringing together paediatric and forensic skills to fulfil all the necessary functions of the comprehensive medical assessment together with evidence gathering in one examination. The timing of this will depend on many factors: medical, forensic and legal (e.g. the time

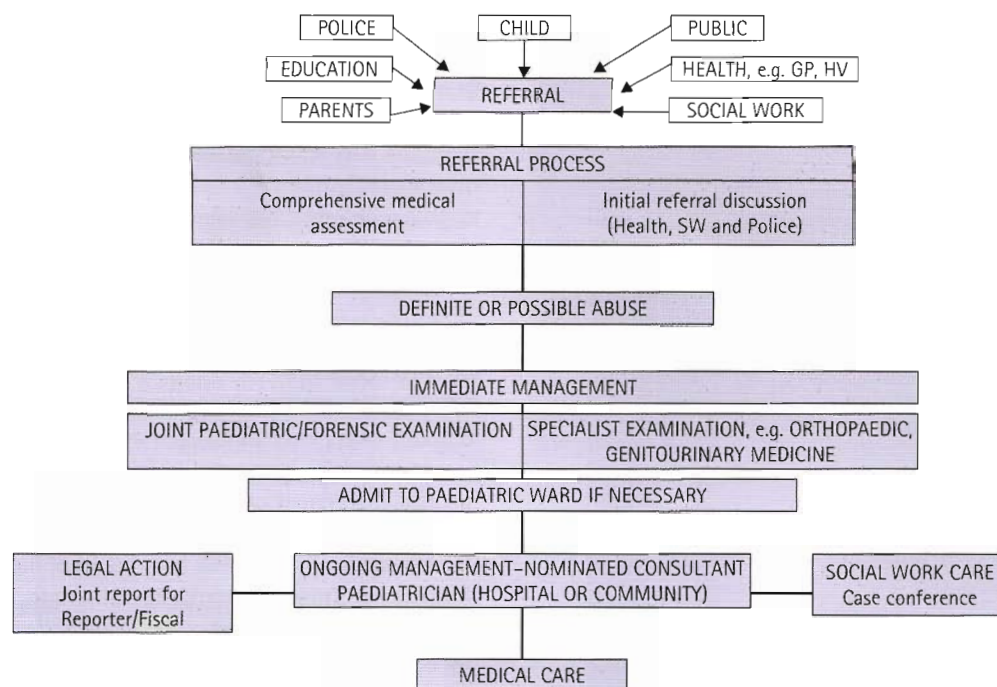


Figure 1.5 Flow chart illustrating the stages in medical assessment of children with suspected abuse or neglect. GP, general practitioner; HV, health visitor; SW, social worker.

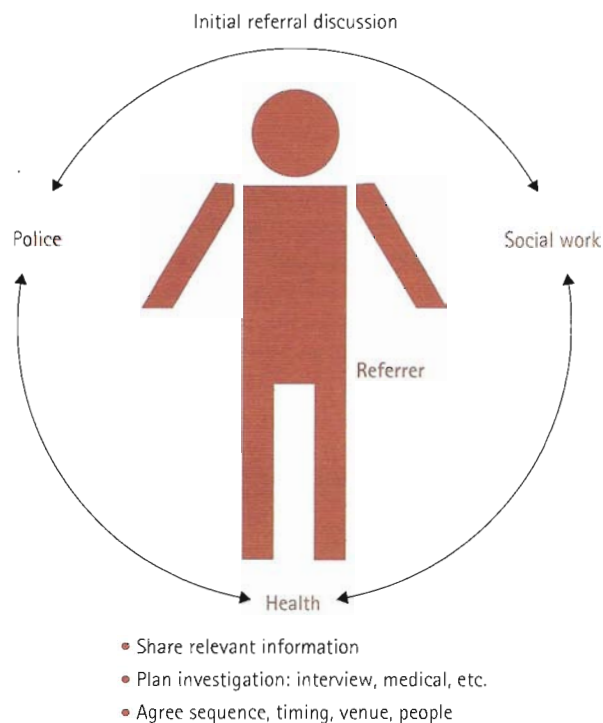


Figure 1.6 Interactions around the initial referral discussion.

between the incident and referral), the nature of the injury (e.g. head injury indicating the need for immediate evaluation) or forensic issues such as the need for immediate examination to secure all trace evidence in acute sexual assault.

The police may be constrained by timescales in relation to their criminal investigation, for example if they have

an alleged perpetrator in custody. In other situations, for example disclosure of historical abuse, a carefully planned interview followed by examination carried out electively during working hours, preferably in a planned specialist clinic, is in the child's and family's best interests.

Immediately following the examination, information concerning the immediate facts and preliminary opinion of the examiners must be made available to the police and their social work colleagues to inform their investigation and contribute to the decision-making about the immediate protection of the child while the investigation continues. In a minority of situations, the child's need for medical treatment will require admission to the ward and at other times a more complex picture of failure to thrive and developmental delay may also indicate the need for admission for further investigation and assessment. Examining doctors must also contribute to the social work child protection process by taking part in case conferences that are held to make decisions about registration on the Child Protection Register and the immediate and ongoing child protection plan, and input into the legal process either in the criminal courts or through the Children's Hearing system.

JOINT WORKING AND THE COMPLEMENTARY SKILLS OF PAEDIATRICIANS AND FORENSIC SPECIALISTS

The evaluation of sexual abuse and severe physical injury requires the involvement of doctors who are skilled in general and social paediatrics and in forensic medicine. The

skills, competencies and facilities required to undertake this are set out in joint guidance produced by the Royal College of Paediatrics and Child Health and Association of Forensic Physicians in April 2002 and updated in 2004.²¹ It is useful to remember that the term *forensic* means 'the application of scientific methodology to the investigation of crime', not simply the taking of samples for trace evidence. In most instances of serious physical assault and sexual abuse the working together of two doctors, a paediatrician and a forensic medical examiner (sometimes known as a police surgeon) will be required, bringing together the two sets of skills. Doctors work together in a complementary way, with the paediatrician playing the lead role in the assessment of the child's development and his or her general physical health, whereas the forensic examiner assists with the description and interpretation of any injuries found, particularly in terms of their possible causation, i.e. whether the cause is likely to be accidental or non-accidental, likely timing and the degree of force required.

The forensic examiner will take the lead in collecting any samples that are required for forensic laboratory analysis, taking care to secure the chain of evidence. As far as possible, photographs of physical injuries should be taken by a police photographer when both doctors are present.

In children in whom sexual abuse is alleged or disclosed, the use of a colposcope with camera facility is essential, so that a continuous video or DVD recording (or series of still photographs) is available for further assessment and, where necessary, viewing by a medical expert instructed by the defence team in relation to any subsequent court procedure. Such recordings are invaluable for peer review. Joint examination also has the benefit of providing internal corroboration of the medical evidence, which is customary in other medico-legal practice. This is of particular importance in Scotland, where legal practice differs from English Common Law. However, clinicians generally find the support of another senior colleague very helpful in reaching an informed opinion in what are so frequently difficult and highly charged circumstances. Appropriate training is obviously of utmost importance, together with ongoing opportunities for continuing medical education and peer review.

The roles of the medical assessment are detailed in Table 1.5, bringing together the needs of the child for medical assessment and treatment with the evidential requirements. The importance of reassurance to the child and family should not be underestimated. Many myths remain in the

minds of children and adults in relation to penetration, pregnancy and infection, and the opportunity to reassure should be one of the considerations taken into account in deciding whether or not to proceed to medical examination.

LEGISLATION

In approaching the gathering and interpretation of the medical evidence in child abuse cases it is useful to have a clear understanding of the nature of the legal processes that may be invoked to protect the child and, in particular, the standard of proof that is required to sustain them and thus to protect the child(ren) from further harm.

In Scotland, criminal proceedings are the responsibility of the Lord Advocate. Procurators fiscal review the evidence gathered by the police during an investigation; they determine whether or not it is in the public interest to prosecute and whether or not there is enough evidence to proceed.

Cases in which physical or sexual assault or serious neglect of a child is alleged may be prosecuted in the High court or sheriff court, depending on the seriousness of the charges laid down in the indictment. That a crime has been committed under Schedule 1 of the Criminal Procedure (Scotland) Act 1995 (offences against children under the age of 17 years to which special provisions apply) must be proven 'beyond reasonable doubt' to secure a conviction.²²

Within the Children's Hearing System in Scotland, grounds of referral are drawn up when there is evidence to suggest that a child is at risk of suffering significant harm from abuse and neglect unless compulsory measures of care are put in place. These grounds may be denied by the parents/carers, leading to legal proceedings before the sheriff. Evidence, including medical facts and opinion, is led by the reporter and is open to cross-examination by lawyers acting for the family and the child. Here the standard of proof required is lower, with the sheriff reaching a decision 'on the balance of probability' as the civil standard. It is important to note that in these proceedings it is not necessary to identify the person or persons to blame, often a major difficulty in child abuse cases, particularly in those involving infants. These procedures are described and discussed by Wilkinson and Norrie.²³ Once the grounds of referral have been established, the case is sent back to the reporter who will convene a Children's panel to determine what action is required to protect the child.

Inevitably legal proceedings are lengthy and often delayed. Children at risk from abuse and neglect require urgent protection, which can be secured though the recent Children Act legislation both in England and Wales (1989) and Scotland (1995). Through this legislation, Child Protection Orders (sect. 57), Child Assessment Orders (sect. 55) and Exclusion Orders (sect. 76 – to remove the alleged perpetrator from the home) have been put in place to allow the investigation to continue at an appropriate pace, while ensuring the protection of the child(ren). Before granting these orders the sheriff may require initial documentation

Table 1.5 Role of medical assessment

To secure any medical treatment required
To gather medical and forensic evidence
To gather relevant background: medical, family and social
To gather information on the child's growth, development and emotional state
To initiate ongoing medical care (including psychological or psychiatric care, treatment of sexually transmitted disease)
To reassure the child and the family

of the medical evidence, which may, if necessary, be submitted in the handwritten format, including injuries depicted by line drawings.

CONSENT AND CONFIDENTIALITY

Child abuse cases regularly raise issues of confidentiality, particularly for doctors working with young people in sexual health or mental health services and those working with parents or carers in general practice or psychiatric departments. These issues are explored in detail in a recent working party report produced by the Royal College of Paediatrics and Child Health (RCPCH) in 2004.²⁴ The document reminds medical practitioners that 'the doctor's primary duty is to act in the child's best interests. If there is a conflict of interests between doctor and parents or parents and child then the child's needs are paramount'. Recent General Medical Council (GMC) guidance in the UK issued in 2004²⁵ makes it clear that when any practitioner suspects that a child may be being abused or neglected he must share the information promptly with an appropriate person or statutory agency when he believes that to be in the child's best interests. The GMC also issued specific guidance in relation to the sharing of information about children and young people in 2007.²⁶ In a situation when the practitioner believes it may not be in the child's best interests to refer the matter on, he should discuss the matter with an experienced colleague and be prepared to justify any decision not to disclose. Some leeway is left in this advice in order to allow colleagues, particularly in the mental health services, to prepare a patient for referral when a child is not considered to be currently at risk, for example if an adult patient reports previous abuse by a father with whom she is no longer living. Of course, care must be taken in deciding to delay referral, as the alleged perpetrator may be a danger to other children.

Obtaining informed consent to examination and to the subsequent sharing of information also raises anxieties, which have been clarified, to some extent, by the recent Children Scotland Act legislation. In 1991 the Age of Legal Capacity (Scotland) Act clarified the position in Scotland by making the age of 16 years the age at which all youngsters (apart from those with a disability) attain the ability to give their own consent but making it clear that prior to that age any child who was felt competent to understand the significance of the examination and treatment should be asked to give his or her own consent.²⁷ It also establishes that it is the doctor's responsibility to make a decision as to whether or not the child is competent to give consent. When the doctor decides the child is competent then the child's consent must be sought and the parents no longer have a right to make the decision for the child, although they would be expected to give the child appropriate guidance and support in reaching a decision. It must be remembered that the wishes of a child deemed competent to give consent must be respected when he or she refuses that consent.

The nature and circumstances of the child's medical, developmental and social condition will of course have an important bearing on whether or not the child is competent to give consent. Giving his or her own consent for examination for sexual abuse, which may lead to the imprisonment of a parent, raises much more complex issues about a child's ability to consent and also to the meaning of the phrase *fully informed*, which is taken to imply that *the child understands fully the implications of the examination*.

Increasingly, as all forms of legal proceedings become more adversarial in nature, aspects of the examination, including the seeking of consent, are brought into question and a failure to properly seek documented consent may lead to the medical evidence being deemed inadmissible.

THE PROCESS – JOINT PAEDIATRIC/FORENSIC EXAMINATION

In arranging and carrying out a joint examination the paediatrician takes responsibility for ensuring that the child receives a high standard of medical care at the same time as contributing to the gathering of the best medical evidence.²⁸ This examination should be seen as the start of the therapeutic process for the child as well as a vital part of the interagency investigation.²⁹ In order to achieve this high standard, a dedicated facility offering privacy, warmth, good lighting, photography, video colposcopy and laboratory services in a context that is child-friendly is essential (Fig. 1.7). Examination, particularly for sexual abuse, is

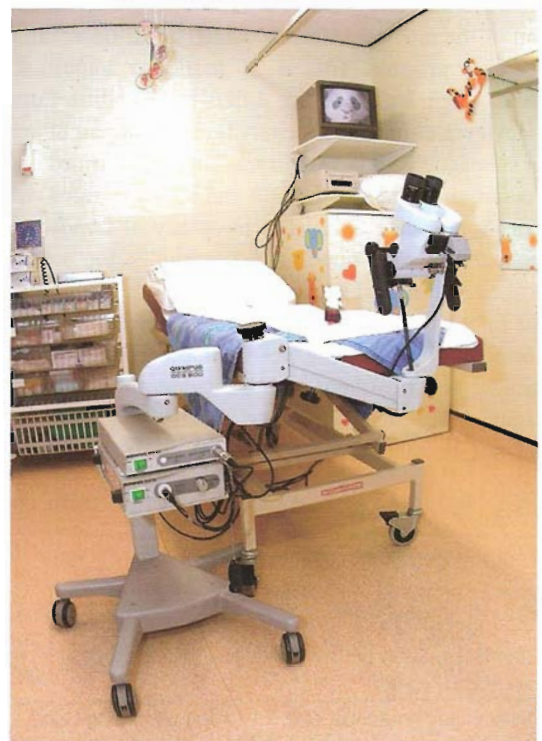


Figure 1.7 Consultation room with video colposcopy facility.

much more likely to be successful if the child feels relaxed. Attention to the general environment in terms of play facilities, food and drink when an investigation has been prolonged, supportive nursing care and replacement clothing and shower facilities where appropriate are all-important. In the majority of situations the child is well although he or she may be subdued and anxious. Kind reassurance will enable the child to take an active part in the discussion and examination and to benefit from the explanation and reassurance at the end of the examination. Wherever possible children should be asked for consent even when formal consent is the responsibility of the accompanying adult. It is important to explain the process very carefully to the child and to allow him or her to see the examination couch, the otoscope and video equipment, and to introduce the child to all of the adults who are present.

When young children are involved, however, it is preferable for the child to be occupied by an appropriately trained nurse or familiar adult while the police and social workers discuss the information available from the earlier investigation and any disclosures that the child may have made and the background medical history is taken from the accompanying adult. Ideally, this can be used as an opportunity for the nurse to make a brief assessment of the developmental status of the child and his or her emotional well-being.

Joint paediatric/forensic examination of the acutely ill child is often problematic and clinical care must, of course, come first. In some situations, for example, severe non-accidental head injury, the child may present with acute encephalopathy with a falling Glasgow Coma Scale score, seizures and/or cardiorespiratory compromise and is clearly not fit to be examined in any detail. However, failure to conduct even a brief joint examination may lead to the loss of significant medical evidence that may be crucial to the final diagnosis. Medical photography may offer a way of rapidly documenting the superficial injuries at that time when meticulous measurement and drawing is not possible. Similarly in children subjected to burns or scalds that will be covered by dressings, or children with long bone fractures that will require splinting, an opportunity for rapid documentation looking, for example, for bruising consistent with a gripping and twisting injury should be sought. At present, that opportunity is frequently missed, as the possibility of non-accidental injury is frequently not raised before emergency treatment is completed. When a full joint examination has not been possible due to the clinical state of the child, a clear plan to return to jointly examine the child when the clinical state improves, or indeed if the child dies, should be made and documented in the hospital case notes. Particular care should be taken in planning the examination of a child when the referrers describe inflicted abdominal or head injuries even where the child is described as clinically well. In offering advice the paediatrician must be aware of the potential risks of intra-abdominal or intracranial bleeding, which may cause

an apparently well child to deteriorate rapidly over a number of hours following injury.

Presenting History

Before proceeding to the physical examination, wherever possible it is vital to obtain a complete and full history both of the events that have led to the presentation of the child and past medical history/family and social history, including the wider history of previous information known to police, social workers and education staff about the child and his or her family. When an accidental explanation is being offered by the parents or carers for physical injury it is vital to obtain a very detailed account of the alleged incident, preferably from individual witnesses, including the precise location of the child before and after the event (e.g. in exactly what position did the child land, which part of his body hit the floor or obstacle first). Also, information on the precise location of the adults who allegedly witnessed and intervened in the event, including exactly the condition in which they found the child after the incident and what attempts they made to resuscitate him or her. Information may already be available from the police about the locus but they may need to revisit this after the examination, for example to look at precise features of a staircase, bunk beds, etc. or to look for bloodstains, semen, etc. It is important to document clearly the source of each piece of information, i.e. those details that have been provided by a carer or witness directly or information from an investigative interview reported by police or social workers. This information can be gathered from the professionals attending the assessment while a caring adult occupies the child. Details of the child's past medical history should then be sought from the parent or carer. General information about the child's birth history, developmental history and information about significant illnesses or operations requiring hospitalization should all be sought and documented. In infants and toddlers, particular attention should be paid to any history of prematurity, intra-uterine growth restriction or difficulties at the birth. When failure to thrive is part of the presentation, particular care should be taken about the feeding history, any history of gagging or choking, vomiting or diarrhoea, abdominal distension or repeated chest infections. When children present with bruising, care should be taken in seeking any history of bruising or bleeding tendency in this child and a history of recent viral illness (see Chapter 4). A history of bleeding, bruising tendency and joint laxity in the extended family should then be sought. When a suspicion of possible cigarette burns has been raised, care should be taken to seek any history of skin disorder, particularly eczema in the child and again in the wider family. In the child presenting with a fracture, previous fractures in this child and/or family members suggesting the possibility of some form of brittle bone disease should be sought.

When allegations of possible sexual abuse are being made, careful history relating to urinary symptoms (urgency, frequency, dysuria), including episodes of documented infection, should be noted together with information around any genital or anal symptomatology, for example pain, itching, discharge, bleeding from the vulva, pain or bleeding on defaecation, constipation or soiling, together with the pattern of symptomatology particularly in relation to timing of access to the alleged perpetrator.

Family medical history should be sought in the usual way but including, in particular, information as noted above that is suggestive of bleeding tendency or bone fragility (including hearing loss). In addition, information on the growth of the natural parents and any information suggestive of significant physical or mental illness, drug or alcohol misuse should be noted.

Social History

Information on the social situation in the family home should be sought from the attending carer but will of course be available in much more detail through the primary care team, social work records and from the ongoing investigation. Of particular note are a history of domestic violence and/or drug and alcohol misuse, all known to predispose to physical and emotional abuse and neglect of children.³⁰ An indication of the level of deprivation within the family home and the local community should be sought, together with information on any previous concerns about the care of this child and his or her siblings.

Presenting History Taken from the Parent

Once a background medical history of the child has been carefully explored with the parent or carer, the examining doctor should seek information about signs and symptoms that the parent might have observed in relation to the alleged abuse or neglect. For example in physical injury, particularly in relation to possible burns, precise detail of the signs of damage to the skin is vital. For example, did this lesion start with a small area of erythema or a blister? Over what time frame did it progress to the current appearance? Did other lesions appear at the same or different times and what was their precise location? Were they itchy or painful? Has any treatment been applied? In alleged head injury, has there been any period of loss or altered consciousness, vomiting or features suggestive of seizure activity?

If a child is able to give his or her own account, again it is important to ask for symptomatology, particularly immediately following the alleged incident: for example in alleged strangulation, did the child feel dizzy, was there any effect on the child's vision, ability to swallow, breathe, etc.? Have there been any subsequent symptoms?

In alleged sexual abuse relevant history in relation to urinary, genital or bowel symptoms should be sought and for a post-pubertal child information about the normal menstrual cycle, including whether or not the child uses pads, tampons or both. It is also important to ask for information relating to general well-being following the alleged incident, for example is the child continuing to sleep and eat well, has there been, for example, the recurrence of nocturnal enuresis or night terrors? How was the child doing at school? Have there been any problems with ongoing relationships at school or at home? When a history of rectal bleeding or anal abuse is put forward it is extremely important to establish the child's normal bowel habit and in particular whether there have been any periods of severe constipation requiring medical treatment. It is important to seek information about the mental health of the child, particularly the teenager, and to at least consider the possibility of self-inflicted injury.

Information from the Child

Having gathered as much information as possible about the medical, family and social context of this presentation together with the early detail from the police about the precise incident, it is then appropriate to proceed to the direct assessment of the child. It is extremely important at this stage to consider carefully who should be in the room during the discussion with the child and, most importantly, during the physical examination of the child. When the child is able to give an opinion (certainly from the age of 8 years onwards) his own view on who should be present should be sought. Care should be taken to develop a rapport with the child by general conversation (e.g. preferred activities, how he is getting along at school, a local football team, etc.). It should then be possible to move on to talking about what has happened.

Although it is entirely inappropriate to go over the statement which the child has given at joint interview, it is often necessary, particularly in relation to sexual abuse, to clarify the child's terminology and when a child has multiple bruises it can also be very helpful for the simple question 'how did that happen?' to be asked, which may enable the child to indicate clearly which injuries were associated with which blow and to increase his credibility by indicating clearly that a particular injury had an accidental origin, for example falling from his bike. Children use many words for their private parts and these vary widely across the country. For example locally, 'flower' is a common word for the vulva, sometimes 'china' is taken to stand for vagina; however, in another part of Scotland 'fluffy' is taken to mean vagina. It is extremely important not to jump to any conclusions, particularly when trying to help the police to establish whether an alleged assault was rape or a less serious sexual offence. The medical examination offers us the only real opportunity to clarify directly what

the child means by her 'flower' or 'fluffy' by asking her to point directly to it with one finger. (It will subsequently be important to clarify the police's understanding of the child's terminology.) It may also be useful to go over directly with the child the nature of any history of genitourinary symptoms, rectal bleeding, menstrual cycle, whether or not protection was used in any under-age sexual intercourse (e.g. condoms). With older youngsters it is important to ask about intake of drugs or alcohol, particularly around the time of the alleged incident. At all times it is important to ask open-ended questions and to do so in the presence of the investigating police officer. It is helpful to hear the child give a clear accidental explanation to some injuries, as this establishes his credibility, his language and understanding.

Before proceeding to examination it is very important to ask the accompanying adults what explanation and information have already been given to the child about the need for medical examination and the likely nature of it. It is then important to ensure that a full explanation has been offered to the parents when seeking fully informed consent: this should be carefully documented. Where the child is old enough to give their own informed consent, similar care must be taken to explain to the child exactly what is required and why and to allow time for the child to explore the examination room and the video colposcopy equipment when detailed examination of the anus and genitalia is required.

In discussing the need for medical examination it is important to emphasize the therapeutic aspects of the examination, i.e. the importance of being able to describe any injuries present and frequently to exclude significant physical injury or transmitted infection and to arrange appropriate follow-up and treatment if required. As noted above it is important to ensure that the child is comfortable with all accompanying persons and that non-essential adults are asked to wait outside.

Examination

The examination of a child who may have been abused or neglected should follow the same format as any other clinical assessment and must include a complete physical examination, including measurement of growth and a brief assessment of development. It must be meticulously and contemporaneously documented, including accurate quotes of any explanation given by the adult or child. In particular, the general examination should include careful assessment of the child's hair, teeth and skin, as these are good indicators of the child's general well-being. Additionally, a note of the child's cleanliness, appropriateness or not of clothing, and his or her demeanour should be made during assessment. Any superficial injury should be carefully measured, documenting the vertical and then the horizontal measurement in centimetres together with the

distance from the nearest anatomical reference point. A careful note of the pattern of injury, for example colour, speckled appearance from fabric weave, loss of skin surface and direction of injury, should be included. It must be remembered that it may be the smallest injury that confirms the non-accidental nature of a child's presentation. Careful drawings should be made, preferably on diagrams within a proforma, numbering each injury (Fig. 1.8) (the full proforma and consent form can be found in Appendix A, p. 457). These will be vital to compare with the photographic documentation. Measurements of weight and height (and head circumference where appropriate) must be plotted carefully on up-to-date population growth charts.

Examination of the genitalia and anus should normally be undertaken as part of the general examination in any young child when abuse is suspected and in any child when the allegations, medical history or findings suggest that sexual abuse in any form may have taken place. The anus and genitalia should be examined using the colposcope for light and magnification and to obtain photo-documentation through video recording (or the taking of a

Confidential medical information	
EDINBURGH AND LOTHIANS CHILD PROTECTION OFFICE	
Joint Paediatric/Forensic Examination/ Specialist Paediatric Examination of Child who may have been Abused or Neglected	
Place of Examination	Name of Examination(s)
Child's surname	Forename(s)
Known as	
Address	Date of Birth
	Sex
	CHI No.
GP	Date of Examination
Address	Time of Examination
	Child accompanied to clinic by (please tick) Mother <input type="checkbox"/> Father <input type="checkbox"/> SW <input type="checkbox"/> Police <input type="checkbox"/> Other <input type="checkbox"/>
School/Nursery Attended	
BACKGROUND INFORMATION (e.g. previous concerns re. developmental delay, poor growth, possible episodes of NAI)	
Family/Social History	

Page 1 of 12

Figure 1.8 Initial page of the locally used examination proforma (the proforma is presented in full in Appendix A, p. 457).

series of still photographs). This allows detailed examination of the labia majora, labia minora, posterior fourchette, vestibule, hymen and urethral meatus, and the anus.

This examination is discussed in more detail in Chapter 2. Examination findings should be documented in detail, again using line drawings and using the convention of the clock face to locate any abnormalities and recent or healed injuries. In undertaking an examination it is again important to recognize that it may be superficial injury, for example a bite mark or imprint injury, that corroborates the sexual assault described by the child, when other, perhaps more specific examination (i.e. anogenital) is inconclusive.

The same careful attention to detail is required in the gathering of the samples that will be processed through the forensic laboratory. This part of the examination is usually led by the forensic examiner who has specialist training in this area and will ensure (together with the attending police officer), for example, that the chain of evidence is maintained. This particularly applies to the examination of the sexually assaulted child when swabs are taken from the vulva, vagina, anus, mouth and skin areas (depending on the history) when looking for semen and saliva, samples and combing of head and pubic hair, and samples of nails and blood, as appropriate, again depending on the history. These investigations may confirm sexual assault when physical findings are normal. When an acute assault has occurred, the child's clothing will be carefully gathered. These details are further described in Chapter 7. The nature of the samples taken should be documented carefully and all specimens carefully labelled and signed by both examiners and the attending police officer. Finally, the paediatrician and police surgeon will oversee the taking of photographs of any injuries by the identification branch of the police. On occasions when there is a medical differential diagnosis, for example on certain skin lesions, medical photography can also be very valuable in enabling a second opinion to be more rapidly obtained.

Immediately following the examination when the paediatrician and the forensic examiner have had an opportunity to confer and possibly to review the video recording, a preliminary conclusion should be reached and communicated clearly to the attending police and social workers. This allows the agencies to plan the further investigation of alleged abuse and also to contribute to their planning for the immediate protection of the child while the investigation is ongoing. It is very important to document precisely the preliminary opinion that is given so that this can be included and, if necessary, modified in the subsequent typed report.

As much information as possible should be shared with the parent and the child, but it may be necessary to withhold some detail, for example of the suggested mechanism of specific injuries, when police investigations are at an early stage and the accompanying parent may be implicated in the abuse. Once a conclusion has been reached on the likelihood of abuse and the possibility of differential

diagnoses, a plan of the investigations necessary to exclude or confirm possible alternative explanations for the child's presentations can be made.

Investigations

Investigations that should be considered in the context of possible physical abuse or neglect include: haematology, clotting studies, biochemistry and tests to exclude malabsorption or other organic causes of failure to thrive where appropriate. Skeletal survey is generally recommended in any child under 2 years of age presenting with non-accidental injury and in older children for whom history or medical findings suggest that it is indicated. Computerized tomography (CT) or magnetic resonance imaging (MRI) of the head should be undertaken in alleged shaking injury, as described in Chapters 3 and 14, and must be considered in any situation of inflicted physical injury in a very young child. In children presenting with multiple fractures without adequate explanation it is important to consider the possibility of osteogenesis imperfecta or other forms of brittle bone disease and to consider carefully what investigations should be undertaken if a diagnosis of non-accidental injury is to be sustained. In the majority of cases the correct diagnosis can be achieved by the taking of a careful history, particularly including the family history, careful examination, and expert radiological review. In considering radiological investigation it is extremely important to take into consideration the risks of exposure to radiation and to consider carefully the indications, discussing the requirements with an experienced paediatric radiologist.

Assessment of Growth and Development

Assessment of the physical growth and developmental stages of the child is crucial to forming an opinion on the significant harm that the child may have or is likely to suffer. Satisfactory growth measurements may be charted during the paediatric/forensic examination and an age-appropriate developmental history confirmed by brief observation. However, in many situations, particularly involving very young children, more detailed evaluation of growth and development is required, including reference to previous health records, particularly those held by the health visitor.

Growth is an important indicator of a child's well-being – both physical and emotional. Placed in the context of previous measurements and the subsequent trend in growth once a child is protected, the pattern of growth can be a vital piece of medical evidence in establishing grounds of referral for ill treatment or neglect (Fig. 1.9).

It is essential to obtain information about the height of the natural parents in order to calculate the target height of the child and determine whether or not the child's current

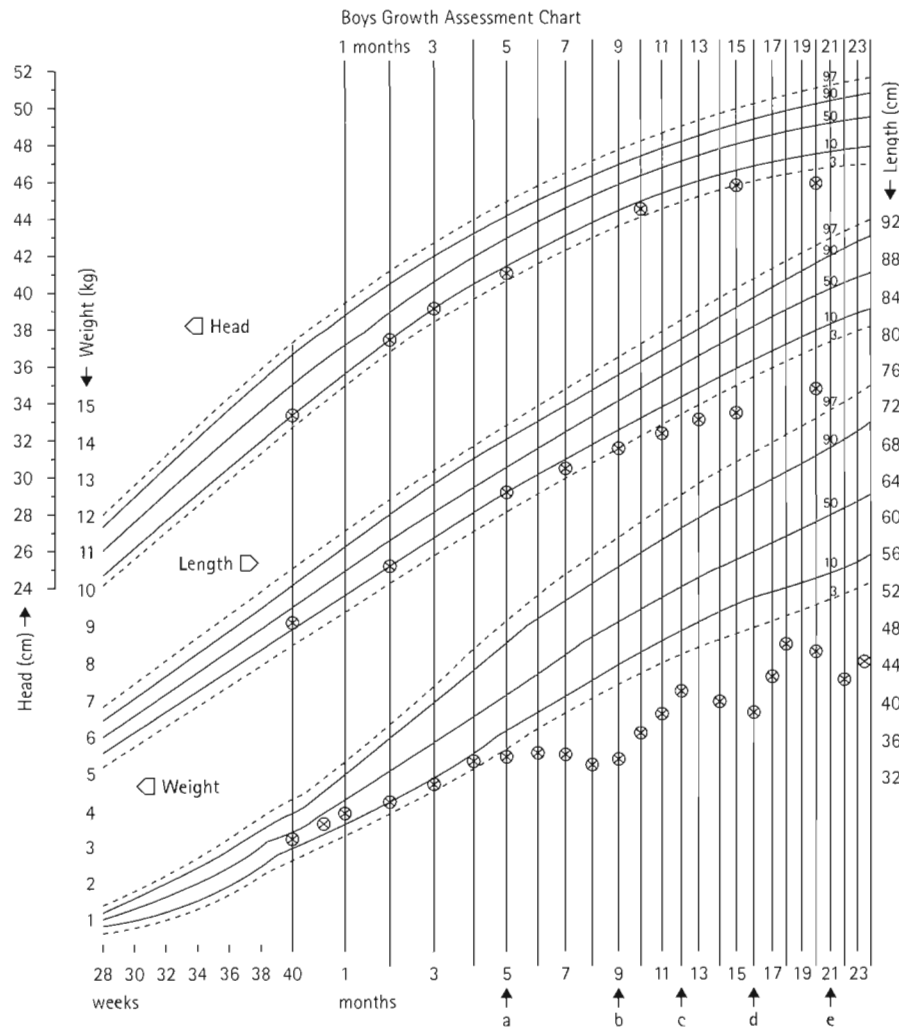


Figure 1.9 Growth chart of non-organic failure to thrive shows weight gain when the child is removed from the home environment. (Chart published by Castlemead Publications, Welwyn Garden City.) a, referred; b, admitted urti.; c, home; d, readmitted; e, fostered.

growth is appropriate for his or her family. The association between failure to thrive and child abuse and neglect is well established; however, the precise definition of failure to thrive remains controversial and its causation in most cases multifactorial. It is also important to note that the word 'thrive' is derived from the Norse *thrifa* to grasp, meaning 'to grow strong and healthy' and therefore is not just about a child's weight but relates to all parameters of growth, height, weight, head circumference and developmental status. The underlying mechanism is undernutrition, with the child either not offered, not taking in or not able to utilize appropriate nutrition.³¹ Early studies tended to define failure to thrive as all children who fall below the third centile in terms of weight gain; however, by definition 3 per cent of our population fall below the third centile if the charts accurately reflect our population. Among these children, clearly there will be some who are genetically small, but other genetically large children may be significantly failing to thrive while their weights are well above the third centile. Work of the Parkin Project in Newcastle identified children

as failing to thrive when they lay in the slowest growing 5 per cent of the population.³² This is equivalent to a fall from the 50th to the 10th centile over a 6-month period. Their work also clearly showed that the surveillance weight measurement at 6 weeks of age was a good predictor of future stature in the well-nourished child, confirming that birth weight is a poor predictor, reflecting maternal and intra-uterine factors rather than the innate growth potential of the child. Therefore, in evaluating a child's growth pattern it is important to obtain the 6 weeks' surveillance weight and length and all other available measurements between that point and the current position.

The work of Wright³³ in Newcastle in the 1990s confirms the difficulty distinguishing between non-organic and organic failure to thrive. The term non-organic failure to thrive is sometimes considered to be synonymous with abuse or neglect of the child's need. However, studies clearly show that there are some children in whom investigation produces no clear organic cause but who continue to fail to thrive despite the best intentions of their parents.

Frequently these children have been of very low birth weight and/or have developed significant feeding problems during infancy. In investigating the child with failure to thrive in whom abuse or neglect is suspected, it is extremely important to exclude the recognized organic causes (for example cystic fibrosis, coeliac disease, cardiac disease or recurrent infection should be considered) and, ideally, demonstrate that the poor growth pattern is *reversible* through offering a period of normal care and nutrition.

Before reaching a conclusion it is important to ask the question, 'what is this child's capacity to grow?'. Careful review of the medical history and examination findings must be undertaken to exclude the possibility that intra-uterine growth retardation has led to failure to thrive, recognizing that studies show that almost 20 per cent of very-low-birth-weight babies remain very small.³³ The possibility should also be excluded that neurological impairment underlies difficulties with feeding³⁴ or that neonatal problems necessitating repeated intubation and tube feeding have delayed the normal processes of learning to feed such that the child has missed a critical period for developing the skills.³⁵ It is important to note here that the child may have missed the critical period because of neglect with the parents not offering or not encouraging the child to explore an appropriate range of solid foods at the appropriate stage, usually around the 6- to 7-month stage. Studies have shown that hunger, satiety and taste preferences are present in normal children by 24 months of age;³⁶ again these opportunities may be missed because of organic illness or because of physical or emotional deprivation.

In the literature, there is a growing body of evidence of the importance of behavioural issues in children's feeding and the importance of the mother's touch; 'maternal, physical and social interaction with her child in promoting feeding and growth' is well described in an article by Polan and Ward (1994).³⁷ How the child responds to being fed and how the parent then responds to them profoundly influences how the feeding behaviour develops and whether or not the child becomes a competent feeder. If the parent responds to a child's early difficulties with dogged determination, prolonging the mealtime and disregarding the child's protests and continuing to present food of a flavour or texture the child dislikes then the child may respond by refusing to eat at all. The child then learns to associate eating with confrontational negative experiences. As a result, although physical factors may have been important in the causation of early under nutrition, behavioural factors become the main determinant in prolonging it.

It is important therefore to recognize that the term *failure to thrive* is not a diagnosis but a description of a physical state resulting from a multiplicity of interacting factors that often change in their individual significance over time. In order to come to any conclusion about causation or required intervention, particularly if there is any suggestion of the need for child protection procedures, a multidisciplinary assessment that looks at all these aspects of the individual child and family in its local community is essential.

When the child's developmental status is a cause for concern, again it is extremely important to attempt to quantify that assessment and demonstrate the change over time and particularly to chart recovery following successful intervention (e.g. if the child is placed in a substitute family setting). Accurate developmental diagnosis involves careful observation of physical, social, communication and cognitive abilities. The work of Mary Sheridan³⁸ provides a developmental scale consisting of an inventory of abilities and milestones. Although it can be regarded as a simple form of psychometric test, the method of administration is not rigorously standardized and normative data consist only of approximate mean ages at which the various milestones are reached. This scale should be used primarily as a guide to normal development. It can be used to describe in terms of age equivalence, i.e. how many months behind its chronological age a child is on the particular axis of development. Although useful, it is not as specific nor as able to chart change over time as quantified assessments, for example the Griffiths Developmental Scales that are particularly helpful in identifying the profile of developmental progress, highlighting, for example, when a child is particularly lagging behind in social communication skills but making better progress in relation to motor skills.³⁹ The more specialist scales, for example the Reynel Developmental Language Scales, measure specific problems in speech and language development.⁴⁰ In applying these tests it is very important to recognize the limitations particularly in children who have a specific impairment or disability, for example visual impairment. When concern is based around the cognitive development of a child, tools such as the Denver Developmental Screening Test are useful.⁴¹ It is important to recognize that the application of psychometric tests is restricted to suitably qualified persons and it would usually be necessary to refer the child on for more specialist assessment when significant concerns have been raised.

Even when drawing an early conclusion about the developmental status of the child it is very important to consider whether the child has failed to demonstrate that skill because he is unable to achieve it, either because of specific physical/neurological impairment or in keeping with global developmental delay; alternatively, is he failing to cooperate because he is tired or hungry, upset or anxious or unable to understand what it is which is expected of him? If an age-appropriate skill is not achieved even in optimum conditions (which may require a follow-up assessment) is this because of limited opportunity, a lack of encouragement to explore the environment and learn new skills or because of underlying neurodevelopmental delay or disability? These questions are of course the key to the assessment of the impact of social deprivation and ill treatment on the presentation of the child.

The negative behaviours demonstrated by children who have been subjected to emotional deprivation and abuse are well recognized but not specific (Table 1.6). They range from the withdrawn, apathetic child at one extreme to the

Table 1.6 Negative behaviours associated with abuse

Withdrawn/apathetic
Attention seeking
Disruptive
Aggressive
Wetting/soiling
School refusal/truanting
Eating disorders

attention-seeking, disruptive and aggressive child at the other end of the spectrum. School attendance is frequently an area of difficulty with patterns of school refusal or truanting. Some show recurrence of wetting and soiling; in others, serious eating disorders are the presenting complaint. Again, the detailed assessment of these children, producing documentation that can be of use in achieving successful intervention, is dependent on specialist assessments by psychologists, psychiatrists and therapists as well as paediatricians.

In summary, careful assessment of growth and development are invaluable in the clinical assessment of the abused child, both as an indicator of the level of care that the child has received and as part of the investigation of any underlying medical explanation for the child's condition. It is vital to the assessment of the child's ability to sustain an accidental injury in the way described, i.e. could the child have climbed out of the cot as described, could the child have inflicted this injury on himself? In a recent case of a four-year-old child with penile injury (Fig. 1.10), careful occupational therapy assessment demonstrated that the child did not have the fine motor skills required to inflict this injury on himself, even if the pain and bleeding had not prevented him from doing so. Assessment of the child's emotional state and language skills are also very important in interpreting the child's account of alleged ill treatment and in considering his or her ability to testify in any subsequent court proceeding.

Emotional Abuse

As predicted by Kemp and Helfer⁴² in 1980, the recognition of emotional abuse as a specific category of child abuse and neglect has followed on slowly after the recognition of the physical forms of child maltreatment. This was despite the fact that it was clearly recognized as a cause for concern within the UN Convention of Rights of the Child (UNICEF 1989, ratified by the UK in 1991). For example, Article 19 of the Convention mentions protection from 'all forms of physical or mental violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation including sexual abuse'. Emotional abuse is now included as one of the categories for which a child's name may be entered on the Child



Figure 1.10 Incised penile injury in 4-year-old boy.

Protection Register in the UK. For this purpose it is defined in the recent revision of the joint working guidance, Working Together to Safeguard Children 2006 as

the persistent emotional maltreatment of children such as to cause severe and persistent adverse effects on the child's emotional development. It may involve conveying to children that they are worthless or unloved, inadequate or valued only insofar as they meet the needs of another person.⁴³

Some level of emotional abuse occurs in all forms of ill treatment of a child though it may occur alone. Emotional abuse however remains difficult to define and quantify, particularly as the main category of abuse. This is reflected in the relatively low percentage of children registered under this category in the UK, 18 per cent in 2000. The concern is not simply the recognition of negative interactions between parents and their children but the persuasiveness, persistence and inflexibility of these in causing significant harm.⁴⁴ Much of what is described as constituting emotional abuse is culturally relative and therefore will vary in different societies.⁴⁵ Glaser (2002)⁴⁶ describes the dimensions of emotionally abusive or inappropriate relationships as

(a) persistent negative attitudes, for example, denigration, blame, belittling, harsh discipline and over control, (b) promoting insecure attachment for example making the child's continued care by the parent contingent on the child's good behaviour and (c) inappropriate developmental expectations

and considerations, (d) emotional unavailability, (e) failure to recognize a child's individuality in psychological boundaries for example failure to acknowledge a child's personality, worth and wishes, (f) cognitive distortions and inconsistencies for example mystification or unpredictable parental responses.

Because these behaviours and attitudes affect both emotion and cognition, Glaser prefers the term *psychological maltreatment to emotional abuse*. Faced with these attitudes and behaviours, children adopt different modes of coping depending on their personality and resilience. Some will become withdrawn, others indiscriminately attention seeking, others seek gratification through food and may be accused by their parents of stealing food and others are described by their parents as showing disordered behaviours by acting out in a way that elicits further negative parental response. Some indication of these features may be identified through the presenting history or through information gathered from the health visitor or education setting. Quantifying the degree of current or future harm is fraught with difficulty but would require the specialist input of psychology and psychiatry services. Successful intervention is even more difficult to achieve, as even when parents accept the potentially damaging nature of their interactions, sustaining a change in behaviour leading to reduction in the extent of harm and a reversal of damage is hard to achieve. Early recognition by the clinician of signs of emotional abuse is therefore extremely important, allowing for the possibility of preventative treatment.⁴⁷

The neglect of a child's emotional and social needs is even more difficult to demonstrate adequately in terms of providing medical evidence that will convince a court. We all recognize the very long-term effects of early lack of bonding, stimulation and positive interaction on emerging language skills, even from the early weeks and months of life. This has been very well documented particularly by Rutter (1975),⁴⁷ who has described the patterns of behaviour and developmental difficulty that are seen in children

from such emotionally and socially deprived backgrounds. Such children lack confidence, are unable to express their feelings or make choices, and remain apprehensive and vulnerable unless very early intervention is achieved.

A particularly difficult area of practice relates to fabricated or induced illness (previously known as Munchausen syndrome by proxy), when, again, meticulous documentation of the repeated presentations together with expert assessments from psychologists or psychiatrists are essential to reaching a diagnosis and protecting the child. Guidance on the health and multi-agency assessment in these cases is contained within RCPCH and Department of Health guidance published in 2002.^{17-19,48,49} Meadow drew attention to this form of abuse through a case study in 1977 in which he described the deliberate fabrication of bizarre symptoms.⁴⁹ Subsequently, many manifestations of fabricated and induced illness have been recognized, including recurrent seizures, deliberate suffocation of infants and salt poisoning. Detailed assessment of the adults caring for the child is essential to gaining an understanding of the nature of the ill treatment in these cases. Is this a parent who is thriving on the ward and is less worried by the child's illness than the staff? Is the carer assuming the sick role by proxy to gain attention or are they genuinely concerned about the child and exaggerating genuine symptoms and signs to get the attention they feel their child needs? The work of Eminson and Postlethwaite⁴⁸ helps us to understand the continuum between neglectful carers, those accessing health care appropriately and carers who seek unnecessarily frequent health contacts from over-anxiety to those who deliberately exaggerate, invent or induce illness. This is illustrated in Figure 1.11.

DOCUMENTATION AND REPORT WRITING

The importance of careful documentation in ultimately achieving a successful outcome for the child at the centre

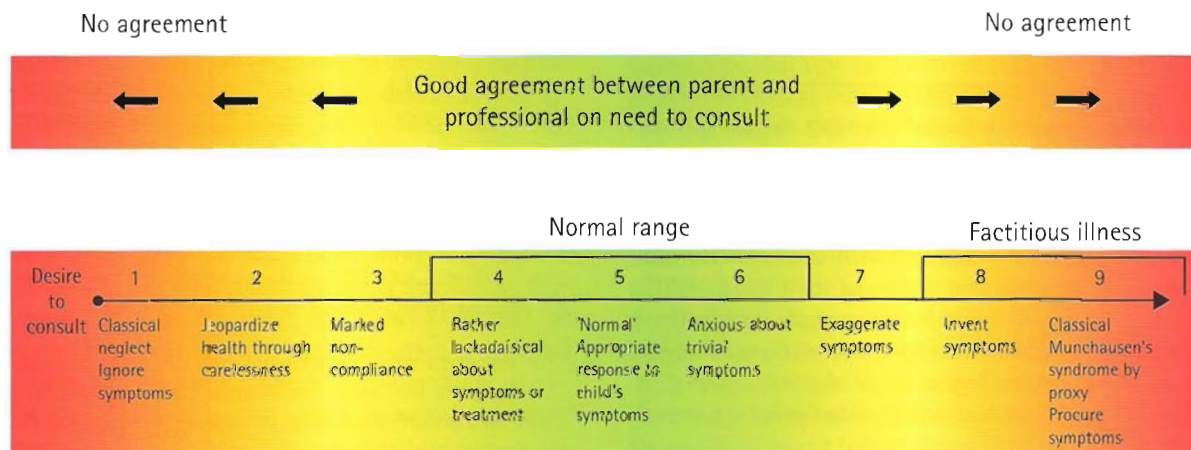


Figure 1.11 The spectrum of fabricated and induced illness.⁴⁸

of a child abuse investigation cannot be over emphasized. The documentation must record an accurate picture of the child, the injuries and the story, together with the background medical, family and social history on which the opinion was based so that this can be recreated often months later for any court proceedings. It must be possible for legal, professional and lay members of the jury not only to understand the basic information, but also to follow the logical thinking through the differential diagnosis to the opinion. It is likely that all documentation from the earliest handwritten notes to the final typed Soul and Conscience reports will be available for scrutiny and to form the basis of not only the prosecution or reporter's case, but also to be tested through cross-examination (the writers of the report are providing fact and opinion as if under oath to the court). The high standard of documentation required is best achieved by using a proforma; an example is included in Appendix A, p. 457. Not only does this act as a vehicle to collate contemporaneous handwritten notes, but also it acts as a prompt throughout the history-taking examination, investigation and conclusion, reminding the clinician, for example, to ask specific history relating to genitourinary symptoms, sanitary protection, etc. in alleged sexual abuse, to clearly record the methodology, for example the use of the colposcope, and the position of the child during the examination, and to document who was present at different stages during the consultation and who was the primary source of the information provided. It includes a record of the specimens taken and their precise source and a record can be made of any further investigation that is required and who will take responsibility for these actions. The proforma provides a vehicle for recording a joint initial opinion, making it easy to see how conclusions have been reached. Clear documentation of the obtaining of informed consent including consent to photo-documentation and the provision of a report for the police and procurator fiscal will be included.

The clear headings of the proforma then provide a template for the preparation of the Soul and Conscience report that should be written jointly by the paediatric and forensic doctors and signed by both. Again, in writing this report a logical train of thought must be evident, leading from facts to opinion with clear reasoning and in language accessible to non-medical personnel. The report should start by identifying the examiners, their skill and experience, and their responsibility to the patient. It should detail the time and location of the examination and summarize the information available prior to examination, summarize the presentation, past medical, family and social history, and describe the process of examination. It must detail the examination findings/their photo-documentation and any investigations that have been carried out, together with any results that are already available. It must give as clear a conclusion and opinion as the available facts allow, clearly taking into account any factors that are at odds with that opinion. It should indicate any areas for which

further information is awaited or specialist medical opinion has been sought, for example the results of screening for sexually transmitted diseases, ophthalmological (see Chapter 6) or orthopaedic opinion.

INTERPRETATION OF THE FINDINGS

During the course of the clinical assessment it is important to start to think about the differential diagnosis, always trying to keep an open mind on the likelihood that there may be an underlying medical problem or accidental explanation for the child's presentation or indeed that there may be have been self-injury rather than inflicted or non-accidental injury. It is important to start thinking about the timing in relation to the injuries and to start to consider whether the gathered facts are consistent with the history or allegations and whether they are supportive or diagnostic of abuse. In attempting to reach a conclusion, consider whether there is any missing or conflicting information. The overall pattern of injury may in itself be highly suspicious either in terms of the extent of bruising, different ages or a particular pattern of injury. The nature of the observed injury may indicate a higher level of force would be required than the accidental explanation offered. The explanation may or may not be consistent with the observed developmental stage or physical size of the child.

To answer the question 'could it have happened this way?' it may be necessary to ask the police to revisit the scene after the examination to consider, for example, could the child have thrown herself out of the cot and if so could she have hit her head against the bedside table? If this child ran across the room would the door handle be at the right height to cause this periorbital bruise? It is important to fetch the alleged implement not only to check consistency (size, shape and pattern) with the imprint bruise, but also to corroborate the child's story, for example 'He always kept the stick under his side of the mattress'.

As noted in an earlier section quantified assessment of the child's development stage using Griffiths or Bayley's motor scales may be essential to demonstrate that a particular accidental explanation could not be correct.

Bruises are present in about 90 per cent of physically abused children but are also of course associated with normal activity in childhood. It is therefore the *pattern* of injury that is crucial as well as the timing. A number of studies have shown the differences in frequency and distribution of bruises in non-abused and abused populations.⁵⁰ In 1982, Robertson *et al.*⁵¹ showed that bruises to the head and neck are particularly associated with non-accidental injury, seen in only 6.5 per cent of the normal population and 60 per cent of the abused children. The face is the most commonly bruised site in fatally abused children.⁵² Some areas of the body are rarely bruised accidentally at any age, for example neck, buttocks and hands in children under two.⁵³ Bruises on the buttocks, lower back and outer thighs



Figure 1.12 Showers of petechial haemorrhages on the upper neck and face following attempted strangulation.

are often related to punishment.⁵⁴ Injuries to the inner thighs and genital area may suggest either sexual abuse or punishment for enuresis. Bruising, particularly showers of petechiae and purpura, over the head and neck particularly around the eyes, behind the ears and inside the mouth suggest mechanical asphyxia, for example as in strangulation or compression of the chest (Fig. 1.12). Sibert *et al.* (2002)⁵⁵ explored the possibility of developing a scoring system to assist in estimating the probability that the pattern of bruising in a given child is non-accidental. Their method of recording bruising by site, maximum dimension and shape was easy to use and showed clear differences between cases and control subjects in the total length of bruises. A scoring system was developed, which discriminated well between the two groups; by including a variable that indicated whether a bruise had a recognizable shape, the discrimination was even better. They concluded that this system has potential to aid the diagnosis. It is important to remember that no site is in itself pathognomonic of non-accidental injury and that a careful history and examination is essential in reaching the right conclusion in all cases.²⁰

Accurate timing of bruises by naked eye examination is not possible. There is wide intra- and interobserver variation in description and estimates of age both in the clinical situation and from photographs.⁵⁶ However, most examiners would feel confident about distinguishing between generations of bruises, for example those that are very recent i.e. less than 18 hours old (showing no yellowing) and frequently accompanied by other signs, for example tenderness and swelling, to those that appear older than 18 hours and those that appear very old. This is very important if one incident is being postulated as a whole explanation for the pattern of injury, for example a fall from a swing.

The pattern of individual injuries or groups of injuries may be highly specific for non-accidental injury. Forceful striking of the skin with an object may leave a clearly identifiable imprint, e.g. of the sole of a slipper or the buckle of a belt. On impact, blood vessels under the central zone of

the impact are emptied and so do not leak blood into the skin whilst the edges are stretched as the instrument digs into the skin, tearing the small blood vessels and leaving two lines of dermal haemorrhage when the object is removed. In addition to the imprint, which may be left by an open hand slap (Fig. 1.13) or forceful grip, we may also see characteristic fingertip bruises, pinch marks or semicircular abrasions from the fingernail of a poking finger. A kick from the toe of a shoe may produce a characteristic bruise with a curved upper outline and a sharply demarcated lower edge with a pale centre. Bruising in association with bite marks is very characteristic whether or not the skin is abraded (Fig. 1.14) (see Chapter 22). Ties or ligatures cause a circumferential band around limbs or the neck.



Figure 1.13 Open slap; the imprint of individual fingers is apparent.



Figure 1.14 Bite mark; in this site the bite could not be self-inflicted (compare with Fig. 1.16).

Fabric imprint (not to be confused with petechiae) leaves a characteristic appearance where an object or hand has impacted forcefully through clothing.

Characteristic patterns also result from the tracking of blood through tissue planes following blunt trauma. It explains a well-recognized phenomenon of bruises 'coming out' and also provides a potential trap in suggesting that new bruises have appeared despite protection from the alleged perpetrator. For example, a bruise from a fractured femur may appear around the knee several days later, a child with repeated injuries to the left side of the face appears to develop a 'new' bruise along the left jaw line during admission. 'Crimping' bruising, i.e. linear bruising running parallel to the curved edge of the buttocks where they meet in the midline, is characteristic of forceful slapping (Fig. 1.15). Periorbital bruising may appear following a blow to the forehead above the hairline, not to be confused with bilateral periorbital bruising in association with a fracture to the base of the skull. It is also important to remember that a linear edge to a bruise may relate to its infliction over a bony plane rather than the nature of any implement.

The position of bruises relative to each other is also highly significant. For example, a multiple row of small round or oval bruises from the knuckles in a fist blow or opposing pinching bruises on each side of the upper arm or the thorax of an infant when a child is gripped by fingers and thumb. Bilateral bruises on the throat and along the jaw line in gripping or manual strangulation (these may be accompanied by nail abrasions). It is also always important to consider the possibility of self-infliction, particularly where a pattern of injury is unusual (Fig. 1.16). The child in this figure was admitted as a possible case of meningococcal septicaemia; however, psychiatric assessment revealed that she was isolated and unhappy and making a silent cry for help.

Having carefully described the bruising and reached an opinion on the likely causation it is important to comment on the degree of force likely to have been required to



Figure 1.15 Crimping bruising of the buttocks of a 4-month-old infant, with sparing of tissue within the gluteal fold.

produce this pattern of injury. It is not possible to give a precise answer to this question as many studies have shown that there is no direct correlation between the nature of the bruise and the force used, but it is customary to describe the force as mild, moderate or severe. Severe would usually be accompanied by internal or bony injury. It must be remembered, however, that even fatal internal injury may result from inflicted trauma, for example a kick to the abdomen with only minimal superficial injury, and that asphyxia, for example through smothering, may lead to the death of an infant without producing any evidence of superficial injury.⁵⁷



Figure 1.16 (a and b) Self-inflicted bruising caused by biting, initially diagnosed as possible meningococcal infection.