



Child Fatality Review

Quick Reference

*For Health Care, Social Services,
and Law Enforcement Professionals*

*Randell Alexander, MD, PhD, FAAP
Mary E. Case, MD*



Child Fatality Review

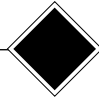
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FOREWORD

If you have opened the pages of this *Child Fatality Review Quick Reference*, you have most likely survived your childhood. Tragically, the children whose deaths are represented in this guide did not. These children are representative of the more than 53 000 aged from birth to 18 who die in the United States each year. On average, almost 150 children die each day in the US from natural causes, accidents, homicides, suicides, and undetermined causes. Children die because they are born too small or too early or with birth defects. They die in car crashes or while crossing streets. Children drown in pools, ponds, and tubs. They die in house fires. They suffer fatal organ failures, cancers, and die from often-treatable infections. Far too many children die when the persons taking care of them kill them. Teenagers die when they kill themselves or are murdered by peers.

We do not expect our children to die. They are affirmations of life. When they die, we lose expectations for a future filled with promise, memories, and innocence. Our world is poorer for their absence.

You most likely turned to this quick reference for help in improving your professional response to child fatalities and injuries. This book can help you understand the physical evidence of fatal events. It provides visual evidence to educate you on the physical and physiological damages to children from a broad spectrum of injuries and illnesses. It can help you classify and categorize deaths from a multitude of causes. The guide may help you provide answers to a child's parents, family members, friends, and other professionals.

This guide is not meant to provide you with answers to the broader questions related to the risky behaviors, inadequate social systems, or dangerous environments that harm children. It is only by understanding the complex and often hidden causes of child deaths that we can work to prevent other deaths. The child fatality review process is one way to do this. It is a process that helps professionals from many disciplines, including forensics, criminal justice, social services, public health, education, and child advocacy, share case information on the complex array of circumstances in individual deaths in order to improve their investigations, services, and systems; and to identify strategies to prevent

other deaths. The *Child Fatality Review Quick Reference* will provide you with information on conducting an effective review.

You will find much sadness inherent in the information in this reference, but you can be a part of translating this sadness into hope by using this guide to help craft interventions to prevent children from dying. In doing so, you will honor the memories of the many children whose far too brief lives and early deaths are depicted here.

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FOREWORD

Most technical literature used for child death team investigation is problematic. Much of it is for a single profession or a single task. The criminal justice literature addresses teams, but mostly for adult deaths. The child abuse literature addresses teams, but generally only for cases involving living children.

You may be on a child fatality review team. You and your team should benefit from this book. Read material that fits the tasks you perform and focus your skills. Read tasks that fall within the scope of other fields, and understand what to expect from those professionals.

This book includes technical information that reflects a change in attitude towards child death investigation. Cases that might have gone unexamined in previous years have been pursued with additional investigation by individuals questioning what others accepted. You will face similar choices where the cause, manner, and circumstances of death are not clear. You will probably find cases where the material in this book has not been applied, where the investigation at least appears inaccurate or incomplete.

The literature can help you develop skills for the investigation of child death. But the application of that knowledge is primarily up to you. Review your cases and your work against the material in this book and your own protocols, if you have them. Keep current with print and Internet literature. Publish your experience formally if you can. Share what you know informally and extend your skills to cases that are not fatal. Team investigation of child death is improving. Be a part of that process.

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FOREWORD

In keeping with their pattern of condensing their larger, more comprehensive works on child maltreatment and sexual abuse, STM Learning, Inc. is presenting this useful quick reference on child fatalities to aid those professionals who serve on child fatality review teams in their effort to understand, interpret, and effectively deal with the circumstances of child deaths.

This manual effectively outlines the structure and function of child fatality analysis. It comprehensively addresses how child fatality teams are organized, their ideal composition, and what procedures these teams are currently using. It details every individual component of a multi-disciplinary child fatality review team and how each member operates. Moreover, team composition is addressed not only in terms of professional representation, but also with respect to how an interweaving of medical, law enforcement, social service agency, and legal issues contribute to the formulation of cause and manner of death in each case. This process is truly the center of child fatality review.

The balance of the manual addresses the actual causes of child fatality. It is in these chapters that the difficult issues often arise. Was this death due to homicide, or was it a “natural” death due to sudden infant death syndrome or the result of some other inborn problem? Was there an abusive injury that led to the death? If so, what was the nature of the abuse? Was it neglect, that difficult-to-define omission of attention, that led to the death, and whose neglect was responsible? Were abuse or neglect proximate causes of death? Was a nonabusive injury responsible, and how was that determined? Was the death a suicide, and what events led to the child or adolescent’s unfortunate decision to take his or her own life? Were there previously undiagnosed medical conditions that contributed to the death? Were there known medical problems that had been ignored by the caretakers? Were there lapses in care or judgment by medical providers?

The manual should be helpful to the members of the child fatality review process in many settings. It should help to clarify their roles in the deliberations and to bring factual information to bear in making decisions about past child fatalities. It elucidates the benefits and processes of

functioning as a team. This undertaking will likely help prevent similar scenarios from claiming the lives of other children in these communities in the future.

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PREFACE

Except for perhaps birth-related deaths, in today's popular culture children are not expected to die. When that sometimes happens, it is typically seen as a great tragedy—for a life not long-lived and companionship too soon denied. Understandably, there is often a need to understand why and how such a death might be prevented in the future. Child death review teams address these concerns.

Child death review teams provide an interdisciplinary means to better explore the causes of death in childhood; more accurately ensure that individual deaths are investigated and properly labeled; and enable the community to develop plans to better prevent such deaths. This manual explores the major causes of childhood death, from infancy to the teen years. Examples are provided about how to recognize the causes of death for conditions, such as child abuse, in which the history might not be forthcoming or accurate, and the determination relies upon careful assessment. Patterns of how children die are increasingly clear to child death review teams and help to inform public expectations and policy.

Recommendations for prevention are the bottom line. How can we increase safe sleeping practices? What might reduce child abuse? Can many accidents be prevented? What can individuals and agencies do to further this? How can we measure whether prevention works? This manual provides concise illustrations of how child fatalities occur and how they may be avoided. Hopefully, with the aid of this quick reference, child fatalities will be better understood and effectively prevented, allowing for a brighter future for children and families everywhere.

Randell Alexander, MD, PhD, FAAP

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Child Fatality Review

Quick Reference

*For Health Care, Social Services,
and Law Enforcement Professionals*



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St. Louis
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Child fatality review (CFR) is a collaborative process that brings together people from multiple disciplines at state or local levels to share and discuss information about the deaths of children and the response to those deaths.

The following are the goals of CFRs (**Table 1-1**):

- Tabulate and better identify the causes of death
- Promote better agency responses to protect at-risk children
- Develop child health and safety services, legislation, and policies
- Develop and promote prevention programs
- Develop product-safety actions
- Increase public awareness of child health and safety issues

Experienced CFR teams' case reviews can identify risk factors, document findings, develop effective recommendations, and move recommendations to actions that promote child, adolescent, and family health and safety.

CORE COMPONENTS OF STATE AND LOCAL CHILD FATALITY REVIEW PROCEDURES

- Case review of deaths at review meetings

Table 1-1. Objectives of the Child Death Review Process

ENSURE ACCURATE IDENTIFICATION AND UNIFORM, CONSISTENT REPORTING OF THE CAUSES AND MANNERS OF ALL CHILD FATALITIES AND ESTABLISH MINIMUM DATA SETS ON THE CAUSES OF CHILD FATALITIES.

- Reviews ensure team members are informed of all deaths and are able to take action in a more timely manner.
- If teams identify insufficient information to determine how children died, more information may be collected.
- More complete information may help to identify causes and manners.
- Reviews can lead to modifications of death certificates.

IMPROVE COMMUNICATION AND LINKAGES AMONG LOCAL AND STATE AGENCIES AND ENHANCE COORDINATION OF EFFORTS.

- Meeting regularly can improve interagency cooperation and coordination.
- The benefits of sharing information and clearly understanding agency responsibilities can make the CDR process worthwhile in and of itself.
- Reviews facilitate valuable cross-discipline learning and strategizing.
- Reviews improve interagency coordination beyond the review meetings.

IMPROVE AGENCY RESPONSES IN THE INVESTIGATION OF CHILD FATALITIES.

- Reviews promote timelier, more efficient notification of child fatalities, facilitating more timely investigations.
- Sharing information on the type of investigation conducted leads to improved investigation standards.
- Reviews can identify ways to better conduct and coordinate investigations and resources.
- Many teams report that new policies and procedures for death investigation have resulted from reviews.

IMPROVE AGENCY RESPONSES TO PROTECT SIBLINGS AND OTHER CHILDREN IN THE HOMES OF DECEASED CHILDREN.

- Reviews can often alert social services that other children may be at risk of harm and identify gaps in policies that prevented earlier social services notification.

IMPROVE CRIMINAL INVESTIGATIONS AND THE PROSECUTION OF CHILD HOMICIDES.

- Reviews can provide new case information to aid in better identifying abusive acts of violence against children.

(continued)

Table 1-1. *(continued)*

- Reviews may bring a multidisciplinary approach to assist in building cases for adjudication.
- Reviews can provide forums for professional education on current findings and trends related to child homicides.

IMPROVE DELIVERY OF SERVICES TO CHILDREN, FAMILIES, PROVIDERS, AND COMMUNITY MEMBERS.

- Reviews can identify the need for delivery of services to families and others in communities following child fatalities.
- Reviews can facilitate interagency notification protocols to ensure service delivery.

IDENTIFY SPECIFIC BARRIERS AND SYSTEM ISSUES INVOLVED IN THE DEATHS OF CHILDREN.

- Team members can help agencies identify improvements to policies and practices that may better protect children from harm.

IDENTIFY SIGNIFICANT RISK FACTORS AND TRENDS IN CHILD FATALITIES.

- With broad ecological perspectives, medical, social, behavioral, and environmental risks are identified and more easily addressed.

IDENTIFY AND ADVOCATE FOR NEEDED CHANGES IN LEGISLATION, POLICY, AND PRACTICES AND EXPAND EFFORTS IN CHILD HEALTH AND SAFETY TO PREVENT CHILD FATALITIES.

- All reviews should conclude with a discussion of how to prevent similar deaths in the future.
- Reviews are intended to be catalysts for community action.
- Teams are not expected to always take the lead, but they should identify where and to whom to direct recommendations, then follow up to ensure they are being implemented. Solutions can be short-term or long-term.

INCREASE PUBLIC AWARENESS AND ADVOCACY FOR THE ISSUES THAT AFFECT THE HEALTH AND SAFETY OF CHILDREN.

- When review findings on the risks involved in the deaths of children are presented to the public, opportunities can be identified for public education and advocacy.

Adapted from Covington, 2005.

- Study of case review findings, recommendations, and actions to prevent deaths
- Management of the review program
- Models:
 1. State and local model
 2. State model
 3. Local model

STATE AND LOCAL MODEL

- State agencies provide oversight and coordinate a network of local review teams.
- Reviews are usually conducted at the local level.
- Prevention initiatives implemented at state and local levels.
- State provides protocols or guidelines for local reviews, with varying degrees of authority.
- The agency that coordinates local teams varies, but is most commonly the health department, social services department, or district attorney.
- The state advisory committee reviews the findings of local teams and makes recommendations for improvements to state policies and practices.
- The committee produces an annual report with mortality data, CFR findings, and recommendations.
- The state rarely funds local teams.
- Most local coordinators and team members participate in the CFR as part of regular agency duties.
- The state CFR coordinator provides training and technical assistance to local team members. Some states have strict requirements that guide local team operations; other states allow local direction.

STATE MODEL

- The state-level CFR committee reviews child fatality cases and issues a state-level report of findings.
- It usually involves state agency representatives.

- With few exceptions, state committees review only a representative sample of all deaths.

LOCAL MODEL

Teams operate independently of the state, although a state-level person may help to coordinate training, give technical assistance to local teams, or both.

GOALS OF CHILD FATALITY REVIEW TEAMS

- Prevent child fatalities and injuries
- Increase awareness of familial genetic diseases
- Accelerate progress in understanding sudden infant death syndrome (SIDS)
- Reduce number of missed cases of fatal child abuse or neglect
- Focus attention on public health threats
- Identify problems of inadequate medical care

CASE REVIEW TEAM AND REVIEW PROCESS

- Members of CFR teams share agency information on specific circumstances leading up to and including fatalities and discuss agency responses to these deaths, including investigations and the provision of services.
- Teams try to identify risk factors in fatalities to prevent other deaths and uncover trends and patterns.

TEAM MEMBERSHIP

- All well-functioning teams require core members representing the office of the medical examiner/coroner (ME/C), child protective services (CPS), law enforcement, pediatrics, and prosecuting attorney's office.
- Possible health care providers include family physicians; emergency department physicians; advanced-practice nurses; public health nurses; neonatologists; first responders such as emergency medical technicians and paramedics; health department staff; and child abuse specialists.
- Team members usually meet the following criteria:
 1. Broadly represent community or state agencies responsible for protecting health and welfare of children

2. Broadly represent populations most at risk and affected by child fatalities
3. Willing to be open, honest, and cooperative
4. Willing to advocate or work directly for change to prevent child fatalities
5. Usually required to participate by legislation or policy, have jurisdictional responsibility to respond to child fatalities, and/or are appropriately positioned to help obtain support for suggested recommendations
6. Vary in size (**Table 1-2**).
7. May invite individuals with particular expertise for specific reviews or to brief team members on the subject of their expertise
8. Ad hoc members can include people directly involved with children or death incidents or investigations.

Law Enforcement Personnel

— Investigate children’s deaths, often along with ME/C.

— Contribute knowledge of the following:

1. Case status
2. Criminal histories of family members and suspects
3. Death scene investigations and interrogations
4. Evidence-collection processes
5. Access to and information from other law enforcement agencies

Table 1-2. Members of Child Death Review Teams

TYPICAL CORE MEMBER AGENCIES

- Law enforcement
- Child protective services
- Prosecutor/district attorney’s office
- Medical examiner/coroner’s office
- Public health

(continued)

Table 1-2. (continued)

- Pediatrics and family health
- Emergency medical services

POTENTIAL ADDITIONAL AND AD HOC MEMBERS

- Attorneys for child protective services
- Childcare licensing investigators
- Domestic violence program experts
- Education representatives
- Fire department members
- Juvenile justice experts
- Local hospital members
- Maternal and child health experts
- Specialty physicians
- Mental health professionals
- Child abuse prevention organization participants
- Housing authority representatives
- Home visiting/outreach program representatives
- Private/nonprofit community group members
- Court-appointed special advocates
- Protection and advocacy agency representatives
- Disabilities experts
- Substance abuse treatment program members
- SIDS experts
- Vital records experts
- Prevention partners (eg, injury, violence, asthma)
- Legislators/representatives from the Governor’s Office
- Representatives from cultural/ethnic communities
- Other members as required legislatively or as appropriate on a case-specific basis

Child Protective Services

- Investigate allegations of child abuse or neglect and recommend or provide services.

— Serve as a liaison to broader child welfare agency and many community services.

— Contribute knowledge of the following:

1. Case status and investigation summaries for deaths
2. Family and child histories and socioeconomic factors that might influence family dynamics (eg, unemployment, divorce, previous deaths, history of intimate partner violence, history of substance abuse, previous abuse of children)
3. Previous reports of neglect or abuse in care of alleged perpetrator and the disposition of those reports
4. Designs for better interventions and prevention strategies and ways to integrate these strategies into system
5. Local and state issues related to preventable deaths

Prosecutor/District Attorney

— Prosecute children's deaths when criminal acts are involved

— May be involved in dependency or juvenile proceedings for surviving children

— Legally define by the cases they take to trial and what the standards of acceptable practices regarding child safety are in their community

— Contribute knowledge of the following:

1. Case status
2. Previous criminal prosecution of family members or suspects in child fatalities
3. When cases can or cannot be prosecuted criminally
4. When cases may be pursued in juvenile court
5. Decision-making process around plea agreements in child fatality cases
6. Legal terminology, concepts, and practices

Medical Examiner/Coroner

— Definition of terms medical examiner (ME) and coroner vary by state.

— *ME*. An ME is an American Board of Pathology–certified forensic pathologist performing this same function.

— *Coroner.* A coroner is a person, almost always an elected official, who is not a forensic pathologist, who usually has no medical expertise, and who is charged with running the death investigation system at the local or county level.

— *Coroner's pathologist.* A coroner's pathologist is a hired physician, preferably, although not necessarily, an anatomic pathologist who performs autopsies on a contract basis for the elected coroner.

Professional Background of the Medical Examiner/Coroner

— As the intersection of investigative, legal, medical, and community interests, the coroner must be multitalented yet not overly focused on any one area. Each background brings potential strengths and weaknesses to the position.

— There are no specific requirements for a coroner to be a physician or even trained in a related field; the coroner system has operated for more than a millennium without much fundamental change from the single requirement that the coroner be a local citizen in good standing.

— Funeral-home directors are still probably one of the most common backgrounds, although retired law enforcement officers and physicians also serve as coroners. A funeral-home director understands postmortem findings and autopsy procedures, in addition to being well-versed in grief counseling for the family and community, but he or she might be construed as having a real or potential conflict of interest regarding bodies whose survivors may or may not use the services of his or her business.

— Retired law enforcement officers should bring strong investigative skills into play but need to be cautious not to become overly involved and attempt to supplant the police.

— Medical practitioners are more at ease understanding the intricacies of the medical findings during the autopsy and should be very familiar with local hospital customs and practices. They can thus facilitate the death investigation team's access to certain tests and records as needed.

— Recently, ancillary medical personnel have begun to serve as coroners. People with these backgrounds must not extend activities into the practice of forensic pathology.

— The community should be aware of potential problems of having a nonprofessional death scene investigator; assuming death investigation expertise of nonprofessionals, even those with medical backgrounds, can irreparably damage case investigation. Arguments regarding (but not limited to) body transportation issues, evidence, and competence can be anticipated with any nonprofessional death investigator.

— If there is truly a need for field examinations to be performed, only an ME should conduct them.

— Ideally, a body should be competently secured at the death scene and transported directly to the ME's office. Anything less, with rare exceptions, potentially constitutes malpractice.

— Very little, if any, formal education in death investigation is offered in US medical schools.

— Medical education is not necessarily relevant to duties of the office of coroner, provided that the coroner makes use of board-certified forensic pathologists to conduct examinations of the deceased.

Qualifications

— In our litigious society, some jurisdictions have introduced education on death investigation.

— Although not considered equivalent to years of formal medical education, courses may last a week and cover rudiments of postmortem change and working of local investigative system(s) to ensure a body receives an examination from a competent forensic pathologist.

— Other training sessions serve as introductions to various disciplines involved in modern forensic work.

— Specialized certification by entities such as the American Board of Medicolegal Death Investigators requires successful completion of courses and certification examinations.

Role

— Contribute knowledge of the following:

1. Status and results of office's investigations into child fatalities
2. Autopsy reports and records reviewed by office for deaths

3. Elements and procedures followed by office investigating children's deaths
4. Specific information about nature of injuries
5. Medical issues, including child injuries and child fatalities, medical terminology, concepts, and practices
6. Records accessed during investigations

Lay Death Investigators

- Employed by ME/C offices
 - Investigate all deaths reported to office
 - Conduct death scene investigations
 - Gather critical data that assist in determining cause and manner of deaths
 - Are a response to severe shortage of American Board of Pathology–certified forensic pathologists
1. Very few certified postsecondary institutions have associate's degree programs available to people interested in becoming medicolegal death investigators.
- *National Guidelines for Scene Investigators* defines 29 essential tasks required to perform thorough death investigations. Publication is now titled *Death Investigation: A Guide for the Scene Investigator*.
 - American Board of Medicolegal Death Investigators:
 1. *Purpose*. Certification board to promote the highest standards of practice for medicolegal death investigators.
 2. Designed to meet the public's and forensic scientists' need to identify professional, qualified medicolegal death investigators and the courts' need to evaluate the competence of individuals.
 - Expected to have proficient investigative techniques, communication skills, and medical knowledge, plus have additional training related to handling of the dead
 - Medicolegal jurisdictions usually employ individuals with training and educational backgrounds in medicine, social and forensic sciences, law, mortuary science, and law enforcement to be investigators

Public Health Personnel

- Develop and implement public health activities to prevent injuries and deaths and for conducting health surveillance activities important to CFR
- All have maternal and child health as core agency functions
- Responsible for programs that improve health and safety of pregnant women, infants, and children; for monitoring infectious diseases in the community; and for providing information from neighborhoods and families, public health clinics, and home visits
- Contribute knowledge of the following:
 1. Contacts made between families and public health agencies
 2. Birth and death certificates
 3. Statistical data
 4. Epidemiological and health surveillance data
 5. Programs for high-risk families
 6. Development and implementation of public child death prevention activities and programs
 7. Data collection and analysis

Pediatric and Family Health Professionals

- Offer expertise in health and medical matters concerning children
- Contribute knowledge of the following:
 1. Services provided to children or families if seen by health practitioners
 2. General health issues, including child injuries and deaths, medical terminology, concepts, and medical and parenting practices
 3. Expert opinions on medical evidence
 4. Injuries, SIDS, child abuse and neglect, and childhood diseases
 5. Medical records from hospitals and other medical care providers

Emergency Medical Services

- Often first to arrive on scene when children die or are seriously injured
- Contribute knowledge of the following:
 1. Emergency medical services (EMS) run reports

2. Details of scene, including people there
3. Medical information related to emergency procedures performed
4. EMS procedures/protocols

Additional Team Members

— *Attorneys for CPS.* If the actions taken to protect other children include removing surviving children from homes or terminating parental rights, the process is shortened if CPS attorneys can hear information firsthand. CPS attorneys also provide legal information to teams, especially about process of child welfare court proceedings. The CPS attorney may be a local prosecutor.

— *Childcare licensing investigators.* Childcare licensing investigators are professional staff charged with investigating injuries and deaths in childcare facilities and home childcare as part of the licensing system. They provide information on specific cases and assist with understanding of systems issues affecting children.

— *Intimate partner violence (IPV) program expert.* Children are at increased risk for injury or death in homes where there is IPV. Participation of IPV program personnel may enable teams to further research links between IPV and child abuse, identify children at risk of injury, and improve communication between the IPV system and child welfare system.

— *Education representatives.* Education representatives provide school information about deceased children and siblings. They serve as conduits for prevention activities fostered in schools or with school-aged children. Included activities are suicide prevention, graduated driver's license, and driver-education programs. Increasing communication between the educational system and child welfare system is another role of the education representation.

— *Fire department representatives.* Fire department representatives provide expertise on investigations of fire-related deaths and prevention efforts related to those deaths.

— *Juvenile justice experts.* Juvenile justice experts provide programs for victims and are responsible for oversight of juvenile perpetrators. They are linked with judges, referees, attorneys, probation and parole officers, and

social workers who may have information relevant to teams. Juvenile justice experts may offer investigation information about cases involving juveniles in state custody.

— *Local hospital representatives.* Representatives of local hospitals may have medical records on children's conditions and treatments. They can help access records, educate first responders and other team members on medical issues and hospital practices, and facilitate team efforts to improve hospital practices.

— *Mental health professionals.* Mental health professionals interpret results of psychological examinations for teams, provide information on family histories of mental health treatment, facilitate access to such information, and help assess current need for mental health care. They also provide information on grief counseling and trauma and assist with debriefing CFR team after deaths.

— *Child abuse prevention organization participants.* Participants in child abuse prevention organizations promote awareness, provide education, and mobilize community resources to prevent child abuse and neglect. State chapters of Prevent Child Abuse America are especially active. Participants offer specific knowledge and expertise about local communities and may be key prevention partners.

— *Private/nonprofit community group representatives.* Private/nonprofit community group representatives are effective in developing and implementing successful prevention programs. They also marshal community support and interest, including advocating for increased funding.

— *Court-Appointed Special Advocates.* Court-Appointed Special Advocates legally represent interests of children in court and may have information pertinent to teams. Because of unique legal and often personal relationships with children, their participation may raise special issues of confidentiality and disclosure (see later section).

— *Disabilities experts.* Disabilities experts review cases involving disabled children, parents, or caregivers.

— *Substance abuse treatment program representatives.* Representatives of substance abuse treatment programs facilitate access to information from

substance abuse agencies. They provide needed expertise on substance abuse–related issues that arise in team deliberations.

— *Bereavement experts.* Bereavement experts provide expertise on child deaths and their effects on families, communities, and care providers. They may provide access to training on grief and bereavement for other team members and the community or serve as a link to bereavement services.

— *Vital records experts.* Vital records experts collect and maintain birth and death certificates; they often have demographers, statisticians, and epidemiologists on staff. The team may benefit from their expertise and assistance in accessing vital records.

— *Experts with knowledge on specific causes of deaths.* Experts with knowledge on specific causes of deaths help teams understand how cause and manner of death are diagnosed, key factors to consider in death investigation, and key risk factors and prevention possibilities for specific types of death.

— *Prevention partners.* Prevention partners may include legislature members, injury and violence prevention experts, and content experts. Prevention partners help teams move from case reviews to action.

— *Legislators or representatives from governor’s office.* Legislators or representatives from governor’s office help determine whether any amendments are needed in existing legislation, carry bill forward through session, and author legislation to enact team recommendations.

— *Representatives from cultural/ethnic communities.* Representatives from cultural/ethnic communities provide insights and explanations for circumstances leading to death and assist in developing culturally-appropriate prevention strategies. Such membership may be legally mandated.

CONFIDENTIALITY AND PRIVACY

— Full and open disclosure from team members is essential for quality reviews, so case review meetings are almost always closed to press and public. Some areas conduct separate meetings that are open to the public.

— Most teams require that members sign statements of confidentiality.

— The records of team discussions are protected from subpoena by legislation in most states.

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FATALITY REVIEW PROCEDURES

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— Child mortality data are usually based on death certificate information, which may inaccurately characterize the cause of the fatality for the following reasons:

1. The possibility of child maltreatment was not recognized.
2. The investigation was incomplete, including lack of autopsies or scene investigations.
3. Law enforcement investigations were unfinished at time of death certificate completion.
4. Input from child fatality review teams (CFRTs) was lacking.
5. Details concerning the child's death (such as negligence or the identity of perpetrators) were not listed on the death certificate.

ROLES OF TEAM MEMBERS

GENERAL PEDIATRICIAN

— Educates team members about various disease processes, reviews and

interprets medical records, assesses adequacy of medical care, and discusses public health and safety issues

— Based on knowledge of medical problems, reviews child fatality data for which no autopsies were performed to advise on the accuracy of the death certificate

— Reviews available medical information to try to identify the cause of death

CHILD ABUSE PEDIATRICIAN AND SPECIALISTS

— An appropriately trained advanced practice nurse or physician assistant can function as child abuse specialist. Physician training is obtained through fellowships or preceptorships in child maltreatment or through clinical work plus continuing medical education relevant to child abuse and neglect.

— These specialists:

1. Perform medical evaluations on children alleged to have been abused or neglected.
2. Work with child welfare and law enforcement agencies.
 - A. Testify in court as fact or expert witness.
 - B. Perform research needed to enhance the ability to diagnose abusive injuries or injuries from other causes.
 - C. Advocate for safe and healthy environments for all children.
3. Perform appropriate questioning of caregivers and accurately document histories.
4. Analyze all injuries and provide detailed documentation of their appearance and possible etiology—often the only such documentation in medical records.

Role at Time of Death

— Observe autopsies and participate in immediate investigations by providing pediatric and child injury expertise

— Evaluate situations during hospitalization before the deaths of critically injured children

— Share information with investigating and prosecutorial agencies immediately after deaths

- Contribute unique expertise in sexual abuse and factitious disorder by proxy (Munchausen syndrome by proxy)
- Offer extensive knowledge about sudden infant death syndrome (SIDS) and events confused with SIDS to help pathologists evaluate unexpected infant deaths

Role During Case Reviews

- Provide expertise as pediatrician plus provide added knowledge on child abuse and neglect
- If involved in cases during initial examinations, share that information during case reviews to help other team members understand important issues
- If no previous involvement, review medical records and results of investigations to identify inconsistencies between histories and injuries, recognize injuries highly suggestive or diagnostic of abuse, and detect other factors that help determine why and under what circumstances children die
- Function as liaisons with local and regional media to discuss important prevention mechanisms (eg, putting infants to sleep in the correct position)

Role in Neglect Cases

- Over half of child maltreatment victims suffer from neglect; neglect also contributes significantly to unexpected childhood deaths.
- Medical neglect is a form of failure to provide for children’s safety and well-being and occurs when children’s basic health care needs are unmet, resulting in actual or potential harm (**Table 2-1**).

Table 2-1. Causes of Medical Neglect
<ul style="list-style-type: none"> — Caregiver or child ignorance and child regarding — Caregiver unable to obtain medical care and/or medication — Intentional noncompliance with standard, prescribed medical care

- Pediatricians on CFRTs can analyze when medical neglect has contributed to unexpected fatalities.
- Specialists can help determine future interventions and determine, in fatalities, ways to prevent children's deaths.
- Specialists can distinguish among different causes of medical neglect that result in death.
- Different circumstances require different responses and interventions, especially if there are surviving siblings.
- *Problems/issues:* An area of concern is the shortage of qualified pediatricians
- One important area of expansion is evaluation of serious, non-fatal childhood injuries.

MEDICOLEGAL DEATH INVESTIGATOR

- Represents the medical examiner/coroner (ME/C) at death scene
- Evaluates the body, evidence, environment, and circumstances of death so that an unbiased historical perspective can be provided to the ME/C and pathologist before the forensic exam (**Figures 2-1 to 2-5**)



Figure 2-1. Fatal crash resulting from a motor vehicle striking an electrical pole. Electrical wires were lying on the car, and no one could touch the victim until the electric company turned off the power. The medicolegal death investigator was the first person to assess the victim for life signs.



Figure 2-2



Figure 2-3



Figure 2-4

Figure 2-2. Young college student found dead on bed in basement of residence. Police initially thought this was a drug overdose because of decedent's age and because a marijuana pipe was found under the bed. At autopsy, he was found to have had a massive heart attack (myocardial infarction). It is important to do a complete autopsy and toxicology examination to determine correct cause and manner of death.

Figure 2-3. Face of a man demonstrating bilateral ecchymoses.

Figure 2-4. Burnt-out trailer that contained a family of 5, including 1 infant. It is important that the circumstances of the fire be determined. Physical evidence may indicate that someone was smoking in bed, had been playing with matches, or had purposely set the fire to kill the family.



Figure 2-5. Shallow “hesitation marks” noted on the wrist of a depressed woman.

— Clears lines of authority and responsibility for the ME/C office and the law enforcement agency are set forth in state statutes

1. Statutes dictate each agency’s responsibilities.
2. Usually, ME/C office is responsible for the decedent and any objects of evidence physically touching the deceased or related to the manner and cause of death.
3. Law enforcement agency is responsible for the surrounding death scene.
4. Two agencies must work together as a team to share information and expertise.

— Determines cause and manner of death for children who die under suspicious, unexplained, or unexpected circumstances

— Receives initial notification of a reportable death from any person having knowledge that a death has occurred

— Responsible for all deaths reported to the ME/C office 24 hours/day, 7 days a week, 365 days/year

— Expected to gather all information that may be needed by ME/C so that cause and manner of death can be certified correctly

Specific Tasks

— Pronounces victim dead at the scene if formal pronouncement’s not already made

- Determines whether death falls under jurisdiction of medicolegal office
- Determines circumstances surrounding death
- Decides whether a scene investigation should be conducted
- Identifies injuries and marks on body that may have caused or contributed to death
- Develops time of death information
- Notifies appropriate social service agencies of immediate need for their services (eg, removal of children from a home)
- Ascertains decedent's medical, social, occupational, and familial history and its relationship to death
- Determines whether decedent has been correctly identified or initiates procedures to identify decedent scientifically
- Contacts morgue support personnel to advise them of any hazardous or contagious decedent issues and orders procedures needed before examination by forensic pathologist
- Notifies ancillary forensic scientists about services that they need to perform to complete death investigation
- Contacts public service agencies to assist with identification when decedent remains unidentified
- Identifies and locates decedent's family and notifies family of the death
- Determines whether tissue or organ donation is possible and provides that information to next of kin
- Facilitates donation process by working with next of kin and organ or tissue procurement agency
- Advises family of grief counseling and social services available to them
- Facilitates information flow between law enforcement personnel, forensic scientists, family, and ME/C office personnel

Role at Death Scene

- Responds to scene where violent, suspicious, or unexpected manner of death has occurred or where decedent was discovered and still remains

— If death formally pronounced at medical facility, not necessary to routinely perform a scene investigation at that site

— Investigates scene of any infant death. Note that the death scene is not the hospital's emergency department where death was pronounced but is site where child originated before transport to emergency department.

Investigatory Role

— Works independently but coordinates activities with local law enforcement personnel to achieve complete, accurate, unbiased, scientific, and timely death investigation

— Promptly responds to scene of death

— Carefully examines scene, noting items that directly or indirectly may have caused or contributed to death (eg, prescription medications, alcohol, illicit drugs, weapons, ligatures)

— Correlates findings of initial body examination with scene and with information provided by witnesses

— When witness statements and evidence presented by body do not correspond, protocol is to believe the evidence of the dead person; such evidence is usually more reliable than witness statements.

— Prepares complete description of death scene and investigation and provides it to ME/C and forensic pathologist

Inspection of Decedent

— Carefully inspects the decedent at scene for purpose of the following:

1. Determining sex and race
2. Estimating age, height, and weight
3. Recognizing and documenting injuries and marks (**Figures 2-6-a** and **b**)
4. Evaluating postmortem changes and insect activity
5. Developing time of death information (eg, rigor mortis, livor mortis, algor mortis)
6. Describing, recording, and safeguarding decedent's body, clothing, jewelry, other valuables, and personal effects

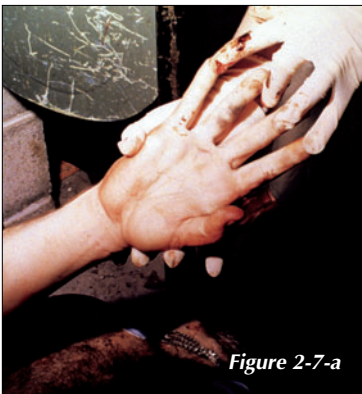


Figure 2-6-a. Pinch marks on back of infant.

Figure 2-6-b. Bite mark on breast of victim

Figure 2-7-a. Photograph is taken to document grayish-black residue from muzzle of gun on stabilizing hand of deceased who had died of self-inflicted gunshot wound to the temple.

Figure 2-7-b. Hand containing trace materials is placed into a paper bag for evidence preservation en route to forensic pathologist's examination room.

7. Protecting decedent's trace evidence and collecting fragile evidence at scene (**Figures 2-7-a and b**)
8. Ensuring evidence is handled according to chain of custody requirements

9. Gathering information to assist in personal identification and next of kin notification
10. Arranging for transportation of body to medicolegal office when further examination is required

Re-creation

— Death scene re-creation investigative protocol has been instrumental in reducing the number of infant deaths incorrectly classified as SIDS.

— Re-creation requires expanded working knowledge of infant growth and development, effective interviewing skills, and psychological preparation to deal with stress of working with witnesses to re-create infant death scene.

— Re-creation process is generally as follows:

1. Gather information from police, emergency medical personnel, and possibly hospital staff, and then closely inspect infant.
2. Ascertain infant's medical history from past 72 hours.
3. Thoroughly interview appropriate individuals before re-creation.
4. Collect information on condition of structure in or on which infant was placed, immediate room environment, any appliances that had been operating, people present at time of death, etc.
5. If bed sharing was involved, determine number, size, and condition of people or pets sharing the sleeping surface.
6. Gather data on health issues of individuals having recent contact with infant.
7. Ask person who last saw infant alive to place a lifelike doll into the exact position where he or she saw the infant.
8. Photograph or videotape scene after asking person who discovered infant to place any dolls, bedding, toys, and other items that may have surrounded the infant in the exact positions in which he or she found the infant dead or in a moribund state.
9. Complete interview by asking about resuscitative efforts done by individuals at scene before arrival of police or emergency medical personnel, noting housing conditions, and asking about previous child deaths in the family.

10. Include the 25 pieces of information considered critical to accurate determination of cause and manner of death of infants.

Follow-up Procedures

- If further forensic examinations or follow-up investigations are required, informs those who will be involved
- Contacts ancillary forensic scientists if forensic specialty is required
- If positive identification of victim has not been made, locates and gathers physical, dental, medical, anthropological, and circumstantial evidence needed to identify the decedent
- After positive identification has been established, locates decedent's next of kin and notifies those kin of death
- Through interviews and scene evidence, develops details regarding decedent's recent history (eg, when last ate or was fed, when last seen alive, when discovered dead)
- In infant death, confiscates bottles containing remaining formula or residue for analysis by toxicology laboratory
- Develops the decedent's medical, psychiatric, social, and occupational history as it pertains to cause of death
- Writes a concise, accurate, unbiased, and timely report documenting all of the above
- The medicolegal death investigator must be aware that errors or omissions at investigative level or death inquiry can be irreparable.

CORONER

- Functions best as case manager for professional death investigation team
- Takes on role of interested, eager advocate for the decedent, ensuring that the concerns of the dead, the next of kin, the community, and the courts are all met
- May preside as chair of CFRT or serve as a member
- Functions as link between other team members, family, and community
- As an elected official, can take certain issues directly to the public in the interest of community health

— Delivers vital public health information from a concerned but nontechnical point of view, so as to reach audiences who can benefit most from the message

— Contracts available, secure, and preferably rent-free facilities in which to store bodies awaiting examination and arranges transportation

— Personally visits or dispatches an experienced investigator to attend child death scenes—for not only those children who have died at home but also for those who have been transported to the hospital for final resuscitation attempts

Subpoenas

— Office(s) charged with death investigation should also have and use subpoena power.

— In jurisdictions with a forensic pathologist, subpoena function is best delegated to the office charged with performing the autopsy and forensic investigation.

— Pathologist is most expeditiously able to secure laboratory samples, medical records, and other evidence needed for formulating opinions as to cause and manner of death.

— When offices of coroner and medical examiner overlap, ideally both officials should have subpoena power.

— In jurisdictions with only a coroner, the coroner should communicate with the autopsy pathologist to determine what is needed for proper case completion and subpoena process expediency.

Role at Death Scene

— Attendance at death scene may be crucial to determining cause and manner of death.

— General death scene processing guidelines, which are geared to law enforcement personnel, promulgated by National Institute of Justice, must be followed.

— Local statutes determine the requirements for death notification and scene attendance.

— Legal control of the body does not necessarily equate with physical presence at a death scene.

- Depending on local statutes, death scene may be controlled by law enforcement personnel, coroner, or medical examiner.
- By law, party responsible for overseeing the death scene, as opposed to control of the body, has fundamental authority to control access into scene.
- In many jurisdictions with medical examiner office, the forensic pathologist does not regularly attend death scenes but sends a medical examiner investigator instead.

Preservation of Scene

- It is important to minimize the number of people who actually handle the body at a death scene.
- The most experienced examiner should be present at the scene to make careful observations without disturbing potential evidence.
- The coroner places the body in a body bag for transport and brings it to the boundary for subsequent examination as needed to protect essential evidence.
- The coroner may need to lock down death scene, permitting only those performing specific necessary functions within the perimeter.
- Law enforcement team members are charged with scene security, and they may prohibit individuals from entering to preserve evidence.
- No one should enter a death scene for the purposes of “exposure” or public relations.
- As family liaison, coroner may gather information that law enforcement cannot without a search warrant or formal interrogation.

Handling First and Emergency Responders

- First and emergency responders tend to disturb the scene, either inadvertently or by design.
- Further disturbances may occur if emergency medical personnel are dispatched to the scene.
- During resuscitative procedures, responders need to follow these procedures:
 1. Assess vital signs, often requiring removal of clothing and other encumbrances on or involving the body.

2. Apply various leads and lines to the body, potentially disturbing evidence.
3. Intubate as needed; if done postmortem, rigor complicates the process and introduces artifacts of specific and potentially diagnostic significance to the forensic pathologist.

— Coroner serves as intermediary between the forensic and clinical teams, striving to ensure regular and complete documentation of body conditions as initially found and as later altered iatrogenically.

— Coroner works with remainder of team to educate emergency responders about the significance of minimizing artifacts and about the investigative value of undisturbed child death scenes.

Processing

— The coroner scrutinizes the death scene to fully understand the perimortem circumstances. He or she makes exhaustive efforts to ascertain exactly what happened and documents findings.

— The coroner observes scene components: the body, the surrounding area, the overall scene, and the ancillary scene(s).

1. The body. The coroner:

- A. Begins with a historical overview of the case circumstances.
- B. Records findings via notes and/or photography or videography (**Figures 2-8-a and b**).

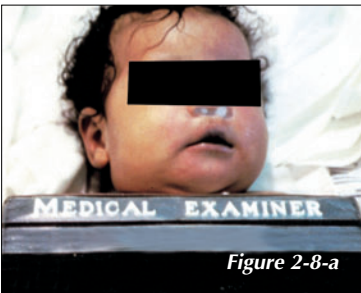


Figure 2-8-a. Infant's overall external appearance is assessed.

Figure 2-8-b. Infant's frenulum is checked for any obvious injury.

- C. Obtains additional documentary photographs for the record; photographs function as backups to police forensic photographs.
 - D. Ideally, such scene documentation is shared with the examining forensic pathologist during the investigation, if not at autopsy.
 - E. Collects scene and case information and provides it to the forensic pathologist before he or she conducts the forensic autopsy.
 - F. When the child's body is still at the scene, records the overall body position (for example, prone/supine, recumbent/inverted).
 - G. Notes any unusual element in the child's immediate vicinity.
 - H. Observes the overall state of the child's hygiene, nutrition, and hydration.
 - I. Documents the state and appropriateness of clothing; gives attention to soiling of the clothes by urine, feces, blood, edema fluid, vomitus, etc.
 - J. Measures body temperature, preferably via noninvasive means, and the presence, distribution, color, blanching, and appropriateness of livor mortis.
 - K. Notes the degree, appropriateness, and extent of muscular rigor mortis.
 - L. In suspicious cases, disturbs clothing and body as little as possible before autopsy.
 - M. Records data as soon as reasonable, given scene circumstances and case history as with all postmortem changes, rigor (stiffness), livor (coloration due to blood pooling), and algor (cooling) mortis data are time-sensitive criteria.
 - N. Considers documentation as an exigent circumstance that may, depending on local laws, obviate the need for a subpoena because data are fleeting and may narrow the time of death window.
2. Surrounding area. The coroner:
- A. Assesses the fit of the child's body into the overall scene.
 - B. Photographs or collects any pertinent positive or negative findings

on the body, clothing, bedding, or other relevant materials (eg, parent's clothes) as potential evidence.

- C. If these data are lost early in the investigation, they cannot be reconstituted later. In child abuse and other high-profile child deaths, failure to recognize the possible importance of such information to the case may prove an issue at trial.
3. Overall and ancillary scenes. The coroner should consider the following:
 - A. At an overview level, the tidiness of the home environment, clothing, toys, and so forth can indicate the caregiver(s)' level of interest in a child.
 - B. Family photographs displayed on walls might suggest how the caregivers view the child.
 - C. The caregivers' answers to questions about the decedent's health and welfare can reveal their level of involvement with the child.
 - D. A preliminary medical history should be obtained, including but not limited to the child's pediatrician, major illnesses or surgeries, recent doctor visits or recent diseases, chronic medical conditions, and prescription medications.
 - E. Specific attention should be given to medications, both prescription and over the counter, to detect surreptitious or inadvertent overdosing or underdosing. Once a scene is released, it can become exceedingly difficult to obtain untainted documentation and evidence.

Conducting Interviews

— The coroner should interview caregiver(s) regarding the child's life and death.

— A coroner is often less threatening to suspicious or confused parents than a homicide detective.

— High interpersonal skills and an advocacy approach should be used to determine, for example, the family's acceptance of the death, level of concern, and final preparations.

— As for any well-trained death investigator, obvious inconsistencies and deceptions should be documented.

Follow-up

— The coroner should obtain a detailed medical history, including at least immediate perimortem records from emergency medical services and the emergency department, significant past medical history (summaries of hospital admissions or visits, major diagnosed conditions, family history, pediatrician records, birth history), and any other pertinent medical data.

— Individuals reviewing the medical records should remember:

1. The death is a possible homicide until data exclude this possibility.
2. People with natural disease can still die an unnatural death.
3. People with a history of abuse may still die a natural death.

— Remember that the possibility of foul play may prevent investigators from missing abusive injuries in the records.

— Once the forensic medical evaluation and investigation commence, the coroner should gather added materials and documentation or secure the laboratory samples from the receiving hospital and emergency department.

— Remember that a clinical history and review of the death circumstances are required for the pathologist to render the diagnosis.

— Hospital policies vary regarding how long samples are retained (possibly as little as 1 week); it is important to make timely attempts to obtain the needed laboratory materials.

Legislation

— Recent federal legislation (the Health Insurance Privacy and Portability Act) has posed problems in some jurisdictions.

— Typically, problems occur when well-intentioned but ill-informed medical care staff try to safeguard the patient's right to medical privacy by refusing to give investigators access to a decedent's medical records.

— The legislation allows the autopsy pathologist to access the records as the treating physician.

— Medical examiners and coroners are not subject to legislative restrictions while working on a specific investigation.

CASE SELECTION

FACTORS AFFECTING CASE SELECTION

Timing of Reviews

— There are 2 major types of reviews:

1. *Retrospective or periodic reviews* usually take place after completion of most, if not all, investigations and information gathering. These reviews are conducted most often and are primarily used to influence system and procedural changes for future investigations and service delivery and to identify factors that can lead to prevention initiatives. These reviews usually have prescheduled meeting dates, where the team reviews all deaths that occur within a certain time period.
2. *Immediate reviews* are investigation focused and typically occur within 24 to 48 hours of specific deaths. Team can affect processes and procedures used during active investigation of child fatalities.

— It is possible to have immediate response reviews and standing meeting dates for periodic reviews. Child fatality review (CFR) process then helps coordinate death investigations and delivery of services and serves as source of information for identification of risk factors and prevention of deaths.

— Individuals attending or contributing vary between the 2 types of reviews.

Age, Manner, and Cause of Death

— States define children as those younger than 18 years.

— Most CFR programs now review fatalities from various different causes, and almost half of states have CFR programs that review deaths from all manners and causes.

— Deaths from natural causes are more infrequently reviewed, compared with accidents, homicides, suicides, and undetermined manners of death.

— Infant deaths due to causes that may have originated during the perinatal period are especially difficult to review. Maternal case information and medical complexity need to be included, which can be problematic.

Location of Fatalities

- Interstate compact agreements between state registrars may limit or improve the ability to obtain death certificates without prior approval of another state's registrar.
- Teams may work directly through neighboring CFRTs or with community's vital record's registrar, medical examiner, or coroner to establish a system for referral.

Multiple Deaths

- When there is more than one death, priorities must be established in selecting deaths to review.

Team Membership

- Specialists on CFRTs may determine the type of cases that can be effectively reviewed.
- Teams' decisions on how often and for how long they are willing to meet may limit case selection.

Access to Information

Teams' abilities to access good case information on specific causes of deaths may be limited, hampering a team's ability to conduct an effective review.

Current Cases

- Sometimes only cases not in or not scheduled for civil or criminal litigation can be reviewed.
- Some states permit reviews of current cases, with findings presented to the legal system to help resolve issues concerning deaths.

CASE REVIEW MEETINGS

- Effective reviews require case records to be available, essential members to be in attendance, and for there to be a good spirit of agency cooperation.
- In the best reviews, participants bring their case records, fully share their information on all circumstances leading up to and including death events, and conduct focused discussions on investigations, services, risk factors, and possible preventive actions.
- **Table 2-2** lists 6 steps to a quality review.

Table 2-2. Six Steps to a Quality Review

1. Share, question, and clarify all case information.
2. Discuss the investigations.
3. Discuss the delivery of services.
4. Identify risk factors.
5. Recommend systems improvements.
6. Identify and take action to implement prevention recommendations.

APPLYING FINDINGS, RECOMMENDATIONS, AND ACTIONS TO PREVENTION

— Local teams submit their findings to state advisory committees, whose purposes are to:

1. Identify and review system problems.
2. Examine child death trends and issues.
3. Promote better communication among agencies at state level, between state and local levels, and among local jurisdictions.
4. Make recommendations about policy or legislative changes.
5. Issue reports on CFRT findings.
6. Advocate for support of preventive efforts.
7. Advocate for enhanced review processes.

REPORTS

INDIVIDUAL CASE REPORTS

— Usually completed on all deaths reviewed by teams.

— Typically include information about child, caregivers, supervisors, circumstances of events leading to death, and team findings related to services and prevention.

— Requirements on submitting local case reports and use of those reports at state level differ.

— National Center for Child Death Review launched a Web-based standardized reporting system in 2005 (The Child Death Review Case Reporting System) that:

1. Uses a standardized case report form that is completed after individual case review and submitted by state or local teams through the Internet.
2. Generates standardized reports and generates local, state, and multistate databases of findings.
3. Allows for consistent CFR reporting and analysis at local, state, and national levels.
4. Provides data from reviews submitted into system on the points listed in **Table 2-3**.

Table 2-3. Information provided in Child Death Review Case Reporting System
<ul style="list-style-type: none"> — Comprehensive information on child, family, and supervisor circumstances and risk factors in child deaths reviewed — Descriptions of death investigations conducted — Descriptions of services provided or needed as a result of deaths reviewed and summary of teams' recommendations for new services or referrals — Teams' recommendations and actions taken for prevention of other deaths — Factors affecting quality of case review meetings

COMPILED REPORTS FROM STATE OR LOCAL TEAMS

— Annual or semiannual reports that often include extensive background information on causes of death

— These reports include national data, current research findings on risk factors, evaluated prevention strategies, and analysis of risk factors of deaths reviewed (**Table 2-4**).

— Collection of findings from case reviews and subsequent reporting can help:

1. Local teams gain support for local interventions.

Table 2-4. Components of Comprehensive Child Death Review Reports

- Executive summary including child mortality data, an overview of the CDR process, CDR findings, and prevention recommendations
- Summary of child mortality data, including numbers and rates for all child fatalities
- Summary of CDR team findings for all deaths by key indicators collected in the case report tool
- Child mortality data, including numbers and rates, and CDR findings by specific manners and causes; for every section include the following:
 - Mortality data by year and trends over 10 years if possible
 - General descriptions of the cause of death, key risk factors, known proven interventions to prevent the deaths, and resources available for more information
 - Review findings by age, race, ethnicity, gender, and other reported demographics
 - Key risk factors identified through the review process
 - Actions taken as a result of the reviews locally or at the state level
 - Recommendations for national, state and local leaders
 - Recommendations for parents and caregivers
- Appendixes possibly including a list of figures and tables, number of cases reviewed and reported by teams, total number of deaths among state residents from birth through the age of 18 years by county of residence and age group and by county of residence and year of death, and a list of review team coordinators

2. State teams review local findings to identify trends and major risk factors and to develop recommendations and action plans for state policy and practice improvements.
3. State teams match review findings with vital records and other sources of mortality data to identify gaps in reporting of deaths.
4. State and local teams use findings as a quality assurance tool for review processes.
5. State and local teams demonstrate effectiveness of their reviews and advocate for funding and support for CFR programs.

6. National groups work toward national policy and practice changes.

MANAGEMENT OF REVIEW PROGRAM

— State coordinator typically supports state and local teams, including the following:

1. Development and management of local review teams, if state follows state and local model
2. Advocacy for CFR legislation
3. Training and technical assistance
4. Identification of deaths for review
5. Collection of case review reports and child mortality data
6. Development of CFR state reports
7. Linkage of review teams to prevention resources
8. Staffing of state advisory committees

CDR LEGISLATION

Table 2-5 describes the key components of legislation necessary to support comprehensive state and local CFR activities.

CHALLENGES IN CREATING AND SUSTAINING CDR SYSTEM

- Teams evolve with time, often leading to changes in function (**Table 2-6**).
- Teams may benefit from a periodic review of how members feel the process is working. Assessing the goals and objectives of review process can help teams refocus efforts.
- Other items to discuss include case selection, whether additional members are needed to fully understand child mortality in communities, and whether records needed for review are consistently available in a timely manner.
- Challenges arise when members do not understand the commitment involved with participating on the team.
- States are improving their capacity to use CFR case findings to prevent other deaths and to promote child health and safety (**Tables 2-7** and **2-8**).

Table 2-5. Elements to Include in Legislation for Comprehensive CDR Programs

- Purpose of the review program
- Funding sources for the program
- Lead agency responsibilities
- Advisory committee purpose, duties, membership, chairperson designation, and length of service
- Review team purpose, duties, membership, and chairperson designation and length of service
- Support provided to advisory and review teams, including training and technical assistance
- Team access to case-specific records and other pertinent information
- Confidentiality provisions for team meetings and case review records
- Reports of individual case reviews
- Advisory committee reports of team findings
- Reports to the legislature

Adapted from Alcalde et al, 2005.

Table 2-6. Current Difficulties in Death Review Process

GENERAL

- Informal versus formal beginnings
- State and local teams and networks that cross political lines
- Funding
- Lack of training
- Authority versus responsibility
- Core professions and potential conflict
- Gender, race, and socioeconomic bias
- Size of populations served
- Intake

(continued)

Table 2-6. (continued)

- Sharing programs and prevention
- Team evaluation

SPECIAL PROBLEMS

- Data collection
- National standard versus local initiatives
- Internet data
- Reports
- Confidentiality
- Media
- Grief and mourning
- Burnout

ISSUES IN SPECIFIC TYPES OF CASES

- Missed intervention with sibling survivors
- Multiple or unidentified suspects and failure to create a retrievable record
- Loss due to death ignored
- Newborn
- Multicountry and multistate cases
- Children who kill other children
- High-profile media cases
- Intimate partner violence, child abuse, and elder abuse
- Undetermined cause and/or manner of death
- Special medical cases
- Foster care deaths

Table 2-7. Factors That Contribute to Successful Development of CDR Programs

FACTOR	EXAMPLE	WHY THIS CONTRIBUTES TO SUCCESS
State support	State MCH Program, Department of Justice, or other state-level organization agrees to support and/or manage the program.	Although a bottom-up process, agreement to participate is often top-down; when state entities make CDR a priority to their functioning, the institutionalization can ensure the future of its existence.
Legislation	Enabling, protecting, and/or information-sharing legislation relating to CDR is passed at the state level.	Gives legal basis for conducting reviews, sharing sensitive information, and protecting confidentiality; this may legitimize the process for some.
Housing of programs	State CDR programs and staff are located in agencies experienced with and committed to working in a multidisciplinary setting; alternatively, they can be teams funded within an existing agency but with separate reporting mandates.	May help lessen turf issues if they have existed in the past, and these agencies can help quickly build an effective multidisciplinary approach. Multidisciplinary efforts may be enhanced if no one agency “owns” the team.
Organizational seminars	States with few or no local teams hold regional seminars, inviting a range of local human service representatives to familiarize them with the CDR process.	Introduces the idea of the CDR process to multidisciplinary audiences at one time; can answer pertinent questions in open, discussion-style formats. Gives representatives from rural areas opportunity to network, possibly forming regional teams.
Organizational meetings	Teams convene their first meetings as organizational only; no reviews are done.	Provides opportunity for team members to get acquainted and set process parameters before attempting reviews.

Interagency agreements	Agency directors sign joint agreements to participate in the CDR process.	Solidifies multiagency commitment and idea of shared ownership in the process. Can ensure participation of field staff.
Confidentiality statements	All members sign confidentiality statements on a regular basis, before sharing information.	Further assures those still wary of liability associated with CDR. Provides safe environments; encourages members and agencies to share sensitive information.
Training	Statewide training is provided to new local- and state-level team members annually.	Informs members about new research on various types of death; builds skills for conducting reviews; provides opportunities for networking and sharing experiences.
Retrospective practice reviews	Teams choose a number of deaths from recent past as the first batch of reviews.	Raises comfort level of members with the process, without the pressure of discussing ongoing investigations.
Buy-in of core members	Agency representatives required by law to participate are committed to CDR and attend all meetings.	Sets tone for other members to follow; raises perceived importance of process; more likely that relevant information will be available to be shared.
Additional membership	Team coordinator invites individuals who were involved in each of the cases reviewed to those meetings.	Gives teams clearer picture of events; adds to completeness of information on report form; facilitates prevention discussions.
Access to records	Adequate records on all deaths are made available to teams for review.	Increases usefulness of aggregate CDR data; makes it easier for teams to identify risk factors and move from findings to recommendations to action.
Dissemination of findings	Findings and recommendations are disseminated to professionals, legislators, agencies, and the public.	Maximizes impact of the review process; reinforces members' commitment; fosters feeling of productivity and accomplishment.

Adapted from Covington et al., 2005.

Table 2-8. Factors to Help Maintain Effective CDR Teams

CATEGORY	EXAMPLE	POSSIBLE SOLUTIONS
Overload	When no local CDR teams exist, state CDR team cannot effectively review all deaths in the state.	<ul style="list-style-type: none"> — State team works to build local teams. — State team identifies specific types of deaths to review.
Buy-in	CDR team member was appointed by supervisor but does not truly buy into CDR process.	<ul style="list-style-type: none"> — Send team member to state or national CDR training. — Request that an effective team member from another jurisdiction contact this person. — Provide technical assistance and support, including information on causes of death and prevention initiatives and activities.
Population	Urban CDR team is overwhelmed by caseload.	<ul style="list-style-type: none"> — Team focuses on one cause of death per meeting. — Team coordinators screen cases under the jurisdiction of the ME/C, choosing to review those with complex or difficult issues.
Rural CDR team meets infrequently or not at all due to lack of caseload.	<ul style="list-style-type: none"> — Team begins reviewing serious injury cases. — Team meets when no deaths have occurred to talk about prevention opportunities. 	
Productivity and accountability	CDR team has consistent problem with key members missing meetings.	<ul style="list-style-type: none"> — Have members designate alternates to attend when they cannot. — Establish formal interagency agreements that outline roles and expected commitment of agencies and members.

<p>CDR team members do not come to meetings with case information.</p>	<ul style="list-style-type: none"> — Team chair emphasizes which records will be of importance for each case in the meeting notices. — Team chair obtains key records before meeting.
<p>Members fail to follow through on promised actions.</p>	<ul style="list-style-type: none"> — Designated team member sends a reminder e-mail the week before meetings to those who volunteered to take action. — Team keeps running account of actions taken on findings, so that follow-through becomes part of team process.
<p>Meetings begin to lack overall focus and productivity.</p>	<ul style="list-style-type: none"> — Reiterate goals of process before each meeting. — Send team members to CDR training.
<p>Coordination</p>	<ul style="list-style-type: none"> — Local chair compiles team findings, sends them to state team, and asks for feedback. — Invite state team representative to meet with local team.
<p>Quality assurance</p>	<ul style="list-style-type: none"> — Attend regional or statewide team coordinator meetings for networking. — Have team members make contact with other teams and attend their reviews.
<p>Access to information</p>	<ul style="list-style-type: none"> — Establish a standard records-sharing protocol signed by all appropriate counties. — Invite people from other counties to attend your meeting.
<p>Access to information</p>	<ul style="list-style-type: none"> — Contact CDR teams in regions where tertiary care centers exist; ask that they inform them when a child is transported and dies in their county.

(continued)

Table 2-8. (continued)

CATEGORY	EXAMPLE	POSSIBLE SOLUTIONS
Ownership and focus	State agency tries to direct focus of CDR team to review child abuse and neglect deaths only.	<ul style="list-style-type: none"> — Appoint representatives with past success in public health prevention programming. — Share success stories with state agency regarding public health prevention programs initiated by other state or local teams.
Funding	CDR team loses momentum due to lack of staff support for core team functions.	<ul style="list-style-type: none"> — Divide administrative duties and costs among several member agencies. — Seek monies in the form of mini-grants from state or local foundations.
Confidentiality	CDR team member leaks confidential information learned at a review meeting to media reporter.	<ul style="list-style-type: none"> — Designate 1 member as media contact; person should be media savvy and follow preset plan agreed on by team. — Require team members to sign confidentiality statements regularly; remind team on an ongoing basis about the importance of confidentiality and establish sanctions. — Ask the district attorney to speak to the offending team member.
Leadership	Agency taking the lead designates a chairperson who lacks leadership skills.	<ul style="list-style-type: none"> — Form subcommittees to address certain issues; formulate recommendations based on team findings. — Rotate chair annually. — Team appoints vice-chair who volunteers to help chairperson with tasks of team.

<p>Trust</p> <p>Agencies without a history of working together (or of prior conflict) do not trust each other.</p>	<ul style="list-style-type: none"> — Have representatives share their agencies' policy and procedure information to increase awareness of others' responsibilities. — Choose a simple initiative to collaborate on that impacts both agencies, building trust.
<p>Reporting</p> <p>State CDR team lacks the ability to consistently obtain reports (data) from local CDR teams.</p>	<ul style="list-style-type: none"> — One local CDR coordinator acts as reporting liaison between state and local CDR teams. — Share statewide and local level aggregate data with local teams, emphasizing the importance of the local reporting.
<p>CDR team conducts thorough reviews but fails to complete or submit case reports.</p>	<ul style="list-style-type: none"> — Appoint agency data analyst to team whose sole task is case report completion and submission. — Participate in the new CDR Case Reporting System through the National Center for Child Death Review.
<p>Reviews to action</p> <p>CDR team has difficulty taking CDR findings and turning them into concrete prevention action.</p>	<ul style="list-style-type: none"> — Invite state and local experts on an ad hoc basis to suggest possible paths of direction. — Help team develop recommendations. — Track findings and recommendations. — Focus on only a few recommendations.
<p>CDR team lacks knowledge regarding effective prevention strategies.</p>	<ul style="list-style-type: none"> — Obtain and provide information on successful prevention initiatives. — Seek trainings and seminars for members.
<p>CDR team lacks awareness of groups that could help turn their findings and recommendations into action.</p>	<ul style="list-style-type: none"> — Team works together to research what is available on state and local levels. — Invite members from these organizations to speak to team.

Adapted from Hilliard & Rusek, 2005.

NATIONAL MCH CENTER FOR CHILD DEATH REVIEW

- Created and funded by US Dept of Health and Human Services, in part to assist states in creating and sustaining their CFR systems
- Coordinates national network of state CFR program directors
- Provides technical assistance and training to states
- Coordinates development, publication, and distribution of National CDR Program Manual
- Manages new *Child Death Review Case Reporting System*

SPECIAL POPULATIONS

HEALTH RISKS ON AMERICAN INDIAN LANDS

- American Indian population is generally younger than general population, with median age of 29 versus 35 years for general population.
- American Indians rank at bottom of all societal, health, and economic indicators.
- Mortality rates for American Indians are 49% higher than those of general population; deaths from alcoholism are 638% greater than in general population, with accidental deaths 215% higher, deaths from suicides 91% greater, and deaths from homicides 81% higher.
- Factors include poverty, low officer-to-population ratio, language and cultural barriers when there are nontribal investigators, and burial customs (eg, requiring immediate burial of the deceased, opposing autopsies, having aversions against directly discussing the deceased, especially in violent deaths).
- Special definitions:
 1. *Reservations*: tracts of land reserved for exclusive use of specific tribes.
 2. *Fee land*: owned through regular title within reservation boundaries.
 3. *Dependent Indian communities*: outside reservations and set aside for use and benefits of Indians under federal supervision.
 4. *Allotment lands*: held in trust by US government for individual Indians and their descendants, just as reservations are held in trust for tribes.
- When child fatalities occur, tribal law and jurisdiction become factors in investigations and in the successful prosecution of a criminal or civil

action against the perpetrators. This adds extra layers of jurisdictional consideration.

1. If deaths are homicides, federal agencies investigate and criminal prosecution is in federal courts. Tribes may choose to prosecute their own cases in tribal courts at the same time.
2. If deaths are accidental, tribal agencies and courts are charged with their resolution.

— Reservations are mostly located in rural areas with limited access to pathologists and trained coroners.

MILITARY COMMUNITY

— Uniform Code of Military Justice governs all active duty and reserve military members, including officers and enlisted personnel from all military branches.

— Command involvement and well-defined reporting laws may contribute to the increased numbers of reported military child abuse and neglect fatalities compared with numbers for civilian families; however, issues of deployment, separation, and domestic violence are factors that compound risk in military homes and demand aggressive prevention and intervention efforts.

— Jurisdiction in military installations are designated as exclusive, proprietary, or concurrent. Jurisdiction is usually established at time of acquisition of property.

1. *Exclusive:* Federal government has sole jurisdiction in investigation of all suspicious, violent, or sudden unexpected deaths that occur on military installations, for both military and nonmilitary members. Legal custody of bodies is taken by Office of the Armed Forces Medical Examiner (OAFME).
2. *Proprietary:* Sole jurisdiction of investigation is given to state, regardless of where crimes took place or who the suspects are. Office of staff judge advocate usually negotiates jurisdiction from state.
3. *Concurrent:* Investigation of military deaths that occur on military installations fall under the concurrent category. Civilian medical examiners and state attorney's offices have authority to take charge of

death investigations but may exercise right of first refusal, waiving jurisdiction to military and OAFME. Usually states release jurisdiction to military when case is connected to military suspects or victims.

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EPIDEMIOLOGIC APPROACH TO CHILD FATALITY

— The epidemiologic approach to child fatality enables the monitoring of trends over time, which is essential when tracking the effectiveness of prevention programs.

— A basic operating assumption underlying epidemiologic analysis is that how children died in one year is a good predictor of how they will die in the next year unless effective prevention or intervention is implemented (eg, a vaccine or superior medication). When this assumption is held without deviation, deaths arising from episodic disasters may be overlooked in recommendations and planning. The child fatality review team (CFRT) seeks to identify *who* died and *why*.

— Capturing all child fatalities may be difficult (see **Table 3-1**).

— **Table 3-2** illustrates some ways the cause of death can be difficult to ascertain or to compare across jurisdictions. Electronic databases can also present problems. Obvious accidents, chronic diseases, and thorough medical examinations can yield a highly accurate diagnosis, but the level of certainty may be lacking in some cases.

Table 3-1. Problems in Accounting for Child Deaths

Record Keeping in Remote Areas of the World

- Accurately recording newborns as born alive or dead
- Central record keeping of child deaths

Finding and Identifying Dead Children

- Homicide deaths that are not detected
 - Children buried without notification of authorities (eg, some religious cults)
 - Disasters
 - Uncertain outcome of abducted children
- Mobility of children and teenagers (lost to families and potentially unidentifiable)
 - Child soldiers
 - Natural disasters separating families
 - Wars separating families
 - Famine separating families
 - HIV separating families

Table 3-2. Problems in Identifying the Cause of Death

Medical

- Different medical customs in labeling causes
- Assigning direct and indirect causes
- Failure to obtain autopsies
- Unknown medical conditions

Systemic Issues

- Lack of multidisciplinary review
- Poor training of the certifier of death
- Insufficient scene investigation or history

— Life expectancies have improved dramatically worldwide over the last several hundred years. Contributing factors include more reliable food sources, sanitation, antibiotics, and effective medical care. These improvements increase the probability a child will survive to adulthood, which increases the overall average life expectancy of any given cohort followed from birth until death.

1. The world rise in life expectancy parallels a major acceleration in world population.
2. For a gain in life expectancy to occur, 1 of 4 possibilities must occur: older people live longer, more children live to older ages, both, or the birth rate is significantly reduced, so there are fewer children (a falling birthrate means more older people proportionately).
3. The life expectancy for a person at birth has increased from around 50 years in 1901 to the mid to upper 70s today, mostly because more people survive to 65 years of age, primarily from decreased child fatality rates.

DEFINITIONS

AGE TERMS

— *Infant*: A person younger than 12 months. Sometimes an additional distinction is made for “neonate” as a person between birth and 30 days of age.

— *Child*: Someone between age 1 and 18 years.

Note: Others sometimes make a further division, with child as someone between 1 and 12 years and adolescent as a person aged 13 through 17 years.

INTENT

— *Intentional, unintentional injuries*: The medical use of these concepts does not follow the legal meanings of these terms, the common meaning of the word intent, or child abuse concepts; rather they emerge from the injury prevention community, terminology also promoted by the Centers for Disease Control and Prevention (CDC). Using these terms from the injury prevention community, neglect would be seen as child abuse and as “intentional” even though caregivers are not performing any volitional acts in nearly all instances. Common phraseology would be that the caregivers did not “intend” to neglect.

MEDICAL TERMS

— *Pathology*: The study of the body – its normal and abnormal processes. The following are the branches of pathology: anatomical, clinical, and forensic pathology.

— *Anatomical pathology, clinical pathology*: Anatomical pathology is concerned primarily with the morphologic study of organs and tissues. Clinical pathology involves mainly the lab aspects of medicine. The two areas overlap, but specific training and primary board certification are available for each.

— *Forensic pathology*: The study of causes and manners of death.

MORTALITY TERMS

— *Cause of death*: The disease or injury that initiates the continuous series of events, however brief or prolonged, that culminates in death.

— *Homicide*: For the purposes of death certification, the term homicide refers to the killing of one individual by another through a volitional act.

— *Mechanism of death*: The physiologic or biochemical derangement through which the cause of death exerts its lethal effect.

— *Manner of death*: A term particular to death certification that refers to the fashion in which death occurred.

INFANT MORTALITY

— About 5.7 million infants die annually worldwide.

1. A country's economic development strongly factors into its infant mortality rate.
2. In the US:
 - A. Perinatal problems (including congenital anomalies, short gestation, maternal pregnancy complications, placenta/cord problems, and intrauterine hypoxia) are the leading causes of death for infants. Perinatal problems are linked to more deaths than any other childhood cause at any age.
 - B. Primarily in the first 6 months, sudden infant death syndrome (SIDS) is the leading cause of death not related to perinatal factors.
 - C. Thereafter, child abuse is the leading cause of death until the preschool years, when accidents become the leading cause.

— Changes in the US infant mortality rate over the last half century are shown in **Figure 3-1**.

1. The largest decline is seen in neonatal mortality.
2. Data from 2002 show the first rise in US infant mortality since 1958.
3. In addition to a decline in late fetal mortality, some infants are born alive who would otherwise have been stillborn.

— US infant mortality is associated with race and cultural background, which relate in part to socioeconomic cofactors.

— There is no single, completely reliable clearinghouse for child death information within the US or among countries (**Table 3-3**).

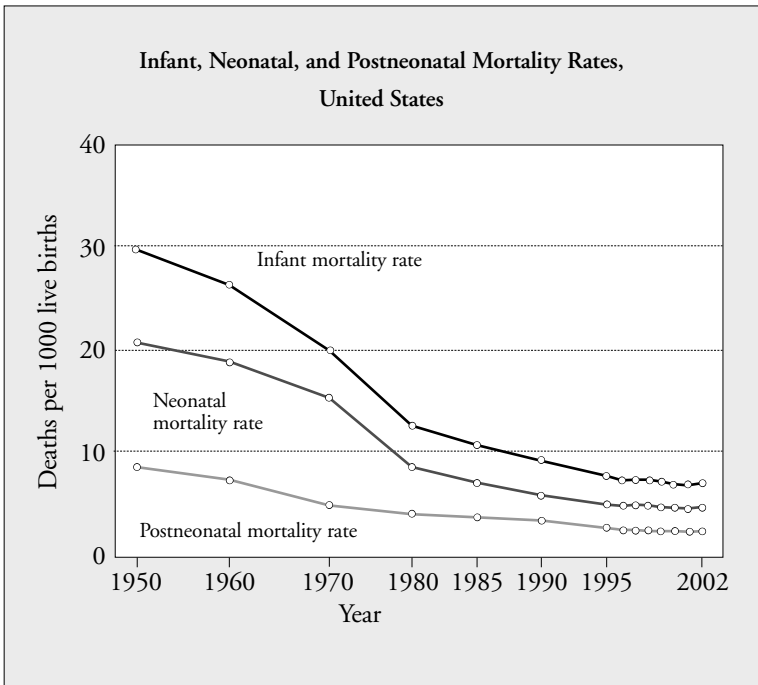


Figure 3-1. Mortality rates for infants, neonates, and postneonates in the United States. Reprinted from National Center for Health Statistics, 2005.

Table 3-3. Resources for Child Fatality Data

Centers for Disease Control and Prevention

— <http://www.cdc.gov>

Child Welfare Information Gateway

— <http://www.childwelfare.gov>

Inter-Agency Council on Child Abuse and Neglect

— <http://ican-ncfr.org>

Kids Count

— <http://www.aecf.org/kidscount>

National Adolescent Health Information Center

— <http://nahic.ucsf.edu>

National Center for Health Statistics

— <http://www.cdc.gov/nchs>

National Institutes of Health

— <http://www.nih.gov>

National MCH Center for Child Death Review

— <http://www.childdeathreview.org>

World Health Organization

— <http://www.who.org>

THE MEDICOLEGAL DEATH INVESTIGATION SYSTEM (FORENSIC PATHOLOGY)

— The medical examiner/coroner (ME/C) determines the cause and manner of death in persons dying under legally specified conditions, notably deaths that are suspicious, unexpected, unattended, or unnatural (ie, not entirely due to natural disease processes).

— The ME/C has the statutory authority and responsibility to officially investigate deaths, which includes ordering and performing postmortem exams.

— Other functions of the ME/C are:

1. To evaluate the nature, extent, and effects of injury and disease.

2. To elucidate the mechanism(s) of injuries and death.
 3. To determine time of death and age of injuries.
 4. To collect and preserve evidence.
 5. To identify previous injuries.
 6. To evaluate comorbid conditions.
 7. To establish the identity of the decedent.
- Forensic pathology involves:
1. Examining living or dead people for the benefit of the public interest and the courts.
 2. Analyzing biologic and physical substances to provide opinions concerning the cause, mechanism, effects, and manner of injury, illness, or death.
 3. Identifying decedents.
 4. Determining the nature and significance of biologic or physical evidence.
 5. Reconstructing wounds, wound patterns, and sequences.
 6. Investigating and documenting the mechanisms of disease and injury.
 7. Completing comprehensive medicolegal death investigations.

CAUSE OF DEATH

- Determine the cause of death as specifically as is reasonably possible.
- Recognize not only the immediate cause of death (ie, what caused death at an exact moment), but also any remote or underlying disease or injury that initiated the sequence that produced the immediate cause of death.
- In delayed death, recognize that information essential to an accurate determination of cause of death may be buried in the individual's medical records, requiring meticulous review.

MECHANISM OF DEATH

- Mechanisms of death are nonspecific pathways through which many different causes of death—such as hemorrhage, dysrhythmia, anoxia, or respiratory failure—may act.

— Recognizing the mechanism(s) of death can help to establish causal relationships and evaluate the clinical course of a process, but the mechanism is not substituted for the cause of death.

MANNER OF DEATH

— Evaluation of the circumstances leading to death is a major step in determining manner of death.

— Death may arise in a natural, homicidal, accidental, suicidal, or undetermined fashion.

COMPONENTS OF THE INVESTIGATION

— Specifically include compiling the history of pertinent past and present circumstances, physical evaluation of the scene, examination of the body, and the use of indicated ancillary studies such as radiologic, toxicologic, and other lab tests. Each component must be considered; however, in any particular case, some components may be more crucial than others.

COMPILATION OF HISTORY

— Knowing the circumstances before, during, and after the death is critical to interpreting the findings of physical observations.

— The critical data that allow accurate evaluation of the death can be found in the decedent's medical and social history.

1. The medicolegal authority must rely on others to provide this information when evaluating a child's death.
2. Informants include parents or other caregivers, siblings, acquaintances, neighbors, uninvolved witnesses, and medical and law enforcement personnel.
3. Reviewing the complete medical and social records allows analysis of prior injuries and illnesses and assessment of the child's health and development. Preexisting conditions that influence or give insight into later events can be revealed.

PHYSICAL EVALUATION OF THE SCENE

— Inspecting the scene of death and where the injury or illness occurred can help explain injuries or corroborate or refute the accuracy of the history given.

- Examining the scene can help verify or reveal instruments or structures that could have produced injuries.
- Scene reconstruction or recreation can assist in proper interpretation.

EXAMINATION OF THE BODY

- The postmortem examination of a child who has died unexpectedly or as the result of possible foul play includes:
 1. A complete autopsy, preferably performed by a forensic pathologist with particular expertise in this area.
 2. A thorough gross examination coupled with microscopic evaluation as appropriate.
 3. Evidence identification and the collection of materials on and in the body; the ME can ensure that evidence is properly identified, collected, preserved, and transmitted among authorities.

ANCILLARY STUDIES

- Appropriate ancillary methodologies include radiography, toxicology, microbiology, and chemistry.

Radiography

- Useful in detecting, documenting, and detailing the presence or absence of injuries and disease, as well as in determining when the injuries occurred and whether they reflect a series of traumatic episodes or a single incident
- May also direct the removal and sampling of injured or diseased sites for histopathologic examination

Toxicology/Microbiology/Chemistry

- Samples of blood, urine, vitreous fluid, and other appropriate tissues are saved for indicated toxicologic, chemical, and microbiologic analyses.
- Standard toxicologic screens for major drugs of abuse and classes of therapeutic agents are usually performed on samples of blood or urine.
- Specific agents or classes of agents not detected by standard screening procedures are assayed according to case information.
- Testing other body fluids or tissues, often liver or brain, is done as indicated.

— Concentration and distribution patterns of a compound and its metabolites may help you differentiate acute from chronic administration, ascertain time or route of administration, and distinguish acute overdose from chronic accumulation.

— Bodily fluids and tissues are also used for other types of chemical testing. For example, most MEs routinely screen blood for inborn errors of metabolism as part of the postmortem evaluation of any child.

— Vitreous fluid, obtained from the globes by needle aspiration, is almost always available because the eyes are in a relatively protected anatomical site. This fluid is the best source for determining antemortem hydration status when there are no data in antemortem medical records. Vitreous analyses also can be used to assess various other antemortem conditions.

— Various fluids and tissues are assessed by microbiologic testing, although great care is taken in interpreting these results, because normally sterile sites are often contaminated by postmortem migration and proliferation of organisms.

INTERPRETATION OF FINDINGS

— After the ME collects all pertinent information, the data are correlated and interpreted by properly trained, experienced individuals.

— The opinions expressed must be reasonable, scientifically/medically supportable, and offered with a reasonable degree of medical certainty as testimony.

— The interpretation process is dynamic, and opinions may change as more data are accumulated; previously obtained data are refined; and all information is assessed according to current knowledge and experience.

WOUNDS

— Involves evaluating each injury alone and with coexistent wounds.

— Process begins with identifying and categorizing each injury as an abrasion, contusion, laceration, incision, stab, bullet entrance, bullet exit, thermal burn, chemical burn, etc.

— Each wound, whether seemingly major or trivial, is examined and documented.

— Whether an injury is “significant” must be determined in context.

Patterned Injuries

- In patterned injuries, wound features offer insight into what object was used.
- Occasionally features can be matched to a specific instrument.

Number, Location, and Relationship of Injuries

- Injuries are also evaluated according to number, location, and relationships to other injuries.
- Constellations of injuries consist of often-nonspecific individual wounds that form patterns indicating their nature. For example, a series of linear facial abrasions concentrated on prominences of one side are typical of injury sustained by falling rather than being struck; cuts across the palmar surfaces of the hand and fingers suggest defensive wounds.
- In some cases the external injuries are correlated with damage to internal organs/tissues before the pattern emerges.

Aging of Injuries

- Signs of healing provide absolute evidence of post-injury survival and offer insight into the length of that period.
- Narrowness of the range—hours, days, or longer—is inversely proportional to length of the survival period.
- Information may help determine who did or did not have access to a child when the injury was sustained and help assess the behavior or symptoms (eg, irritability, loss of appetite) a child exhibited before death.
- Injuries heal progressively and, to some degree, predictably.
- Injury aging helps you determine when postinjury complications occurred, such as delayed bowel rupture that follows nontransmural bowel wall laceration.
- Injury aging can be used in a relative fashion to determine whether certain injuries occurred before or after others or whether one or more traumatic episodes occurred.
- Caution is needed when interpreting timing because many factors influence the appearance and time course of any injury. Allow for variability of healing among wounds, even in the same person.

FORENSIC AUTOPSY

— In forensic autopsy the body is examined after death in an area similar to an operating suite.

— Forensic autopsies differ from hospital autopsies in the following ways:

1. Forensic autopsies are performed by forensic pathologists who have an additional year of training in forensics. Hospital autopsies may be performed by forensic pathologists, pediatric pathologists, or anatomical pathologists.
2. Forensic autopsies enable the evaluation of individuals who experience sudden and unexpected deaths, unnatural deaths, natural deaths of particular interest to society, or deaths that may represent a danger or risk to others.

— Purposes:

1. To obtain toxicologic specimens and evidence that may be present on the body (eg, material for DNA analysis, fibers, or hairs).
2. To thoroughly document and evaluate injuries.
3. To describe disease states.
4. To consider mechanisms of injury.
5. To determine cause and manner of death.
6. To consider numerous forensic issues such as time of death and identification of the body.

EXTERNAL EXAMINATION

— Begin with a detailed description, including all clothing on or accompanying the body.

— Examine the clothing for physical evidence and collect it before the clothing is removed from the body.

— Document the handling, packaging, and maintenance of the evidence according to strict procedures so that it is submitted to the proper labs for analysis through an acceptable chain of custody that ensures its value in court proceedings.

— Remove any physical evidence found on the body after the clothing is removed in the presence of a pathologist.

- With suspected sexual assault, follow the prescribed routine for specimen collection.
- Obtain swabs and smears of the oral cavity, vagina or penis, and rectum, as well as samples of head hair and pubic hair.
- Provide a detailed description of the body, including identifying features such as hair and eye color, scars, tattoos, height, and weight.
- Mention each body part, and note whether the part is or is not normal.
- Describe the state of rigor mortis and livor mortis and other parameters of the length of time since death.
- Describe all medical devices in detail.
- Carefully describe visible injuries, organizing them in a logical manner depending on the types of injuries present.
- Proceed in an orderly manner from head to foot or from least serious to most serious.
- Include each injury, noting its type and character, size, and position on the body in anatomic terms.
- Take photographs and chart injuries as needed.
- Take radiographs of the entire body of any child younger than 3 years and others as deemed necessary.
- Include views of the anteroposterior (AP) and lateral skull, AP and lateral cervical spine, AP chest and abdomen, lateral spine, and multiple views of the extremities to adequately depict all the bones. This is best done to American Academy of Pediatrics guidelines for an acceptable skeletal survey.
- Obtain a height/length and weight.

INTERNAL EXAMINATION

- After the external examination, begin the internal examination by opening the body using an incision from each shoulder down to the midline of the lower chest and then from the midline to the pubis (Y-incision).
- In proceeding through the body, make a detailed description of all findings, including injury, disease, or other abnormality, at each step in the procedure.

Chest and Abdomen

— Open the soft tissue, incise the bones of the rib cage, and open the chest cavity.

1. As the chest cavity is entered, note the presence of fluids or adhesions within the pleural spaces of the chest and pericardial sac of the heart.
2. Because acute rib fractures in young children may not be visible either on radiographs or during gross observation of the pleural surface, you will need to strip away the pleural membrane from the rib cage and inspect the periosteal surfaces of the bones.
3. If rib fractures are noted, remove the entire rib cage or individual ribs as needed (**Figure 3-2**).
4. To demonstrate fractures, photograph the ribs and then have them decalcified so the rib can be sectioned (**Figure 3-3**).
5. Also photograph the sectioned view.
6. Submit the rib for microscopic sections.

— Enter the abdominal cavity and note the presence of fluids, adhesions, or other abnormalities.

— View the chest and abdominal organs in situ.

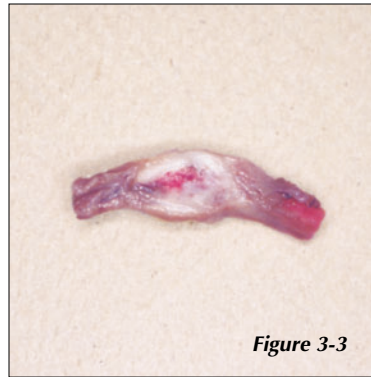
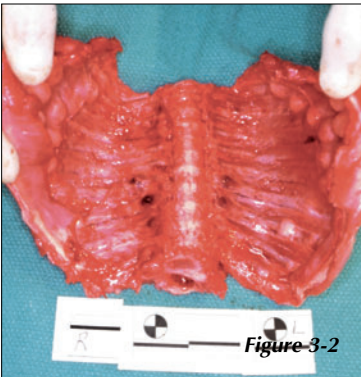


Figure 3-2. Rib cage removed in its entirety to demonstrate multiple rib fractures.

Figure 3-3. Rib with healing fracture removed from rib cage and cut into cross section to demonstrate fracture.

- Trace injuries such as gunshot or stab wounds along their pathways through the viscera.
- Either remove the organs of the chest and abdomen en bloc or one organ at a time.
- Individually dissect and examine the organs of the chest and abdomen.
- Weigh the organs; describe them grossly and on the cut section.
- Take sections of each organ for microscopic examination.
- Save additional portions of tissue for future use if necessary.

Head and Neck

- The internal examination of the head begins with a coronal incision across the head running from ear to ear.
- Reflect the scalp forward and backward and examine it. This action reveals the underlying bone of the skull for inspection (**Figure 3-4**).
- Describe the undersurface of the scalp and the external skull.
- Photograph injuries to the scalp, such as subgaleal hemorrhages.
- Take sections for microscopic examination.
- Open the skull by using a saw to cut around the top of the head to remove the skull cap above the level of the ears.
- Note the presence of blood within the intracranial cavities and any abnormality of the bone.

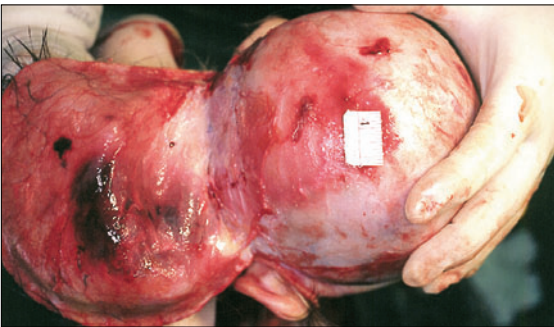


Figure 3-4. Scalp reflected to demonstrate subgaleal hemorrhage.

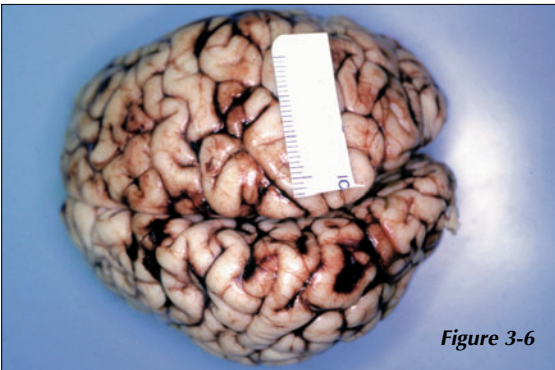
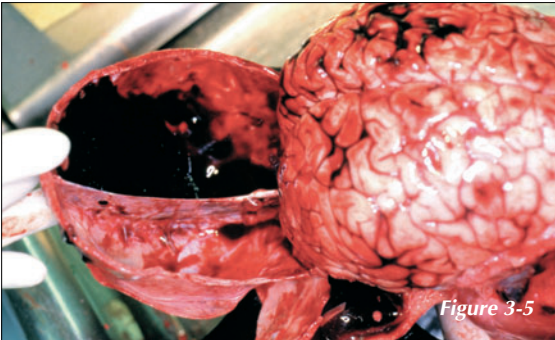


Figure 3-5. Removing skull cap to demonstrate acute subdural hemorrhage over left cerebral convexity.

Figure 3-6. Fixed brain demonstrating patches of subarachnoid hemorrhage on convexities.

— Note the *dura*, a thick membrane between the skull and brain; bleeding within the intracranial cavities is classified in terms of its relationship to the *dura* (**Figure 3-5**).

— Remove the brain from the base of the skull by an incision across the lower brainstem and upper cervical spine.

— With head injury or other brain abnormality, fix the brain in formaldehyde for about 2 weeks in preparation for a later, more detailed neuropathologic examination (**Figure 3-6**).

- Note the base of the skull, and then strip the dura off the bone of the skull base so it can be examined directly.
- If a skull fracture is present, photograph it and take sections of the bone for microscopic examination.
- When head injury or possible head injury is found, remove the eyes so that they can be examined.
 1. Removal is accomplished from inside the base of the skull by using a saw to cut through the thin bone of the roof of the orbit.
 2. The eyes are usually examined after a period of fixation in formaldehyde.
 3. Note their gross appearance.
 4. Make a single horizontal section through each eye to examine the interior of the eye for abnormalities within the various layers (**Figure 3-7**).
- The last part of a routine forensic autopsy is the removal of the neck structures, including the tongue, airway, and esophagus. These are further dissected and described.

REMAINDER OF THE BODY

- Put the body in a prone position.
- Make long incisions into the soft tissues of the back, buttocks, and extremities to determine whether soft tissue hemorrhage is present (**Figures 3-8 to 3-10**).
- Photograph the injury and remove sections of soft tissue for microscopic examination.
- Examine the spinal cord, and remove it by a posterior dissection, in which the posterior laminae of the vertebrae is removed to open the spinal canal (**Figure 3-11**).
- If radiographs show a fracture or abnormality of a bone, dissect that bone free to view the surrounding soft tissue and to remove the bone (**Figures 3-12 and 3-13**).
- Submit sections of the soft tissue for microscopic examination (**Figure 3-14**).
- In this process, the bone is decalcified (**Figure 3-15**).

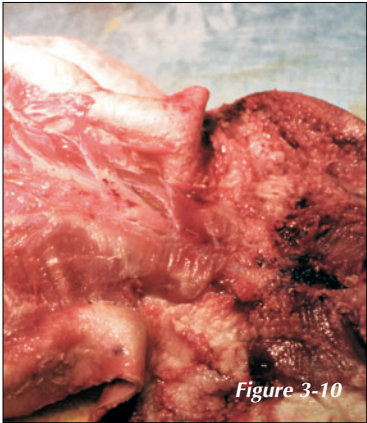
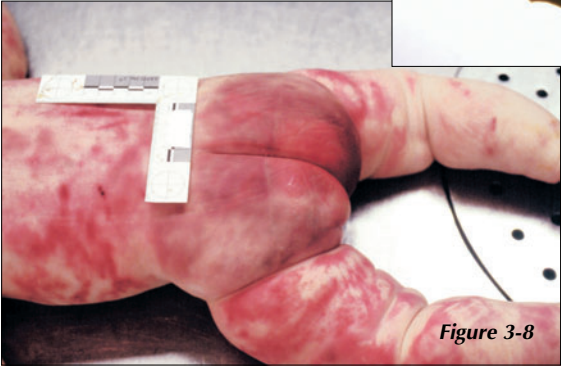
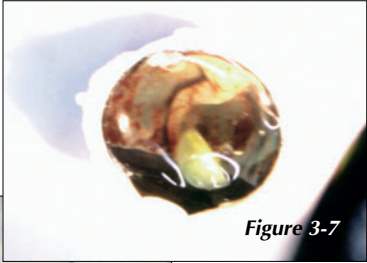


Figure 3-7. Eye cut into cross section to demonstrate multiple retinal hemorrhages.

Figure 3-8. Buttocks showing multiple bruises.

Figure 3-9. Incisions in buttocks to demonstrate bruises.

Figure 3-10. Incisions in buttocks showing hemorrhage in soft tissues.



Figure 3-11



Figure 3-12



Figure 3-13

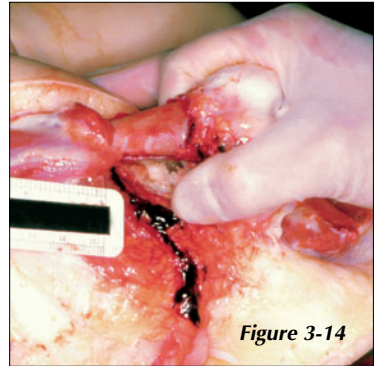


Figure 3-14

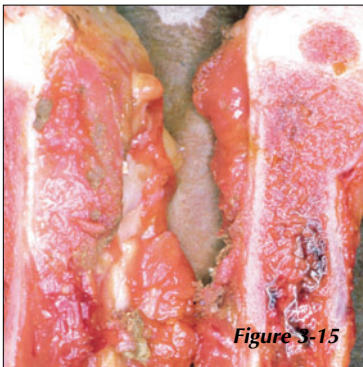


Figure 3-15

Figure 3-11. Incisions in back to examine soft tissues for injury.

Figure 3-12. Radiograph of forearm showing fracture of radius (arrow).

Figure 3-13. Fractured radius dissected out to demonstrate hemorrhage of fracture site and to submit for histology.

Figure 3-14. Fractured femur being removed and demonstrating hemorrhage into the soft tissue.

Figure 3-15. Fractured femur cut into cross section to show hemorrhage of fracture.

— Photograph fractures or abnormalities.

— In addition to the tissue samples taken for microscopic examination of individual organs, obtain specimens of blood, urine, vitreous humor, gastric fluid, and other tissues, such as liver and brain tissues, for toxicology tests to determine whether alcohol, drugs, medications, or other poisons or materials are present.

— Obtain vitreous humor to test for electrolytes, glucose, urea nitrogen, and other chemicals that cannot be detected postmortem in blood.

— In children younger than 3 years, perform genetic testing for metabolic genetic defects; this procedure requires the use of a blood spot on filter paper.

— Culture specimens of blood, cerebrospinal fluid, or other material to identify organisms in cases of possible infectious diseases.

— Routinely preserve blood samples so that DNA testing can be done if ever needed.

AFTER THE AUTOPSY

— Once the autopsy is complete, the body is released to the funeral home so the family can arrange for its disposition.

— Autopsy findings are documented by notes made at the time of the autopsy and then transcribed into a detailed autopsy report.

— It may take several weeks to complete toxicology or other lab tests and to make microscopic slides of the specimens taken at autopsy.

— All results are considered, plus autopsy findings, the circumstances, and other known information (eg, police reports, investigative reports, medical records) to make conclusions as to the cause and manner of death.

1. Sometimes the autopsy reveals no abnormal findings, but the circumstances in which the person was found provide information about why the person died.
2. After considering autopsy findings, circumstances, and history, it still may not be possible to determine why the individual died.
3. The term “undetermined” can be used for either the cause of death or manner of death or both.

4. In approximately 4% to 5% of all ME cases, cause of death remains unknown; it is not unusual or bad judgment to certify a case as undetermined.

ACCIDENTAL VERSUS NONACCIDENTAL INJURIES

— Injury to the brain is the leading cause of both death and disability in children suffering from physical abuse, however, many discrete, “typical” central nervous system lesions are caused by nonaccidental head injury (NAHI).

— A general pattern of injury types prevails, but any type of fatal trauma may be associated with child abuse.

— Injury patterns do not necessarily occur as a single type, and overlap of the types is common.

— Because an injury pattern does not fit a classic variety does not mean it could not have occurred as a result of child abuse or neglect.

— Essential in assessing NAHI are a thorough knowledge of the circumstances surrounding the injury; an explanation of the events that led to the child being placed at risk; an understanding of any preexisting medical conditions; and a thorough discussion of the mechanics of injury, including the plausibility of such a mechanism causing the injuries the child exhibits.

COMMON INJURY PATTERNS

HYPOXIC-ISCHEMIC INJURY

— The brain dies ultimately because of complex interactions predominantly based on a loss of blood supply providing nutrients to the brain cells (*ischemia*) and a loss of oxygen, a key nutrient, to the brain tissue (*hypoxia*).

1. Pure hypoxia affects the highly metabolically active parts of the brain most severely, usually affecting the basal ganglia and superficial gray matter neurons. Such a pattern is seen, for example, in carbon monoxide poisoning.
2. Pure ischemia affects the lowest arterial perfusion zones of the brain most severely, typically causing cell death in the so-called watershed areas at the periphery of arterial perfusion areas.

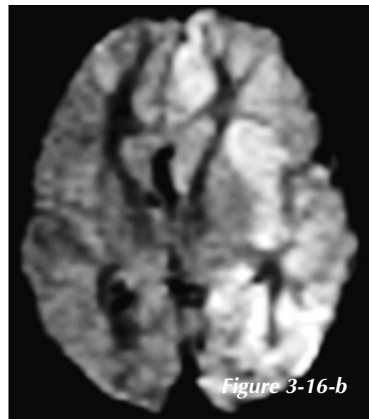
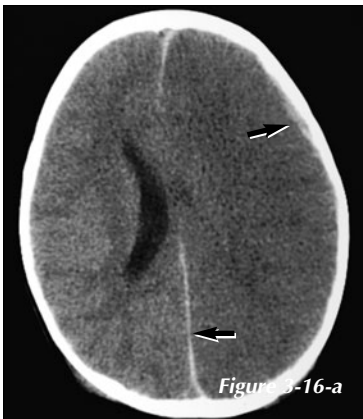
3. Instances in which an insult is purely either hypoxic or ischemic are unusual.

— Cerebral tissues are very sensitive to oxygen deprivation, and cerebral blood flow is the predominant source of this oxygen; therefore, the term hypoxic-ischemic injury reflects a state in which the causes cannot be separated.

— Complex autoregulatory and cytotoxic factors affect the analysis; however, the brain's mechanisms for preventing hypoxia and ischemia are limited.

— The most straightforward, but unusual, NAHI cause of severe brain injury is choking at the neck (**Figures 3-16-a** and **b**).

1. Represents a combination effect: the carotid arteries and the airway are simultaneously injured, restricting blood flow and oxygen.
2. Laryngeal fractures, laryngeal crush injuries, tracheal occlusion, and neck bruising are among the hallmarks of choking injuries.



Figures 3-16-a and **b**. This 9-month-old boy was allegedly strangled. Unenhanced computed tomography (CT) scan (**a**) demonstrates diffuse hypoattenuation of the left cerebral hemisphere related to ischemia and edema. There is loss of grey-white matter interface, effacement of the left lateral ventricle, and subfalcine shift to the right. Small subdural hemorrhage (arrows) is also seen in the left frontal region and along the falx. On diffusion-weighted magnetic resonance imaging (MRI) (**b**), there is hyperintensity in the entire left cerebral hemisphere, indicating diffusion restriction and infarction.

3. In imaging analyses, choking injuries often appear to be unilateral obstruction of a carotid artery, predominately the left.
4. With no intervention, a unilateral injury rapidly becomes bilateral.
 - A far more common pattern of hypoxic-ischemic injury to the brain occurs when a child suffers a head injury severe enough to cause prolonged *apnea*, or suspension of breathing, causing cell death, neurotoxin release from affected cells, and severe brain swelling.
 1. May occur in either shaken baby syndrome or shaken impact syndrome.
 2. The more severe the injury, the more severe and rapid the swelling.
 3. When the brain swells, it compromises intracranial blood flow, effectively worsening any existing injury.
 4. If treatment is delayed, swelling worsens and becomes clinically irreversible.
 - The classic imaging example of overwhelming hypoxic-ischemic injury is the “bad black brain,” in which cortical edema becomes so severe that the distinguishing characteristics of the cerebral cortex are lost.
 1. The posterior fossa and basal ganglia tend to maintain blood flow and will appear as a relatively higher density than the cerebral cortex by computed tomographic (CT) scan.
 2. Symmetrical, uniform global ischemia can occasionally be difficult to document by CT scan or magnetic resonance imaging (MRI) if all areas are equally affected.
 3. In these unusual cases, check that the standard window and level of depiction of the brain have been used on the CT scans, because widening the window or using incorrect leveling can obscure the lesions.
 4. With MRI, different reference signals or pulse sequences, especially diffusion-weighted imaging, can help document the severity of injury.
 5. Susceptibility imaging, T2-weighted MRI, gradient echo, or blood oxygen level–dependent sequences may yield clues to the origins of the child’s clinical state by enabling you to document the presence of intracranial extravascular blood.

6. Clinical clues, an infant with severe brain injury symptoms, and a normal MRI or CT scan suggest this review of techniques.
7. The clinical outcome of children with “bad black brain” is uniformly poor. Those who do survive suffer severe cerebral atrophy or, if the injury occurs before age 3 months, cystic encephalomalacia; both are irreversible changes.
8. Delay in receiving medical intervention often allows the brain injury to progress and the swelling to worsen and become clinically irreversible. Failure of the child to receive medical care for abusive head injury, or failure to recognize abuse has occurred may result in repeated and cumulative episodes of brain damage.

EXTRA-AXIAL INJURIES

— Extra-axial injuries affect the tissues surrounding the brain but are not necessarily discrete injuries to the brain parenchyma.

Subdural Hematoma

— The most common extra-axial injury in child abuse is subdural hematoma (**Figures 3-17-a, b, c, and d**).

— Subdural hematomas of NAHI may be relatively small (ie, less than 1 cm in width) and alone are usually not lethal. They indicate the severity of head trauma and the likelihood of comorbid injury to brain tissue, as well as to tissues surrounding the brain.

— Subdural bleeding occurs when bridging veins from the cerebral cortex are torn, causing low-pressure venous leakage of blood into the space deep to the dura but superficial to the brain.

— The low pressures of venous circulation result in “oozing” of blood, making most of these hematomas self-limited in size; these subdural hematomas are often termed “marker” injuries.

— Rarely does subdural hematoma caused by NAHI reach a size that will cause death or require surgical intervention.

— Subdural hematomas caused by abuse can become quite large, but these are usually more chronic in nature and associated with cerebral atrophy or megalencephaly.

— Isolated acute subdural hematomas large enough to cause herniation or other life-threatening conditions are unusual in child abuse.



Figure 3-17-a



Figure 3-17-b



Figure 3-17-c



Figure 3-17-d

Figures 3-17-a, b, c and d. This 3-month-old infant allegedly fell off a changing table and was brought to the hospital with lethargy and vomiting. The CT scan (a) demonstrates large bilateral subdural hematomas of different ages along the convexities (arrows). These hematomas are slightly hyperdense to cerebrospinal fluid (CSF), representing chronic hemorrhage, with hyperdense foci interspersed within them indicating a superimposed acute hemorrhagic component. On MRI the fluid collections are hyperintense to CSF on T1- (b) and T2-weighted (c) images, indicating subacute to chronic hemorrhage. There is layering of fluid with hematocrit effect in the dependent portion, representing different ages. Gradient echo images (d) are more sensitive to hemorrhage and demonstrate acute components as hypointensities (arrow).

Epidural Hematoma

— Epidural hematoma is a rare injury in child abuse, but one that can cause rapid deterioration and death (**Figure 3-18**).

— The epidural arterial hematoma usually occurs because of a skull fracture that injures branches of the middle meningeal artery, causing high-pressure arterial bleeding and a rapidly growing arterial hematoma, displacement of the brain, pressure-related compromise of blood flow to the brain, and, if not treated, death.

— Epidural hematoma is the lesion classically associated with the “lucid interval,” during which the victim is briefly unconscious because of the concussive impact, partially recovers as the effects of the concussion wear off, then rapidly collapses as the expanding hematoma compresses the brain.

1. This sequence of events is seen in adults, but is poorly documented in children.
2. It is unlikely that any child who has suffered severe-enough head trauma to have an arterial epidural hematoma will be asymptomatic.

— The imaging appearance of an epidural hematoma is specific, with these lesions rarely subtle on CT scans or MRI scans.

— Venous epidural hematoma has the following characteristics:

1. It is an unusual injury that tends to have a delayed onset and a relatively symptom-free lucid interval.

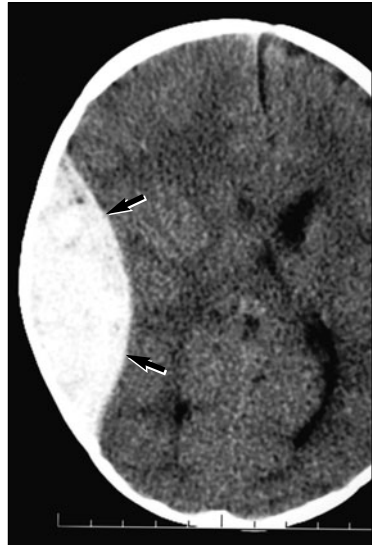


Figure 3-18. This 11-month-old boy was apparently hit by an older, larger sibling with a toy. The patient was doing reasonably well for a few hours after the injury but had sudden deterioration with loss of consciousness. Unenhanced CT scan demonstrates biconvex, hyperdense, acute epidural hematoma (arrows) in the right parietal region. There is associated mass effect with effacement of the right lateral ventricle and shift of the midline structures. No fracture was seen on bone windows, suggesting that this was a venous epidural hematoma.

2. Lesions often correct themselves and rarely require surgical intervention. Venous bleeding is under lower pressure and is less likely to adversely affect the brain than arterial hemorrhage.

Subarachnoid Hemorrhage

— Subarachnoid hemorrhage (SAH) occurs when the venous bleeding lies under the arachnoid membrane and irritates the pia-arachnoid membrane along the surface of the brain (**Figures 3-19-a, b, and c**).

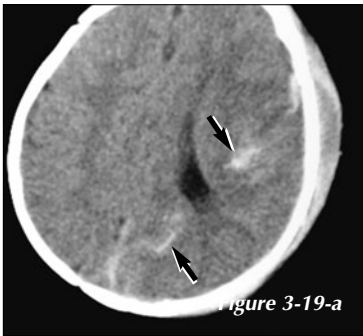


Figure 3-19-a

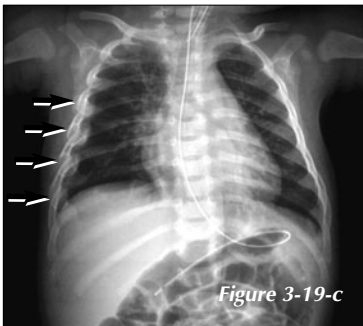


Figure 3-19-c

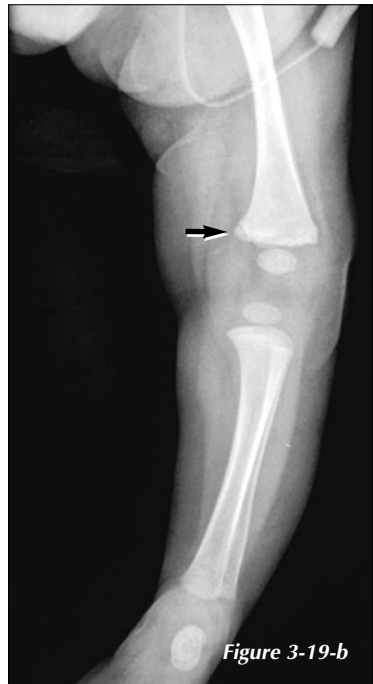


Figure 3-19-b

Figures 3-19-a, b, and c. This 3-month-old boy was allegedly dropped from the car seat and was “not acting right” after the fall. This history was probably false, given the severity of the injury ascribed to minor trauma. On unenhanced CT scan (**a**), there is a subgaleal hematoma in the left parietal region. Hyperdense subarachnoid hemorrhage is seen in the left sylvian fissure and along the sulci in the left occipital lobe (arrows) and posterior falx. A skeletal survey was performed. The left lower extremity radiograph (**b**) demonstrates a metaphyseal corner fracture (arrow) that is highly specific for child abuse. On the chest radiograph (**c**), there are multiple healing fractures involving the right fourth through seventh ribs (arrows).

— SAHs are often seen in conjunction with subdural hematoma because a similar mechanism of injury prevails.

— The importance of SAH is as follows:

1. Presence of SAH causes vasospasm, which may exacerbate a hypoxic-ischemic injury.
2. SAH causes an almost instant and universal onset of significant symptoms, a fact often used in determining the timing of a NAHI.

Parenchymal Injuries

— With severe trauma to the brain, brain tissues can literally tear.

— Where the density of tissues differs sharply, differing elastic properties respond to shear stresses by tearing.

— Hemorrhages associated with shearing forces are seen on CT scans or susceptibility imaging MRI sequences and are called *diffuse axonal injuries*; in younger children they can be called “glide injuries.”

— The actual diffuse axonal injury is the physical separation of axons from neural cells.

1. In living humans, this change is not seen at the present resolution of imaging with conventional imaging techniques.
2. Points of differing brain tissue density include the junction of gray and white matter in the cerebral cortex or the junction of the corpus callosum (white matter) and the rest of the cerebral cortex (**Figure 3-20**).
3. Shearing injuries in the brainstem are more dangerous because of the high concentration of critical neural fiber tracts present.
4. Actual injury may involve a relatively small area of tissue, but injured cells release intracellular substances that act as neurotoxins and cause a “cascade effect” that damages nearby neurons. Rapidly spreading neuronal cascade causes cerebral edema, decreases cerebral blood flow, and touches off a severe hypoxic-ischemic injury to complicate the shearing injury.
5. It is possible to have a shear injury that extends through the ependyma, allowing bleeding into the ventricles.

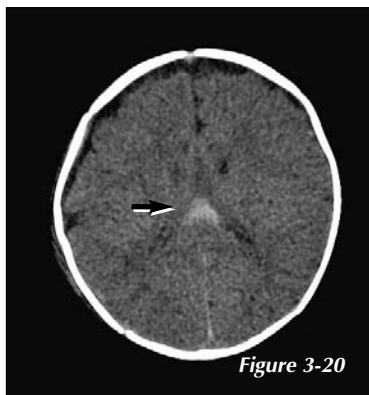


Figure 3-20

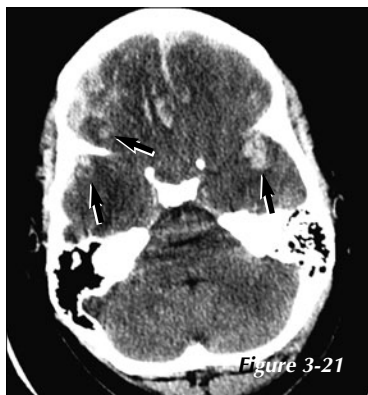


Figure 3-21

Figure 3-20. This 1-month-old girl was involved in a motor vehicle crash. Unenhanced CT scan demonstrates hyperdense hemorrhage in the splenium of the corpus callosum (arrow) consistent with shearing caused DAI.

Figure 3-21. This 6-year-old girl fell off a speeding sport-utility vehicle and was found face down and unresponsive. CT scan demonstrates multiple, hyperdense areas of hemorrhagic contusions in the frontal and anterior temporal lobes bilaterally (arrows).

6. Intraventricular hemorrhage caused by trauma usually requires surgical intervention to drain the ventricles; a poor outcome is common.
 - Focal hemorrhagic contusions occur with brain injury severe enough to cause bleeding or edema in the brain tissues (**Figure 3-21**).
1. Often seen where the brain impacts the skull from acceleration-deceleration movements.
 2. The impact locations of these contusions are where the base of the frontal lobes collide against the floor of the anterior cranial fossa and where the tips of the temporal lobes strike the greater wing of the sphenoid bone in the middle cranial fossa.
 3. Such injuries can accompany shearing injuries, but the neuronal cascade effect is less common with isolated hemorrhagic contusion than with shear injury.

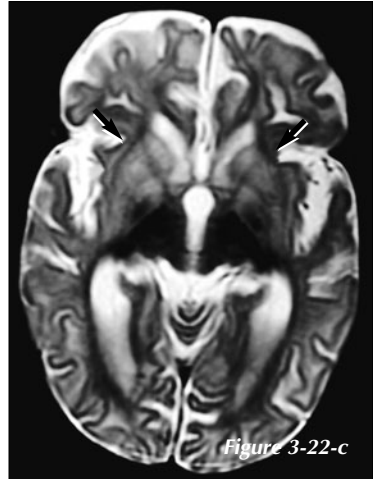
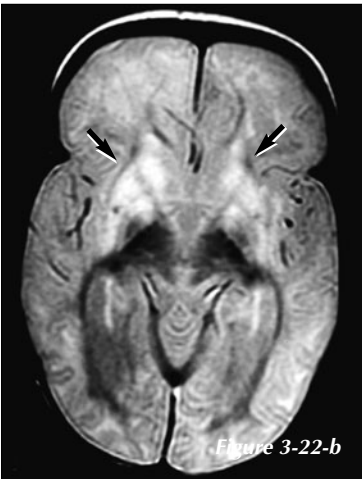
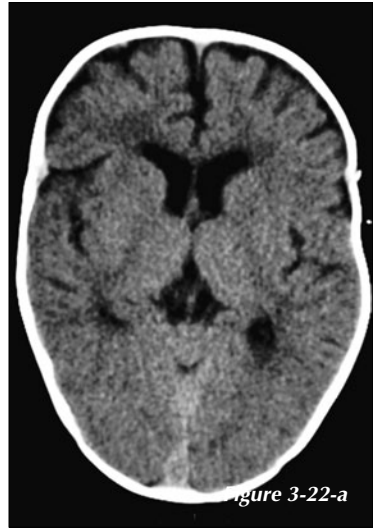
OTHER LETHAL EVENTS

— Starvation causes failure of brain growth that is less dramatic than an abrupt trauma, but it can eventually lead to death.

— Poisonings caused by neglect and some chronic and acute conditions (eg, carbon monoxide encephalopathy or lead encephalopathy) can lead to death (**Figures 3-22-a, b, and c**).

— Basal ganglia are among the brain's most metabolically active tissues and are often selectively adversely affected.

— Osmotic forces, sometimes seen after forced feeding of salt water or other chemicals that cause electrolyte imbalance, can lead to acute brainstem edema and death (called *acute pontine myelinolysis*).



Figures 3-22-a, b, and c. This 15-month-old child had carbon monoxide poisoning. Unenhanced CT scan (**a**) is relatively unremarkable. On MRI with proton density (**b**) and T2-weighted images (**c**), there is hyperintensity in the caudate heads and basal ganglia bilaterally (arrows), as well as in the left occipital cortex.

— Specific nutrient deficiencies, as opposed to general starvation, can be fatal.

Visceral Injuries

— Visceral injuries usually affect the soft tissues around the abdominal midline. If neglected, these injuries may cause death.

— Hepatic lacerations, splenic fractures, pancreatic injuries, and bowel wall trauma all have caused death from child abuse (**Figures 3-23-a and b**).

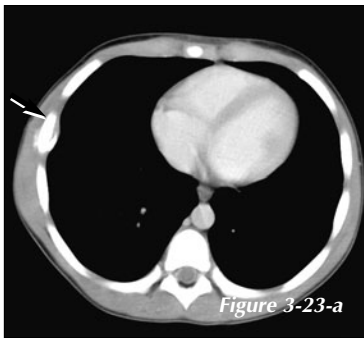


Figure 3-23-a

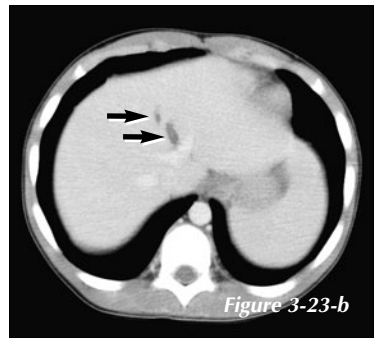


Figure 3-23-b

Figures 3-23-a and b. This 5-year-old malnourished boy had an alleged history of abdominal trauma related to bicycle injury and hematuria. Contrast-enhanced CT scan (a) shows healing, right sixth rib fracture (arrow). Axial section through the upper abdomen (b) shows linear, hypodense lacerations in the superior aspect of the right lobe of the liver (arrows).

— Children chronically starved through neglect may develop acute gastric paresis (**Figure 3-24**).

1. Originally described during and after World War II in Europe and in an experimental group of conscientious objectors starved to simulate concentration camp conditions.
2. Starved individuals who are rapidly re-fed develop gastric paresis that can cause acute gastric distention and rupture.
3. Gradual, rather than ad libitum, feeding prevents gastric paresis.

— Children with curable medical conditions such as Hirschsprung's disease, inflammatory bowel disease, or urinary tract disorders can also die of neglect.



Figure 3-24

Figure 3-24. This 10-month-old boy with Hirschsprung disease was seen with abdominal distension. The plain radiograph of his abdomen demonstrates multiple, abnormal, amorphous-looking bowel loops with thumb print suggestive of edema, and colitis.

1. Often the child is chronically ill and is either ignored or the parent seeks unconventional treatment that causes suffering and eventual death for the child.
2. Imaging is often vital in detecting and explaining serious illness in a child, especially with brain injuries.

SIDS

— The term *sudden infant death syndrome* (SIDS) describes the sudden and unexpected death of an apparently healthy infant in which no cause is identified after a complete postmortem examination and investigation, including investigation of the scene where the incident occurred and investigation of the clinical circumstances.

— In *sudden unexplained infant death*, a cause may or may not be determined.

EVALUATION OF SUDDEN INFANT DEATHS

— The components of the evaluation of sudden infant death are scene-based, autopsy-based, lab-based, and records-based.

— Essential practices that result in the cause of infant death being determined or remaining unexplained are established for each component.

— At a minimum, the following criteria should be met to classify a death as consistent with SIDS:

1. A scene investigation is performed, including photographic or diagrammatic documentation of the scene, or both, and a written narrative of the reported death circumstances based on witness interviews.
2. A skeletal survey is performed.
3. A complete autopsy is performed, including microscopic examination of the brain, heart, lungs and airways, liver, and thymus, with retention of stock tissues or paraffin blocks of other solid and hollow viscera and endocrine organs.
4. Blood and urine are retained for toxicology.
5. A vitreous sample is retained for routine chemistries, as indicated.
6. Blood spot cards are obtained and tested for a routine metabolic screen.
7. Medical history is obtained, and growth, development, and immunizations are assessed, preferably using official medical records.
8. Previous police or social service interventions are reviewed.
9. Death information for any deceased siblings is reviewed.

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LAW ENFORCEMENT, PROSECUTORS, CHILD PROTECTIVE SERVICES, AND MENTAL HEALTH PROFESSIONALS

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LAW ENFORCEMENT PROFESSIONALS

— The primary role of law enforcement agencies is to protect and serve the citizens of their community. Standard practice is to take proactive steps to prevent future crimes from occurring at the same locations. Standard practice involves the following:

1. Preventing avoidable injuries and fatalities
2. Identifying potentially dangerous situations and taking appropriate actions to eliminate them
3. Studying past events and working with community leaders to help formulate new prevention strategies and activities
4. Coordinating activities with other agencies as needed

— Law enforcement has a legal mandate to determine the cause of fatalities and what circumstances might have contributed.

— Its role in child fatality is to search for possible criminality and, if appropriate, arrest perpetrators.

— Officers serve as active members of state or local child fatality review teams (CFRTs).

1. Individuals representing law enforcement agencies should have considerable skill, training, and experience related to child abuse and neglect and child fatality investigations.
2. Unfortunately, many police officers do not have the specialized training and experience needed to properly investigate infant and child fatalities.

DEATH INVESTIGATIONS

— When law enforcement or emergency medical services (EMS) receives a call for a supposed child fatality, it is responded to as an emergency.

— **Table 4-1** shows a quick-reference model of serious crime/event response procedures for the first arriving officers.

Table 4-1. Serious Crime/Event Response Procedures

ASSIGNMENT OR NOTIFICATION

Record time of assignment and arrival at scene. Attempt to obtain all available information from the reporter and EMS/law enforcement telecommunications operator.

UPON ARRIVAL

1. Preserve and Protect Life

— Determine whether any injuries or imminent dangers require immediate attention. Seek medical help as needed; obtain names of medical personnel and other responders. Call for other assistance, as necessary (law enforcement, ME/C, social services, juvenile officer, fire department, utility company, etc).

2. Determine What Has Occurred

— Identify victim(s) and witness(es); make preliminary determination of what has occurred and what actions are required.

3. Identify and, if Appropriate, Arrest Suspected Perpetrator(s)

— Document name/alias(es)/nickname (if available), race, gender, age and date of birth, address, physical description (eg, height, weight, hair color, eye color, complexion, scars, tattoos), clothing description, any other identifiers, vehicle description, direction of flight, weapon description (if any).

— Broadcast description and crime as soon as possible; update as needed.

(continued)

Table 4-1. (continued)

- Request additional help if needed; follow agency policy.
- If arrest is required, secure and search suspected perpetrator as quickly as possible. Seize any weapons, evidence, or contraband.

Note: Safety and the protection and preservation of life are paramount. Do not take unnecessary risks.

4. Establish and Protect the Crime/Event Scene

- Once perpetrators are identified, “freeze” the scene and everything in it. Except as needed to assist injured, keep the crime/event scene untouched pending appropriate processing and photographing.
- Within personnel limits, identify, separate, and isolate witness(es) before interviewing.

Note: In an obvious fatality (no possibility of life), leave the body and its surroundings unremoved until the ME/C arrives. Photograph the body and scene before other processing. While transporting a body to the morgue or other facility, protect the head and extremities from accidental damage. If available, a clean sheet can be used under the body to catch possible evidence.

- If the victim appears near death (and it does not interfere with medical assistance) and the child is old enough, attempt to obtain a declaration of what occurred.
- If the victim is alive at the scene and is transported to the hospital, ensure he or she is accompanied by a law enforcement officer. If the victim survives until arriving at the hospital and then dies, secure the body and the area where the body is located, especially if the attending physician declares the death something other than natural. Only law enforcement or medical personnel may touch, hold, or have contact with the body.

5. Process the Scene

- When in doubt, “freeze” the scene and do nothing until you are prepared to do it correctly. Do not hesitate to ask for outside advice and assistance. Develop investigative goals and objectives.
- Determine the legal basis for any search and seizure, particularly beyond the immediate crime/event scene. Consult the prosecuting attorney on specific legal questions.
- Establish a chain-of-custody log to be maintained by a single officer. Designate that person to receive and take charge of all physical evidence at the scene.

(continued)

Table 4-1. Serious Crime/Event Response Procedures *(continued)*

- Only designated people should search the crime scene and handle evidence. Keep all others, excluding emergency medical personnel, outside the protected area.
- Take measurements and make sketches related directly to the photographs. Indicate north in all sketches. Include enough detail to make diagrams later.
- Take a complete photographic set of the entire scene area including a “landmark” photo (front of house, vehicle license, etc). Complete and use photograph cards with an introductory “preamble” of date and location. Scale measurement cards should be used for most close-up photographs. Video recording may be very useful.
- Before seizure, if appropriate, examine evidence for latent fingerprints. Wait to process weapons and nontraditional surfaces (paper, cardboard, leather, masonry, etc) at the laboratory. Transport such evidence in a paper or cardboard container.

Note: All recovered and seized weapons should be considered loaded and dangerous until examined by a qualified person familiar with firearms.

- Mark all seized evidence, package accordingly, and place it in a secure evidence locker or ensure it is delivered to the appropriate laboratory for processing. Maintain a chain-of-custody log.

6. The Interview/Interrogation Process

- If the person(s) to be interviewed is a child, consider requesting the assistance of someone trained and experienced in child interviewing, child protection team or child advocacy center personnel, or specially trained child interviewers.
- Separate suspected perpetrator(s) and witnesses and interview them individually.
- Interrogate suspected perpetrator(s) relative to his/her/their part in the crime/event. Note improbabilities and inconsistencies; use them to enhance the questioning process. Avoid factual challenges until the suspect has made a definitive statement.

Note: Follow your agency's policy and procedures for advising suspected perpetrators of their Miranda rights and obtaining verbal and written waivers of these rights.

- Question witnesses regarding their firsthand knowledge of the event—that is, what they actually saw or heard. To obtain the most detail, ask specific questions concerning the event and the persons involved. Always ask for and look for more detail. Secondhand information can lead to an unidentified witness or suspected perpetrator. Always attempt to obtain names and specific verifying facts.

(continued)

Table 4-1. (continued)

- If appropriate, initiate a canvass of the entire neighborhood or area.
- Make note of spontaneous statements made by witness(es), family, and suspected perpetrator(s). These unsolicited, voluntary utterances usually do not require that the subject have prior warning of his/her Miranda rights.
- Record all investigative results such as interviewing, disposition of evidence, names of responders and what they did, etc. Following the policy and procedures of your agency, take handwritten notes, record electronically, videotape, or use a combination of all these methods for every aspect of the investigation.

A. Video re-enactment

- Video re-enactment is very important when there is a history of alleged accident.
- Sometimes the perpetrator will confess when asked to show how a particular injury occurred.
- By documenting the alleged mechanism of injury, this memorializes the story by the perpetrator. This can be then shown to medical personnel who can determine whether the injuries could have been caused as reported. The advantage is that there is no argument over the meaning of words or forces when the video representation is being offered as what actually happened.

7. Resources, Support, and Assistance

- Identify and learn the roles of every member of your child protection community. Know how to access their specialized services when necessary.

8. Report Preparation

- Assemble all information into a logical sequence of events. Ensure all people, observations, statements, evidence, sketches, photographs, and medical and technical findings are prepared to clearly portray all the known facts of the case. If new or additional information becomes available, prepare a supplemental report and distribute it to all the participating agencies. To minimize informational conflicts and contradictions between or among agencies, attempt to reconcile differences *before* final reports are written.

9. Prosecution Support

- If appropriate, provide quality charts, photographs, diagrams, recordings, and other visual and audio aids suitable for court viewing.

— Child fatalities differ considerably from adult fatalities.

1. Because they are smaller, infants and children are more vulnerable to serious injury or death, whether accidental or an intentional assault.
2. Strict case management by a designated team leader is required.

— Law enforcement officers work closely with the medical examiner/coroner (ME/C) to keep cases open and active until complete and thorough investigations are concluded.

— Law enforcement investigators may encounter resistance in continuing investigations.

1. When the death has been ruled natural, parents and other relatives may resist efforts to interview them.
2. When children appear to have died from abuse or neglect by the parents or other caregivers, law enforcement personnel must coordinate with child protective services (CPS) agencies (see later discussion). Joint investigations are helpful to be sure that one investigation does not interfere with the other, and to have the benefit of several lines of thinking.
3. When child abuse is suspected, law enforcement should consult with a child abuse pediatrician.

— The law enforcement role in CFR is threefold:

1. To improve the criminal justice response to the deaths of children.
2. To enhance interagency cooperation and coordination in child fatality investigations.
3. To prevent future avoidable child fatalities through public health, education, and enforcement initiatives.

Legal Authority

— Law enforcement personnel investigate the sudden and unexpected deaths of children, regardless of the cause.

— They provide other CFRT members with information relevant to the fatalities being reviewed, including the following:

1. Official law enforcement agency reports related to child fatality investigations

2. Call sheets and audio recordings of emergency response calls
 3. Other agency reports, recorded statements, or documentation related to deceased children or their families, witnesses, suspects, other relevant people, and the location where the children died or lived
 4. Contact information and official reports or statements generated by the investigating officers or other law enforcement officers (eg, patrol officers, accident investigators, crime scene technicians)
 5. Any electronically recorded statements or confessions of suspects and the results of polygraph examinations
- Law enforcement officers can use professional relationships and various legal processes to obtain relevant information.
1. Includes the use of open-records laws, subpoenas for records, grand jury subpoenas, court orders, and search warrants.
 2. Information typically obtained includes medical records, school records, driving records, and criminal histories.

Investigative Expertise

- Key component of the review process even when law enforcement team members were not directly involved in the investigations being reviewed
- Can examine files (eg, incident reports, witness affidavits, crime scene photographs) and explain to other team members what occurred in the investigation
- Includes formal training, skill, and practical experience
- Officers can explain why certain actions were or were not taken, such as when arrests can be made and when criminal charges can be filed.
- Educate team members about law enforcement policies, procedures, and relevant legal issues.
- Investigators who have a thorough understanding of child abuse, child development, and CPS procedures generally are better at conducting high-quality, comprehensive child fatality investigations.
- If an agency has specialized homicide and child abuse units, the investigative responsibilities may be transferred to these units.

— Child abuse detectives may also assist homicide detectives during investigations.

— Detectives who regularly investigate child abuse have greater knowledge, understanding, and experience in child development, child abuse injuries, and CPS procedures.

— Team members from other disciplines must understand the limitations of officers' abilities to make arrests, obtain confessions, and recover DNA or other critical evidence to solve crimes.

— Officers can educate the team about legal issues like probable cause and the requirements for obtaining search warrants.

Matching Evidence and Statements

— Most infant and child fatalities result from natural causes and accidents, but the possibility of abuse and neglect is never overlooked.

— Children who die from deliberately inflicted injuries rarely die as a result of a single event but rather from a steady escalation of violence.

— Investigators should consider the following factors:

1. The type of injury or injuries
2. The location of the injury or injuries
3. Whether there are multiple injuries
4. Possible explanations
5. When the injuries occurred (eg, if over a period of time, "pattern abuse" is indicated)

— Most infant and child homicides occur as a response to "crying" or even "diarrhea."

— Perpetrators usually react with anger escalating to rage, precipitated by natural behaviors of infants or children.

— Most child homicides occur at the hands of parents or caregivers.

— Investigators must show by whom, how, and why the death happened.

— Most of these deaths are not witnessed, so investigators must build a circumstantial case based on physical evidence.

— Interviews and interrogations may be the best sources of evidence.

- It is best to approach parents and caregivers as soon as possible.
- Investigators match the explanations given with all available evidence; this evidence includes the child's developmental level, the scene, and medical and pathologic findings.
- Each situation dictates what must be done, but in all child fatalities, complete statements from the caregivers and witnesses are needed.
- The goal of investigations is to prove or disprove the explanation through science, observations, witnesses, and evidence, remembering that no single expert can determine exactly what happened and why.
- Matching and comparing explanations with emerging evidence is often the basis for determining how fatalities occurred.
- Even when statements appear improbable or contrary to known facts, it is usually best to avoid challenging the individual until medical, pathologic, and investigative findings are in hand.
- If the person is clearly a suspect and there may be no other opportunity to obtain a statement, reserve challenges for the end of the interview, after the suspect is locked into an explanation.
- Whenever possible, assign interviews and interrogations to someone knowledgeable about the event and persons involved.

TOOLS

- If polygraph or voice stress analyzers are used, understand their limitations.
 1. They are not substitutes for thorough, objective investigations.
 2. They are never sufficient to use as the sole reason for eliminating suspects.
- Use experienced and trained child interviewers.
- The goal is to obtain usable information without harming children.
 1. Use techniques that are legally acceptable and usable in court or civil hearings.
 2. Child advocacy centers or child protection teams provide trained personnel and an environment conducive to children, plus equipment to record interviews.
 3. Use trained victims' advocates to help conduct these investigations.

— Use death scene checklists.

1. A checklist reminds one to obtain specific information and provides a means of organizing and measuring the status of the investigation.
2. Lists can be adapted to meet most agency requirements.
3. **Figures 4-1-a, b, c, and d** outlines information essential to the investigation of suspected child maltreatment.

— Public alerts serve 2 purposes:

1. Prevention, by warning citizens to avoid contact with suspects or situations in which they are likely to encounter them.
2. Apprehension, by increasing the chance that the public will contact the police if suspects are seen.

Collaboration with Team Members

— Law enforcement team members learn from other team members about their respective agencies' policies and procedures.

— Information shared by medical professionals about children's anatomy and physical development can assist in future investigations.

— Law enforcement officers must understand how CPS agency policies and procedures direct investigations.


— Suggestions can be made to initiate further investigations, including conducting additional witness interviews and additional and more detailed background checks, or to require further work by CPS investigators or another team member.

— As part of the national criminal justice network, law enforcement personnel can contact any local, state, or federal law enforcement agencies formally or informally for assistance.

TEAM LEADER ROLE

— Team leaders, with advice, determine what services and assignments are needed, who should do what, and the order in which these services are accomplished.

— A law enforcement officer is generally an effective team supervisor, in part because law enforcement experience and resources are specific to planning and carrying out complex investigations.

	<p style="text-align: center;">MISSOURI DEPARTMENT OF SOCIAL SERVICES DIVISION OF LEGAL SERVICES MISSOURI CHILD FATALITY REVIEW PROGRAM DEATH SCENE INVESTIGATIVE CHECKLIST FOR CHILD FATALITIES</p>	<p style="text-align: center;">STAT PO Box 208 JEFFERSON CITY, MO 65102-0208 (573) 751-5980 (800) 487-1626</p>
<p>When a child dies suddenly and unexpectedly, or suspiciously, a thorough evaluation/investigation of the scene is necessary to accurately determine the cause and manner of death. The scene investigation should happen as soon as possible after the child's death, optimally within 24 hours.</p> <p>This checklist should be used as a guide to your investigation of the scene of a sudden and unexplained or suspicious death, especially to a child under the age of one. Completing all information appropriate to the fatality will help our pathologist determine how and why the child died. For assistance, call (800) 487-1626.</p> <p>The questions in the checklist will lead you through a thorough investigation. It is not expected that you will be able to answer all of the questions. You should attempt to interview witnesses, EMS and emergency room personnel, child care providers, law enforcement, and other persons from the scene.</p> <p>In conducting the investigation, criminality or negligence should not be assumed, but the possibility should not be overlooked. An empathetic, non-confrontational approach is both appropriate and effective.</p> <p>Complete as many sections as possible. If appropriate, attach this form to your investigation report. Submit a copy to the Medical Examiner's Office prior to the autopsy.</p> <p>Because the child will probably have already been transported to a hospital or other facility, it is important that, based on evidence and witness accounts, you try to recreate the scene to approximate actual events. This may include the use of dolls or silhouettes to reconstruct location and position of body. Attempt to acquire scene and reconstruction photographs as appropriate.</p> <p>Contact your Prosecuting Attorney's Office to ensure that all laws and regulations are followed in the search of the area, the interviewing of witnesses, and the collection of evidence. Only use procedures and forms approved by your agency and prosecutor. Sample forms are available from STAT.</p>		
1. CHILD'S NAME		2. SOCIAL SECURITY NUMBER
3. SCENE ADDRESS		
4. DATE OF BIRTH	5. DATE OF DEATH	6. RACE OF CHILD
7. SEX		
8. DECEDENT'S ADDRESS		
9. MOTHER'S NAME		
10. MOTHER'S ADDRESS		
11. MOTHER'S TELEPHONE NUMBER	12. MOTHER'S DATE OF BIRTH	13. MOTHER'S SOCIAL SECURITY NUMBER
14. GESTATION IN WEEKS	15. BIRTH WEIGHT	16. KNOWN MATERNAL PRE-NATAL HEALTH PROBLEMS (DIABETES, HYPERTENSION, ETC.)? <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> UNKNOWN
IF YES, DESCRIBE		
17. WAS MOTHER TAKING PRESCRIPTION MEDICATION FOR ABOVE MEDICAL CONDITION DURING PREGNANCY? <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> UNKNOWN If yes, what type of medication?		
18. PRE-NATAL MATERNAL CIGARETTE, ALCOHOL OR DRUG USAGE? <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> UNKNOWN		IF YES, <input type="checkbox"/> Alcohol <input type="checkbox"/> Cigarettes <input type="checkbox"/> Cocaine <input type="checkbox"/> Heroin <input type="checkbox"/> Marijuana <input type="checkbox"/> Methamphetamine <input type="checkbox"/> Other
19. KNOWN COMPLICATIONS OF PREGNANCY OR DELIVERY? <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> UNKNOWN If yes, explain:		
20. LOCATION OF BIRTH AND NAME OF FACILITY		
21. ATTENDING MEDICAL PRACTITIONER		
22. BIRTH DEFECTS OR OTHER ABNORMALITIES OF DECEDENT AT BIRTH. DESCRIBE:		

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Figure 4-1-a. Death Scene Investigative Checklist for Child Fatalities. Reprinted from Missouri State Technical Assistance Team, 2005.

23. ANY FAMILY HISTORY OF SIDS OR OTHER INFANT DEATH? <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> UNKNOWN			
IF YES, DESCRIBE DETAILS INCLUDING DATE OF DEATH AND LOCATION OF OCCURRENCE: 			
EVENTS SURROUNDING DEATH			
24. PLACE OF FATAL EVENT (E.G., IN CRIB, IN CAR)?		25. DEATH WITNESSED? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, provide detail in narrative.	
26. WHO FOUND CHILD?		TIME FOUND	
27. STATUS OF CHILD WHEN FOUND <input type="checkbox"/> Dead <input type="checkbox"/> Unresponsive <input type="checkbox"/> In Distress <input type="checkbox"/> Unsure		28. WHEN WAS CHILD LAST SEEN ALIVE (TIME, WHERE, BY WHOM)?	
29. DESCRIBE CONDITION OF CHILD WHEN LAST SEEN: 			
30. MEDICAL ASSISTANCE SUMMONED? <input type="checkbox"/> NO <input type="checkbox"/> YES		31. 911 CALL? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, obtain tapes.	
32. RESUSCITATION ATTEMPTED? <input type="checkbox"/> NO <input type="checkbox"/> YES		BY WHOM?	HISTORY OF PREVIOUS RESUSCITATION? <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> UNKNOWN
33. CONVEYED TO A MEDICAL FACILITY? <input type="checkbox"/> NO <input type="checkbox"/> YES		WHERE?	NAME AND ADDRESS OF FACILITY
34. WHO PRONOUNCED CHILD DEAD?			
CONDITION OF CHILD			
35. BODY TEMPERATURE (DEGREES)		TIME	METHOD
36. LIVOR MORTIS <input type="checkbox"/> NO <input type="checkbox"/> YES		TIME	WHERE OBSERVED?
37. RIGOR MORTIS <input type="checkbox"/> NO <input type="checkbox"/> YES		TIME	38. HEMORRHAGE OF EYES, LIPS OR EARS? <input type="checkbox"/> NO <input type="checkbox"/> YES
39. CHILD APPEARS CLEAN, WELL NOURISHED AND CARED FOR <input type="checkbox"/> NO <input type="checkbox"/> YES If no, explain in narrative.			
40. CLOTHING CLEAN? <input type="checkbox"/> NO <input type="checkbox"/> YES		RIGHT SIZE? <input type="checkbox"/> NO <input type="checkbox"/> YES	CLOTHING REMOVED AFTER DEATH? <input type="checkbox"/> NO <input type="checkbox"/> YES
41. DIAPERS USED? (COLLECT AS NECESSARY) <input type="checkbox"/> NO <input type="checkbox"/> YES		WET? <input type="checkbox"/> NO <input type="checkbox"/> YES	SOILED? <input type="checkbox"/> NO <input type="checkbox"/> YES
42. ARE THERE BIRTHMARKS OR INJURIES OF ANY TYPE, INCLUDING BRUISES, SCRAPES, CUTS, BURNS OR DIAPER RASH? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, describe colors, shapes, sizes and locations in narrative. Ensure that necessary photos are taken if possible.			
POSITION OF CHILD			
43. SKETCH POSITION OF CHILD AND IDENTIFY WHERE IN CRIB, BED, OR OTHER PLACE. IF BABY IS NOT PRESENT, ENSURE THAT PHOTOS ARE TAKEN OF POSITIONED DOLL OR SILHOUETTE.		INDICATE DIRECTION OF CHILD'S HEAD (CHECK ONE):	
[Sketch area for child position]			
44. WAS CHILD MOVED FROM ORIGINAL POSITION? <input type="checkbox"/> NO <input type="checkbox"/> YES		WHY?	

Figure 4-1-b. Death Scene Investigative Checklist for Child Fatalities. Reprinted from Missouri State Technical Assistance Team, 2005.

45. POSITION WHEN DISCOVERED (REFER BACK TO QUESTION 43):	
BODY <input type="checkbox"/> On Stomach <input type="checkbox"/> On Back <input type="checkbox"/> Seated Upright <input type="checkbox"/> Left Side <input type="checkbox"/> Right Side	
BODY PINNED <input type="checkbox"/> Pinned Vertically <input type="checkbox"/> Pinned Horizontally <input type="checkbox"/> Other Wedging <input type="checkbox"/> Not Pinned	
HEAD AND NECK <input type="checkbox"/> Face Directly Up <input type="checkbox"/> Face Directly Down <input type="checkbox"/> Face to Right <input type="checkbox"/> Face to Left <input type="checkbox"/> Neck Flexed to Chin <input type="checkbox"/> Neck Extended Back	
USUAL SLEEPING POSITION <input type="checkbox"/> On Stomach <input type="checkbox"/> On Back <input type="checkbox"/> Seated Upright <input type="checkbox"/> Left Side <input type="checkbox"/> Right Side	
46. WAS AIRWAY OBSTRUCTED WHEN DISCOVERED?	
<input type="checkbox"/> Airway Not Obstructed <input type="checkbox"/> Right Nostril Blocked <input type="checkbox"/> Object Covering Mouth <input type="checkbox"/> Objects Near Face <input type="checkbox"/> Both Nostrils Blocked <input type="checkbox"/> Left Nostril Blocked <input type="checkbox"/> Object Covering Nose	
47. DESCRIBE ANY OBJECTS COVERING NOSE, MOUTH OR FACE:	
48. IF CHILD WAS FOUND FACE DOWN, IS THERE A VISIBLE CUR, POCKET OR DEPRESSION IN THE BEDDING?	
<input type="checkbox"/> NO <input type="checkbox"/> YES Depth: _____ Diameter: _____	
49. IS THERE A VISIBLE CREASE ON FACE, NECK OR HANDS FROM PILLOWS OR BEDDING?	
<input type="checkbox"/> NO <input type="checkbox"/> YES	
50. MATERIAL FOUND IN NOSE OR MOUTH:	
<input type="checkbox"/> None <input type="checkbox"/> Formula <input type="checkbox"/> Bloody Froth <input type="checkbox"/> Blood-Tinged Secretion <input type="checkbox"/> Mucus <input type="checkbox"/> Vomit <input type="checkbox"/> Dried Secretion <input type="checkbox"/> Other <input type="checkbox"/> Food <input type="checkbox"/> Froth <input type="checkbox"/> Urine or Stool	
51. SECRETION FOUND ON:	
<input type="checkbox"/> Blanket <input type="checkbox"/> Sheet <input type="checkbox"/> Clothing <input type="checkbox"/> Pillow <input type="checkbox"/> Other Item	
52. WHAT TYPE OF SECRETION	
<input type="checkbox"/> None <input type="checkbox"/> Formula <input type="checkbox"/> Bloody Froth <input type="checkbox"/> Blood-Tinged Secretion <input type="checkbox"/> Mucus <input type="checkbox"/> Vomit <input type="checkbox"/> Dried Secretion <input type="checkbox"/> Other Secretion <input type="checkbox"/> Food <input type="checkbox"/> Froth <input type="checkbox"/> Urine or Stool	
53. FACE IN CONTACT WITH WET MATERIALS	
<input type="checkbox"/> NO <input type="checkbox"/> YES	DESCRIBE:
54. IF FOUND WHILE SLEEPING, WAS CHILD SLEEPING ALONE?	
<input type="checkbox"/> NO <input type="checkbox"/> YES If no, who was child sleeping with?	
55. DESCRIBE BED AND/OR OTHER SLEEPING SURFACE	
56. LIST ALL MATERIALS AND OBJECTS NEAR CHILD WHEN FOUND, INCLUDING BED, SHEETS, PILLOWS, COVERS, TOYS, HOUSEHOLD OBJECTS, ETC.	
57. COULD ANY OF THESE MATERIALS AND OBJECTS HAVE INFLUENCED THE DEATH?	
<input type="checkbox"/> NO <input type="checkbox"/> YES If yes, describe in narrative	
58. IS THERE ANY POSSIBILITY OF OVERLYING? FOR EXAMPLE, TOO LITTLE ROOM FOR TOO MANY PEOPLE, RECENT ALCOHOL OR OTHER DRUG CONSUMPTION BY PERSON SLEEPING WITH CHILD.	
<input type="checkbox"/> NO <input type="checkbox"/> YES If yes, explain in narrative	
59. IS THERE AN APNEA MONITOR IN THE HOME?	
<input type="checkbox"/> NO <input type="checkbox"/> YES Download information from monitor.	WAS CHILD ON MONITOR AT TIME OF DEATH? <input type="checkbox"/> NO <input type="checkbox"/> YES Collect monitor as evidence.
SOCIAL AND ENVIRONMENTAL CONDITIONS	
60. WHO DOES CHILD LIVE WITH?	
61. WHO HAD RESPONSIBILITY FOR CHILD AT TIME OF DEATH? IN NARRATIVE, DESCRIBE ACTIVITIES OF CAREGIVERS DURING DAYS LEADING UP TO THE DEATH.	
62. HAVE FAMILY MEMBERS OR CARETAKERS BEEN REPORTED FOR PAST ABUSE OR NEGLECT?	
<input type="checkbox"/> NO <input type="checkbox"/> YES Contact Hotline to obtain information. (800-392-3738)	FOR DOMESTIC VIOLENCE? <input type="checkbox"/> NO <input type="checkbox"/> YES
63. LIST CHILD CARE PROVIDERS - LICENSED	
UNLICENSED	
64. DO SIBLINGS EVER WATCH CHILD UNATTENDED?	
<input type="checkbox"/> NO <input type="checkbox"/> YES If yes, age:	
65. ARE THERE ANY CULTURAL PRACTICES THAT MAY HAVE INFLUENCED THE DEATH?	
<input type="checkbox"/> NO <input type="checkbox"/> YES If yes, explain fully in narrative.	
66. DESCRIPTION OF DWELLING:	
67. CLEANLINESS OF DWELLING	
<input type="checkbox"/> BELOW AVERAGE <input type="checkbox"/> ABOVE AVERAGE <input type="checkbox"/> AVERAGE	
68. NUMBER OF CHILDREN LIVING AT ADDRESS	
NUMBER OF ADULTS	OVERCROWDED?
	<input type="checkbox"/> NO <input type="checkbox"/> YES
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Figure 4-1-c. Death Scene Investigative Checklist for Child Fatalities. Reprinted from Missouri State Technical Assistance Team, 2005.

- Team leaders examine and evaluate all aspects of the multidisciplinary effort to organize findings and to plan, strategize, and measure progress.
- Consider using a leads-tracking system.
- Team leaders must determine how and what information is released to the public and media, as in abduction cases. Sometimes information that only the suspect would know should be protected.
- By taking on high-profile leadership roles in the community, law enforcement members can provide CFRTs with instant credibility in the eyes of the public.
- They can also propose or support legislative changes that relate to child safety and accident prevention.

CHILD FATALITY SPECIALIST

- When conducting an investigation, the child fatality specialist should neither automatically assume nor overlook the possibility of criminality or negligence.
- Investigators should assume an empathetic, nonconfrontational approach.
- Child fatality specialists may work in tandem with prosecutors, EMS personnel, juvenile officers, ME/Cs, law enforcement officers, public health providers, physicians, and department of family services workers when investigating a case.

TIPS TO REMEMBER

1. A death scene investigation is always necessary when an infant dies, even if the infant is transported to a hospital.
2. Re-creating the scene with a re-creation doll is a critical part of the investigation (**Case Study 4-1, Figures 4-2-a, b, and c**). This should be video recorded.
3. Document both the placed and the found positions (**Case Study 4-2, Figures 4-3-a, b, and c**).
4. To ensure that the scene is accurately re-created, the individuals who actually witnessed the scene (placer and finder) should always be the ones to re-create the scene (**Case Study 4-3, Figures 4-4-a, b, c, d, and e**).

Case Study 4-1

This 8-week-old boy and his 2-year-old sibling were in the care of their paternal grandfather and his girlfriend. The children had been dropped off for the weekend the previous evening around 10:00 pm. The infant was given half of a bottle between 10:30 and 11:00 pm. At approximately 1:00 am the infant and his sibling were placed down to sleep on top of a comforter on a full-sized bed located against the wall in the spare bedroom. The sibling was sleeping on the inside of the bed near the wall. The infant was placed down on his right side. A row of pillows was placed around the outside of the bed in an attempt to keep the infant from falling out of bed.

The grandfather, his girlfriend, and the 2-year-old woke up at 8:00 am. The girlfriend walked into the bedroom to check on the infant. She found the infant in a prone position, with his nose and mouth facedown into the comforter. She turned him over and found him blue, cold to the touch, and unresponsive. EMS was called. The grandfather performed cardiopulmonary resuscitation (CPR) as instructed by EMS. The infant was pronounced dead upon EMS arrival at 8:35 am.

The infant was born with medical complications, including bilateral clubfeet, missing ribs, a hole in his heart, a closed right ear canal, absent left testis, and left intestine bulging out of his left side. All of these were confirmed during autopsy, and a thin, old, left occipital subdural membrane was found. The cause of death was suffocation, and the manner of death was accident.



Figure 4-2-a. Placed position.



Figure 4-2-b



Figure 4-2-c

Figures 4-2-b and c. Placed position.

Case Study 4-2

The mother of this 3-month-old boy placed him in his crib around 11:30 pm. The crib was next to the mother's bed. Around 2:00 am the mother woke up to the infant crying. She picked him up, changed his diaper, and fed him a bottle. She brought him into her full-sized bed along with his crib blanket and a small crib-sized comforter. He was placed in a prone position in the middle of her bed. The mother woke up around 8:30 am and found the infant still lying prone, with his face and nose down into the bedding. Froth was coming out of his nose and mouth, he appeared grayish, and he was unresponsive. EMS was called, and the mother attempted CPR as instructed by EMS until personnel arrived. The infant was pronounced dead at the scene.

The mother's bed had a fitted sheet, the infant's crib comforter, and another full-sized comforter on the bed. There were 2 standard-sized pillows at the head of the bed. Also on the bed were a white cloth, a baby bib, and a small suitcase that was open and contained a pile of clothing and a teddy bear. There was a baby bottle with formula between the comforter and the suitcase. Secretion was noted on the bed where the infant was found facedown.

Autopsy findings included petechial hemorrhages of the epicardium, thymus, and lungs, frothy fluid from the nose, and moderate acute chronic inflammation of the laryngeal mucosa. The cause of death was suffocation, and the manner of death was accident.



Figure 4-3-a. Bed showing blood-tinged spot.



Figure 4-3-b. Placed position.

Figure 4-3-c. Found position.

Case Study 4-3

This 3-month-old girl was dropped off at a babysitter's home by her father around 8:30 am. She was fed a bottle around 10:00 am and then was put down for a nap. She was placed in a portable playpen in a bedroom near the living room. The playpen had a mattress pad with a nylon-type covering with a 2.5-cm foam pad and a foam wedge covered with flannel that was used to keep the infant propped up on her left side. The babysitter checked on her around 10:30 am and again just after 11:00 am, at which time she found that the infant had rolled forward and was facedown with her nose and mouth into the bottom of the playpen. The babysitter quickly picked her up, realized she was not breathing, and called EMS. She attempted CPR until EMS arrived. She stated she had received CPR training in the past. The infant was transported to the ER, where she was pronounced dead by the ER physician.

The babysitter stated that the infant had been acting normally. The babysitter was watching a total of 7 children on this date (2 of those children were her twin sons). Upon arrival of EMS and law enforcement, the parents were called and asked to pick up their children. The babysitter helped perform a scene re-creation.

An autopsy showed no significant findings. The cause of death was suffocation, and the manner of death was accident.



Figure 4-4-a. Bedroom with playpen.



Figure 4-4-b



Figure 4-4-c



Figure 4-4-d

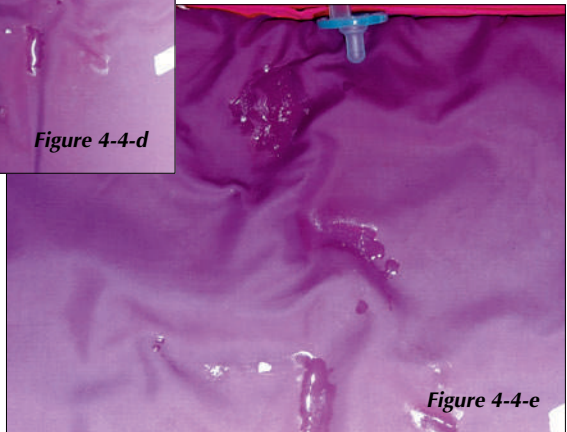


Figure 4-4-e

Figure 4-4-b. Scene re-creation of placed position.

Figure 4-4-c. Scene re-creation of found position.

Figures 4-4-d and e. Mucous secretions in playpen after infant was found, with outline of wedge and infant's head and shoulder.

OVERLAPPING INVESTIGATIONS

- Social service agencies also conduct child fatality investigations.
- If the child were in foster care or under other state control or supervision at the time of death, a special investigation would usually be conducted to identify systemic issues that may have contributed.
- Such cases may form the basis of state CFR or be an integral part of a larger review process.
- In fatalities that occur in juvenile penal facilities, hospitals, and other institutions, special investigators from those agencies and institutions are usually involved.
- Cross-jurisdictional issues require cooperation and coordination to prevent duplication and interagency conflicts.
- Formal multidisciplinary team agreements and protocols guide investigations of child fatalities and other serious children's events.
- Because of differing approaches, investigative and interview results are often different, creating possible superficially contradictory reports and evidence, which can potentially damage criminal, civil, and even regulatory proceedings.

PROSECUTORS

- Prosecutors review evidence, determine whether criminal charges are warranted, and present the case as persuasively as possible to judges or juries.
- Prosecutors must understand how jurors typically make their decisions.
 1. Although jurors are told to base decisions only on evidence presented in the courtroom, most have preconceived notions of child abuse and neglect.
 2. It may be difficult for jurors to believe that someone intends to shake a child to death.

MEDICOLEGAL CONSIDERATIONS

- Many states require proof of “malice aforethought” or some form of “premeditation” in homicide cases.

- Prosecutors must show that perpetrators had the requisite “intent to kill” before the crime, or “ill will and hatred” toward their victims.
- Child homicides have been newly defined since Kempe defined battered child syndrome.
- Evolving from battered child syndrome, shaken baby syndrome and shaken impact syndrome were identified.
- Common laws did not address shaking a child to death, so homicide laws did not accommodate such injury patterns.
- Prosecutors must therefore educate juries about new and often complex medical conditions in understandable terms.

EVIDENTIARY CONSIDERATIONS

- Although evidentiary rules in states may vary, they are all based on the same fundamental principles of common law.

Burden of Proof

- When cases go to trial, judges instruct jurors that the prosecution has a burden of proof to meet.
- In a criminal matter, the burden of proof is “beyond a reasonable doubt,” meaning the prosecution must prove that beyond a reasonable doubt, the crime occurred and the defendant committed the crime.
- In civil cases, plaintiffs may only have to prove the defendant’s negligence by a preponderance of evidence.

Circumstantial Evidence

- Child fatality cases rarely include eyewitness testimonies because these crimes typically occur privately, without witnesses or surveillance cameras.
 - Weapons or poisons are rarely used.
 - With little direct evidence, prosecutors must rely on circumstantial evidence to prove cases.
1. The law ascribes neither greater weight to direct evidence nor lesser weight to circumstantial evidence.
 2. Criminal convictions may be sustained on circumstantial evidence alone if jurors are convinced beyond a reasonable doubt.

3. Prosecutors on CFRTs evaluate the circumstantial evidence in suspected child abuse cases to determine whether it is sufficient to get a conviction.

Hearsay

— *Hearsay* is a statement made by someone other than at the trial or hearing and is offered to prove the truth of the matter asserted.

— As a general rule, hearsay is not admissible in court, but many exceptions to this rule exist.

1. The *medical exception to hearsay* provides that statements made for the purpose of medical diagnoses or treatments are admissible. This means that any statements made in seeking medical treatment are probably admissible as evidence. Includes medical history given to nurses, physicians, emergency medical technicians, and possibly therapists. In CFRTs, conflicting histories can often be critical in building a circumstantial case.
2. *Admissions against interest* are made by suspects and are against their interest. Include confessions or inconsistent statements of material facts; can be critical to proof of guilt.

ROLE IN CFRT'S

— Prosecutors often provide strong leadership to CFRTs, depending on the experience of the prosecutor and the makeup of the team.

— Primary CFRT functions are as follows:

1. Identify cases to be prosecuted.
2. Recommend improvements in the investigative process.
3. Recommend improvements in the social service system for preventive efforts.

— Prosecutors' most important role is to help identify cases that evidence criminal behavior and to assist in getting them into the judicial system.

— Without prosecution, *there would be no judicial accountability for child fatalities resulting from criminal behaviors.*

— When prosecutors decide that child fatalities were likely homicides but evidence is insufficient to sustain charges, they must determine what could have been done differently during the investigative phase to correct evidentiary deficiencies.

— The prosecution then works with law enforcement, medical personnel, and social services to correct solvable problems in investigations and prevent future fatalities.

— In the team review process, prosecutors examine information and make recommendations for charges to be filed, cases to be closed, or further investigations to be undertaken.

— Prosecutors assess what other evidence could be obtained within the procedural and evidentiary rules of court. Additional investigation may include the following components:

1. More witness interviews
2. Further consultation with experts to support or clarify existing opinions
3. Execution of *subpoena duces tecum* (a subpoena instructing the witness to bring specific documents) or search warrants to obtain records not available through the teams
4. Request for scientific testing or examination of physical evidence

— The timeliness of additional investigations is critical to successful criminal prosecutions.

1. Over time, evidence diminishes and memories fade.
2. The best reviews occur when meaningful investigations are still possible.
3. The greater the amount of participation by prosecutors at this stage, the more likely the success of the ultimate prosecution.

— Prosecutors should review the following:

1. All reports and transcripts of interviews by law enforcement
2. Photodocumentation of crime scenes, autopsies, and evidence
3. Autopsy reports and findings
4. Nationwide criminal histories of suspects
5. Nationwide histories of department of family services interventions
6. Relevant educational records
7. Public health records

8. Prior court records of judicial intervention with families

9. Prior relevant medical records

10. Copies of relevant radiographs

— Most states provide such information without a warrant or *subpoena duces tecum* for the purpose of multidisciplinary reviews of child abuse.

— If these safeguards are not in place, it will be necessary to enter into a statutorily-approved confidentiality agreement or agree to the issuance of a *subpoena duces tecum* to each of the responding agencies before the meeting.

— The prosecutor must assist with the issuance of subpoenas or confidentiality agreements.

Search Warrants

— In cases of clear criminal conduct, search warrants are necessary.

— When it is clear that fatalities are homicides, search warrants are preferable to obtain information that is otherwise statutorily unavailable.

— The search warrant is a finding by a judge that there is probable cause to believe crimes occurred.

— When evidence in major criminal cases is obtained by consent or by searches without warrants, defendants usually challenge the validity of the searches with a motion to suppress evidence obtained. Obtaining search warrants bypasses this defense argument.

Charging Process

— Criminal charges are initiated either by prosecutors of the jurisdiction (ie, district attorneys, state's attorneys, county attorneys, or the attorney general) or by grand jury indictments.

— Typically, prosecutors have sole discretion to file the charges.

— In CFRT settings, decisions should be a consensus.

— Prosecutors may recommend referring cases to a grand jury.

1. All states have a statutory provision for calling a grand jury.
2. Grand juries are composed of citizens to convene and conduct investigations.

3. Grand juries can call witnesses, subpoena information, review the evidence, determine whether there is probable cause to believe crimes have occurred, and issue grand jury indictments.
4. Grand jury processes are secret.
5. Witnesses are sworn in as if they were in court and typically do not have the benefit of counsel while giving testimony; witnesses can invoke Fifth Amendment rights against self-incrimination.
6. Witnesses usually provide relevant information they were reluctant to give to investigators, or suspects may make statements that change the nature of the case.

Disposition of Cases

— As criminal court cases proceed, prosecutors keep CFRTs apprised about whether charges are filed or not.

— Prosecutors should also notify team members of pending plea bargains or dispositions.

CPS

— The role of CPS is to conduct civil investigations to determine whether child abuse and neglect occurred, to identify those responsible, and to determine whether continuing risks to the abused children or other children exist.

— CPS can provide services to the family in which the abuse has occurred and institute legal actions in civil court to terminate parental rights in the most serious acts of child abuse or neglect.

— Few children known to CPS die in childhood, but when this occurs, missed opportunities or bad judgments may be contributing factors.

— Teams must recognize the natural tensions CPS administrators feel between a desire to engage in the process and a desire to avoid criticisms by other professionals in review meetings.

— CPS must also protect surviving siblings.

1. Threats to their physical, emotional/developmental, or environmental well-being from irresponsible caregivers may be identified.
2. It is important to be aware who has the authority to remove children from danger and what procedures are followed to exercise such authority.

ROLE IN DEATH INVESTIGATIONS

— Good working relationships among involved personnel from MEs' offices, law enforcement, and CPS are crucial.

— CPS personnel offer knowledge of child abuse and neglect indicators, safety and risk assessment, and resources and services needed to support the family and protect children.

— Role varies depending on suspected causes or circumstances of fatalities, whether they are natural, accidental, homicide, or of unknown causes.

— CPS may be asked to:

1. *Immediately check all internal information systems for prior CPS involvement with deceased children, parents, caregivers, and surviving siblings.* If there was prior involvement, CPS staff should provide verbal reports detailing the nature and extent of involvement. If allowed by state law or CPS policy, CPS should be contacted on the first day of any investigations or inquiries for unexpected child fatalities.
2. *Assist in interviewing parents, caregivers, and surviving siblings of deceased children.* Information collected assists investigative teams in gathering and analyzing descriptive information about fatalities and reveals pertinent data on family problems, strengths, and needs. Through knowledge of family dynamics, CPS can be supportive of and sensitive to issues of family grief but neutral and objective in collecting information.
3. *Conduct a safety and risk assessment on surviving siblings in families.* Risk factors that may pose danger to surviving siblings are identified. Those situations requiring immediate CPS intervention or provisions of supportive services are addressed.
4. *Assist in interviewing witnesses and other people who may have relevant knowledge.*
5. *Assist in observation and documentation of reported child fatality scenes.*

— CPS participates in determining whether death resulted from natural causes, child abuse or neglect, or accidental injury.

- A CPS history of contacts with families can clarify the context in which children were living.
- CPS representatives should be drawn from the highest possible level capable of making decisions and commitments on behalf of their agency.
- They must know agency policies and systems, as well as the dynamics of child maltreatment and best practices in prevention and response.
- They must have the time and skills to gather and understand the information in agency records.
- It may be preferable to involve more than one CPS staff person to ensure all the important roles are adequately addressed.

Internal Review of CPS History

- CPS personnel should routinely review agency records for all deceased children, parents, caregivers, and surviving children who appear on review agendas before meetings.
- At a minimum, note the following:
 1. Agencies' management information systems for prior referrals, including reports related to children's fatalities. With records of contacts, agencies should review facts about current incidents (if reported to CPS), especially:
 - A. What agencies perceive happened that resulted in children's fatalities
 - B. Safety and risk assessments
 - C. The presence of individuals who accentuated or helped mitigate risks
 - D. Key decision points (to remove or not, to return a child)
 - E. What services were offered and provided to families before fatalities
 - F. How frequently agencies visited families and what was observed
 2. Review all past reports of child maltreatment, identify outcomes of previous referrals, and look for patterns. Whenever possible, agencies may interview CPS staff involved with prior reports to obtain accounts of those incidents in more detail. CPS representatives must report accurately on allegations of maltreatment, perpetrators investigated, and resulting classification decisions. Note dates of referrals, other professionals involved, and services offered. Report the presence of family strengths or resources.

3. Check for reports to other CPS jurisdictions, including those located out-of-state, in which families had lived or where reports may have been filed.
4. Note the presence of indicators of substance abuse, intimate partner violence, caregiver mental illnesses, unusual demands on caregivers by this child or other children (chronic illnesses, developmental delays, physical limitations), or other potentially comorbid risk factors.
5. Identify other contacts with agencies (where available), such as income maintenance, food stamps, work programs, or training.

Case Presentation

— CPS personnel should present the information obtained in internal reviews in a clear, structured way, typically stating basic facts not already articulated.

— When casework judgments or inaction may have played a pivotal role in child fatalities, CPS can present the facts without commentary.

— Explain how cases, in retrospect, should have been managed and explain internal reviews or actions that are underway.

Consultant Role

— CPS representatives are focused on the role of caregivers in fatalities and events leading up to the deaths.

— Listen to the medical representatives' explanations of the cause of death and any death scene information and apply CPS policies to determine:

1. Whether the deaths resulted directly or indirectly from caregivers' behaviors or inattention.
2. Whether behaviors or inattention were within the reasonable limits of parenting.
3. Whether the reported facts meet the criteria for CPS investigations.

— Seek expert opinion beyond that of the treating physicians.

— CPS should also ask probing questions of other team members to help form opinions.

1. Could help fact-finding processes move forward

2. Can identify strategies used to reduce the risk of such events for other children
 - Such considerations are critical when CPS has no reports, but surviving siblings or other children are living in environments in which fatalities occurred.
 - CPS representatives may determine that new reports on behalf of siblings are needed to investigate immediate or future safety concerns.

CPS CASE RESPONSIBILITIES

- Gather all the information available from all related disciplines as rapidly as possible to assess the safety of siblings and the risk for future maltreatment.
- Process facts as learned.
- Obtain insights of team members to help determine whether other children need protection and from whom.

Case Classifications

- CFRs facilitate proper case classifications in CPS records and information systems.
 - Accuracy of CPS classifications in the central registry can have long-lasting effects on the parties involved.
 - Effects may include denying people the ability to care for children in licensed agencies or work or volunteer for childcare organizations.
1. Inaccurately classifying people as responsible for abuse, especially in maltreatment-related fatalities, is very difficult for those involved.
 2. Failing to classify a case accurately when individuals are culpable for a child's death can put other children at risk. This can be devastating.
 3. Thorough reviews of the circumstances and facts surrounding fatalities are the best way to prevent errors.
 4. CFRTs at state levels have uncovered systematic discrepancies among state CPS data systems, vital statistics, and state homicide data attributable to differing definitions and systematic underreporting.
 5. Problems are most acute when there are no surviving siblings and no official CPS records.

Role in System Improvements

— CPS agency members can determine what lessons can be learned by the following:

1. Assessing gaps and inadequacies in community family and service support systems
2. Identifying opportunities to improve state laws, policies, or procedures
3. Identifying enhancements to agency safety and risk assessments
4. Identifying strategic partners in communities
5. Identifying training improvements
6. Preventing accidents

MENTAL HEALTH PROFESSIONALS

— Historically, the mental health profession has provided leadership and set structure for developing the CFR process.

— The role of mental health professionals differs based on team function.

— Includes psychiatrists, psychologists, social workers, counselors, and therapists, with a range of specialties in the areas of families, children, adults, forensics, and child welfare.

EXPERTISE

— Backgrounds and experience in mental health disorders, treatment, and diagnoses.

— Use of research methods and statistics.

— Establish data systems that document cases and manners of death and establish computer-tracking databases that use statistical methods so teams can identify child fatality trends over time.

Psychiatrists

— Possess backgrounds in medicine and mental health and provide information on the connections between them.

— Know about mental illness and psychotropic medications and, therefore, can help CFRT members understand aspects of cases.

— Have training in identifying and diagnosing symptoms of mental illness.

Psychologists

- Have training and experience in mental health assessment and diagnosing mental illness.
- By reviewing case records, can identify symptoms associated with mental illness and provide perspectives on how this might contribute to the child's death.
- Know about and can explain clinical treatments and interventions.

Social Workers/Counselors

- Have focused training in family dynamics and family systems.
- May be able to identify critical aspects related to cases.
- Traditionally are well trained in child welfare policies; can be excellent sources of information in this area.
- Social workers on CFRTs may represent CPS; can offer information specific to social work and the child protection system.

CONTRIBUTIONS TO CFRT PROCESS

- Must understand family dynamics, mental illness, individual motivation, and parent-child relationships.
- Offer advanced clinical knowledge of psychological factors associated with infant and child homicide or fatal neglect (eg, maternal depression, parental mental illness, substance abuse).
- Knowledge related to the psychological correlates of child abuse and neglect, suicide, homicide, and other violent behaviors.
- Knowledge of the symptoms, progression, and possible consequences of mental illness.
- Diagnostic skills to identify undiagnosed mental illness.
- Knowledge of mental health treatment and the skills to review and provide information based on records.
- Training in how to identify risk factors for violence and suicide.

Knowledge About Child Development

- Includes physical and cognitive development.

1. Knowledge of children's developmental stages and abilities can help members of the team consider the developmental expectations of parents and the role these expectations may have played in fatalities.
 2. Accidents, neglect, and child abuse leading to child fatalities can be associated with a lack of parental understanding about children's developmental abilities.
- Includes making recommendations for interviewing siblings in a manner consistent with age and developmental level.

Forensic Evaluations

- Designed to give the legal system information about alleged perpetrators.
1. Information used to determine whether individuals can assist in their defense or whether they have severe or disabling depression or psychiatric features.
 2. Mental health team members may be involved in forensic evaluations or may be able to give feedback about forensic aspects of the case that have been conducted by others.
- When parents appear to be involved in children's deaths, forensic evaluations could include assessments of the following parental behaviors:
1. Distorted thinking about the child by the caregiver(s). For example, the child is demanding too much from the parent, the child did not return the parent's love or affection, or the child needs constant discipline.
 2. Ability to differentiate the child's needs from their own.
 3. Personal sense of neglect, psychological needs, or entitlement.
 4. Level of psychotic delusion or depression that could produce highly distorted thinking (eg, the world is too evil a place for the child to live).

Note: For additional information, see Bonner et al, Ewing, Finkelhor, Korbin, and Resnick.

CONTRIBUTIONS TO TEAM

Team Dynamics

- Traditionally have extensive training in interpersonal processes and understand principles of group dynamics.

- May help sustain successful and cohesive teams by managing difficult interpersonal situations among team members.
- Facilitate positive team dynamics by identifying team members who are defensive, overwhelmed by information, or dominating.

Vicarious Traumatization and Defusing

- Help team members cope with the effects of vicarious traumatization.
 1. The cumulative stress of continued exposure to traumatic information can affect normal coping mechanisms and lead to physical and emotional exhaustion, burnout, or compassion fatigue.
 2. Develop programs to support and help members of their team cope with the vicarious trauma of repeated exposure to other people's trauma.
- Defusing process has 3 sections (**Table 4-2**).

Table 4-2. The Defusing Process

INTRODUCTION

- Introduce the defusing team
- Inform the group about the purpose of the defusing
- Describe the defusing process
- Encourage voluntary participation
- Discuss the need for confidentiality
- Summarize the main guidelines of the defusing process
- Motivate participation and encourage mutual support among the participants
- Alleviate anxiety and answer questions about the defusing process
- Provide assurance that the defusing is not investigative
- Offer any additional support, if necessary, following the defusing

EXPLORATION

- Invite participants to discuss their individual experiences with the traumatic event
- Ask participants to share facts, thoughts, reactions, and symptoms
- Set the tone as conversational, not investigative

(continued)

Table 4-2. The Defusing Process *(continued)*

- Encourage everyone in the group by inviting them to speak
- Ask clarifying questions about the incident and the participants' roles in it
- Inquire about signs and symptoms of distress
- Wrap up conversation about the incident, if it begins to lag, so you can move into the final phase

INFORMATION

- Accept and summarize the information provided by the group in the exploration phase
- Answer any questions the group may have brought up
- Normalize the experiences and reactions of the group
- Share and teach practical stress-survival skills
- Provide summary comments to conclude the defusing
- Be available to the group upon conclusion of the session

Debriefing with CPS Workers

— The deaths of children are the most emotionally distressing critical event experienced by child welfare workers.

— Workers typically face internal reviews by the CPS agency about how the cases were handled and may be called to testify in criminal proceedings.

— Three major areas of concern are: distress experienced by individual workers, distress radiated throughout the CPS agency, and weakened community and public support.

Critical Incident Stress Management

— Mental health professionals often have specialized training in critical incident stress management (CISM) that can be used to assist members of CFRTs or other professionals in communities.

— Involves debriefing and defusing processes developed to reduce traumatic reactions to stressful situations, prevent the development of posttraumatic stress disorder, and help identify individuals who might need additional mental health services.

- CISM interventions are informal and usually conducted within 24 hours of stressful incidents or in response to accumulated stress.
- Focus of interventions is to verbalize and process the traumatic experience in small, structured group settings in which the participants describe their feelings or reactions to incidents or events and receive support from their peers.
- Problem-solving strategies are developed so the productivity of groups or work units is unimpaired.
- Used by law enforcement, firefighters, emergency medical teams, disaster response teams, military personnel, clergy, and public school staff.
- Interventions help decrease job turnover rates and the need for additional mental health services.
- One-time interventions may be insufficient to meet individual needs and can make symptoms worse; debriefing sessions must be followed up and referrals for additional services provided.
- Interventions are conducted individually and in small groups.
- The educational phase of the debriefings focuses on helping workers identify effective coping skills, identify their social support systems, and learn how to manage their anxiety at work and at home with their families.
- Participants should contact their employee assistance program or other mental health professionals if symptoms persist for more than 3 weeks.
- Investigations and legal processes can be ongoing for many months, making it difficult for workers to have a sense of closure.
- Workers' stress comes from the following situations:
 1. Thinking there was something else they could have done to make certain that the child was safe
 2. Having had a prior relationship with the family
 3. Viewing the infant or child in the hospital
 4. Reading the autopsy report
 5. Visiting the death scene

6. Continually being assigned the normal number of cases when feeling anxious and highly stressed
7. Completing the documentation required to write up a case
8. Appearing before the CPS internal review board
9. Having to testify in court

Professional Training and Education

— Involved in local and state training related to child fatalities.

— Additional trainings may focus on specific topics related to child fatalities, such as shaken baby syndrome, the effects of prenatal substance use, and home safety.

ROLE IN COMMUNITY

Assistance to Surviving Victims

— Bereavement counseling of surviving family members to assist in recoveries after fatalities.

— Provide services to emergency department personnel or nursing staff.

— Professionals with training in grief counseling or specialized CISM training can assist students and staff in their own emotional responses.

— Mental health professionals on CFRTs may serve as liaisons between the mental health community and the CFRT and can provide referrals to community services for surviving family members.

Prevention Efforts

— Develop and guide public education campaigns.

— Disseminate information through community presentations of prevention messages.

ETHICAL ISSUES

— Involvement in the review of children's fatalities when they have had prior professional or personal relationships with the children or the families can raise legal and ethical issues that must be resolved before reviews.

— The information they have may not be confidential and can be discussed with team members.

— Professionals may determine that they have information they are not free to discuss and they may need to recuse themselves from cases.

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SOCIAL AND ENVIRONMENTAL ISSUES

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INTIMATE PARTNER VIOLENCE

— Intimate partner violence (IPV), also known as domestic violence, is a crucial risk factor in child fatalities.

— Children living in violent homes may be physically abused, neglected, or at risk of death.

— The coexistence of substance abuse and domestic violence in homes increases the risk of neglect.

— In-depth evaluation for domestic violence is uncommon on child fatality review teams (CFRTs), and the role of IPV in child fatalities is poorly studied as a result.

EPIDEMIOLOGY

— Nearly 25% of women and 7.6% of men surveyed have been raped or physically assaulted, or both, by intimate partners.

— The National Crime Victimization Survey revealed that 43% of battered women lived in households with children younger than 12 years.

— All children living in violent homes should be evaluated for abuse, neglect, and safety issues to prevent fatalities.

Prenatal Trauma

— When pregnant women are battered by intimate partners, both fetus and mother may experience physical harm such as placental abruption before birth.

— Battering during pregnancy is associated with other factors that cause fetal harm:

1. Late prenatal care
2. Preterm labor
3. Illegal substance, alcohol, and tobacco use
4. Increased risk of low birth weight infants

Neglect

— Many injury fatalities result from lack of supervision; the important issue is why supervision was lacking.

— Children exposed to IPV have more health problems.

— Victims of abuse may focus attention on batterers to control violence or withdraw from children in self-protection.

— Could lead to poor supervision and unattended children.

— Coexisting alcohol and substance abuse leaves impaired parents, poor supervision, and increased risk of injuries or harm to children.

— Mental health problems (eg, depression) are more common in abused women, causing poor supervision and unintentional injuries.

Emotional Consequences

— Children and adolescents exposed to IPV have more behavioral problems, both externalizing and internalizing.

— Internalizing behaviors are also risk factors for suicides.

DOMESTIC VIOLENCE FATALITY REVIEW TEAMS

— Seek to determine what went wrong and what could have prevented these fatalities.

- Operate at systemwide levels rather than personal ones to affect systemic changes rather than assess blame.
- All IPV-related fatalities are reviewed, both homicides and suicides.
- Membership tends to be inclusive and is often based on legislative requirements.
- Core membership is from public health, criminal justice, and advocacy and social services.

THE GRIEVING PROCESS AND FAMILY SUPPORT

- Fatalities can occur:
 1. At any time, including the neonatal period, infancy, childhood, or adolescence.
 2. From congenital defects, illnesses, accidents, homicides, suicides, or from unknown causes.
- Death notifications begin the process.
 1. Parents often begin to deny the death.
 2. With an extended illness, parents may “bargain” with higher powers.
 3. Parents may question professionals’ credentials, knowledge, and backgrounds, convinced a mistake was made.
 4. Many parents report “magical thinking,” such as reading signs into the changes displayed on the monitors of medical equipment or clocks. These “games” allow parents to exert some control over situations in which they really have none.
- Families’ abilities to cope with grief and face death are influenced by physical health, feelings of self-worth, and their view of the child’s illnesses or injuries.
 1. Caring, involved pediatric intensive care staff who become emotionally engaged with parents may positively affect the long- and short-term effects of grieving.
 2. The process begins when medical professionals with a warm, caring manner use readily understood language to explain that the child has a critical condition or injury.

3. Understanding what medical terms mean and why certain tests are needed helps caregivers and families prepare for death in critical situations.
4. Families are usually devastated by a child's death but must deal with individuals and agencies that advance them through their child's last days, such as fatality investigations, funeral arrangements, and criminal inquiries.
5. Families and friends of deceased children need to understand what has happened and why; the "system" needs to process the death and move on.
— Most professionals are taught to present a caring public face but not become personally involved with families.
 1. The public face is designed to distance professionals (and their emotions and feelings) from families and can be perceived as cold, mean, or uncaring.
 2. When traumatized individuals most need care, professionals may inflict further harm through unacceptably insensitive responses.
 3. Professionals must recognize that words, actions (or inactions), and attitudes toward families have long-term consequences.
— Professionals must effectively assist families during and after the child's death.
 1. Emergency medical technicians can provide the parents with detailed information from the scene about the last moments of the child's life.
 2. Some hospitals allow families to be present during resuscitation efforts. Parents are part of the process and witness that medical personnel are doing everything possible. Also ensures parents are present at the declaration of death, giving them a sense of control.
 3. When further evaluations of the death are necessary, investigators (child protection and law enforcement) can reduce secondary traumatization and gather critical information by being compassionate and allowing parents to remain with their children (before deaths and immediately after deaths) rather than requiring them to leave hospital facilities.
— Legal professionals can educate families about the renewed grief accompanying criminal proceedings.

1. Many families believe resolution of the criminal case will bring relief but find it brings added grief.
2. If cases are postponed and court dates changed repeatedly, families remain in trauma and grief.
3. Legal professionals should keep postponements at a minimum and inform families of details as cases move forward.
4. Regardless of the court outcome, the child is still dead and the family suffers.

IMMEDIATE SUPPORT

Family Members

— Well-meaning family members may “take charge” and handle details or make decisions they believe are needed.

— Many parents are initially grateful for this support, but others can become angry and resentful.

— The best approach for family members immediately after the child’s death is to be available to parents (eg, through hand-holding and support), but to allow parents to make decisions and final arrangements.

Friends and Coworkers

— Relationships between grieving parents and their friends often change.

1. Friends can become distant or elusive because they don’t know what to say.
2. Friends feel helpless around grieving families and confused as parents continue to speak of their child in the present tense. Parents often do this to keep the child alive in their minds.
3. Friends become uncomfortable when parents go through long silences or extended periods of crying.
4. Parents may experience guilt severe enough to become incapacitated.
5. Friends and family members may become judgmental regarding grieving parents’ actions or lack of actions.
6. Friends, family members, and sometimes professionals often make misguided comments or offer too-easy explanations for the death.

7. The statement that does bring comfort to most grieving parents is, “I am sorry.”
8. Many parents do not begin healing for years, and some might never heal.
9. The word “closure” can also be offensive to parents.
10. Many parents feel angry that no one will acknowledge their lost child. It is as though they have had 2 losses—their child and the friends they thought would be there for support.

— Bereaved parents often receive strong initial support from coworkers and bosses, but when they go back to work after the death, colleagues expect them to be “normal” and become frustrated that they cannot continue working as before the child’s death.

1. Parents report anger and pain that coworkers are “going on with their lives” as if nothing happened, when they are caught in inescapable grief.
2. The situation can become intolerable to parents, who then resign or see termination as the only solution.

Professionals

— Help family members prepare for coworkers’ reactions by talking honestly about what they can expect.

1. Provide information about the grieving process in advance to employers to help them understand the trauma and to prepare coworkers for grief reactions.
2. In the work environment, work goals are primary—but caring professionals can prepare the work environment to meet the needs of grieving parents.

Parents/Childcare Providers

— Parents feel guilty about not being with their child when he or she died.

1. Especially true when they had doubts about whether working or other events that took them away from the child were truly important.
2. Parents often believe that the death would not have happened if they’d been there.
3. The more information childcare providers can offer parents about the last hours, the better for the parents.

— Educate childcare providers to avoid washing clothes or other belongings because these items often have the children's smells on them.

1. Parents, especially mothers, put these items in plastic and smell their child's scent for months and even years after the child is gone.
2. This practice offers some comfort and a more gradual good-bye for parents.

LONG-TERM SUPPORT

Parents' Reactions

— Parents experience hysteria, fear, shock, disbelief, and sometimes much more in the first weeks and months after a child's sudden death.

— Whether children die because of accidental or natural means or at the hands of other people, the shock and grief of parents is not completely describable.

— Many feel grief physically, including symptoms such as nausea, headaches, a "knot" in the chest that will not move, pain in the arms or legs, or other ailments.

— Grieving couples may express their grief in completely different ways.

1. Mothers and fathers grieve differently; differences usually have less to do with gender than with personality.
2. The toughest challenge is separating the pain of the child's loss from their feelings for one another.
3. Many fear they can never be happy together again and experience guilt when they enjoy each other without their child.

— The emotional and physical states in which parents start are often predictive of where they will end.

1. Those who were relatively healthy before their loss tend to invest the time and work needed to ensure they end up relatively healthy.
2. Healthy couples give one another permission to deal with losses individually yet have a means of connecting.
3. Couples with fragile relationships before the death of a child may not wish to continue the relationship.
4. Professionals should discuss the individuality of grief.

Children's Rooms

- Many parents keep rooms as they were; visits make them feel peaceful and closer to their child.
- Some parents feel depressed and uncomfortable in their child's room; they pack away belongings almost immediately.
- When a child's death occurred at home, many families move because the memories are so painful; others never want to leave these homes.
- Most families need to see all of their feelings as valid; they should do what makes them most comfortable.
- Some parents stay with friends or relatives until they feel able to make permanent decisions.

Reminders and Keepsakes

- Many parents find great comfort in having a tangible representation of their child.
- Funeral homes can help grieving parents by allowing them to take footprints, handprints, or locks of hair.
- Parents report these items are crucial in processing their grief.
- Such items can be the beginnings of memory books or family keepsakes.

Cultural Differences

- Some cultures are less likely to seek help from counseling professionals.
 1. These cultures typically feel that “family business” should be handled within families; going outside the family is admitting the family is inadequate.
 2. Don't assume members of certain ethnic groups will not seek professional counseling, but Asians, Hispanics, and African-Americans are less likely to seek outside organizations for help, often because they feel these services cannot identify with their cultural needs.
- People may reach out to individual religious or social organizations.
 1. Middle-income families are most likely to seek assistance.
 2. Services must be available at no or low cost so middle-income families can obtain them over the long period needed.

— Agencies that want to meet the needs of many cultures should provide counseling professionals who can relate to culturally diverse clients at low or no cost.

FATALITY CAUSED BY ABUSE

— Perpetrators can be parents, other household members, relatives, friends, neighbors, those hired for in-home childcare, or a childcare center employee.

— Denial by nonoffending caregivers and family members of victims is common and expected during the initial period after injuries or deaths of children.

— People generally do not leave children with caregivers they know are abusive.

— Most people believe their children will be safe, so they react with denial when told a trusted caregiver caused the fatality.

— In abuse, families' grieving processes are postponed until the legal steps occur.

— How parents grieve will be judged and sometimes criticized.

— Professionals must realize it may be years before families can begin their grief process because of investigative and legal delays.

THE GRIEF PROCESS

Emotions of Grief

— Family members may experience grief emotions singly or many at once.

— In the process, they may experience the "tasks of grieving" (see **Table 5-1**).

Posttraumatic Stress Reactions

— Psychosocial distress is expected after sudden, traumatic deaths and is seen in suicide, sudden infant death syndrome (SIDS), and fatal accidents.

Note: Similar reactions may be seen with miscarriages and stillbirths.

— The best predictor of distress is family members who begin to self-isolate.

— Posttraumatic stress reactions are also common after a child's death.

Table 5-1. Tasks of Grieving for Families Who Have Lost a Child

1. Family members must acknowledge and accept the reality that the child is dead.
2. Family members must acknowledge and experience the pain (physical and emotional) associated with losing the child.
3. They also have lost not only the child, but also the dream of the child they were going to have.
4. Family members must adjust to a life in which their child is no longer present.
5. Family members must find a place in their minds for the child who is no longer alive.

Adapted from Worden JW. Children and Grief: When A Parent Dies. New York, NY: Guilford Press; 1996.

— Feelings can be exacerbated in homicide and include the following:

1. Recurrent and intrusive reexperiencing of the events (dreams or flashbacks)
2. Avoidance of places or events that remind them of the death and the child
3. Ongoing feelings of increased arousal (eg, constant vigilance, exaggerated startled reactions)

— Professionals must consider how children’s violent deaths affect parents’ mental health and their ability to move forward.

— Children’s deaths by accidents, suicides, or homicides may require 3 to 4 years for parents to put the death into perspective.

Implications for Professionals

— Professionals who understand they are a part of the traumatic event are better able to work with families.

— Family members’ interactions with medical personnel, investigators, child protection workers, and prosecutors can trigger emotional reactions that manifest as physical illness.

— The dynamics of victimology can make them feel they are emotionally back to “square one” each time they interact with professionals.

Grandparents' Grief

— The loss of grandchildren to traumatic deaths creates complicated scenarios for grandparents because they must face their own losses and also deal with the losses and grief of their children.

— When the loss of grandchildren is due to causes, such as SIDS or stillbirth, the need to help their children may sidetrack the grandparents' addressing of their own grief.

— When grandchildren die from abusive injuries at the hands of their parents:

1. Grandparents' reactions range from the need to care for surviving grandchildren to becoming central figures in criminal investigations.
2. These situations may cause strained loyalties, confusion, or compromised health for grandparents.
3. They may feel they are alone in the world and need support.
4. Professionals must coordinate all information about grandchildren's deaths and ongoing investigations to minimize confusion and protect case integrity.

Effects on Siblings

— Siblings often handle their pain alone because parents are overwhelmed by grief.

— Siblings can experience extreme loneliness and believe no one understands what they're going through.

— They often do not understand why their sibling was taken from them so quickly.

— Some siblings feel a loss of identity because their self-image is interrelated with the lost child, anger, guilt, grief, and abandonment.

— In cases of abuse, siblings may also grieve the loss of functional parents and could experience foster care or relative placements that require adjustments.

— Adolescents experience unique effects, especially if they are in placements outside the home when their sibling died.

1. If adolescents have social networks that provide for open, supportive communication, healthy grief resolution can be more readily reached.

2. Professionals must assess whether adolescents can accept intense, focused interventions and provide professionally organized support groups.

Factors that Inhibit Grieving in Children

- The reaction of adults can dramatically influence the surviving children’s ability to grieve.
- Children may have endured multiple losses and face future losses.
- Some coping skills and strategies that parents can learn and pass on will help children through this process (**Table 5-2**).

Table 5-2. Assisting Children to Live with Death

1. Children need to learn how to mourn; that is, to go through the process of giving up some of the feelings they have invested in an animal or person and go on with other and new relationships. They need to remember; to be touched by the feelings generated by their memories. They need to struggle with real or imagined guilt over what they could have done. They need to deal with their anger over the loss.
2. Children need to mourn over the small losses, such as animals, in order to deal better with larger, closer losses of people.
3. Children need to be informed about a death. If they aren’t told, but see that adults are upset, they may invent their own explanations and even blame themselves.
4. Children need to understand the finality of death. Because abstract thinking is difficult for them, they may misunderstand if adults say that a person or animal “went away” or “went to sleep.” If you believe in an afterlife and want to tell your child about it, it is important to emphasize that they won’t see the person or animal again on Earth.
5. Children need to say good-bye to the deceased by participating in viewings or funerals, if only for a few minutes. No child is too young to participate in these activities.
6. Children need opportunities to work out their feelings and deal with their perceptions of death by talking, dramatic playing, reading books, or expressing themselves through the arts.
7. Children need reassurance that the adults in their lives will take care of themselves and probably won’t die until after the children are grown; however, children need to know that everybody will die some day.

(continued)

Table 5-2. (continued)

8. Children need to know that other children die, but only if they are very sick or if there is a bad accident. It is equally important that they understand that almost all children grow and live to be very old.
9. Children need to be allowed to show their feelings; to cry, become angry, or even laugh. The best approach is to empathize with their feelings. For example, you might say, "You're sad; you miss grandma. Tell me about it."
10. Children need to feel confident that their questions will be answered honestly and not avoided. They need to know that adults will give them answers they can understand. Adults should take their cues from the children and answer only what they ask.

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- Siblings must have their grief acknowledged and receive help.
 - Professionals must provide information about local resources for the siblings of deceased children.
 - Children's hospitals, community mental health centers, religious organizations, and chapters of Mothers Against Drunk Driving might have specially trained social work staff members to help in death notification, trauma, and grief.
 - The agencies listed in **Table 5-3** offer free support services to families nationwide.
 - National incidents of school violence bring to the forefront the role of school nurses and counselors in helping students face losses.
1. When schools are associated with death, special attention and care are needed to lessen the fear and anxiety.
 2. Information can also be provided to help siblings cope with death.
 3. The grieving process is an individual experience that all people go through differently.

Table 5-3. Organizations With Support Services for Families

The Compassionate Friends

- <http://www.compassionatefriends.org>
- A national self-help support organization, which assists families in the positive resolution of grief following the death of a child

The Shaken Baby Alliance

- <http://shakenbaby.org>

First Candle

- <http://www.sidsalliance.org>
- Focused on stillbirths and SIDS, First Candle exists to promote infant health and survival during the prenatal period through two years of age.

Cancer Lifeline

- <http://www.cancerlifeline.org>

National Organization of Parents of Murdered Children, Inc.

- <http://www.pomc.com>

Mothers Against Drunk Driving

- <http://www.madd.org>

PREVENTION RECOMMENDATIONS AND ACTIONS

— A major challenge for the CFRT is ensuring that what is learned from review is translated into solid, actionable recommendations heard by the right people and results in action and changes that lead to prevention.

— Many state CFRTs produce annual reports sent to the legislature, the governor, state agencies, and others on request.

— Very little empirical evidence shows that the knowledge of how and why children die has had a significant impact on the number of children dying.

INCREASING PREVENTION EFFECTIVENESS

— Success in translating child fatality data into actions to prevent child fatalities and increase overall safety for children is most likely to occur when certain conditions are present.

Share a Common Belief in and Commitment to Prevention

- CFRTs are responsible for using data from the review process to teach their own agencies and the community that injuries to children are predictable, understandable, and preventable.
- Members must be credible and have influence to affect prevention outcomes.

Become a Prevention Advocate

- A prevention advocate is responsible for ensuring a systematic review of prevention and keeping the discussion focused on prevention.
- Time is allotted to periodically review trends and patterns in the fatalities reviewed so that broader recommendations for policy, practice, societal, and other changes are considered.
- Prevention advocates and the committee must share information about proven prevention strategies to avoid duplicating the process.
- Advocate for implementing evidence-based prevention and intervention efforts; tracking data on child fatalities to help define and redefine local and state prevention strategies; compiling information to guide policy and legislative changes; and acting as a liaison between the committee and community resources.

Consider Systematic Approaches to Prevention

- See **Tables 5-4** and **5-5**.

Make Clear and Effective Recommendations

- CFRT prevention recommendations should be clearly written and communicated, identify the desired outcome and risk or protective factors to be influenced, and identify the target population.
- Most shaken baby syndrome prevention efforts employ the strategy of telling parents “don’t shake” to focus on the main cause of the shaking—the inability to cope with infant crying (**Figures 5-1-a** and **b**).
- Guidelines for writing effective recommendations are listed on the National MCH Center for Child Death Review Web site (<http://www.childdeathreview.org>).

Table 5-4. Spectrum of Prevention

Developed by Larry Cohen of the Prevention Institute, the Spectrum of Prevention offers a useful model for prevention advocates and CFRTs as they consider prevention recommendations. There are 6 levels at which prevention activities can occur:

1. Strengthening individual knowledge and skills
2. Promoting community education
3. Educating providers
4. Fostering coalitions and networks
5. Changing organizational practices
6. Mobilizing communities and influencing policy and legislation

Adapted from Cohen L, Swift S. The spectrum of prevention: developing a comprehensive approach to injury prevention. Inj Prev. 1999;5:203-207.

Table 5-5. National Maternal and Child Health (MCH) Center for Child Death Review Approach to Prevention of Child Deaths

1. Know where and how often these deaths occur.
2. Understand who is most at risk and why.
3. Create effective interventions.
4. Immunize other children from harm.
5. Understand that injuries to children are not accidents, random, or unstoppable.
6. Initiate prevention activities at a team level and at each member's level.
7. Identify who will take the lead.
8. Foster accountability and recognize and reward community efforts.

Adapted from Preventing child deaths. National MCH Center for Child Death Review Web site. Available at: <http://www.childdeathreview.org/preventing.htm>. Accessed April 7, 2006.



Figure 5-1-a



Figure 5-1-b

Figures 5-1-a and b. Parent educational materials targeting infant crying. Reprinted with permission from Prevent Child Abuse Georgia.

Promote Both Difficult and Easy Recommendations

— Prevention measures for situations perceived by people as “accidents” and not viewed as directly involving parental or caregiver behavior tend to be easier to move into action phases.

— CFRTs must be persistent and creative to effect changes in the more difficult areas. Identifying multiple strategies with small, measurable steps may be a more effective approach than a broad recommendation, such as increasing parent education.

Build Public Will

— Years of strategic work may be required to move from public acknowledgment of the problem to recognition of possible solutions, to understanding what it will take to produce change, to finally being willing to make the sacrifices and compromises to accomplish change.

— Learning about social marketing and communication; building strategic partnerships; establishing data- and strategy-sharing and data-pooling across states and CFRTs, and other strategies may be needed to build the public will required to help prevent child fatalities.

Understand the Audience

— Before selecting a key prevention message and the messenger for CFRT recommendations, one must understand the target audience and what they know and believe about the problem.

— Prevention advocacy and prevention strategies can be pointless if CFRTs have no awareness of the audience's existing frames on the issue.

— Also helpful is the recognition that the target population usually contains 3 main subgroups:

1. The group who just needs to hear the right message to act as desired.
2. Those who can hear the message about safety but will not act until there is a consequence to not changing their behavior.
3. The very resistant group who will need to hear the message, the consequences, and even more to change behavior. The third group is often most at risk, and we seem least equipped to reach them.

— The messages, delivery vehicles, and messengers differ for each group.

Enlist the Help of Legislators and Elected Officials

— Legislators and other elected officials are an important audience in prevention advocacy.

1. Requires they fully hear and act on recommendations.
2. The most effective message clearly identifies the problem, describes what can make a difference, and states desired actions.

— Presenting a few key facts and a brief proposal for prevention is more effective than using pages of data and information.

— Identifying the specific impact of the problem on the area the official represents helps in getting the elected official's attention.

— Demonstrating constituents' support for proposed recommendations is also important.

1. Build relationships with key legislators and chairs of key committees that review potential legislation related to the issue.
2. Cultivate bipartisan support, but in the end, majority party support will be needed.
3. Build relationships with key aides in the governor's office and position the CFRT as a credible source of information.
4. Realize it is unlikely that child fatality prevention will be accomplished through legislation alone.

Develop Prevention Messages

— Identify the most effective prevention recommendation and learn about the individuals or groups to reach to bring about action on the recommendation.

— Determine key messages to be communicated and the most effective way to communicate them (**Figures 5-2** and **5-3**).



Figure 5-2



Figure 5-3

Figure 5-2. Infant outfit promoting proper sleeping position. Reprinted with permission from Manatee County Sheriff's Office, Florida.

Figure 5-3. Poster targeting children being left alone in cars. Reprinted with permission from Prevent Child Abuse Missouri.

— Teams should ask themselves the following:

1. What is the goal? What is the primary outcome of interest?
2. Who is the audience?
3. What is being “sold”—eg, a new policy or law, a change in parenting behavior, awareness of a problem or solution, a new service program?
5. Are you interested in a public awareness campaign, which takes time and can cost a lot of money? If so, is it a behavioral-change campaign or a campaign to build public will? Or are you interested in a direct-response campaign asking for an immediate action from the target audience?
6. What are the key messages you want to communicate?
7. Who is the best messenger?
8. What is the “call to action”? What do you want the audience to do or change?
9. What is the best method or vehicle for delivering your message? Radio, television, public-service announcements, billboards, brochures, a formal presentation to a particular group, or a training program for professionals?

— With these answers, you can determine the direction of your messages and advocacy efforts.

— Primary recommendations or messages should be simple and consist of no more than 3 points. For example:

1. Account of the problem
2. Solution to the problem
3. Call to action

Turn Recommendations into Messages That Stick

— Keep messages brief.

— Recognize the “curse of knowledge.”

1. In his article, “Loud and clear: crafting messages that stick—what nonprofits can learn from urban legend,” Chip Heath explains, “Once people know some piece of information, they find it hard to imagine

what it was like *before* they knew it. Their own knowledge makes it harder for them to communicate, and thus it is a curse.”

2. The solution to the curse of knowledge is to think like an outsider.

Select the Right Messenger

- Requires credibility or visibility with the target audience.

Work with the Media

- Recognize that the media are the gatekeepers of the messages the public receives about the condition of children and greatly influence the agenda of legislators, governors, and child protection professionals.

- Become media-savvy: understand how the media work and their priorities and limitations; build relationships with print, radio, and television reporters and newscasters who cover children and family issues; develop effective messages about prevention that stick; and identify and prepare the best spokesperson or messenger.

- Be ready to respond both proactively and reactively to help shape media coverage of child fatality prevention and child health and safety promotion.

- Be prepared to respond effectively when the media contact you.

- Develop a media crisis protocol before the need arises; include who can speak for the team, what can and cannot be shared, and what key prevention messages your team wants to advance.

Evaluate Progress

- Have a plan in place to monitor and evaluate the results of recommendations made by local and state CFRTs.

- Evidence that a strategy is working is the most powerful tool for increasing the support or reach for that strategy and for ensuring that recommendations of CFRTs continue to be heard.

- If effectiveness is not proven, CFRT members should look at alternative prevention approaches.

LICENSED CHILDCARE CENTERS

- Leaving infants or toddlers without supervision is generally considered neglectful.

— Supervision can forestall the nonabusive events that cause injury to infants and young children and may prevent injuries some adults inflict.

— Childcare arrangements are essential to most developed and developing economies.

1. They are part of the protective ecology of children but vary greatly.

2. An important variable is the number of caregivers present at a care site.

— Lower rate of mild to moderately severe injuries in childcare settings than in homes, but slightly higher rates of minor injury.

— Extremely low rates of very serious injuries in large, licensed centers.

— Large childcare centers are highly protective against life-threatening head injury.

— Short falls abound in childcare centers and rarely cause serious head injury.

PROTECTION FROM DEATH

— Reasons large childcare centers experience fewer child fatalities:

1. Cars do not drive through the centers.

2. The dedicated premises are subject to inspection and provide no opportunities for free falls from balconies or high windows.

3. More than one caregiver is usually present most of the time.

4. Criminal background checks are performed to screen prospective employees, which is particularly useful against sexual abuse but also excludes persons with a propensity for violence. However, criminal background checks will not enable a center to screen out every person who may, under stress, assault an infant.

— Parents' agreements or contracts with caregivers of their children should always include the likelihood of unscheduled visits.

— The use of videotape surveillance in childcare settings as a security measure is gaining popularity. Generally, providers should be made aware of the use of surveillance, but this may not always be necessary or desirable.

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HOMICIDE*

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— *Homicide* is defined in forensic pathology as one individual causing the death of another.

1. *Homicide* differs from the legal term *murder* in that it does not imply either the degree of intention or a lack of intention.
2. All fatal child abuse cases are, by definition, homicides.
3. Some child fatalities are best considered homicides rather than child abuse because they require deliberation.
4. Other child abuse fatalities are acts of impulse rather than planning.
5. Children who are shot, stabbed, or asphyxiated by others are included in the homicide group.

— Asphyxia is usually caused by the interruption of breathing or inadequate oxygen supply. Can be caused by various mechanisms, including the following:

1. Pressure applied to the neck during strangulation or hanging
2. Obstruction of the airway from smothering or suffocation
3. Pressure applied to the chest

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— Homicide of juveniles is unevenly distributed geographically and demographically.

1. Rates are substantially higher for African-American and Hispanic juveniles, for certain jurisdictions, and for certain counties.
2. Homicides differ among teenagers, young children, and children in middle childhood.

— Included are child maltreatment homicides, multiple-victim family homicides, female-offender homicides, abduction homicides, juvenile-on-juvenile homicides, and school homicides.

OVERALL PATTERNS

— Murder rates are the same among children and adults.

— Murder is the only major cause of childhood fatality that has increased in incidence during the last 30 years.

— Homicides of children (0 – 17 years of age) are among the most unequally distributed form of child victimization.

1. Overall rates for African-American children (9.1 per 100 000) and Hispanic children (5 per 100 000) dwarf the rate for whites (1.8 per 100 000).
2. Data from 1996 and 1997 show that states with the highest rates (Nevada, Illinois, and Louisiana) have rates 6 times higher than those with the lowest.
3. Levels for large cities greatly exceed those of rural areas.

— Homicides of children have different sources and require different preventive strategies.

1. Children of different ages suffer different homicide-related perils, and some have a low homicide risk.
2. Homicides of children are also categorized in terms of perpetrator characteristics and other contextual factors.

VICTIM AGE

TEENAGED CHILDREN

— From the 1980s to the early 1990s, homicides among teenaged children (defined here as those 12 – 17 years of age) increased nearly 158%.

— Although the rate of homicides among teenaged children declined from 1993 to 1997, teenagers are still killed today at a rate 10% higher than the average rate for all persons.

— Like homicides among adults, homicides among teenaged children overwhelmingly involve male victims (81%), male perpetrators (95%), the use of firearms (86%), or the use of knives or other objects (10%).

— Relatively few (9%) are committed by family members.

— A much higher percentage of homicides among teenagers are committed by other youths, although two thirds of the offenders are adults.

— The jump in homicides among teenagers during the late 1980s and early 1990s has been attributed to the following factors:

1. Increased child poverty
2. Gang activity
3. Spread of crack cocaine and drug market competition
4. Availability of handguns

— Some of the gun proliferation among teens may be connected to the drug trade and the need to protect valuable drugs and money. The cycle accelerates as more youths acquire guns to protect themselves from other armed youths.

— Risk for minority teenagers has risen disproportionately.

1. Homicides for white teens increased 92% from 1984 to 1993, but more than tripled in the same period among minority teens.
2. The number for African-Americans jumped 233% and for other races, 275%.
3. Rural areas are relatively unaffected.

— Gangs and drugs remain a factor in many homicides among teens.

— From 1993 to 1997, more than 80% of homicides among teenagers involved a firearm.

MIDDLE CHILDHOOD

— Describes the period between age 6 and 11 years

— A time of relative immunity from homicide risks

— Children this age face substantial violence through parental assaults at home and peer aggression at school, but relatively little is lethal.

— Homicide rate is lower than for any other segment of the population.

Reasons for Low Rate

— Probably a result of this being a time of transition

1. Have outgrown some of the characteristics that make the very young vulnerable but have not begun to engage in activities that increase the rate for adolescents
2. Are less dependent; require less continual care; and have some self-sufficiency, socialization, and verbal skills
3. Are less of a burden; less potentially frustrating; bigger; and better able to hide, dodge blows, and get away from angry parents
4. More force needed to inflict a lethal injury

— Still protected from some dangers experienced by teens

1. Under adult supervision and protection most of the time
2. Have little access to weapons, drugs, and cars
3. Gang activity has not become highly dangerous

— Other criminally minded older children and adults are less likely to consider these children as threats or candidates for involvement in criminal enterprises.

Murder Patterns

— Homicides result from a mixture of causes, some related to early childhood and some to adolescence.

— Relative to their dependent status, children are primarily murdered by family members (61% of the perpetrators).

— Murders are not usually committed with “personal weapons” (eg, clubs or knives held in the hands). Almost half (49%) are committed with firearms.

— With the greater independence of children in middle childhood, strangers kill 1 out of 8 children who die of homicide in middle childhood, more than 3 times the percentage for younger children.

- Older children in middle childhood begin to be touched by gang-related violence.
- A substantial number (52%) of murderers of children are over age 30 years.
- Children begin to be vulnerable to sexual homicides. Pedophiles attracted to children in this age range sometimes murder to hide their crimes.
- Significant number of gun homicides among these children attributable to adult negligence.
- Children may also be killed as innocent bystanders in the course of crimes such as robberies or car-jackings.
- When family members murder children of this age, sometimes it is in the course of whole-family suicide-homicides or arson attacks.

YOUNG CHILDREN

- Describes the period under 6 years of age
- Each year, more young girls are murdered than teenaged girls (320 versus 230).
- The rate for white victims younger than 6 years is 25% less than for white teenagers (1.8 per 100 000 and 2.4 per 100 000, respectively).
- The rate for young children may be higher than available official statistics suggest.
 1. Difficult to document because homicides often resemble deaths from accidents and other causes.
 2. Actual rate of homicides for young children may be double the official rate.
 3. Greater scrutiny may have pushed up rates without a true underlying increase.
 4. More than 23 states have adopted “homicide by abuse” statutes that make it easier to charge homicide in child abuse cases even in the absence of intent to kill.
- Two distinguishing features of homicides involving young children are that they are primarily committed by family members (71%) and are committed with personal weapons (68%) or hands or feet to batter, strangle, or suffocate victims (**Figures 6-1-a and b**).



Figures 6-1-a and b. This 3-month-old infant was suffocated by the mother's hands. Extensive abrasions on nose, cheeks, and chin.

- Highest homicide rate is for children under age 1 year.
- Some infanticides are distinguished from other homicides of young children as being recently born children killed by relatives who do not want the child, are ill-equipped to care for the child, or are suffering from a childbirth-related psychiatric disturbance (**Figures 6-2-a and b**).

CHILD MALTREATMENT HOMICIDES

- *Child maltreatment homicides* are committed by persons who are charged with care of the child; includes parents, family members, babysitters, and friends.
- Neglect deaths generally include situations when a child dies because caregivers fail to provide food or needed medical attention.
- Deaths from negligence involve caregivers who fail to provide basic supervision or take precautions, which results in the child dying in a preventable accident, such as falling out of an open window while unattended.
- Most child maltreatment deaths (92%) are of children under age 5 years.
- Most deaths in children under age 5 years recorded as homicides result from child abuse (70% perpetrated by family caregivers).
- Two factors account for the vulnerability of young children:

1. The considerable responsibility required of caregivers. Two of the most common triggers for fatal child abuse are crying that will not cease and toileting accidents.
2. Children of this age are small and physically vulnerable.
 - The major cause of death is cerebral trauma, especially for the youngest victims.
 - Homicides are more common in conditions of poverty, in families marked by paternal absence or divorce, among African-Americans (2 to 3 times that of other racial groups), and with drug use.



Figure 6-2-a



Figure 6-2-b

Figures 6-2-a and b. This newborn infant was found abandoned in a plastic bag. Fingerprints on the bag were traced to the mother. (a) The infant was examined and was determined to be a full-term newborn without any abnormality that would cause death in utero. It was not possible to conclusively prove live birth, but the concealing of the birth raised the question of homicide. The cause of death was exposure to harsh weather and asphyxiation due to being placed in the plastic bag, and the manner of death was homicide. (b) Full-term abandoned infant, with cord attached.

— Boys and girls are at roughly equal risk for fatal abuse, but boys are at slightly higher risk for fatal neglect.

— Male caregivers account for a disproportionate share of child abuse homicides.

— Women who spend more time caring for young children are responsible for more child neglect fatalities.

— A large minority occur in families known to child protective authorities because they had a previous family or childcare problem.

MULTIPLE-VICTIM FAMILY HOMICIDES

— About 6% of all homicides involving children occur as part of multiple-victim family murders.

— Three fourths of these child victims are younger than 12 years, approximately equally divided between boys and girls.

— Fathers and stepfathers are responsible for most of these cases (60%) (**Figures 6-3-a and b**).

— Victims tend to be white more often than are typical child victims of homicide.

— Cases are associated particularly with separations from intimate partners and mental illness of the depressive and psychotic, but not personality-disordered, sort.



Figure 6-3-a



Figure 6-3-b

Figures 6-3-a and b. This 7-year-old boy was shot by his grandfather and died from a gunshot wound to the head. The grandfather also shot other members of the boy's family, including the parents and siblings. (a) Gunshot entrance wound on the forehead. (b) Gunshot exit wound on the back of the head.

- Firearms are often involved.
- Perpetrators commit suicide in as many as 40% of cases.

FEMALE-OFFENDER HOMICIDES OF CHILDREN

- Murderers who are women are responsible for 43% of children under age 12 years being killed by identifiable people, a percentage that has been relatively stable since the 1980s.
- Female killers of children most often kill young children (75% younger than 6 years) and members of their family (79%).
- Female killers of children are concentrated in the child abuse homicide and infanticide categories.
- Consistent with this, they tend to use hands and feet as weapons much more often than do men (54% versus 22%) rather than firearms (only 17% for women versus 63% for men).
- In 20% of female-perpetrated homicides, an additional offender, almost always a male accomplice, is involved.
- Women who kill children are more likely to be labeled mentally ill than are male offenders and may be somewhat more likely to commit suicide.
- Women committing infanticide tend to be younger, unmarried, and use suffocation or strangulation as the means to kill.
- Older, married women use beatings to commit child maltreatment homicides.

STRANGERS AND UNIDENTIFIED OFFENDERS

- Approximately 11% of child murders are officially classified as committed by strangers; an additional 29% are committed by unidentified offenders.
- Most unidentified offenders are considered strangers because stranger homicides are more difficult to solve.
- The distribution of unidentified offenders by victim characteristics looks much more like stranger offenders by victim characteristics than does the distribution of nonstranger offenders by victim characteristics. This does not necessarily mean that all unidentified offenders are strangers.
- Between 11% and 40% of the homicides of juveniles are committed by strangers.

— Such murders disproportionately involve the murder of teenagers (81% to 87%), boys (80% to 84%), the use of firearms (82% to 92%), and apparent gang situations (approximately one third in both cases).

ABDUCTION HOMICIDES

— An estimated 200 to 300 stranger abductions of children and youths each year involve being gone overnight, transportation more than 50 miles, ransom, murder, or an intent to keep permanently.

— Fewer than half involve homicides.

— Most such crimes occur to teenagers, especially teenaged girls.

— The motive in more than two thirds of abduction-homicide cases is sexual.

— Strangers constitute approximately half of the offenders.

— Approximately 4 in 10 are acquaintance perpetrators.

— Offenders are usually males, two thirds of them are under age 30 years, and most are unmarried or divorced (85%).

— Half of perpetrators are unemployed at the time of the homicide.

— In 58% of cases, offenders made contact with victims within a quarter mile of the victim's home.

— In 54% of cases, the murder occurred within a quarter mile of the site of initial contact.

— Abduction-homicide murders are substantially more likely than other child murders to involve strangulation or stabbing.

YOUTHS KILLING OTHER YOUTHS

— A number of high-profile incidents in the 1990s highlighted the problem of youths who kill other youths.

— The phenomenon increased dramatically, from 400 juveniles in 1980 to 900 in 1994, but fell back to approximately 500 in 1997.

— The predominant pattern is for youths to kill other teenagers (84%) who are acquaintances (68%) and to use firearms (74%).

— A few (7%) were teenaged parents killing their young children in what would be considered an infanticide or child maltreatment homicide.

SCHOOL HOMICIDES

— Annual number of school-associated violent deaths was 25 in 1998 and 1999, even including the 15 at Columbine High School in Littleton, Colorado.

— Most (88%) involve a firearm.

— Seventy-two percent occurred in high schools, 17% in junior high or middle schools, and 11% in elementary schools.

— Seventy-one percent occurred within a school facility; the rest at school playgrounds, parking lots, bus stops, or around school facilities.

— Schools are statistically not a particularly risky place for homicide victimization.

JUVENILE HOMICIDE INITIATIVES

— Targeted at preventing youths from killing other youths

1. Laws to criminalize firearm possession by minors or to prosecute minors as adults or hold adults responsible when minors gain access to firearms.
2. Coordinated community programs to control gang activity stop the flow of guns to juveniles, improve the supervision of delinquent youth, counsel victims of violence, and teach alternatives to violence.
3. Credited with reducing the homicide rate of teens killing other teens

— Targeted toward the homicides of younger children

1. Establishment of child fatality review teams in almost all states to review suspicious child fatalities, identify possible homicides, and make recommendations for prevention.
2. Passage of statutes to facilitate the prosecution of child maltreatment deaths as homicide, removing the need to prove intent to kill.
3. Mandatory minimum sentencing in some states.
4. Established protocols for more rapid responses to child abductions to prevent child fatalities.
5. Child protection investigations turned over to law enforcement authorities or involve greater police cooperation to provide more safety and protection for children in high-risk situations.

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PERINATAL DEATHS

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Herman A. Hein, MD

- Perinatal deaths constitute a majority of child fatalities.
- By definition, *perinatal deaths* encompass all deaths of pregnant women, fetuses, and neonates; extend to deaths of infants largely caused by perinatal events.
- Deaths that come under a child fatality review are only those involving live-born infants, so only neonatal and postneonatal deaths are reviewed in this chapter.

DEFINITIONS

- *Neonatal death*: Death of a live-born infant in the first 27 days of life.
- *Neonatal death rate*: Number of neonatal deaths, divided by number of live births in the same age range, multiplied by 1000; expressed as number of deaths per 1000 live births.
- *Postneonatal death*: Death of a live-born infant after 27 days of life but before age 1 year.
- *Postneonatal death rate*: Number of postneonatal deaths, divided by number of live births in the same age range, multiplied by 1000; expressed as number of deaths per 1000 live births.
- *Infant mortality rate*: Combination of neonatal deaths and postneonatal deaths, calculated by dividing the number of deaths of children under age 1 year by the number of live births and multiplying the result by 1000; expressed as number of deaths per 1000 live births.

FATALITY CLASSIFICATION

- The classification scheme of child fatality is based on life stage or age at death.

— Most fatalities in children under age 1 year fall within 7 categories:

1. Pregnancy-related complications
2. Delivery-related complications
3. Infectious diseases
4. Congenital malformations or congenital disorders
5. Maternal disorders
6. Other specific system disorders
7. Trauma

FATALITY REVIEWS

— Almost all of the information needed for review is contained in hospital records.

NEONATAL FATALITIES

Perspectives

— *What is the true clinical cause of death?*

1. Death certificate diagnoses (eg, cardiac arrest, respiratory failure) are generally set aside, and the true underlying cause of death, such as respiratory distress syndrome (RDS, which is a surfactant deficiency associated with severe immaturity), is identified.
2. By identifying the true source of death, prevention measures can be instituted.
3. Do not rely on death certificate diagnoses to establish cause of death.

— *Did outside influences contribute to the fatality?*

1. Review all neonatal fatalities from the perspective of nonmedical causality.
2. Most neonatal fatalities occur in hospitals with all events under careful scrutiny. Occasionally, a death that raises suspicion occurs in a mother's hospital room or in the home after hospital discharge.
3. Most sudden infant death syndrome (SIDS) fatalities occur in children age 1 to 6 months, so review all cases of SIDS victims under age 1 month.
4. An increasing number of fatalities occur in children under age 1 month who sleep in adult beds with adults or older children.

5. Investigate all neonatal fatalities for which there is no clear-cut cause through the use of full postmortem examinations and death scene investigations, as for older infants.

POSTNEONATAL FATALITIES

— Postneonatal fatalities are largely relegated to the SIDS category (see **Chapter 8**).

— SIDS has clear perinatal implications; the most important is maternal smoking.

— Congenital malformations and syndromes incompatible with life are major sources of postneonatal fatality (**Figures 7-1-a and b**).

1. Smoking and other substance abuse can play a major role in these fatalities.
2. Infants with congenital malformations and syndromes incompatible with life can be diagnosed in the neonatal period and live longer than 28 days.

— The review of postneonatal fatalities must focus on preventable aspects and a careful consideration of outside influences.

CLINICAL CAUSES OF NEONATAL AND POSTNEONATAL FATALITIES

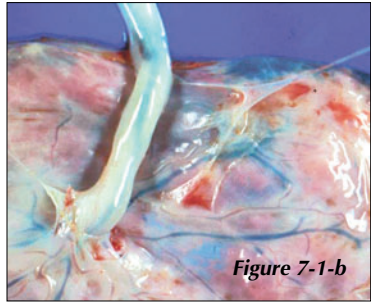
NEONATAL CAUSES

— Birth weight of less than 500 g

1. Neonates who are appropriate for gestational age (AGA) but who weigh less than 500 g might live if given the best possible care. Such neonates are usually not expected to live; their deaths are generally seen as medically nonpreventable.
2. The gestational age of AGA 500-g neonates, 22 weeks' gestation, is currently the approximate earliest cutoff for viability.

— The designation of congenital malformations and syndromes incompatible with life includes neonates and infants born with malformations or syndromes that will not support life for an extended period of time (**Figures 7-2-a and b**).

— Birth weight of 500 g through 699 g



Figures 7-1-a and b. This pregnancy was terminated due to multiple congenital malformations. A strand of amnion connective tissue partially encircled the face of the delivered fetus. This finding in and of itself is considered nonlethal malformation with amnion bands most often associated with malformation and amputation of fetal parts, generally an extremity. (a) Strand of amnion connective tissue partially encircles the face. (b) The magnified view of the placenta shows strands of amnion connective tissue extending from the fetal surface.

Figures 7-2-a and b. The fetal karyotype of this stillborn hydropic fetus was identified as 45,X, confirming a diagnosis of Turner syndrome. (a) Generalized edema and a prominent postnuchal fluid collection. (b) The placenta in cases of hydrops is large, bulky, and friable.

1. An extension of the previous category
 2. The gestational period from 22 to 24 weeks is the current range of gestation for earliest survival.
 3. Twenty-four-week gestational age neonates who are AGA weigh approximately 700 g, which is the reason for the 699-g cutoff.
 4. Even if care is appropriately provided, fatalities in this weight category are considered nonpreventable.
 5. Not all physicians, including those delivering and those caring for neonates, recognize that neonates with a gestational age of less than 24 weeks have a possibility of survival; education about current limits of viability is important.
- Preventable and nonpreventable birth asphyxia
1. Birth asphyxia is listed as cause of death when 1-minute and 5-minute Apgar scores are 5 or less and the infants never achieve a stable condition after birth.
 2. Other disease processes may be diagnosed postmortem, but if the dominant process is believed to be asphyxia, fatalities can be so categorized.
 3. With reasonable obstetric and resuscitative care, fatalities are considered nonpreventable.
 4. If care could have been improved, fatalities are classified as potentially preventable.
- Other: includes tumors, twin-to-twin transfusion, and hydrops of unknown cause
- RDS
1. Requires radiographs consistent with a diagnosis of RDS (“ground-glass” appearance on air bronchograms with patient hypoventilated); onset of respiratory distress within 1 hour of birth; course consistent with RDS; patient maintained on ventilator; and nonpathogenic results of blood and cerebrospinal fluid cultures.
 2. RDS listed as a principal cause of death when the disease is severe, even when other major pathologic events are present.

3. In mild or moderate RDS when recovery from the disease was occurring or had occurred, other diagnoses are considered the cause of death.

— Hypoplastic lungs

1. Requires a history of loss of amniotic fluid or other evidence of little or no amniotic fluid
2. Histories should be consistent with difficulty ventilating infants and include no other apparent cause of death

— Infection (**Figures 7-3-a and b**)

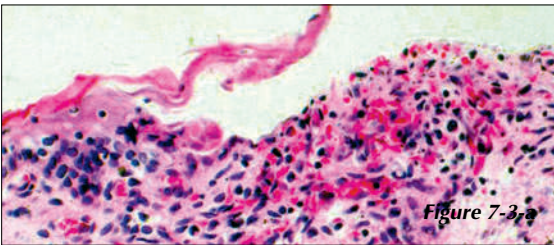
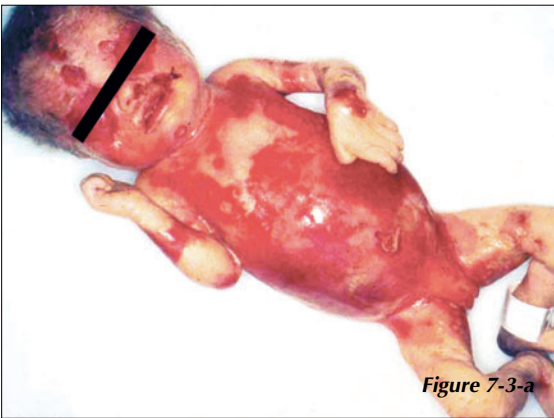


Figure 7-3-a. Full frontal photograph of a term infant shows skin lesions associated with herpes simplex virus (HSV).

Figure 7-3-b. Histologically, HSV skin lesions show epidermal-based inflammation and necrosis.

1. Includes sepsis and necrotizing enterocolitis
 - A. *Sepsis*: Generalized infection in newborns.
 - B. *Necrotizing enterocolitis*: Intestinal disease causing disruption of the lining and wall of the intestine; commonly associated with infection documented by a positive blood culture.
2. Sepsis cases are included if positive blood cultures or confirmatory postmortem evidence is obtained.
 - *SIDS*: Death of a previously healthy infant in which a postmortem examination, death scene evaluation, and review of clinical case yield no clues to cause of death and no other diagnosis is apparent.
 - Homicide (**Figures 7-4-a and b**)
 1. Often linked to a pregnancy hidden by the decedent's mother and a birth outside of the medical care system.
 2. After delivery, the mother discards the child and the event is discovered only when she seeks help for complications of childbirth.

POSTNEONATAL CAUSES (**Figures 7-5-a, b and c**)

- *SIDS*, syndromes and malformations incompatible with life, infection, homicide, and others are the same as for neonates.
- *Bronchopulmonary dysplasia*: Chronic lung disease in infants who are recovering from RDS and have reached age 28 days or more and still require oxygen therapy.
- *Unknown*: No clear causes of death, but the facts do not fit the circumstances of a *SIDS* fatality.
- Accidental deaths
 1. The accident is the actual cause of death, with no other apparent contributing circumstances.
 2. The most frequent form of accidental deaths is fatal motor vehicle crashes.

IMPLICATIONS FOR PREVENTION

- The major cause of neonatal fatality is low birth weight (ie, less than 700 g).



Figure 7-4-a

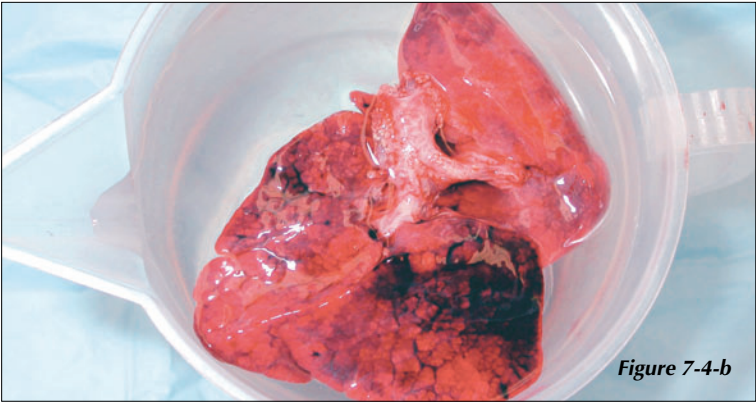


Figure 7-4-b

Figures 7-4-a and b. This full-term infant was found in a chest-style freezer by 2 teenage to young adult siblings. The mother was in her 40s and eventually reported that the infant was a difficult footling breech delivery and was stillborn. She initially reported that a neighbor may have placed the infant in the freezer. She testified during the trial that she became unconscious during her unattended delivery at home and awoke to find the infant with the umbilical cord twisted around her leg and neck. The infant was reportedly delivered 2 years prior. Family and friends of the mother were not aware of the pregnancy or delivery. (a) Frontal view of infant after overnight thawing. (b) The complete autopsy established live birth on the basis of the lung floatation test.

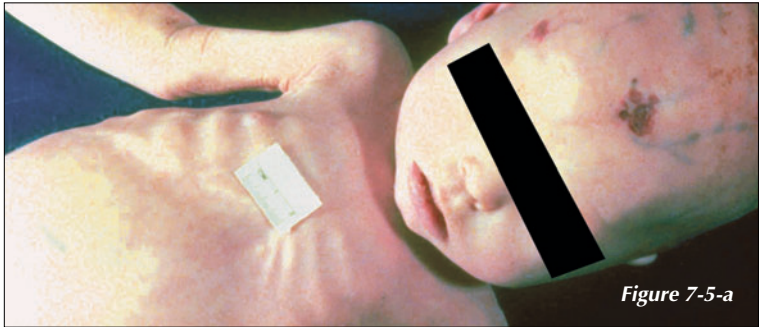


Figure 7-5-a

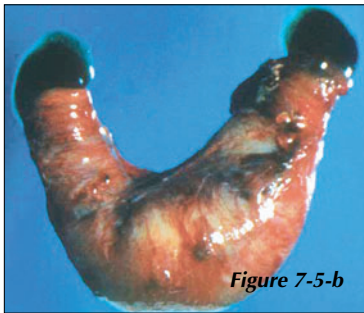


Figure 7-5-b

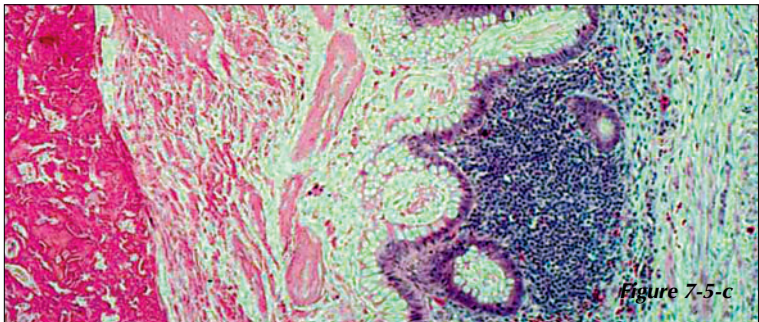


Figure 7-5-c

Figures 7-5-a, b and c. This neonate had characteristic features of failure to thrive associated with identified cystic fibrosis. Meconium ileus may be seen in newborn infants with cystic fibrosis. Bronchiectasis is a characteristic lung finding. **(a)** Neonate with failure to thrive. **(b)** Meconium ileus. **(c)** Microscopic features of meconium ileus include distended crypts with inspissated mucus in the lumen and muscle hypertrophy.

— Other categories of death are influenced by early birth; include RDS, asphyxia, and hypoplastic lungs.

— The second leading cause of death involves syndromes and malformations incompatible with life.

— None of these deaths are currently considered medically preventable, but some might be prevented by altering parental behavior (social interventions).

1. Maternal smoking is associated with preterm labor.
2. The fetuses of women who smoke have an increased rate of congenital malformations.
3. Need to document the association of fatalities with maternal smoking and with smoke exposure in the home.
4. Cotinine analysis of all infant fatalities enables the documentation of tobacco product exposure.

— Deaths attributable to infection, RDS, and hypoplastic lungs may decrease over time with new and improved medical treatments, so fatalities in these categories are considered potentially medically preventable.

— Homicide and SIDS have strong potential for prevention, but not medically.

— Sleeping position, tobacco smoke exposure, and bed-sharing with an adult or older child can be controlled.

APPLICATION OF INFANT FATALITY REVIEW DATA

— Infant mortality review beneficial when done consistently and when relies on clinical cause of death data instead of death certificate data.

— Potential preventive measures appreciated from the perspective of altered care practices and localizing the greatest need for improved outcomes.

— Data allow for a review of changes in distribution and outcomes among the categories of cause of death.

— Fatality data show that the number of deaths caused by asphyxia has fallen.

- RDS fatalities have declined; the emergence of various surfactants and of better ventilation methods has contributed to this trend.
 - The overall incidence of neonate deaths from low birth weight has not improved.
1. Numbers are up dramatically considering the overall reduction in births.
 2. Major factors in this change are (a) improved obstetric care so pregnancies that previously ended in fetal deaths now result in live births, albeit of low birth weight infants, and (b) assisted reproduction can produce multiple births that occur early and include low birth weight infants.
 3. The overall incidence of malformations has not changed much, but as the total number of fatalities decreases, the relative percentage increases.
 4. Bacterial infections appear to be decreasing over time.

GATHERING DATA

Data can be gathered using a simple 1-page form, noting the following:

1. Identification data regarding the infant
2. Hospital of birth and death
3. Date of birth and death
4. Birth weight
5. Gestational age
6. Apgar scores
7. Postmortem data
8. Clinical cause of death
9. Preventability or suboptimal care noted
10. Evidence of parent or caregiver neglect noted
11. Evidence of substance abuse
12. Recommendations for prevention

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SUDDEN INFANT DEATH SYNDROME

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HISTORICAL CONTEXT

— Sudden infant death syndrome (SIDS) was not recognized in the past as a specific entity because it was rare compared to infectious diseases, malnutrition, and other disorders, which cause most infant fatalities.

1. SIDS probably existed at least 2000 years ago.
2. *Overlaying* of the infant (ie, suffocating by lying on top), infanticide, and thymic disorders were considered common causes of death in apparently healthy infants.
3. Most contemporary SIDS cases occur when the infant is alone in the crib.
— Older concepts of the “cause” of what is considered SIDS are not considered viable or sufficiently explanatory today.
— Infanticide cited as the sole cause of death does not take into account the following factors:
 1. Why SIDS fatalities peak at age 10 weeks, when infants begin to sleep through the night
 2. Why the incidence of SIDS is nearly 3 times higher in the winter than summer
 3. Why the incidence of SIDS is higher for second-born than firstborn children
 4. Why the number of SIDS victims diminishes as maternal age increases

— Thymic enlargement

1. Believed that compression of the trachea by an enlarged thymus causes sudden, unexpected infant death.
2. Stress of any cause can shrink thymus volume and weight; called *status thymicolymphaticus*.
3. Characterized by thymic and lymphoid hyperplasia, generalized arterial (especially aortic) hypoplasia, small adrenal glands, postadolescent hypogonadism, and sudden death.
4. Thymic enlargement with tracheal compression, anaphylaxis, and nutritional and metabolic imbalance are a suggested mechanism of death.

— Infection

1. Hypothesized that the first attack of “suffocating catarrh of children” could cause death in young infants.
2. Streptococci have been isolated from 2 infants whose sudden deaths were ascribed to suffocation. Their rapidly declining clinical course did not permit the development of visible pathologic lesions.
3. Microscopic pulmonary inflammation occurred in 19 of 30 cases of sudden, unexpected infant death and bacteria were frequently grown from postmortem cultures, but all cerebrospinal cultures obtained at necropsy were negative.
4. Viruses have not been found in blood or tissues of SIDS victims, but a virus might trigger catastrophic loss of cardiorespiratory control and death.

— A careful death scene investigation may disclose risk factors or external stressors, including the following:

1. Bed-sharing or sharing the same sleep surface
2. Unsafe sleep surface or environment
3. Previous unexplained sibling death(s)
4. Detected drugs or toxins of uncertain significance
5. Excessive blanketing or wrapping
6. Drug use in the home environment

DEFINITIONS

— *Sudden infant death syndrome*: “The sudden death of an infant under 1 year of age that remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history.” SIDS diagnosis remains one of exclusion for diagnostic and research purposes.

— *General definition of SIDS for death certification, vital statistics, and grief counseling*: “The sudden and unexpected death of an infant under 1 year of age, with onset of the lethal episode apparently occurring during sleep, that remains unexplained after a thorough investigation including performance of a complete autopsy and review of the circumstances of death and the clinical history.”

1. General definition has been stratified to make it more inclusive and to enhance research.
2. Stratified, separate categories reflect variables in the medical history of the decedent and family, circumstances of death, and extent of postmortem evaluation including ancillary testing.
3. Cases that do not fit into the categories are considered *unclassified sudden infant death*. Includes fatalities not meeting the criteria for Category I or II SIDS, but where alternative diagnoses of natural or unnatural conditions are equivocal and cases where autopsies were not performed.

EPIDEMIOLOGY AND RISK FACTORS

— In Western countries, SIDS is the most common cause of sudden unexpected death in well or essentially well infants.

— Rates between 1 and 2 per 1000 live births; higher among selected populations.

— Public education campaigns designed to modify infant care practices have reduced rates.

— Occurs at all socioeconomic levels, but rates always higher in lower-income groups, perhaps a result of higher rates of prone sleep position and smoking.

— Timing is a unique characteristic of SIDS, with most in the first 6 months of life, usually between the second and fourth months; uncommon during the first month of life, particularly the first week.

- Boys outnumber girls approximately 3:2; male preponderance not observed among indigenous populations.
- The risk factors presently recognized for SIDS are listed in **Table 8-1**.

Table 8-1. SIDS Risk Factors

INFANT FACTORS

- Age at death
- Male gender
- Premature birth
- Low birth weight
- Low socioeconomic status
- Ethnic minority
- Usual prone and side sleep positions
- Unaccustomed and secondary prone sleep position
- Bed sharing (cosleeping)
- Product of multiple births

MATERNAL FACTORS

- Young age
- Short intergestational interval
- Higher parity
- Limited prenatal care
- Anemia
- Prenatal, gestational, and postnatal smoking
- Substance abuse
- Binge drinking

ENVIRONMENT FACTORS

- Soft sleeping surfaces and pillows
- Head and face covered
- Warm environment
- Pacifier use
- Fall and winter months

— Not an ethnic disorder; standard diagnostic criteria not always applied in isolated communities.

1. African-Americans have persistently higher rates than whites, Asians, and Hispanics, but effect of race is eliminated by controlling for family income, education, use of prone sleep position, and other factors.
2. Rates among Native Americans higher than among whites except in Oklahoma.
3. Maternal alcohol use periconception and in first trimester an important risk factor among Northern Plains Indians.

— Occurs more often during fall and winter than spring and summer. Seasonal curve has flattened in some groups since risk-reduction campaigns were instituted.

— Prone sleep position is an important risk factor.

1. More common among African-American and Hispanic families than among Asians and whites.
2. Infants who usually sleep nonprone but are placed prone for their last sleep (unaccustomed prone sleep) are at higher risk.
3. Higher rates also observed in infants usually placed nonprone but who accidentally moved into a prone position (secondary prone sleep position).

— Tobacco smoke exposure, prenatal, gestational, or postnatal

1. Pericardial fluid cotinine levels significantly higher in SIDS victims than in controls who died of infectious disorders.
2. Higher nicotine concentrations in the lungs of SIDS children compared to control cases, independent of prenatal smoking habits.

— Sleep apnea

1. Arousal important in recovering from sleep apnea; failure of arousal hypothesized to contribute to SIDS.
2. Infants exposed to gestational or postnatal cigarette smoke show diminished arousal responses to auditory stimuli compared to nonexposed infants.
3. Eliminating cigarette smoke exposure from the prenatal and postnatal environments of infants can reduce SIDS rates.

— Bed-sharing or cosleeping

1. Controversial risk factor for infant fatality.
2. Evolutionary and physiological evidence favors parent-infant cosleeping.
3. Chaotic bed-sharing—bed-sharing that is accompanied by overcrowding, smoke exposure, illegal drug use, or alcohol consumption—increases risk.
4. The American Academy of Pediatrics recommends avoiding cosleeping.

— Thermal stress

1. Moderate hyperthermia in infants can result from factors such as infections, excessive bedclothes, overwrapping, diminished sweating capacity, and elevated climatic temperature.
2. Enhanced by the prone sleep position.
3. Infection, hyperthermia, somnolence, and sleep apnea linked to SIDS through the production and interaction of interleukins on the central nervous system.
4. Public education needed about care practices that guard against infant overheating.

PATHOLOGY AND PATHOPHYSIOLOGY

— Postmortem examination

1. The body of a typical infant who died of SIDS appears well developed and well nourished even though weights are <50th percentile expected for age.
2. Hands may be clutching fibers from bedclothing.
3. Diaper is typically wet and contains fecal matter.
4. No evidence of lethal trauma.
5. Thymus, adrenal glands, and costochondral junctions show no microscopic evidence of recent stress or illness.
6. Oronasal secretions described as mucoid, frothy, sanguineous, pink, or even bloody common; overt blood uncommon.

INTRATHORACIC PETECHIAE

- Seen in approximately 85% of SIDS victims; the most common pathologic finding observed (**Figures 8-1-a, b, c, and d**)
- Gross and microscopic distribution consistent with pathogenesis as terminal

PRONE SLEEP POSITION, APNEA, AND AIRWAY OBSTRUCTION

- Obstructive apnea, narrowing of the upper airway, intrathoracic petechiae, and deep gasping linked to SIDS
- External and internal airway obstruction considered
- Prone sleep position suggests external oronasal obstruction might contribute

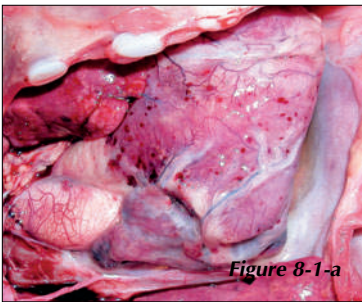


Figure 8-1-a

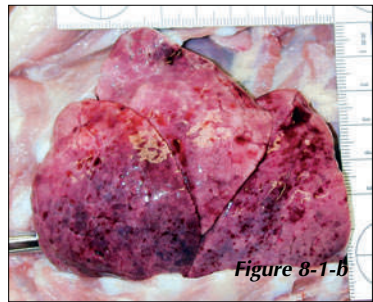


Figure 8-1-b



Figure 8-1-c

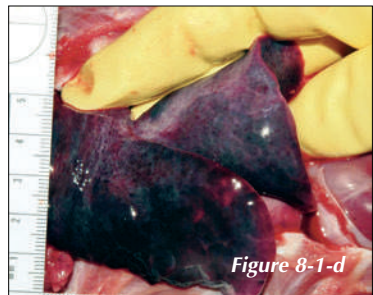


Figure 8-1-d

Figures 8-1-a, b, c, and d. Intrathoracic petechiae, including epicardial, visceral pleural, and thymic petechia, are common autopsy findings in SIDS cases. Pulmonary congestion is also a frequent occurrence. (a) Epicardial petechiae. (b) Visceral pleural petechiae. (c) Thymic petechiae. (d) Pulmonary congestion.

— Passive pharyngeal collapse

1. Documented in infants and small children between ages 10 weeks to 101 weeks.
2. Prone position reduces maximal pharyngeal distension; associated with supra-atmospheric closing pressures.
3. Negative pharyngeal pressures associated with prone position.

— Short intervals of intermittent collapse of the upper airway during normal sleep (obstructive sleep apnea) are normal in all infants.

— Few SIDS victims have life-threatening apnea.

— The results of sleep studies do not allow for the prediction of SIDS, and large-scale in-home monitoring programs do not decrease SIDS incidence.

— Arousal factors

1. Focus now on mechanisms important to reinstating breathing after the onset of apnea
2. Responses to various respiratory stimuli being tested
3. Failure to arouse can lead to failure to terminate obstructive apnea during sleep and theoretically cause SIDS.
4. Rebreathing of exhaled air may also cause SIDS.

LUNG HEMORRHAGE AND HEMOSIDERIN

— Intra-alveolar hemorrhage of more than 5% of the microscopic area proposed as an indicator of inflicted suffocation

— Pulmonary siderophages

1. Originate in previous episodes of hemorrhage
2. Appear as early as 50 hours after pulmonary hemorrhage
3. May suggest previous hypoxic episodes or acute life-threatening events, the latter possibly caused by attempted suffocation
4. Hemosiderin an unreliable indicator in differentiating a history of a previous acute life-threatening event
5. Average number of siderophages per 20 high-power field divided into the following categories:

- A. Category 1 = fewer than 5
 - B. Category 2 = from 5 to 100
 - C. Category 3A = from 100 to 500
 - D. Category 3B = more than 100 in a single lobe
 - E. Category 4 = more than 500
6. All SIDS fatalities in category 1.
 7. Documented homicidal asphyxia with repeated episodes of abusive smothering, probable asphyxias, nonaccidental trauma, or undetermined causes of death fall into categories 3 and 4.
 8. *Conclusion:* large numbers of pulmonary siderophages may occur in repeated asphyxia, but not in SIDS. When they are seen, a thorough case evaluation is advised.

LARYNGEAL PATHOLOGIC CONDITIONS AND PULMONARY INFLAMMATION

— Laryngeal basement membrane thickening not pathognomonic of SIDS, is present or absent with equal frequency in SIDS and controls, increases with postnatal age, and does not correlate with passive smoke exposure.

— Minor inflammatory infiltrates, particularly those in the lung, are often present.

— Homicide victims show more severe inflammation in the proximal and distal trachea.

CARDIOVASCULAR PATHOLOGIC CONDITIONS

— Abnormalities of the coronary arteries supplying the conduction system occur in a small percentage of SIDS cases include intimal thickening, internal elastic lamina fragmentation, and stenosis in a small percentage of SIDS victims.

— Cardiac conduction system inflammation is uncommon and appears with equal frequency in control cases.

— Prolongation of the QT interval (long QT syndrome)

1. Neonatal electrocardiographic screening needed to detect at-risk infants.

2. Mutations in cardiac ion channels may create the substrate predisposing at-risk infants to lethal arrhythmias.

NEUROPATHOLOGIC CONDITIONS

— Combination of atlanto-occipital instability, neck extension, and rotation potentially precipitating vertebral artery compression and brainstem ischemia hypothesized as cause of SIDS

1. Based on premortem blood flow and postmortem anatomical and angiographic studies
2. Presumably infants sleeping with their neck extended and rotated would be at highest risk of vertebral artery compression and death from brainstem ischemia, but importance of neck rotation and extension unconfirmed.

— “Triple risk” model

1. Postulates SIDS occurs when there is an underlying vulnerability during a critical developmental period and the infant experiences an exogenous stressor
2. Exogenous stressor must match the specific vulnerability.
3. The 2 main hypotheses concern cardioventilatory/arousal control abnormalities or developmental immaturity:
 - A. First, SIDS results from a disturbance of brain circuits regulating respiration and autonomic activity during sleep or those stimulating normal protective arousal during life-threatening events.
 - B. Second, susceptible infants are physiologically immature because of delayed brain development.
4. The model has achieved considerable acceptance, but there is insufficient evidence to prove conclusively that SIDS originates during prenatal life; the brainstem abnormalities may be secondary to hypoxia.

— Central nervous system abnormalities

1. Include increased brain weight; gliosis of nuclei related to cardiorespiratory control; decreased muscarinic, kainate, and serotonergic receptor binding in the arcuate nucleus; and hypomyelination of intrinsic and extrinsic pathways

2. Cerebrospinal fluid alterations include increased levels of homovanillic acid, tryptophan, 3-methoxy-4-hydroxyphenylglycol, 5-hydroxyindoleacetic acid, gamma-aminobutyric acid, and vascular endothelial growth factor.
3. Consistent with recent hypoxia before death
4. Significantly increased levels of dopamine and serotonin metabolites also reported

DIAGNOSTIC DIFFICULTIES (Figures 8-2-a, b, c, and d)

- SIDS has no pathognomonic features.
- Autopsy findings usually do not help establish or refute the diagnosis.
- Unless toxicologic blood and tissue screening is routinely performed at infant autopsies, cases of poisoning will be missed.
- The autopsy diagnosis of obvious trauma with soft tissue and skeletal injuries is not difficult, but some abusive injuries are impossible to detect; SIDS may be diagnosed inappropriately in these cases.

STANDARDIZED SCENE INVESTIGATION AND POSTMORTEM EXAMINATION PROTOCOLS

- Standardized protocols for death scene and postmortem examination maximize the chances of identifying subtle abusive injury.
 - Accurate diagnosis is dependant on thorough scene investigation, including the use of mannequins, to reconstruct exact details of infants' positions. Optimally, this would be video recorded.
1. Document sleep surface characteristics and any potentially dangerous items.
 2. Perform a meticulous postmortem examination with careful selection of microscopic sections and ancillary studies.
- Guidelines for Death Scene Investigation of Sudden, Unexplained Infant Deaths: Recommendations of the Interagency Panel on Sudden Infant Death Syndrome.
1. Created by individuals from disciplines such as forensic pathology and pediatric pathology, scene investigation, and epidemiology



Figures 8-2-a, b, c, and d. The observance of a variety of marks/scars or skin lesions does not preclude the diagnosis of SIDS given an otherwise classic scenario and absence of external stressors. (a) Fungal dermatitis involving the face. (Photograph courtesy of Anthony Clark, MD.) (b) Chemical excoriation reportedly associated with a lotion/cream used on the infant's face. (c) Chronic dermatitis involving the neck. (Photograph courtesy of Anthony Clark, MD.) (d) Scrotal and perineal diaper rash.

2. Use of this protocol enhances the collection of information relevant to factors contributing to and causing SIDS.
 - International Standardized Autopsy Protocol
1. Created and implemented by a multinational group of forensic and pediatric pathologists under the auspices of the SIDS Global Strategy Task Force created by the National Institute of Child Health and Human Development and SIDS International
2. Major goals are to:
 - A. Facilitate standardization of postmortem examination of infants whose cause of death was not apparent at the beginning of the autopsy.
 - B. Supplement information gained from the scene examination and medical history review.
 - C. Improve diagnostic accuracy and precision.
 - D. Enhance the ability to compare accurate SIDS rates within and across countries.
 - E. Facilitate means by which rates of SIDS and other causes of sudden infant death can be reduced.
 - F. Foster research not only within but also across medical disciplines.
- Most infants who die suddenly and unexpectedly come under the jurisdiction of the medicolegal authorities.
- Forensic pathologists with limited experience in pediatric pathology generally perform the postmortem examinations.
- A collaboration of forensic and pediatric pathologists can be advantageous to achieving accurate diagnoses.
- Criteria to meet to classify a fatality as consistent with SIDS:
 1. Perform a scene investigation including photographic or diagrammatic documentation of the scene and a written narrative of the reported circumstances of the fatality based on witness interviews.
 2. Complete a skeletal survey.

3. Perform a complete autopsy, including microscopic examination of the brain, heart, lungs and airways, liver, and thymus; retain stock tissues or paraffin blocks of other solid and hollow viscera and endocrine organs.
4. Keep blood and urine samples for toxicologic testing.
5. Retain a vitreous sample for routine chemistries, as indicated.
6. Obtain blood spot cards and test for routine metabolic screen.
7. Obtain medical history and assess growth, development, and immunizations, preferably using official medical records.
8. Review previous police or social service interventions.
9. Assess death information for any deceased siblings.

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PHYSICAL ABUSE

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— More than 75% of child fatalities from abuse or neglect occur in those under age 4 years.

— Death can be caused by almost any inflicted injury or serious neglect.

1. Includes parental psychosis, parental drug use, and premeditated murder
2. Most cases result from overzealous punishment or loss of control by a caregiver faced with normal infant behaviors.
3. The role of poor coping ability in child abuse has led to the creation of prevention programs that teach parents coping mechanisms for common stressors.

— Many state laws require the assessment of intent in determining a potential arrest or criminal charge in relation to child abuse.

1. Often the most challenging question in the investigation
 2. Usually requires a multidisciplinary team to assist primary investigators
- There is no clear evidence that abused children automatically become abusing parents, but most parents who kill their children were exposed to family violence as children.

— No clear evidence exists that a profile of the perpetrators of child fatalities due to abuse can be developed or used.

— Improved investigative methods, multidisciplinary case review, postmortem skeletal surveys, and accurate death certificates have helped case handling.

MECHANISMS LEADING TO DEATH

— Evaluators are hampered because the history the caregiver provides is usually misleading, incomplete, or fabricated.

— Certain injuries by their nature are more readily apparent.

— Other injuries show no external signs or have clinical symptoms that develop only with time.

1. Serious bruises may take several hours to develop.

2. In extensive injury, bruises may not show because of poor perfusion.

— In severe abuse with multiple injuries, it is difficult to identify a single cause of death.

1. Manner of death may be easily determined, yet the exact cause elusive.

2. Extensive investigation with exhaustive scene investigations is needed.

ABUSIVE HEAD TRAUMA

— Head injuries cause most fatalities from both abusive and nonabusive trauma.

1. The forces needed to cause head injuries and the vital structures in the head make it likely that injury will have serious ramifications.

2. Blunt forces that cause death are *impact* (the head moves against an object, an object moves against the head, or both), *shaking* (repetitive shakes at adult human force levels), or both (**Figures 9-1-a, b, c, d, and e**).



Figures 9-1-a, b, c, d, and e. Autopsy findings included left parietal and occipital skull fractures, frontal and right parietal subgaleal contusions, brain swelling, focal subarachnoid hemorrhage, contusional injury in the occipital skull and dura (hemosiderin in dura, over occipital region), and hemosiderin in the periosteum over the skull in the left parietal region. The cause of death was considered to be blunt force head injury and the manner of death was homicide. The child's father became frustrated with the crying child and "popped" him. A week earlier, he threw a bottle of formula at the child's head. This caused the resulting impact injuries. (a) Child's head showing no external abnormality.

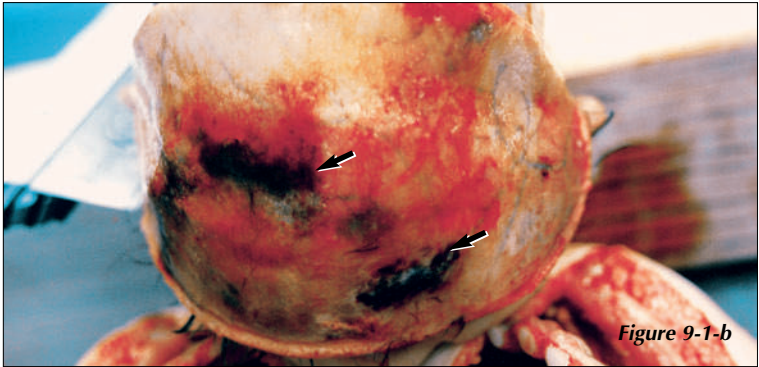


Figure 9-1-b



Figure 9-1-c

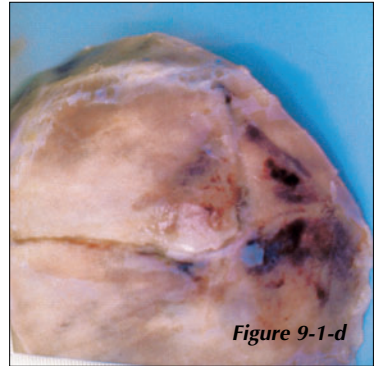


Figure 9-1-d



Figure 9-1-e

Figure 9-1-b. Multiple areas of subgaleal hemorrhage (arrows).

Figure 9-1-c. Left parietal and occipital skull with fractures.

Figure 9-1-d. Healing skull fractures of left parietal skull, complex and stellate, fixed bone cleaned.

Figure 9-1-e. No subdural hemorrhage at autopsy.

3. *Penetrating injuries* occur at high (eg, firearms) and low speeds (eg, knives).
4. *Fatal brain injury* can occur by interrupted blood flow (eg, strangling, acute blood loss), no oxygen (eg, suffocation, carbon monoxide poisoning), or both.

TERMINOLOGY

— *Shaken baby syndrome* (SBS) is also called craniocerebral trauma, blunt head injury, inflicted neurotrauma, or abusive head trauma.

— SBS is the most precise term; must describe injuries carefully and explain what the terms encompass.

SHAKEN BABY SYNDROME

— The mechanism of repetitive, violent shaking with brain injury, intracranial bleeding, and retinal hemorrhages defines shaken baby syndrome.

— SBS estimates are 1200 to 1600 US children each year; death rate approximately 25%.

— Children with SBS may have no external signs of injury; without medical evaluation and an autopsy, such cases can be missed.

— SBS primarily consists of direct brain damage caused by repeated shaking that mechanically injures or kills brain cells.

1. During shaking, blood vessels may also be injured. Nearly all children with SBS have bleeding between the brain and skull (*subdural hemorrhage, subarachnoid hemorrhage, or both*).
2. Bleeding on the inside back layers of the eye—*retinal hemorrhages*—occurs in approximately 90% of children. Usually it is multilayer, diffuse, and extends to the sides of the retina.
3. This pattern of retinal injuries is not seen in household accidents, cardiopulmonary resuscitation (CPR), or motor vehicle crashes.

— Acceleration-deceleration movement of the head, through shaking or impact, induces rotational displacement of the brain within the cranial cavity, causing subdural and subarachnoid hemorrhages and tearing of axonal processes in the brain (*traumatic diffuse axonal injury*) (**Figures 9-2-a and b**).



Figure 9-2-a

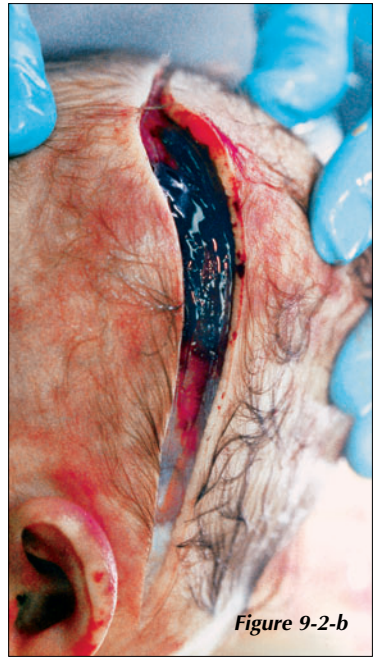


Figure 9-2-b

Figures 9-2-a and b. This 2 1/2-month-old boy was taken by his family to the hospital. The history elicited from the family was that the father awoke to feed and change the infant. While he was out of the room, the infant fell off the couch. When the father picked the infant up to console him, his eyes rolled back and he began gasping for air. The father woke the mother and they went to the ER. The cause of death was craniocerebral trauma, and the manner of death was homicide. The infant had an impact head injury of the acceleration-deceleration type. The injury was inconsistent with the history of a fall from the couch. (a) Left side of head with no obvious injury. (b) Subgaleal hemorrhage of left parietal scalp incised.

- Tearing of the axonal processes and resulting brain swelling and intracranial pressure can cause loss of consciousness.
 - Significant rotational head injuries are immediately symptomatic.
 - In a few cases, the child dies quickly.
1. Injury apparently occurs directly to vital brain centers near or in the brainstem that control respiration and other vital functions (eg, blood pressure).

2. Few or no signs of intracranial bleeding or brain swelling (*cerebral edema*) may occur when the child dies so quickly.

— In most fatal cases, the child lives long enough for substantial cerebral edema, intracranial bleeding, and retinal bleeding to occur.

AUTOPSY FINDINGS

— Thin layers of subdural blood and small amounts of subarachnoid blood may not be seen on computed tomographic (CT) scans or even magnetic resonance images (MRI) but will be seen by the pathologist at autopsy.

1. Failure to see the blood on radiographs means there was too little to see by that technique.

2. With bleeding, children often have low hemoglobin and hematocrit levels.

— Approximately 75% of children with SBS survive beyond the diagnosis.

1. From 33% to 40% of victims exhibit evidence of prior shaking when diagnosed.

2. Perpetrators who admit shaking children often describe previous shaking incidents.

3. Usually, shaking is an ongoing and escalating activity that eventually causes sufficient injuries to be diagnosed.

— All survivors of SBS have some brain damage.

1. Most have moderate to major deficits in 1 or more of 3 major areas: motor skills, vision, and cognitive skills.

2. A few have minor deficits. At the young ages when follow-up examinations usually occur, minor developmental deficits are undetected because young children have a limited repertoire of language, motor, and other developmental skills, so developmental testing is too general.

3. Long-term follow-up enables the detection of more subtle manifestations of brain damage, which are sometimes evident only when the child enters school.

4. Motor skill deficits range from reduction to a vegetative state to cerebral palsy to awkwardness.

5. Visual deficits usually involve the visual cortex, with varying degrees of visual acuity problems, but eye muscle coordination and retinal injuries (eg, detachment, vitreous hemorrhage) are possible outcomes.
6. Cognitive deficits range in severity from primitive reflexes only to mental retardation to learning disabilities.
 - Major reason that young children are shaken is because they can be.
 - Crying is usually the precipitating cause when the victim is under age 1 year.
 1. Infants aged 2 to 3 months cry 2 to 3 hours a day for nonnutritive reasons, but such crying decreases markedly by age 4 to 6 months.
 2. Even though infant crying is normal, it often upsets caregivers.
 3. Some caregivers become frustrated with crying and hit, slap, yell at, or shake the child.

Severity and Timing of Injuries

— Per the American Academy of Pediatrics, “the act of shaking leading to shaken baby syndrome is so violent that individuals observing it would recognize it as dangerous and likely to kill the child.”

— The mortality rate for young children falling from second-, third-, or fourth-story balconies or windows is less than 1%; the death rate for SBS victims is 25%.

— Least severe cases: Children have concussionlike symptoms such as lethargy or vomiting and are misdiagnosed with a viral illness such as gastroenteritis.

— Fatal cases: Children have immediate and overwhelming symptoms (eg, pale, limp, unresponsive, breathing poorly). An observer may not know what is wrong but would still recognize the condition as severe.

— Timing of the injury is generally straightforward.

1. Onset of symptoms is usually immediate, so determination of when the child began acting differently will establish when the injuries occurred.
2. Clinical determination is usually the most precise method for dating the injuries; radiologic and pathologic evidence provides wider windows.

Characteristics

- In early accounts, SBS was defined as internal injuries with no signs of impact.
- Gradually recognized that a shaken child could also be hit on the head or against a surface, causing shaking and impact injuries.
- Severe shaking alone can cause serious or fatal injuries. Repetitive shaking overwhelms the body's ability to manage such external forces and leads to almost certain injury or death.
- Shaking probably occurs at a rate of 2 to 3 complete oscillations per second and is more than a brain of any age can tolerate (**Figure 9-3**).

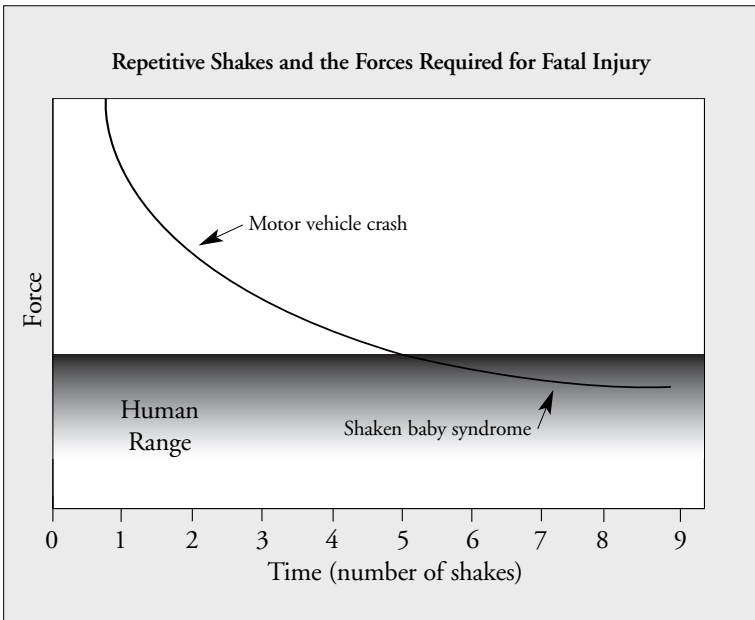


Figure 9-3. The theoretical line represents the combination of force and time (repetitive oscillations) needed to cause a fatal brain injury. Note that fatal brain injuries in motor vehicle crashes are caused with only 1 to 2 oscillations, whereas shaking requires at least 4 or 5, leading SBS to have a somewhat different pattern of brain injury. With SBS, intracranial bleeding can occur without an impact, and a relatively unique pattern of retinal hemorrhages is often produced.

IMPACT INJURIES

- Developmentally, infants cannot roll purposefully for the first several months.
- Unless placed in unsafe situations, young infants cannot inflict significant impact trauma upon themselves by creating great forces against objects.
- When children can roll, crawl, or walk, they can fall from beds, changing tables, or down stairs.
- Evaluating the plausibility of a fall or impact in creating an injury requires a thorough history and understanding of the natural results of accidental falls.
- Perpetrators often attribute injuries to a short fall.
- Falls from beds should not cause serious or fatal injuries.
- Studies of falls from hospital beds, when circumstances are known and medical evaluation is immediate, show a 1% occurrence of skull fracture to the side of the head but no serious or fatal injuries.
- Children falling down stairs should not have serious injuries unless they fall while in a walker or a caregiver falls on top of them.
- Accelerated impact (beyond gravity), may occur when a caregiver hits a child's head with an object or fist or swings the child against an unyielding object, which may cause death.

SUFFOCATION AND STRANGULATION

- Suffocation and strangulation interrupt oxygen flow to the brain by occluding respiration, stopping circulation (oxygen carried by red blood cells), or both.
1. Younger children may not exhibit the classic signs of suffocation seen in adults or older children.
 2. A chest radiograph may reveal fluffy alveolar densities in upper airway obstruction, but the results can be interpreted as normal.
 3. Signs of suffocation injury may not be seen at the time of autopsy, so death might be interpreted as sudden infant death syndrome (SIDS).
 4. In strangulation the physical examination may reveal bruising to the neck or ligature marks that must be distinguished by history from

accidental causes (eg, window-blind entanglement), suicide, or sexual or other self-induced behavior by older children.

5. When multiple children in a family seemingly die of SIDS, search for an alternative explanation such as a physiologic problem (eg, long QT syndrome) or murder.

THORACOABDOMINAL INJURIES

CHEST BRUISES

- Bruises on the chest are relatively unusual in normal, active children.
- When present, they should trigger further investigation for underlying injury.

RIB FRACTURES

- Ribs are the most commonly injured bones in abusive injuries.
- Rib fractures rarely occur in accidental injuries and are not caused by overlaying a child in bed.
- Ribs are fractured when an abuser grips, squeezes, impacts, or compresses the child's chest with too much force. This prevents breathing, and if held tightly long enough, the child dies of asphyxiation (**Figure 9-4**).

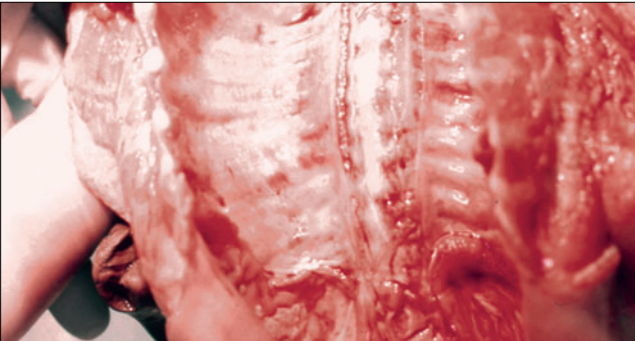


Figure 9-4. This 3-week-old girl was placed on her back in a large bed between the mother and mother's boyfriend. In the morning, the infant was lying face down in the bed and not breathing. Autopsy findings included multiple lateral, posterior, and anterior rib fractures and contusions of the chest and scalp. The cause of death was asphyxiation due to chest compression with multiple rib fractures, and the manner of death was homicide.

- Multiple rib fractures may result when an adult holds a child tightly to prevent crying. If the child's chest cannot move, the child cannot cry.
 - Fractures of multiple ribs cause the rib cage to become unstable, so a flail and flaccid chest results and breathing is hampered.
 - In accidental rib fractures, there is usually a clear history (eg, a motor vehicle crash, fall).
 - In fatal child abuse cases, the first indicator of abuse is the presence of posterior rib fractures on a routine chest radiograph or as part of a skeletal survey.
1. Posterior rib fractures in the area of the costochondral junction are rare except in abused children and may raise questions about abdominal trauma.
 2. Posterior rib injury usually results from squeezing of the chest or grasping the chest during shaking.
 3. Posterior costochondral fractures caused by CPR have not been observed.
 4. Scapular fractures are highly specific for inflicted trauma (**Table 9-1**).

ABDOMINAL INJURIES

- Represent a small percentage of traumatic injuries in children, but cause a disproportionate number of deaths.
- Discrepancy probably reflects later arrival for emergency care and abuse population being injured at a younger age.
- Fatal abdominal injuries are difficult to diagnose because external signs are few and symptoms are nonspecific.
- In abdominal injuries, symptoms are delayed, causing a postponement in seeking medical attention.
- Liver contusions and fractures are often missed initially because the overlying skin injury is minimal or absent.
- Intestinal perforation and mesenteric injury may be masked by attempts at healing.
- The force applied to the abdominal wall is typically dissipated, so the skin is minimally involved, but the underlying organ absorbs the force and ruptures.

Table 9-1. Specificity of Skeletal Injuries as Evidence of Child Abuse*

Specific Fractures

- Metaphyseal-epiphyseal (<2 years of age)
- Thoracic cage
 - Rib
 - Sternum
- Shoulder
 - Scapula
- Spine
 - Vertebral body (anterior compression)
 - Spinous process

Highly Suggestive Fractures/Patterns

- Multiple: bilateral, symmetric
- Repetitive/different age
- Hands and feet
- Skull, complex fracture line
- Associated nonskeletal injury; intracranial, visceral

Nonspecific Fractures

- Diaphyseal (shaft of long bone)
- Clavicular, midshaft
- Skull, linear

**In otherwise healthy infant/child without major trauma (ie, vehicular).
Reprinted from Cooperman and Merten, 2001, with permission from Robert Reece, MD.*

— The liver capsule may contain blood loss for a time before rupture and peritoneal signs manifest.

— Intestinal injuries often occur with kicks to the abdomen and happen where the intestine is fixed in position.

— Visceral rupture results from shearing forces of opposing intestinal surfaces or a rapid increase in intraluminal pressure.

- Crush injuries to the pancreas are relatively common because it is trapped between the site of impact and the vertebral column.
- As much as 10% of all traumatic pancreatitis is due to child abuse.
- The kidney is protected because of its retroperitoneal position, but there may be bleeding into other retroperitoneal tissues that affect kidney function.
- Child abuse victims with extensive tissue injury may have a positive reaction on urinalysis for blood but no red cells on microscopic examination; indicates myoglobin in the urine and may be the precursor of acute renal failure.
- Abdominal injuries can occur in any organ, and children often die from bleeding of lacerated organs or rupture of a hollow viscus leading to infection.
- In blunt abdominal trauma, no contusions or bruises are seen externally because the child's abdomen is thin with little subcutaneous soft tissue. The force passes through without bruising the surface. Bruises, when present, often look like knuckle marks.
- Stomach lacerations are uncommon abusive abdominal injuries.
 1. Not sustained in trivial incidents about the home.
 2. Similar accidental injuries occur when older children riding bicycles are struck firmly in the abdomen with a handlebar during a collision. The injury requires a significant impact, with a small surface striking the abdomen.
 3. The stomach is not likely to tear open unless it is full. Stomach contents spill into the peritoneal cavity, causing peritonitis, a painful acute inflammation that progresses over several hours until the child dies.
 4. A child with this injury will not want to eat food but may want to drink fluids.
 5. Symptoms progress over time, with nausea and possibly vomiting.
- Spleen lacerations from abuse are uncommon.
- No normal accidental mechanisms in the home account for this type of trauma.

- Accidental splenic lacerations are more likely in trauma.
- Liver lacerations are common abusive abdominal injuries.
- 1. When large, they cause very rapid blood loss and death in a short time.
- 2. Symptoms result from massive blood loss and consist of weakness leading to collapse.
- 3. Many children with injuries this severe die in an hour without medical care.

MUNCHAUSEN SYNDROME BY PROXY

- Cases usually characterized by fabrication of symptoms or signs that occur only in the presence of the reporting caregiver, usually the mother.
- Symptoms or signs can be caused by the caregiver (eg, suffocation, administration of a drug or noxious substance, manipulation of bodily fluids).
- The caregiver seeks medical care for the patient, initiating a series of diagnostic tests or invasive procedures.
- Unchecked, the caregiver's activities often harm the child or lead to death.
- Do not focus on the pathologic condition of the offending parent, but rather on the actual or potential harm to the child.

POISONING

- Children sometimes arrive at the emergency room after having sampled drinks or recreational drugs left by adults too impaired to supervise them.
- Parents may be unaware how little alcohol will kill a small child.
- Cocaine and methamphetamines are also responsible for poisonings; the clinical presentations are severe and variable in small children.
- Children living in households used as methamphetamine laboratories are at special risk from the solvents, substrates, and fire hazards attendant with these substances.

INTENTIONAL POISONING

- No clear way to identify victims; many are missed because investigators and care providers do not consider the possibility.

- May be the presenting symptom in Munchausen syndrome by proxy (MSBP).
- Most poisoning cases diagnosed as the result of a high index of suspicion and the timely use of toxicology screens.
- Typical clinical presentations of deliberate intoxication:
 1. The child is brought to a medical facility with a history of accidental ingestion. The history is accepted at face value, particularly for an active toddler. Only if the child or other observer can give an alternate history will the true cause be discovered.
 2. The child has signs of poisoning and no satisfactory causes when a history is taken. If toxicology screens are not performed, the child may recover with symptomatic treatment and be discharged without a diagnosis. If toxins are found, the parents may deny knowing the cause or invent an explanation.
 3. Differential diagnosis in cases later proved to be intentional poisoning include sepsis, meningitis, seizures, intracranial hemorrhage, head trauma, gastroenteritis, apnea, an apparent life-threatening event, SIDS, bleeding diathesis, and metabolic derangement.
 4. The child has recurrent unexplained illnesses (eg, seizures, vomiting or diarrhea, or apneic spells). Repeated medical examination results are negative for poison until the toxins are discovered. The parents may create factitious symptoms by means other than poisoning. These cases overlap MSBP.
 5. The child dies unexpectedly. Autopsy may or may not reveal the cause of death. Some clinical indicators of abuse by poisoning are summarized in **Table 9-2**.

CLINICAL INDICATORS OF ABUSE

- Children whose injury explanations are inconsistent with age and development.
 1. History important when injuries are attributed to falling from a sofa or bed.
 2. With multiple bruises, contusions, or burns in a nonambulatory child, assume the injuries are inflicted.

3. Abnormal bruising patterns indicate abuse.
4. Determining how much of a history is accurate is not always easy.
— Injuries that raise suspicions of abuse include metaphyseal chip fractures in long bones, scapular fractures, sternal fractures, retinal hemorrhages, immersion burns, and all unexplained fractures.

Table 9-2. Clinical Indicators of Abuse of Poisoning

Age

- Younger than 1 year or between 5 and 10 years

History

- Nonexistent, discrepant, or changing
- Does not fit child's development
- Previous poisoning in this child
- Previous poisoning in siblings
- Does not fit circumstances of scene
- Third party, often a sibling, is blamed
- Delay in seeking medical care

Toxin

- Multiple toxins
- Substances of abuse
- Bizarre substances

Presentation

- Unexplained seizures
 - Life-threatening events
 - Apparent sudden infant death syndrome
 - Death without obvious cause
 - Chronic unexplained symptoms that resolve when the child is protected
 - Other evidence of abuse or neglect
-

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NEGLECT AND SAFETY ISSUES

Mary E. Case, MD

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— Fatalities resulting from neglect may be caused by fires, drownings, lack of medical care, or starvation, among other mechanisms.

US INCIDENCE OF FATAL CHILD NEGLECT

— Official estimates of deaths by neglect grossly underrepresent the problem.

— Accurate estimates are unavailable for several reasons.

1. Even when neglect may be involved, children's deaths are tragedies, and professionals may be reluctant to aggravate families' grief.
2. Limited data on the circumstances of the death preclude inferences of neglect. Approximately 85% of deaths due to child maltreatment are not identified as such on death certificates.

— The US Advisory Board on Child Abuse and Neglect estimates 2000 children die each year because of abuse or neglect.

— Prevent Child Abuse America estimates 1396 children died from abuse or neglect in 1999, an 11% increase over the previous 5 years.

DEFINING CHILD NEGLECT

— Most state statutes and child welfare agencies focus on omissions in care by parents or caregivers, so *neglect* is defined as omissions in care causing actual or potential harm.

— The reasons for defining child neglect are to protect children and ensure their safety, health, and development, not to blame parents.

— This priority calls for a broad, child-focused definition of neglect: *when the basic needs of children are inadequately met.*

— Basic needs include adequate food, clothing, health care, supervision, protection from hazards, education, nurturance and affection, and shelter.

“ADEQUATE” CARE

— The continuum of basic needs makes the “neglect” charge arbitrary; there is a large gray area.

— For relatively minor concerns, no report to child protective services (CPS) is made; an alternative approach involving community interventions, such as parent education, may be appropriate.

— More serious circumstances (eg, life-threatening conditions) require CPS involvement plus community services or out-of-home placement.

— The broad, child-focused definition of neglect includes circumstances when CPS involvement is inappropriate legally.

Nutrition

— Must do a careful nutritional assessment and detailed dietary history, including feeding behavior and possible medical and psychosocial contributors.

— Compare diet with daily requirements for specific nutrients (**Figures 10-1-a and b**).

— Much attention given to inadequate food, but childhood obesity may also be a problem.

Supervision

— Children’s needs vary with age, developmental level, and behavior.

— *Adequate supervision*: Although children’s developmental level, mental health and behavior, and the environment are taken into consideration, children are nevertheless supervised to minimize the risk of moderate or serious harm.

— Supervision and other care aspects fall on a continuum from children’s needs being consistently and well met to being grossly inadequate.

Health Care

— Reasonable efforts are made to treat minor health problems.

— Professional care is obtained for moderate or severe problems (**Figures 10-2-a, b, and c**).



Figure 10-1-a



Figure 10-1-b

Figures 10-1-a and b. This 4-month-old girl died from nutritional neglect. Photographs show the lack of subcutaneous tissue on the face and body. (a) Lack of subcutaneous fat on the body. (b) Lack of subcutaneous fat on the face.

- Recommended preventive health care is given to the child.
- Professional care meets accepted health care standards.

Single or Rare Incidents

- From a child's perspective, a single lapse can be fatal.
- At a minimum, a thorough assessment of the family circumstances and of the other aspects of care is needed.



Figure 10-2-a



Figure 10-2-b

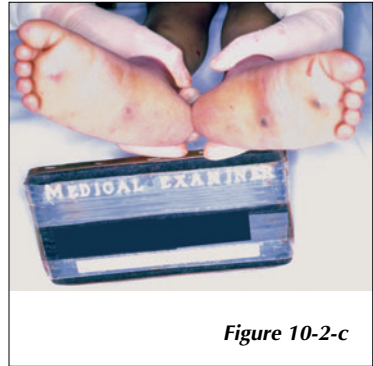


Figure 10-2-c

Figures 10-2-a, b, and c. This 7-year-old boy died of medical neglect from untreated streptococcal pharyngitis leading to retropharyngeal abscess and pneumonia. The home contained human fecal material that covered the floors and filled the nonfunctional toilet. The child's body had numerous skin abscesses resulting from superficial scratches becoming infected. (a) Abscesses on right elbow, left ear, and right lateral chest. (b) Abscess on left knee. The child's feet had 17 foci of cellulitis from walking on the fecal material. (c) Multiple foci of cellulitis on both feet.

PREVENTABILITY

— *Preventability* hinges on public education, parents' and caregivers' knowledge of certain risks, and public policies and resources.

— The spectrum covers situations including those in which the death was difficult to foresee, those in which outrageous neglect made child fatality an expected outcome, and those falling between these extremes.

- Key issues in gauging whether a fatality was preventable are as follows:
1. The extent to which warning signs or evidence of probable harm were apparent
 2. The likelihood of harm occurring
 3. Viewing some risks as remote
 4. The extent to which a reasonable layperson would have recognized the risk
 5. The likelihood that certain actions would have prevented the death
- See **Table 10-1**.
- Context also shapes our view of neglect and its seriousness.
1. Community norms and standards contribute to context; some suggest that only circumstances deviating from these standards can be deemed neglectful.

Table 10-1. Estimating the Extent to which a Child's Death Could Have Been Prevented

VERY EASILY

These preventable deaths occur when caregivers or communities fail to recognize or act on *clear* warning signs or *strong* evidence of a moderately high likelihood of serious harm or death, for example, the need for close supervision of young children near a swimming pool and the need for a surrounding fence with a latched gate around the pool. There is *clear* indication that appropriate actions could have prevented the death.

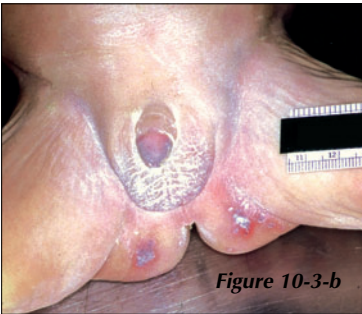
SOMEWHAT EASILY

These preventable deaths occur when caregivers or communities fail to recognize or act on *probable* warning signs or *moderate* evidence of a moderately high likelihood of serious harm or death, for example, locking away a gun, storing the bullets elsewhere, and limiting access to a young child. There is *good* indication that appropriate actions could have prevented the death.

NOT EASILY

These preventable deaths occur when caregivers or communities do not recognize or act on *possible* warning signs or *suggestive* evidence of a moderately high likelihood of serious harm or death, for example, an infant left sleeping in the prone position. There is *some* indication that appropriate actions could have prevented the death.

2. The goal is to ensure children's health and safety; conditions that jeopardize children's health and safety are neglectful (**Figures 10-3-a, b, c, and d**).



Figures 10-3-a, b, c, and d. This 4-month-old boy died from sepsis. The infant was rarely picked up and was kept in bed with fecal material on his body. (a) Old fecal material on lower half of body. Pressure sores evident (b and c) on buttocks and (d) back of the head.

ECOLOGICAL THEORY OF FATAL NEGLECT

- Involves multiple and interacting factors
- Characteristics may indicate risk factors on all societal levels: individual (child and parent), family, community, and society.

CHILDREN

- Characteristics can increase vulnerability to neglectful circumstances.
- Young children depend on caregivers to respond appropriately to basic needs.
- Children with physical disabilities or mental health problems are at increased risk because they have special needs.
- Children's mental health problems may be masked so that the family and others are unaware of the need for help.
- Children engaged in high-risk behaviors are at higher risk and are neglecting themselves.

PARENTS

- Have the primary responsibility for ensuring children's basic needs are met.
- Factors that may compromise parents' abilities are:
 1. Parents' mental health problems, particularly depression. Occasionally, children are deliberately starved or confined, suggesting a serious mental illness is involved.
 2. Problems with alcohol and other drugs.
 3. Parents who are cognitively impaired may be unaware of their children's needs or unable to respond to them.
 4. Parents who themselves were neglected may not know how to nurture and protect their children.
- Focus is often on mothers, who are typically held responsible when children die from bathtub drowning, dehydration, starvation, lack of supervision, or household fires.
- Many men have limited involvement in their children's lives, thus contributing to neglect.

- Parents may reject their offspring.
- Religious beliefs may result in children receiving inadequate medical care, leading to their death.

 1. Requires balancing a constitutional right to practice religious beliefs, parental rights, and a societal interest in protecting children from harm.
 2. Most states have religious exemptions in child maltreatment statutes, exempting parents from civil liability if they obtain health care according to their religious beliefs.
 3. The American Academy of Pediatrics (AAP) states that all children should have access to medical care and that this right supersedes parents' religious beliefs.
 4. The US Supreme Court has asserted that children should not be martyrs for their parents' beliefs.

FAMILIES

- Serious conflict, including domestic violence, can harm children.

 1. Children may become directly involved and be injured or killed.
 2. Witnessing the violence can lead to mental health problems and suicide.

- When parents cannot meet children's needs, consider the role of other family members. Their lack of support can contribute to neglect.

COMMUNITIES

- Community violence contributes to neglect and child fatalities.
- Dangerous neighborhoods with scant resources stress and isolate families and compromise their ability to protect children.

SOCIETY

- Poverty is strongly connected to neglect and adverse developmental and health outcomes in children.

 1. Living in high-crime neighborhoods may jeopardize children's safety.
 2. Indirectly, the burdens associated with poverty may compromise families' abilities to protect and nurture children.

— Lack of health insurance is a problem often found in low-income families.

1. Approximately 1 in 6 children in the US lack health insurance; the link to decreased health care is clear.
2. Low-income families have more health problems and receive less care, possibly contributing to children's deaths.

— Many low-income children do not experience neglect; by the same token, neglect also occurs in high-income families, especially emotional neglect.

— Laws have been passed to protect children.

ETIOLOGY OF NEGLECT

FIRES

— Unsupervised children may die in fires.

— In the US, 70% of residential fire deaths occur in homes without working smoke detectors.

FIREARMS

— Firearm death rates among US children and youth have declined since 1993 but remain high compared with historical rates and rates in other developed nations.

— Child deaths occur from playing with firearms; also, having access to guns can facilitate suicide.

— The AAP recommends that pediatricians advise parents on the risks and safe storage of guns.

— States are increasingly willing to hold gun owners liable if children gain access to guns and kill someone else.

MOTOR VEHICLES

— Motor vehicles are the major cause of trauma-related deaths in children.

— Child safety restraints are key in preventing occupant deaths to preschoolers.

— Pedestrian fatalities must also be considered.

FATAL HEAT EXPOSURE

- Usually involve parents leaving children (perhaps sleeping) for “a few minutes” while running an errand.
- Young children may enter unlocked vehicles to play and become trapped inside.
- Parents may forget children are in the car or use vehicles as “safe places” to leave children while they pursue various activities (work or play).
- Most deaths occur in the warmer months, but dangerous temperatures are possible during milder weather and in northern states.
- Parents may erroneously think that leaving windows slightly open will provide adequate ventilation, but temperatures approach ambient levels only if windows are at least half-open.
- The temperatures in closed vehicles create a severe risk for rapid dehydration and heat stroke.

DROWNING

- Unsupervised children may drown in bathtubs, swimming pools, and other bodies of water.
- A momentary lapse in supervision (eg, “I just went to get a towel”) is often given as a reason for a child drowning.
- Submersion time is predictive of survival.
 1. Survivors and those with mild neurologic injury may have submersion times of 1-21 minutes.
 2. Nonsurvivors may have submersion times of 2-75 minutes.
- Shared bathing is common in early childhood, but a young child may be unable to care for an infant or toddler in the bathtub.
 1. Continuous adult supervision is required.
 2. Infant seats or rings are not a sufficient substitute.
 3. Drowning in bathtubs is entirely preventable.
- For pool drownings, the need is for better inspections and public education.
- Pool drowning is also considered totally preventable with 4-sided fencing, self-latching gates, and adult supervision.

COSLEEPING AND OTHER SLEEP FACTORS

- Infants who sleep with their parents are at risk for smothering from overlaying.
- Sudden infant death syndrome (SIDS) deaths are rare in parental bed-sharing.
- In addition to cosleeping, the prone position and loose bedding that may cover infants' faces are risk factors for deaths.
- Unsafe sleeping practices occur in most cases diagnosed as SIDS, accidental suffocation, and undetermined cause.
- Cosleeping risks are most significant in the first 14 weeks of life, particularly if the parent smokes or uses alcohol or other drugs, if the sleeping surface is a sofa or waterbed, and if the infant is in the prone position.

FALLS

- Usually, fatalities occur after children fall from substantial heights (more than 2 stories, or 6.7 m) or when children's heads hit hard surfaces, such as concrete.
- The existence of multiple-story, deteriorating, low-income housing explains how falls from heights account for 20% of nonabusive deaths in some urban areas, compared with 1% to 4% nationally.
- The age distribution is bimodal, with preschoolers falling out of windows and older boys falling off dangerous "play areas" such as rooftops.
- The AAP recommends the following preventative measures:
 1. Parent counseling.
 2. Modifying the physical environment, such as reducing the spacing of the individual vertical bars of railings to 10 cm apart.
 3. Placing window guards and window locks to limit opening to 10 cm.
 4. Discouraging children from playing in dangerous, high locations.
 5. Pediatricians engaging in advocacy with manufacturers and legislators to ensure safe building codes and appropriate protective devices for children.

ASSESSMENT OF FATAL CHILD NEGLECT

— Goals for assessing factors contributing to children’s deaths:

1. Understand the factors and dynamics and provide solace and “closure” to those grieving.
2. Protect other children in the household and community.
3. Prosecute those responsible.

— Multidisciplinary approach is exemplified by child fatality review teams (CFRTs).

— An assessment guide is given in **Table 10-2**.

— A challenge in assessing children’s deaths is how to do so in a way that is framed positively and does not unduly aggravate families’ grief, because children’s deaths are tragedies.

Table 10-2. Key Questions in Assessing Neglect

WAS IT NEGLECT?

- Type: medical, supervisory, nutritional
- Severity
- Duration or chronicity
- Frequency of incidents
- Other forms of neglect or abuse present?

WHAT CONTRIBUTED TO THE NEGLECT?

WHAT PROTECTIVE FACTORS ARE PRESENT?

- If appropriate, does the family accept responsibility for the child’s death? Are they remorseful?
- Does the family appear willing and able to address underlying problems?
- Does the family appear capable of adequately caring for their other child(ren)?
- Do appropriate resources exist to support the family and monitor the safety of other children?
- Is the family willing and able to accept services?

WHAT INTERVENTIONS HAVE BEEN TRIED, AND WITH WHAT RESULTS?

1. State that it is helpful for everyone to understand what happened, so the assessment is cast in a constructive light.
2. Recognize that grieving family members often feel guilty for not preventing deaths and need support.
3. Keep in mind that crimes may have been committed and thorough death scene investigations are essential.
 - Base the assessment on information from key family members and professionals involved with the families or children.
 - Check for possible CPS involvement and information.
 - Check with peers and neighbors.

CHILDREN

- High-risk behaviors, such as drinking and driving, raise the question of suicidal tendencies; assess whether children gave any warning.
- Children often mask their depression; probe for its causes.
- Adolescents in denial of a chronic disease may refuse to adhere to treatments.
- Key questions:
 1. Did the child give reasonable indication that a basic need was not being met?
 2. How did the child respond to efforts to address basic needs?

PARENTS

- Parents are usually the focus of investigations, and investigators need their detailed descriptions of events surrounding children's deaths.
- Ascertain their actions over time, such as efforts to monitor the child's behavior, to obtain and provide health care, and to provide adequate supervision.
- Include characteristics of substitute caregivers, use of alcohol and other drugs, mental health problems, presence and storage of guns in the home, and the presence of working smoke alarms.
- Ask yourself, "How reasonable was the parental behavior?" to determine context.

— Parental roles are viewed differently if the goal is to prosecute rather than prevent future deaths.

— Consider the safety of other children in the household after a fatality.

— Determine the following:

1. If appropriate, does the family accept responsibility for the child's death?
2. Do they express remorse?
3. Is there confidence that they would carefully avoid similar circumstances in the future?
4. Does the family appear capable of protecting their other children?

FAMILIES

— Extended family members may have shared responsibility for children's care; clarify their involvement.

— Their ability and willingness to support their immediate families can be a helpful buffer against stressors and may be a factor in weighing the safety of other children in the household.

— Conversely, violence in the families may directly or indirectly contribute to death.

— Understand families' needs to assess whether there are appropriate resources to ensure the safety of other children in the household.

— Also consider whether families are willing and able to accept recommended services.

COMMUNITIES

— Examine the contributions of broader professional and community factors; remedy when necessary.

RESPONDING TO DEATHS FROM POSSIBLE NEGLECT

— Ensure the safety of other children in the household.

1. First priority. **Children's safety**, especially after fatalities, supersedes an interest in preserving families.
2. Notify CPS to check for prior involvement with families and to help assess the situation of other children in households.

3. Pending a comprehensive assessment, out-of-home placement is essential, at least in the short term.
 - Support the family. Make efforts to support family members, especially other children.
 - Consider the need for referral to CPS.
 - Address underlying problems that contributed to the death through comprehensive assessments, including reviews by CFRTs.
 - Respond to “single” lapses in care that result in a death.
1. Obtain histories; do not simply accept them as accurate, but carefully assess the situation.
2. Be aware that single, brief lapses in care are common.
3. If assessments yield no additional concerns, it is hard to know whether to prosecute. Many would prefer not to, believing that those responsible have been punished enough by their loss. Others may believe that further punishment is necessary and that prosecution is important for establishing community standards of expected behavior. Less-severe charges, such as involuntary manslaughter, may be appropriate compromises.
 - Support the professionals. Such cases can be traumatic for professionals involved.

PROSECUTION

- Determining the extent of parental responsibility is key to whether to prosecute; it is tied to the “preventability” of deaths.
 - **Table 10-3** offers a rough guide in considering possible parental responsibility.
1. “Major” responsibility is illustrated by a death in which a father forgot his toddler in the car on a scorching summer day while gambling in a casino.
 2. “Moderate” parental responsibility is reflected in a situation in which an infant had been hospitalized for severe dehydration with gastroenteritis. The child’s pediatrician was quite concerned, and a home visitor was involved through a community program. Still, the 9-month-old drowned in his bathtub when his mother left him “for a few seconds to answer the door.”

Table 10-3. Rating the Level of Caregiver Responsibility in Fatal Child Neglect

	MAJOR	MODERATE	MINOR
Caregiver behavior	Outrageous	Unreasonable	Possibly unreasonable
Behavior in relation to community standards	Markedly deviant	Somewhat deviant	Not deviant
Risk foreseeable	Risk common knowledge	Risk somewhat known	Most community members not aware of risk
Preventability of death	Easily	Probably	Possibly
Pattern of neglect	Clear, repeated	Somewhat	No
Appropriate interventions implemented by professionals	Yes, if not cooperative	Partially	No, if cooperative
Parents willing and able to accept community resources	No	Partially	Yes (but No if few community resources)

3. “Minor” parental responsibility can be inferred when a 9-year-old is playing outside on a hot summer night in a neighborhood that is well known to be dangerous and without safe places for children to play. The child was inadvertently shot when caught in the cross fire between rival gangs.

PREVENTING CHILD FATALITIES DUE TO NEGLECT

— Key principles:

1. *Education of children and youth.* Health care and school professionals and the media can educate youth about taking good care of themselves and can address the hazards of risky behaviors.

2. *Parent education.* Health education specifically can help ensure that children's needs are met. Educate parents about children's basic needs and support their efforts to meet them. Indicate where to get help.
3. *Community programs.* Support parents by providing safe places to play, accessible health care, and substance abuse treatment. Strengthen the ability of health care and school professionals to identify youth engaging in high-risk behaviors or children who may be severely depressed, and link them to appropriate programs. Strengthen CPS agencies to better support families in which neglect (or abuse) has been identified.
4. *Public policy.* "Passive" measures (eg, safety caps for medications) requiring no specific actions by individuals are more effective than "active" ones. Laws can address systemic problems that jeopardize children's health and safety. Health insurance is important to ensure children receive necessary care.

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NONABUSIVE INJURIES

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— Nonabusive injuries (NAIs) are the most frequent cause of fatalities in the US population aged 1 to 24 years.

1. Less frequent in children under age 1 year.
2. Most deaths in male victims aged 15 to 24 years; female victims account for only 25.9%.
3. Black male victims aged 15 to 24 years die from NAIs less frequently than from homicide.
4. Suffocation is the main cause of NAI deaths in children under age 1 year, drowning in those aged 1 to 4 years, and poisoning in those aged 10 to 14 years.

MOVING-VEHICLE ACCIDENTS

— The most common cause of NAI-related deaths beyond age 1 year

— Overall pattern of deaths same for the last 2 decades

— Among fatalities caused by NAIs, one third occur in moving-vehicle occupants aged 1 to 4 years, half in those aged 5 to 14 years, and three fourths in those aged 15 to 24 years

— Fatalities more likely among male than female passengers, especially after age 10 years

MOTORIZED VEHICLES

Adolescent Drivers

- Especially likely to die in moving vehicles
- Male drivers (aged 15 to 20 years) 3.6 times more likely to be killed than female drivers of the same age and 2.4 times more likely to be in a fatal crash
- Often, victims this age have previously experienced crashes (18%), speeding convictions (24%), or other violations (20%)
- Twenty-five percent of dead have blood alcohol concentrations (BACs) above 0.08 g/dL; 12% of surviving drivers in a fatal crash have BACs over this level.
- Most who die in crashes were not wearing seat belts and were either driving themselves or had another adolescent driving.
- Most fatalities occur during weekday hours before and after school.
- The hours from 8:00 pm to midnight are twice as dangerous as those after midnight.
- Teenaged drivers are challenged by immaturity, lack of concentration, excessive optimism, and undue peer influence.
- Formal driver education is of unproven value.

Children as Passengers

- Child occupant fatalities in moving-vehicle crashes have not declined despite the wider use of restraints.
1. Quality of restraint installation and use vary widely, but restraints save lives even if misused.
 2. Half of the crashes in which restrained children die are deemed unsurvivable.
 3. In two thirds of fatalities involving restrained children, the collision was with tractor trailers or other large vehicles; fatalities of unrestrained children involve large vehicles approximately one third of the time.
 4. Likelihood of injuries (fatal or nonfatal) is 59% lower in children aged 4 to 7 years in belt-positioning booster seats than for children in seat belts.

- Increased risk of death for children when driver is an alcohol-impaired adult, when riding (especially if unrestrained and small) in the front passenger seat with functioning air bags, or when riding in the cargo area of pickup trucks
- Children (especially infants) at risk of fatal hyperthermia when left in closed vehicles (See **Chapter 10**)
- School buses are the safest mode of vehicular travel. Being a pedestrian around school buses is more dangerous than being a passenger.

Pedestrians

- Second leading cause of deaths related to motor vehicle crashes
- In children over 5 years, pedestrian injuries primarily involve being struck in traffic by rapidly moving vehicles.
- For children younger than 5 years, injuries are from non-traffic causes, such as being struck in residential settings like driveways.
- Pedestrian injuries from automatic garage doors
 1. Most occur when children have access to remote activation devices or when garage doors come down on trapped children.
 2. Boys at higher risk of injuries than girls
 3. Overall injury highest in children aged 2 to 8 years
 4. Types of injuries include compression injuries to the head and thorax, leading to traumatic asphyxiation.

All-Terrain Vehicles

- Motorized vehicles with 3 or 4 balloon-style tires designed for off-road use on various terrains
- High center of gravity makes all-terrain vehicles (ATVs) unstable, especially on hard surfaces or if 3-wheeled.
- Most ATV injuries occur when drivers lose control, vehicles roll over, drivers or passengers are thrown off, or vehicles collide with stationary objects.
- Many seen in children under age 16 years; these children lack the physical strength, size, motor skills, and cognitive judgment needed to operate the vehicle properly.

- May be neglect by caregiver in allowing an underage child to use an ATV.
- Head injuries cause most of the deaths. Proper helmets should be used.
- Serious, nonfatal injuries involve head and spinal trauma, abdominal injuries, and multiple trauma.
- Abrasions, lacerations, and extremity fractures are more common but less serious.

Snowmobiles

- Popular because of their speed and size, especially in cold-weather regions
- Boys are 3 times more likely than girls to be victims.
- Head injury is the leading cause of death.
- Usually, snowmobiles collide with stationary objects.
- Children under age 16 years are injured or die when thrown off, the vehicle rolls over, or they crash into other snowmobiles.
- Children under age 8 years are injured when the vehicle is being towed or the equipment overturns.

Farm Equipment

- Predictable and usually seen on moving vehicles when youths are doing something beyond their mental, physical, or emotional abilities
 - Most prevalent types of injuries differ depending on developmental stages and physical abilities.
1. Birth through 4 years: falling off farm equipment or pickup trucks
 2. 5 to 9 years: being crushed by livestock, moving machinery, or falling off the back of a pickup truck
 3. 10 to 12 years: machinery causes
 4. 13 to 15 years: falls or rollovers of the machinery during work or recreation
 5. 16 to 18 years: operating equipment while impaired by drugs or alcohol, injuries mostly from rollovers and entanglements
 6. Types of injuries usually involve head or spine injuries from falls, abdominal injuries from being run over by farm equipment, or the amputation of limbs by machinery.

Airplanes

- Child airplane deaths are infrequent.

NONMOTORIZED VEHICLES

Bicycles

- Fatalities are often related to lack of early recognition and treatment.
- Approximately 70% of pediatric bicycle trauma are in patients aged 15 years or younger.
- Approximately half of bicycle deaths occur in children; boys are 2.4 times more likely to be killed than girls.
- Most common injuries affect head and neck area, especially in children aged 5 to 9 years.
- Bicycle helmet use is the most important factor in reducing risk of head injuries.

Scooters

- Children under age 10 years should use scooters only with close adult supervision; should not ride in streets, in traffic, or at night; and should always wear helmets, kneepads, and elbow pads.
- Care should be taken that they not be used in dangerous off-road locations (eg, empty swimming pools, down stairs).

Skateboards

- Approximately 90% of adolescents and children treated for skateboard injuries are male.
- Severe head or abdominal injuries seen in less than 5% of children.
- Most common and severest injuries involve collisions with or interactions with moving motor vehicles (holding onto moving vehicles) and may be fatal.

Infant Walkers

- Movable walkers are still used in many US households even though the American Academy of Pediatrics called for a ban.
- Infant walker deaths primarily result from infants falling down stairs.
- Injuries occur from the walker or when the infant is in the walker during a fall.

— The child in a movable walker may pull objects over on top of himself from above causing burns or other injuries.

POISONINGS

- See **Table 11-1**.
- Adolescents and adults are most likely to die (**Table 11-2**).
- Death is more likely in intentional than accidental poisonings.
- Child-resistant containers have reduced poisonings of young children up to 70%.

STRANGULATION OR SUFFOCATION

- Strangulation or suffocation may occur accidentally or abusively (**Figures 11-1-a and b**).
- Infants and young children may become entrapped between crib bars, between the bed or bedding and pillows, or by adults sleeping in the same bed.
- Children can become entangled in window-blind sash cords.
- Necklaces or lanyard chains worn around the neck to hold keys, whistles, or badges are a strangling risk.
- About half of playground deaths result from accidental strangulation; falls account for one quarter of fatalities.

Table 11-1. Poison Exposures and Outcomes Reported to US Poison Centers

AGE GROUP (YEARS)	POISON EXPOSURES REPORTED (% OF TOTAL)	DEATHS RESULTING (% OF DEATHS)	CASE-FATALITY RATE (DEATHS/MILLION EXPOSURES REPORTED)
1-5	998 423 (46.3%)	20 (2.2%)	20
6-12	151 221 (07.0%)	6 (0.7%)	40
13-19	160 505 (07.4%)	66 (7.2%)	411
Unknown child	7316 (00.3%)	0 (0.0%)	
All	2 168 248	920	424

Adapted from Litovitz et al, 2001.

Table 11-2. Role of Selected Categories in Fatal Outcomes

SUBSTANCE CATEGORY	NUMBER OF ATTRIBUTED DEATHS (FREQUENCY RANK)	FREQUENCY RANK IN CHILD EXPOSURES (YOUNGER THAN 6 YEARS)	FREQUENCY RANK IN ADULT EXPOSURES
Analgesics	405 (1)	3	1
Antidepressants	242 (2)	not in top 15	4
Sedatives, hypnotics, and antipsychotics	225 (3)	not in top 15	2
Stimulants and street drugs	187 (4)	not in top 15	17
Cardiovascular drugs	108 (5)	not in top 15	11
Cosmetics, personal care products	5 (not in top 20)	1	8
Cleaning substances	29 (12)	2	3

Adapted from Litovitz et al, 2001.



Figure 11-1-a

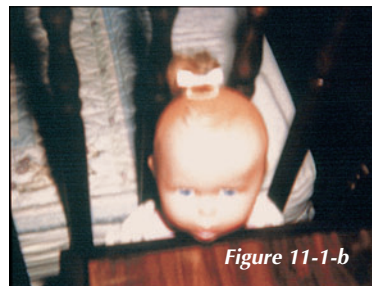


Figure 11-1-b

Figures 11-1-a and b. A 10-month-old boy had climbed out of his crib, fallen over the edge, and become hung up on the way down with his chin on an adjacent dresser drawer top. (a and b) A recreation doll is used to show the child's position with chin on dresser. The cause of death was asphyxiation by neck compression, and the manner of death was accident.

FALLS

— In children aged 5 to 9 years, falls from playground equipment cause more than 50% of injuries.

— Approximately 45% of playground-related injuries are severe fractures, internal injuries (abdomen and spleen), or dislocations.

TRAMPOLINES

— More injuries occur on home trampolines than any other piece of equipment.

— Children aged 5 to 14 years are at greatest risk.

— Injuries occur while jumping or performing stunts or when a person falls off the trampoline or collides with another person or the equipment.

— Deaths occur when victims fall off the trampoline and suffer cervical spine injuries.

BUNK BEDS

— Injured are likely to be under age 6 years, did not have beds on carpeted floors, and were playing.

— Most injuries seen when children are trapped or fall from top bunks, ladders, or bottom bunks.

— Head injuries (including concussions) are most common, followed by lacerations, contusions, and long bone fractures.

SPORTS-RELATED DEATHS

— Low incidence of sudden cardiac deaths in high school or college athletes

— **Table 11-3** lists the most common cardiovascular causes of death.

— May be direct (resulting directly from sports participation) or indirect (caused by systemic failure or a complication)

1. Direct football and soccer fatalities are often secondary to head trauma.
2. Indirect causes are primarily cardiac and heat-related.

ANIMAL INJURIES

— Although venomous animals (usually Hymenoptera and bees in particular) account for about one third of animal bite deaths in the US for all ages, most deaths are caused by dogs.

Table 11-3. Causes of Cardiovascular Death Among Young Athletes

CAUSE	FREQUENCY OF OCCURRENCE
Hypertrophic cardiomyopathy	36%
Coronary artery anomalies	19%
Increased cardiac mass, which may or may not have represented an abnormal heart	10%
Ruptured aorta	5%
Tunneled left anterior descending coronary artery	5%
Aortic stenosis	4%
Myocarditis	3%
Dilated cardiomyopathy	3%
Arrhythmogenic right ventricular dysplasia	3%
Mitral valve prolapse	2%
Coronary artery disease	2%
Other	8%

Adapted from Litovitz et al, 2001.

— Avoiding Hymenoptera with clothing or chemicals or both, portable epinephrine, and immunotherapy for allergic patients is effective.

FIREWORKS

— Two thirds of fireworks injuries in the US occur in the 2 weeks before and after Independence Day (July 4th).

— Boys are affected approximately 3 times more often than girls.

— Injuries usually affect the eyes, hands, and face.

— Types include burns, explosion trauma, and trauma caused by flying pyrotechnics or falling debris.

— Deaths are usually in adults and caused by a device's premature discharge or failure to ignite as expected.

— Fireworks have the potential to cause asthmatic exacerbations.

— Sparklers are one of the most common causes of injury. Even when used as labeled and under adult supervision, the high heat (up to 538°C [1000°F]) emitted can cause fire, dermal burn injuries, or both.

TOYS

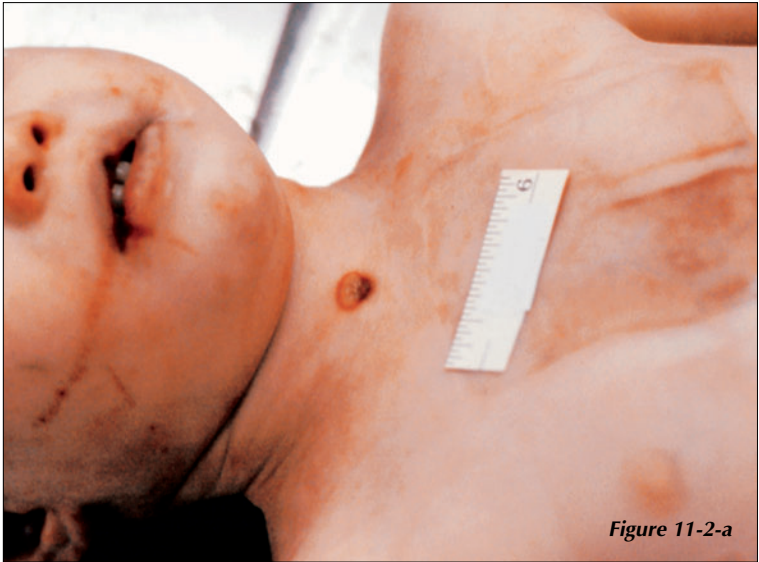
- Apparently harmless toys can cause serious or fatal injuries.
- Problematic toys are usually small or have loose or broken parts.
- Loose strings and cords can lead to choking and strangulation deaths.
- Balloons cause death more often than any other toys, with swallowing, inhaling, or choking the mechanisms.
- Toy chest or storage container lids may fall on children or children may suffocate after being trapped inside toy boxes.

LIGHTNING AND LIGHTNING INJURIES

- The National Weather Service reports that lightning is superceded only by heat-related conditions, floods, and tornados as a weather-related cause of death.
- Lightning occurs when a sufficient electrical potential difference between a thundercloud and the ground overcomes the insulating properties in the air and is dissipated.
- Fifty to 100 people per year in the US die from lightning strikes, most frequently in southern states.
- Damage, injury, and death gradually increase through the spring, reach a peak in the summer, and then decline dramatically in the fall.
- Reports of death and damage occur most often between noon and 6:00 pm.

DIFFERENTIATING LIGHTNING AND ELECTRICAL INJURIES

- Injuries caused by lightning or electricity depend on voltage, current, duration of contact, conversion of electrical energy to thermal energy, and trauma.
1. Lightning has a higher voltage and current than artificial electricity.
 2. Artificial electricity is alternating current and causes continuous muscle contractions and the tendency to maintain contact with the electrical source, increasing contact time and injury severity (**Figures 11-2-a and b**).



Figures 11-2-a and b. This 2-year-old girl was found lying on her abdomen with an electrical wire in her mouth and electrical burns on her body. Autopsy findings included electrical marks/burns on the (a) upper lip, right lateral aspect of the lower lip, right cheek, midline lower neck, and (b) palmar surface of the left hand and. The cause of death was electrocution, and the manner of death was accident.

3. Lightning strikes often follow a path over the skin's surface before discharging into the ground, called the "flash-over" effect.
4. Injuries are limited to people involved in the strike itself.
5. Disruptions occur to the electrical patterns of cardiac, vascular, and neurologic systems, leading to cardiopulmonary arrests and other sequelae.

— Mortality occurs in 5% to 10% of cases, but morbidity can be significant in survivors.

— Lightning injuries occur with direct hits, contact, splash, step/stride, blast, and upward streamers (**Table 11-4**).

Table 11-4. Mechanisms of Injury

Direct	Bolt of lightning strikes victim or object held by victim.
Contact	Bolt of lightning hits conductor (plumbing, fence, computer) that victim is holding.
Splash	Bolt of lightning strikes near victim (more common than direct hit).
Step/Stride	Bolt of lightning hits ground and current conducts through ground to victim, often entering one leg and exiting other.
Blast	Lightning superheats air surrounding it, and rapid cooling of that air results in an explosion and conclusive effect.
Upward Streamer	Charges begin in the ground and surge upward through object projecting above the ground.

Cardiopulmonary Systems

— The most immediate and life-threatening injury is cardiac arrest.

— Asystole, ventricular fibrillation (VF), and dysrhythmias are possible.

1. Asystole is more common with lightning strikes.
2. VF is more common with electrical injuries.

— Cardiopulmonary arrests result from asystolic cardiac arrest and respiratory standstill.

— Lightning depolarizes the entire myocardium.

- Pulmonary complications occur if the respiratory center or respiratory muscles are paralyzed.
- Victims require aggressive resuscitation.
- Myocardial infarction (MI) can occur by primary or secondary means.
 1. Primary MI is caused by direct electrical injuries to the myocardium.
 2. In secondary MI, right coronary artery spasm occurs with reduced blood flow to the myocardium. The right coronary artery is more susceptible to vasospasm because of its proximity to the chest wall.

Dermatologic Systems

- Burn injuries are usually minor compared to high-voltage electrical injuries.
- Can be punctate, partial- or full-thickness, linear, or have more distinctive patterns
 1. *Punctate lesions*: Scattered over body; may have discrete entry and exit points.
 2. *Full-thickness burns*: Rare; more likely from heating of metal objects (eg, watches or belt buckles) or from clothing on fire.
 3. *Partial-thickness burns*: More common than other types.
 4. *Linear burn lesions*: Produced when electrical current tracks along the victim's perspiration, often turning it to steam.
 5. *Feathering or arborescent patterns* (**Figure 11-3**): Distinctive; seen with splash injuries; considered pathognomonic of lightning injuries.

Neurologic Systems

- Immediate stages: victims suffer unconsciousness, seizures, confusion, amnesia, weakness, paresthesias, and keraunoparalysis, a transient paralysis of the limbs.
- More serious but rare injuries: cerebral edema, syndrome of inappropriate antidiuretic hormone secretion, intracerebral hematomas, spinal cord injuries, and autonomic instability.
 1. Intracerebral hematomas and spinal cord injuries are likely the result of trauma from the concussive force of blast injuries; intracerebral milieu



Figure 11-3. Arborescent lightning burn. Reprinted from Domart and Garet, with permission from the Massachusetts Medical Society. Copyright ©2000 Massachusetts Medical Society. All rights reserved.

disturbed or cervical, thoracic, or lumbar vertebrae fractured, with underlying spinal cord injuries.

2. Autonomic instability resulting in catecholamine release seen as dilated pupils, hypertension, peripheral vasospasm, and transient paralysis

— Peripheral vasospasm causes transient loss of pulse, cyanosis, and weakness of the extremities, which have long-term effects (eg, paraplegia or neuritis).

— Symptoms associated with central or peripheral nervous system dysfunction usually transient; long-term dysfunction relatively common.

— Children and adults have neurophysiologic sequelae like those seen in disasters; includes storm anxiety, nightmares, cognitive impairment, attention deficit, memory loss, sleep disorders, postconcussion syndrome, headaches, depression, and posttraumatic stress disorder.

Otologic and Ocular Systems

— Tympanic membrane rupture is the most common form; seen in 30% to 50% of lightning victims.

1. Rupture from direct electric current or the blast/concussive effect
2. External canals usually spared; surgical repair seldom needed

— Disruption of ossicles of the inner ear and mastoid can cause tinnitus and vertigo.

— Hemotympanum and otorrhea with cerebrospinal fluid leakage also reported.

— Ocular damage in some 50% of victims; seen as mydriasis, anisocoria, corneal lesions, hyphema, retinal detachment, macular holes, optic nerve injuries, and cataract formation.

1. Cataracts are the most common and can develop days to years later.
2. Respond well to surgical repair
3. Mydriasis and anisocoria are caused by stimulation of the autonomic nervous system; do not necessarily indicate brain injuries.
4. Rescuers should perform cardiopulmonary resuscitation until a full evaluation of the victim can be undertaken.

Other Types of Injuries

— Rare damage to the abdominal viscera and lungs can be caused by the concussive effect of shock waves generated by rapid cooling of superheated air.

— Myoglobinuria is infrequently seen because of lack of deep tissue injury; screening for this defect is suggested.

CARING FOR VICTIMS OF LIGHTNING STRIKES

Differential Diagnosis

— Signs and symptoms resemble those of central nervous system injuries sustained from head trauma, new-onset seizures, cardiac dysrhythmias, assault, and glucose and electrolyte abnormalities.

— Some clues identifying lightning as the cause of injury include outdoor occurrences, history of a recent thunderstorm, a person under age 16 years who is more likely to stay outdoors during a storm, disintegrated clothing,

pathognomonic burn patterns, rupture of the tympanic membrane, and magnetization of metal objects on or around victims.

Medical Care

— Immediate Treatment

1. Perform routine treatment of presenting injuries.
2. Undertake adequate resuscitation, if possible, as the patient is being transported to a hospital setting.
3. Institute basic life support and contact emergency medical services.
4. Begin pediatric advanced life support as needed.
5. “Resuscitate the dead” rule.
 - A. Refers to the fact that lightning victims may have fixed and dilated or unequal pupils due to autonomic nervous system instability and surges in catecholamines.
 - B. Do not assume the victim is brain-dead or in prolonged cardiopulmonary arrest.
 - C. Begin resuscitation unless reliable information indicates otherwise.
6. Immobilize the cervical spine in case trauma-related injuries are present.

— Ongoing Management

1. Gather thorough histories and detail the circumstances.
2. Interview witnesses to determine the time of strikes and what resuscitation measures were begun.
3. Perform a complete physical examination.
4. Perform a more in-depth and methodical secondary survey.
5. Recommended tests: urinalysis looking for blood or myoglobin or both, evaluation of electrolytes to determine potassium and calcium levels, evaluation of cardiac enzymes, and electrocardiogram (ECG).
6. Order radiologic studies based on circumstances.
7. Computed tomography indicated for known head injury, delayed return to consciousness, or deteriorating neurologic status.
8. Reserve ECGs for patients with a history of seizures.

9. Sometimes follow-up for long-term problems of chronic pain and cognitive dysfunction is needed.
10. Patients with postinjury psychological disturbances can be referred to the Lightning Strike and Electric Shock Survivors International, Inc. support group (LS&ESSI) through their Web site (<http://www.lightning-strike.org>) or by telephone (910-346-4780).

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SUICIDE

Michael R. Pines, PhD

Lakshmanan Sathyavagiswaran, MD, FRCP(C), FACP, FCAP

— Each year the US loses 30 000 people to suicide, and emergency care is provided to another 650 000 individuals who attempt to take their own lives.

— Suicide is defined by the coroner's office as "intentional death by your own hand."

— To declare a death a suicide, the medical examiner must exclude an accidental manner of death or death at the hands of another (homicide).

1. Insufficient evidence collection (or alteration of evidence) by first responders frequently occurs at the scene.
2. With transport to the emergency department (ED), evidence collection/documentation at the scene may be compromised even if law enforcement responds to the hospital and interviews witnesses.

— The medical examiner's conclusion is often based on law enforcement reports that include witness statements, scene descriptions, physical evidence collected, suicide notes, and autopsy findings.

— Surviving family members are often stigmatized by a suicide determination, with grief compounded by feelings of responsibility and guilt.

— Suicide is the third leading cause of death among persons aged 15 to 24 years (**Figure 12-1**).

COORDINATED PUBLIC HEALTH STRATEGY

— Public health approach focuses on identifying patterns of suicide and suicidal behavior throughout a group or population and consists of the following:

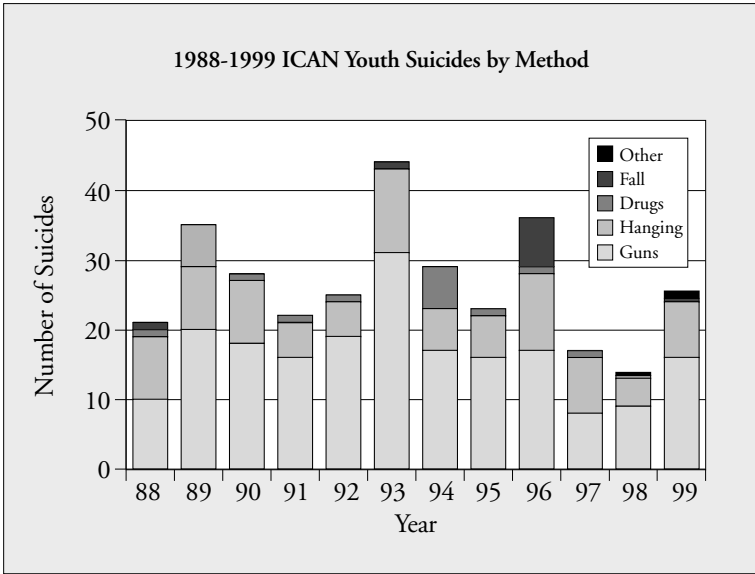


Figure 12-1. Method of suicide from 1988 through 1999. Reprinted from ICAN.

1. Defining the problem
2. Identifying causes
3. Developing and testing interventions
4. Implementing interventions
5. Evaluating effectiveness

— Strategy encompasses the promotion, coordination, and support of activities to be implemented nationwide as culturally appropriate, integrated programs for suicide prevention at national, regional, tribal, and community levels.

— Interrelated elements of the planned national strategy:

1. A way to engage diverse group of partners to develop and implement the national strategy with support of public and private social policies
2. Sustainable, functional operating structure for partners, with authority, funding, responsibility, and accountability for national strategy development and implementation

3. Agreements among federal agencies and institutions defining and coordinating their segments
4. Summary of scope of the problem and consensus on priorities
5. National aims, goals, and measurable objectives integrated into conceptual framework
6. Appropriate and evaluative activities for practitioners, policy makers, service providers, communities, families, agencies, and other partners
7. Data collection and evaluation system to track information on suicide prevention and set benchmarks to measure progress

DEFINING THE PROBLEM

Note: Data in this chapter are largely based on California state statistics.

— In 1998, suicide was the third most-common cause of death among children aged 10 to 14 years and among persons aged 15 to 24 years.

— All suicide deaths are not reported as such; actual rates are considerably higher.

1. Deaths are often misclassified as homicides or accidents even when an individual intended suicide.
2. Other deaths are misclassified in deference to community or family pressures.

— There is no national database of suicide attempts.

— Costs include the physical and emotional pain of those who attempt or fully commit suicide; the emotional distress of family members, friends, and schoolmates; and financial costs.

— Creation of a national database was hampered by lack of uniformity in defining suicide. The definition presented in this chapter was used in California to gain the illustrative data presented.

GENDER

— Most youth (under 18 years of age) suicide victims are male.

AGE

— Average age of youth suicide victims is approximately 15 years.

— Number of suicide deaths among younger children is increasing.

RACE

- White youths accounted for 41% of suicides; increased 375% over previous years in California.
- In 1999, the number of suicides among Hispanic youths decreased 25% compared to the previous year, with Hispanic youths representing 33% of total suicides.
- Number of African-American and Asian adolescents who committed suicide increased.

METHODS OF DEATH

- See **Case Study 12-1, Figure 12-2; Case Study 12-2, Figures 12-3-a, b, and c; Case Study 12-3, Figures 12-4-a, b, c, and d.**

TEMPORAL PATTERN

- March, July, and November (25% of the year) accounted for 45% of recorded suicides in California.

SUICIDE REVIEW TEAM

- Developed to implement public health approaches.
- Review individual cases to define the problem, identify causes, develop and test interventions, implement interventions, and evaluate effectiveness (**Figure 12-5**).
- Data collection instruments designed to accurately record warning signs, risk factors, and protective factors (**Figures 12-6-a, b, c, d, e, f, and g**).

CONCERNS AND ACTIONS

MEDICAL EXAMINER/CORONER

- Evidence of suicidal intent is often difficult to acquire.
- Many suicide findings are challenged by family members.
- Psychological autopsies are beneficial, but families often decline to participate in lengthy interviews. Such interviews with family members and friends of the decedent are necessary to complete these kinds of autopsies.

LAW ENFORCEMENT

- Inconsistencies in crime scene investigation process and evidence preservation; need standardized practices for law enforcement and hospitals.

Case Study 12-1

After school, this 16-year-old girl, a high school junior, climbed on the dresser in her bedroom and hanged herself from a rafter on the ceiling using a rope. She was pronounced dead at the hospital following unsuccessful resuscitation efforts by paramedics and ER physicians.

The girl lived with her mother. Prior to her death, she did not seem depressed and never expressed any suicidal ideation. At the time of her suicide her older brother was not speaking to her because he believed she had been smoking marijuana and he did not approve of her boyfriend, an incarcerated gang member. She corresponded with her boyfriend through letters and her mother was unaware of the relationship. After her death, investigators found letters from her boyfriend in the trash. In these letters he implored her not to take her life.

After the initial review of the case by the CASRT, contact was made with the boyfriend. He said that he made 3 failed attempts to get assistance from staff after receiving letters indicating her suicidal intent. His final attempt to reach her by phone was too late. Subsequent dialogue with CASRT and the management at the facility resulted in increased suicide prevention training for professional staff.



Figure 12-2. Ligature mark consisting of a deep abrasion furrow associated with conjunctival petechial hemorrhages.

Case Study 12-2

This 16-year-old girl suffered a self-inflicted gunshot wound to the chest and was found by her mother when she returned home from work. Paramedics pronounced her dead at the scene. A handgun was discovered next to her. Subsequently, a journal was found in her room that described her relationship with a 30-year-old man who broke her heart. She stated that she was tired of suffering and would rather die than go on living without him. The mother had never met this boyfriend. The mother also reported that the girl had been depressed over the death of her cousin 6 months prior to the incident.

The girl had dropped out of high school and spent most of her time partying. She stayed out late at night and drank alcohol, causing many arguments between her and her parents. The girl had an arrest record, having been charged with 2 counts of assault with a deadly weapon. One count was dismissed, and she was released to the custody of her mother for one conviction. Shortly thereafter she was arrested for possession of cocaine and was placed on house arrest. Although the mother told the judge that her daughter was beyond her control, the girl was again released to her custody.

CASRT discussed the advantages of mental health screening in the juvenile justice system and the advantages of continued connections to staff and friends at school. They recommended that schools better monitor student dropouts to prevent suicides.



Figure 12-3-a. Death scene showing decedent on couch with handgun between her legs.



Figure 12-3-b

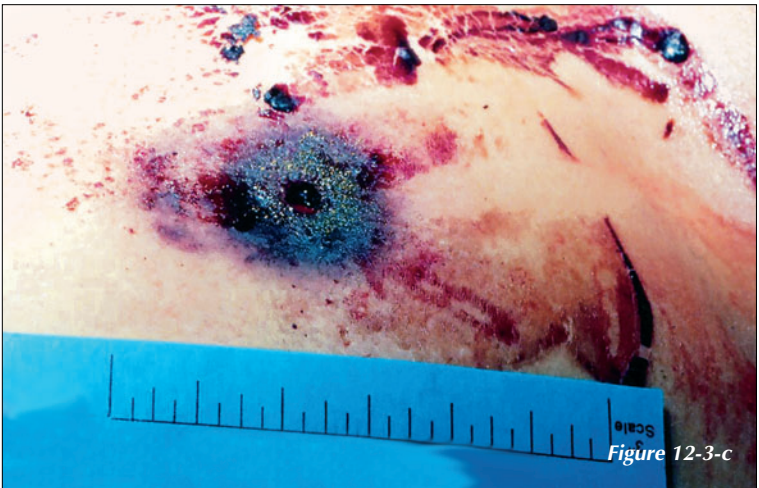


Figure 12-3-c

Figure 12-3-b. Entrance wound on chest.

Figure 12-3-c. Wound entrance with black soot surrounding it, indicating close contact.

Case Study 12-3

The mother of this 16-year-old girl discovered her in thick ground cover under the bedroom window of her high-rise condominium residence. A security officer had heard a loud thud between 11:00 and 11:30 pm but did not see anything due to the thick shrubbery. Her mother had spoken with her approximately 1 hour before the decedent went into her room and closed the door. At approximately 1:30 am her mother went to check on her and found the bedroom window open and a suicide note by the window. The security guard heard the mother scream upon finding the body, and EMS was called. Paramedics pronounced her dead at 1:50 am.

The girl was reportedly happy, with no history of depression or expressed suicidal ideation. The city crisis response team responded to the scene, but the mother refused their assistance. Investigators discovered that the girl's father had killed himself a few years prior, but the mother refused to provide any information. In the handwritten note the decedent stated that she loved her mother and did not blame her for her actions.

The girl attended a private school known for academic excellence. In response to the news of her death, the school psychologist met with her friends and a school assembly was scheduled. At the time the school did not know the death was a suicide. When the school learned that it was suicide, her friends were shocked. Students reported that her mother drank heavily and put pressure on her to succeed academically. Some students came forward with feelings of guilt, and the school arranged for memorial activities under the guidance of the school clergy. The school increased its suicide prevention activities as a result. Other suicide prevention activities were recommended by CASRT, including risk assessment for students with undiagnosed mental disorders.



Figure 12-4-a

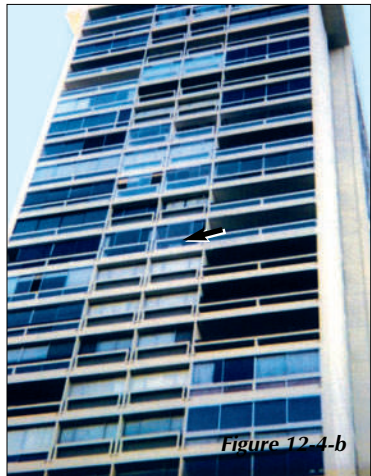


Figure 12-4-b

Figure 12-4-a. Possible foot marks on windowsill (arrow).

Figure 12-4-b. View of bedroom window (arrow) from street.



Figure 12-4-c



Figure 12-4-d

Figure 12-4-c. View below window where decedent landed (arrow).

Figure 12-4-d. Bushes where decedent was found.

Child and Adolescent Suicide Review Team Case Review Agenda

REPORTS FROM AGENCIES WITH RECORDS

- A. Law Enforcement
- B. Coroner
- C. School
- D. Other Agencies (as appropriate)
 - Children's Services
 - Probation
 - Mental Health
 - Hospital
 - Crisis Response Team
 - Other

INPUT FROM TEAM EXPERTS

- A. Alcohol/Substance Abuse
- B. Pharmacological Treatment
- C. Gay, Lesbian, Bisexual, and Transgender & Gender Identity
- D. Weapons
- E. Internet
- F. Hospitals & Transitions
- G. Survivors & Survivors Services
- H. Culture, Race, Gender

CASE DISCUSSION & ANALYSIS

- A. Precipitating Factors
- B. Risk/Protective Factors

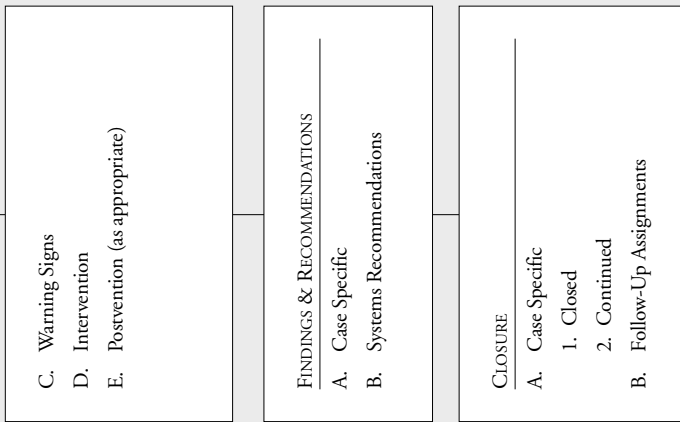


Figure 12-5. Flow chart summarizing the case review agenda of CASRT meetings.

**LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY
AGENCY REPORTING**

Review Date	Case #	Case Closed ()	Case Held Over () Date
Last Name	DOB	Date/Time of Death	Type of Death per Coroner () Suicide () Accidental () Homicide () Natural () Undetermined
		Date/Time of Injury	
INVESTIGATIVE SUMMARY			
I. Dept. of Coroner Information			
Nature of Lethal Injury		Location of Injury	Location of death
Gunshot wound _____			
Knife wound _____			
Poisoning or drug overdose _____			
Hanging _____			
Gas asphyxiation _____			
Fall _____			
Drowning _____			
Other _____			
II. Other Information			
III. Toxicology Test Findings			
PRECIPITATING FACTORS TO SUICIDE			
Risk Factors (check)	< 6 mos.	> 6 mos.	Comments
1. Past suicidal idea/attempts			
2. Past homicidal idea/behavior			
3. Stress event/loss Describe:			
4. GLBT sexual orientation			
5. Hx Child physical abuse			
6. Hx Child sexual abuse			
7. Hx Child emotional abuse			
8. Hx Family domestic violence			
9. Hx of own dating violence			
10. Hx of Pregnancy/parenthood Describe:			
11. Hx Substance abuse			
12. Hx Impulsive behavior			
13. Hx Aggression/violence			
14. Physical disabilities, Illness Describe:			

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Figure 12-6-a. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

**LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY
AGENCY REPORTING**

Environmental Factors (check)	< 6 mos.	> 6 mos.	Comments
15. Parental Supervision			
Biological/adoptive parent			
Foster parent/kinship relative			
Group home			
Shelter care			
Juvenile detention			
Hospital care			
Other:			
16. Siblings in Residence			
a. No siblings			
b. Age: M F			
c. Age: M F			
d. Age: M F			
e. More than 4 siblings			
17. Caregiver Challenges			
Hx of domestic violence			
Hx of caregiver mental disorder			
Hx of caregiver substance abuse			
Hx of caregiver alcohol abuse			
Hx of caregiver incarcerated			
Hx of caregiver abusing children			
Hx of caregiver sex abusing			
Hx of caregiver extreme neglect			
18. Access to weapons			
At home			
Stored in locked container Y N			
Gang or other peers			
Legally purchased			
Stolen			
Foster parent			
Access at school			
Hx prior use of weapons			
Hx threats with weapons			
19. Sociological Factors			
Gang involvement			
Deviant peer group			
Social isolation			
Peers abusing drugs/alcohol			
Internet peer group			
Video game involvement			
20. Educational Factors			
Low performance/high pressure			
Turancy/school drop out			
Discipline/suspension/expulsion			
Subjected to peer abuse (bullying)			
Learning difficulties			
Alternative ed (continuation, private)			

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Figure 12-6-b. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY
 AGENCY REPORTING

Individual Factors (check)	< 6 mos.	> 6 mos.	Comments
21. Juvenile Justice Factors			
Probation/parole			
Hx of arrest			
Hx of incarceration			
Hx of Juvenile diversion			
Pending court appearance			
Pending sentencing			
22. Subs Abuse/Dependency			
Alcohol A D			
Crack A D			
Cocaine A D			
Crystal Meth A D			
Heroin A D			
Marijuana A D			
LSD A D			
Other A D			
Describe:			
23. Mental Health/Sub Abuse TX			
Pharmacological tx			
Simplify:			
Individual, family MH tx			
Group MH tx			
DSM IV tx			
Out-patient treatment			
In-patient treatment			
Specify:			
24. Significant Losses			
Parent/caregiver death			
Parent/caregiver suicide:			
death			
attempt			
Parent/caregiver separation			
Close friend			
suicide death/attempt			
relocation			
social loss			
Loss of pet			
Loss of physical possession			
Romantic break up			
Change of residence/school			
Other			
Describe:			

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Figure 12-6-c. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

**LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY
AGENCY REPORTING**

Individual Factors (check)	< 6 mos.	> 6 mos.	Comments
25. High Risk Behavior			
Life threatening Specify:			
Socially disruptive Specify:			
Educational disruptive Specify:			
Family disruptive Specify:			
26. Perceived Social Rejection			
Describe:			

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Figure 12-6-d. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY
AGENCY REPORTING

Suicidal Behavior (check)	< 6 mos.	> 6 mos.	Comments
27. Suicide warning communicated to:			
Parents			
Siblings/relatives			
School staff			
Boyfriend/girlfriend			
Other peers			
Physician or MH professional			
Other			
Specify:			
28. How warning communicated			
Verbally			
Handwritten note			
Internet or computer communication			
Other			
Specify:			
Suicide Intervention Attempts (circle)	MH	Schools	Other Parties (please identify)
29. No-suicide contract			
30. Personal or family physician			
31. Parental restraint			
32. Peer intervention			
33. Crisis hot line			
34. Law enforcement			
35. Mobile emergency team			
36. Hospitalization			
37. Out-patient mental health			
38. Pharmacological tx			
39. Faith-based counseling			
40. Other			
Specify:			
41. Other			
Specify:			

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Figure 12-6-e. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

**LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY
AGENCY REPORTING**

Postvention	Check	Other Info.
42. Injury Scene Investigation/Services		
Physical evidence secured/collected		
Computer files reviewed		
Witnesses interviewed on scene		
Witnesses interviewed at hospital		
Witnesses interviewed other location		
Specify:		
43. Survivor Services Provided For:		
Parents/caregivers		
Siblings		
Other relatives		
Peers in neighborhood		
Peers at school		
School staff		
Other		
Specify:		
44. School/Community Postvention		
School notified by		
Specify:		
School policy/procedures on file		
School prevention procedures followed		
School announcement to students		
School letter to parents		
School MH crisis team activated		
Memorial activity at school		
School participation at funeral		
Memorial activity in community		
Professional consultation at school		
Peer helping at school		
Community crisis team responded		
Other		
Specify:		
Other		
Specify:		

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Los Angeles County Child & Adolescent Suicide Review Team

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Figure 12-6-f. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

LOS ANGELES COUNTY CHILD & ADOLESCENT SUICIDE REVIEW STUDY AGENCY REPORTING	
Interventionable/Not Interventionable/Undetermined Status	
1. Interventionable at the level of: Individual/Family () Agency () Public Policy ()	
2. Not interventionable _____ (Given similar circumstances, no opportunity existed to intervene.)	
3. Undetermined _____ (Unable to determine if intervention was possible on the limited information available to the team.)	
4. General Policy _____ (While not directly related to the findings of the case, policy recommendations were determined.)	
Case Specific Recommendations	
1.	
2.	
3.	
Review Status	
Case Closed () Case Held Over ()	
1.	
2.	
General Recommendations	
1.	
2.	
3.	

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Los Angeles County Child & Adolescent Suicide Review Team

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Figure 12-6-g. Suicide and Death Data Collection Form. Reprinted from the Los Angeles Inter-Agency Council on Child Abuse and Neglect Child Death Review Team and Los Angeles County Child & Adolescent Suicide Review Team.

- Lack of communication between hospitals and law enforcement is problematic.
- Law enforcement and other first responders help survivors who need psychological services.
- Uniformed personnel have unique opportunity to identify and refer those in need, but require more training and referral information.

SCHOOLS

- Policies and administrative procedures needed to ensure that at-risk children are identified and directed to appropriate services.
- Crisis intervention on campus needed after suicides of teenagers to support those most affected and prevent future suicidal behavior (See **Case Study 12-3, Figures 12-4-a, b, c, and d**).
- Schools cautioned to conduct only memorial activities that do not glamorize the suicidal act or normalize suicide as appropriate way to handle adversity.
- School personnel need training to provide appropriate educational placement and support.

HOSPITALS

- Hospital EDs for acute care often treat at-risk youth, some with self-inflicted injuries not resulting in death.
- ED personnel must use appropriate injury codes (E codes) to improve available data on suicide attempts.
- Discharge-planning and outpatient treatment services require coordination.

EMERGENCY SERVICES

- Crisis intervention team not always available 24 hours a day.

OTHER AGENCIES

- Agencies' personnel lack the skills to identify children and youth at risk for suicide and to intervene effectively.

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BURNS

Kenneth W. Feldman, MD

— Burn injuries may be the cause of death or result in incidental findings in child fatalities.

1. Fatal burn injuries can result from accidents or child neglect.
2. Abusive burn injuries may be part of fatal battered child syndrome.

— Postburn fatalities caused by smoke inhalation, immolation, or severe electrical injury usually occur soon after injury.

1. Subacute mortality can result when extensive burns are complicated by hypovolemic shock. Unless medical care is delayed or fluid resuscitation is not performed, death from shock is rare.
2. Delayed mortality usually results from secondary infection, though burn-related cardiac dysfunction and adult respiratory distress syndrome also occur.
3. Neglect is often a prominent part of complications.

— Burns are caused by various energy sources.

1. *Flame burns* generally occur in house fires, when clothing ignites, or with burning solvents or fuels.
2. *Contact burns*
 - A. Result from direct contact with hot solids or smoldering objects
 - B. When abusive, often marked by clear imprints of the injuring object
 - C. When accidental, usually produce single, smeared burns of normally unclothed body parts
3. *Pressure injuries* can share morphologic similarity with contact burns from hot solids (**Figure 13-1**).



Figure 13-1. A circumferential pressure injury from elastic in clothing resembles a dry contact burn.

4. Scalds

- A. Usually result from contact with hot liquids
 - B. Most common are injuries from hot foods and drinks
 - C. Tap water scalds tend to produce more extensive and severe damage.
 - D. May involve either flowing liquids or immersion in basins of hot fluids
 - E. Patterns and distribution of abusive and accidental immersion scalds differ.
5. Steam burns and burns from heated air resemble hot liquid scalds.
 6. Electrical injuries cause deeply coagulative burns; injuries resulting from higher voltage may have entrance and exit burn sites.
 7. Radiant sources of energy can also cause injury.
 8. Sunburns are common but usually not complicated or fatal.
 9. Though rare, microwave energy and ionizing radiation can cause severe or ultimately fatal injury.
 10. Chemical or caustic burns are seen with accidents or abusive trauma.

INCIDENCE AND INVESTIGATION

- Home investigations can confirm and illustrate burn scenarios.
- Younger children are more likely to be victims of homicidal fire- and flame-related deaths.
- In 1995, the National Safety Council identified fires and burns as the fourth leading cause of accidental death for children younger than 1 year and the third for children age 1 to 4 years.
- Databases of death certificate information that do not express the nuances of abuse and neglect do not give an accurate impression of why fatalities occur.
- Seven historical and 6 physical criteria suggest injury from abuse.
 1. Validated criteria include burns attributed to a sibling, differing historical accounts, previous accidental injuries, inappropriate parent affect, history incompatible with results of a physical examination, and burns incompatible with developmental abilities.
 2. Infrequently occurring, unvalidated criteria include an unrelated adult seeking medical care; inappropriate child affect; burns localized to perineum, buttocks, or genitalia; injuries older than the history is reported to be; and additional injuries.
- Few data substantiate the utility of skeletal surveys in the diagnosis of abusive injuries with isolated burns; however, routine skeletal surveys can be useful in the youngest age group.

BURNS AS THE PRIMARY CAUSE OF MORTALITY

FLAME AND FIRE

- Abusive flame and fire deaths in young children usually occur with extrafamilial arson or arson during domestic disputes.
- Children are usually not the primary targets of the arson.
- Be aware of social situations and carefully evaluate the source and location of fire ignition.
- Children may be the direct targets of ignition.
 1. Flammable liquids may be thrown on them and those liquids ignited.
 2. Such injuries are more frequent in extrafamilial conflicts among adolescents or adults.

SCALD BURNS AND IMMERSION INJURIES

— Burns caused by hot tap water figure in 7% to 24% of all scald injuries.

— Hot tap water is the most common source of scald injury from submersion or immersion.

1. The most frequent heat source in fatal scalding.
2. Mean body surface area (BSA) burned (19%) far exceeds mean BSA burned with food, beverage, or other hot-liquid exposures (11%).

— Heat content of a substance is dictated by temperature and specific heat.

1. Liquid's heat content modifies burn patterns.
2. Water temperatures do not exceed 100°C (212°F), but other fluids can reach hotter temperatures and have a greater specific heat.
3. Water has only enough heat content to cause splash burns at temperatures of 60°C to 66°C (about 140°F to 151°F) or higher. At lower temperatures, the thin film of splashed water cools before burning occurs.
4. Liquids or semiliquids (eg, cooking oil, chili) have greater heat content and are more viscous, so they will spread, thin, and cool more slowly, causing splash burns at lower temperatures and with greater local depth of injury.
5. Relationship of burn time to temperature is well described for hot water (**Table 13-1**), but comparable data for foods with other heat content are not available.

— Burn time in any scald at lower temperatures is determined by how long basal skin layers must be heated before necrosis occurs.

1. At lower temperatures, burn time is relatively long, so time for heat to penetrate to basal layers is insignificant.
2. If basal skin layers are heated to 54°C (about 130°F) or greater, cells undergo nearly instant necrosis.
3. At higher temperatures, the time for heat to pass to basal skin layers is the primary determinant of burn time.

Table 13-1. Deep Partial-Thickness Burn Time/Temperature Thresholds and Hot Water Temperature Associations

CONDITION	TEMPERATURE (°C/°F)	TIME TO CAUSE BURN (EXPERIMENTAL)	TIME TO CAUSE BURN (CALCULATED)
Comfortable child bath temperature	38/101		
Hot tubs	39-40/102-104		
Threshold for pain in adults	43-45/109-113		
Threshold for deep partial-thickness burns	45/113	6 h	
Deep partial-thickness burns	49/120	10 min	
Deep partial-thickness burns	52/125	2 min	
Deep partial-thickness burns	53/127	1 min	
Deep partial-thickness burns: adult	54/130	35 s	31 s
Deep partial-thickness burns: child	54/130		10 s
Deep partial-thickness burns: adult	60/140	5 s	3 s
Deep partial-thickness burns: child	60/140		1 s
Deep partial-thickness burns: adult	65/149	2 s	1 s
Deep partial-thickness burns: child	65/149		0.5 s

Adapted from Feldman, 1983 and 1997.

4. Children's skin is thinner than adults' skin, so children suffer burns from higher temperatures more quickly than adults.

5. Skin thickness also dictates burn-time thresholds at higher temperatures. For example, heavily callused palmar skin is more resistant to burning than thinner skin on the dorsum of the hand.

— To get clear water lines and spared areas with tap water immersion burns from lower-temperature water, children must be restrained for a prolonged time.

1. For groin creases to be spared burning, children must be restrained in a hip flexion position.

2. Clothing inconsistently modifies burn patterns.

A. With brief exposures, clothing may protect the skin from hot water. Diapers may cause a "bathing trunk" unburned area within an otherwise uniformly burned lower body if immersion time is brief.

B. When diapers are soaked with hot water, they have a greater depth/volume of hot liquid in contact with skin for a longer time, increasing injury severity and modifying burn patterns.

— Criteria associated with abusive burn injuries.

1. Include historical, physical, and burn-topographic attributes.

2. Delay in seeking professional attention, beyond that of a "reasonable" caregiver dealing with serious burn injuries, is associated with abuse.

3. Seventy percent of tap water burn victims brought to care by someone other than their caregiver are likely to be abuse victims.

4. Symmetric burns of the extremities and burns of the perineal region are likely to be abusive.

5. Most common abusive immersion fatalities involve buttock and lower extremity immersions and are precipitated by toilet training frustrations; the mean age of these children is near 2 years.

6. For children forcibly held in hot water, areas of skin-to-skin contact remain unburned due to flexed posture.

7. Parts of seated children's bodies, such as the front of flexed knees, are spared from burning.

8. Children held firmly seated against the tub bottom, which is cooler, may have a doughnut-shaped burn pattern on the buttocks.
 - Forensic photos with color charts, size references, and labels help define all burn margins and all spared areas.
 1. Burn diagrams are *usually* inadequate to document burn details.
 2. By reviewing full-burn photographs, one can define burn contour lines and re-create children's position in the water; dolls or an artist's recreation drawings may be used.
 3. The recreated position may be an unbalanced posture the child could not have maintained without support or restraint.
 - Water depth can be estimated from burn pattern.
 1. The burn depth of all regions below the water contour line will appear uniform, except where skin is thicker.
 2. Document the temperature of water flowing from the tap at different times after it is turned on.
 3. Note the resulting temperatures at different positions in the basin over time. These help you define the potential times needed to cause burning.
 4. With water temperatures at the lower end of burning range, an extended, painful, immobile exposure to scalding water is required to cause injury.
 - Perform careful scene investigations to test the plausibility of accidental injuries in tap water burn deaths.
 1. Contact law enforcement officials promptly so that you can conduct the evaluation as soon as possible after the injury or fatality.
 2. View scenes in relationship to children's developmental abilities.
 3. Note where the toilet and other raised surfaces are in relationship to the sink counter, if they can be used as a step up to the counter, if the child can climb into the sink, the type of faucet handle (eg, single or double, temperature or flow-limiting), and the force needed to turn it.
 4. Document the water heater's temperature setting and type (gas or electric).

5. Determine how rapidly water from the faucet heats after hot water is turned on, how rapidly the basin fills, and what temperatures result as the basin fills at various times.
6. Determine whether water accumulates in the basin with the drain open and if the child fits in the basin in the position indicated by the burn pattern.
7. Consider time of day, environmental temperatures, and recent hot water usage pattern.
 - A. Gas heaters may “stack,” with multiple short draws of hot water causing the burner to come on repeatedly and heat the water at the top of the heater above the steady state reservoir temperature.
 - B. If outside temperatures are cold, water supply reservoirs are likely colder than normal, and less cold water is needed to temper hot water and obtain comfortable bathwater.

— With abusive immersions, caregivers may give false histories that children were left comfortably bathing in water determined by the caregiver to be of appropriate temperature, but when the caregiver returned, the children had burned, peeling skin.

1. Young children bathe comfortably in 38°C (101°F) water.
2. Partial-thickness burning of a child’s skin is possible at 45°C (113°F); this level of injury requires a 6-hour exposure at this temperature.
3. In normally sensate children, drawn water that is checked by parents should not cause injuries.

— It may be alleged that children do not experience or react to pain, a claim easily refuted by history or observation of the response to burn care.

— If children’s peers are said to have added hot water to a comfortable bath, ask about the original water depth so you can empirically determine how hot the water became over what time by adding unblended hot water (**Figure 13-2**).

1. It is behaviorally implausible that older infants and children will remain quiet and immobile, not attempting escape, for a painful duration.
2. Children’s burn patterns often reflect forced immobilization in nonphysiologic positions.

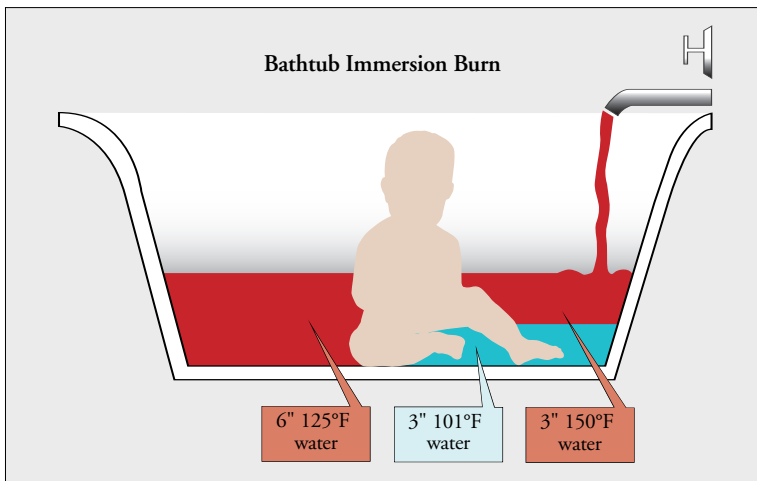


Figure 13-2. In a normal bathtub it takes approximately 2 minutes to add 3 inches of 66°C (150°F) water to 3 inches of 38°C (101°F) water, making the final temperature 52°C (125°F). It takes an additional 2 minutes to cause deep partial-thickness burning of a child at this final temperature.

NEGLECT IN BURN FATALITIES

DEATH FROM BURN COMPLICATIONS

- Advances in burn care (eg, early fluid resuscitation, aggressive early homografting and allografting, and nutrition and infection control) have dramatically reduced childhood burn mortality.
- Early burn deaths result from frank incineration or smoke inhalation.
- Deaths in the next several hours result primarily from postburn shock.
- Late deaths result primarily from infection, pulmonary insufficiency or damage (including adult respiratory distress syndrome), and associated injuries.
- Children with abusive scalds have a significant risk of early mortality, primarily from delay in seeking care, which may result in cardiopulmonary arrest.
- Children with otherwise survivable burns may die of late infectious complications that were managed at home with topical remedies.

NEGLECT RESULTING IN FATAL NONABUSIVE BURN INJURY

— Neglect may place young children in unsafe situations so they burn themselves.

1. Parents may run undiluted or insufficiently diluted hot water and place children in the water without checking the temperature, fear criticism or retribution for lapses in supervision, and lie about injury scenarios. These false scenarios may be implausible enough to raise concerns for abuse.
2. Having run bathwater too hot, adults can be called away and leave young children alone in the bathroom.
3. In either of the cases described, caregiver judgment may be impaired by, for example, intoxication.
4. The burn pattern in these scenarios should lack evidence of restraint.
5. Assuming caregivers are of normal cognitive and functional states, the victims' cries are likely to evoke rapid rescue.

— Fire hazards left in children's environments (eg, matches and cigarette lighters) are major causes of house fires.

1. Children may be left without supervision or locked inside to keep them from getting into trouble outside.
2. Parents who smoke may cause house fires when they fall asleep in bed.
3. Intoxication plays a role in many of these events.

— Space heaters, matches, cigarette lighters, and other ignition sources may be left in positions dangerously accessible to children.

1. Death is preventable with working and clearly audible smoke detectors, but smoke detectors are often lacking or not working.
2. Fires from heating or electrical ignition sources are more prevalent in lower socioeconomic population groups.

— Kitchen and food-related scalds are the most frequent non-tap water scalds.

1. Lapses in supervision of young children around stoves are causative.
2. Cups of hot beverages or bowls of soup may be left within children's reach.

3. Basins of undiluted hot water for cleaning or other tasks may be left unattended.
4. When cords to electrical appliances are longer, children can pull teapots or coffeepots down on themselves.
5. Contact burns occur when children touch or pull the cords of irons or curling irons, but these are usually not extensive enough to be fatal unless the child develops infectious complications from failure to seek proper medical care.

DEATHS FROM OTHER CAUSES ACCOMPANIED BY BURNS

- Abusive burns are seen in children who die from other abusive injuries.
- Most common among incidental abusive burns are contact injuries.
 1. Accidental contact burns are usually caused by single brushing contacts of exposed body parts.
 2. Burn appearance suggests mobility and lack of restraint.
 - A. Accidental burns from curling irons tend to be indicated by a V-shaped tail formed as they sweep away from the primary contact site.
 - B. Children with accidental facial cigarette burns from sitting in the caregiver's lap have an injury resembling a comet with a tail.
 3. Hot objects may be pressed deeply and directly onto the skin in abuse.
 - A. Areas normally clothed or protected by normal body position may be injured.
 - B. These actions cause intensely burned, clear images in the shape of the burning object (**Figure 13-3**).
 - C. Injuries may be multiple and of different ages.
 - D. Due to failure to provide proper care, injuries may be infected when the child is first seen by a medical professional.
- Young children may grasp curling irons; touch clothes irons; or touch accessible oven, woodstove, or fireplace doors with their palms and volar sides of fingers.



Figure 13-3. Child burned with a heated top of a cigarette lighter.

— Abusive burns from these objects involve the dorsum of the hand and cause unusually discrete injuries.

— No documentation that young children “freeze” their positions in hot water, but newly walking children may touch hot surfaces and lack the motor skills to back away.

— Burn times are less predictable for heated solid objects.

1. They depend on the conductance of heat to the hot object’s surface.
2. Transfer rate from hot objects to the skin varies depending on the substance and surface texture.
3. Barriers such as skin moisture are protective.
4. Specific objects used to burn children create recognizable patterns (**Figure 13-4**); the specific pattern of contact-burn injuries in individual cases can be demonstrated by burning meat with the suspected object.

— Some injuries caused by hot, flowing liquid are abusive.

1. Children may be force-fed hot soup or cereal, causing burns that cascade from their mouths and down their chins (**Figure 13-5**).
2. Hot water may be thrown, poured, or sprayed on children.
3. Abusive injuries are more likely to occur on the child’s back areas.

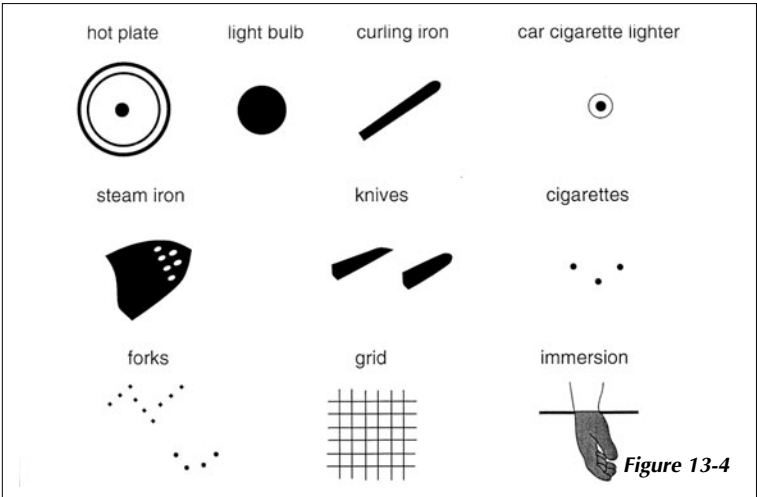


Figure 13-4. Patterns of burn injuries reflect the hot object that caused the burn. Reprinted from Johnson, 1990, with permission from Elsevier.

Figure 13-5. Burns on the lower lip and chin from being force-fed hot cereal a few days before. The grid burn on the face matches the pattern of an electric hair dryer.

4. Reconstruct the child's position, relative to vertical.
5. Note if the water thinned and cooled as it flowed down.
6. If water was hot or another fluid of high heat content caused injury, splash marks may be seen.

CONDITIONS POTENTIALLY CONFUSED WITH BURN INJURY

— Pressure injury to the skin can cause a mummified-appearing skin necrosis like that seen with dry contact burns.

1. Pressure injuries can result from restraint and binding (**Figure 13-6**).
2. Clothing elastic that is too tight can be an innocent cause of circumferential injury, which can be bilateral.
3. Innocent pressure injury is more likely in young, insensate, or immobile children.

— Cold injuries can cause bullous skin damage resembling partial-thickness burns.



Figure 13-6. Ligatures used to restrain the legs of this child caused pressure necrosis of the skin that resembles healed deep burns. The child died of abusive head injury.



Figure 13-7. Ammoniacal diaper ulcers can be confused with cigarette burns.

— Diaper area rashes sometimes cause discrete, punched-out lesions resembling cigarette burns (**Figure 13-7**).

1. Seem less frequent with current disposable diapers than with home-laundried cloth diapers, which could have a heavy ammoniacal odor.
2. Staphylococcal pyoderma can cause local superficial bullae that resemble a cigarette burn, but cigarette burns are deeper and more symmetrical.
3. During healing, lesions appear dried and dished, distinct from what is usually seen.
4. Culture of the denuded skin's base reveals the infectious source.
5. Some staphylococci produce toxins that cause intradermal skin cleavage, positive Nikolsky's sign, and widespread sloughs, similar to scalding.
6. A focus of infection can usually be found and cultured, but the denuded dermal base is often initially sterile.
7. Neglect may be contributory.

— Hereditary epidermolytic dermatoses may initially resemble burn injury.

1. Lesions predominate in areas of skin friction and tend to recur.
2. Due to variable heredity, a positive family history may or may not be present.
3. Lesion appearance on electron micrographs will enable an accurate diagnosis.

— Chicken pox scars are often suspected to be cigarette burn scars.

1. Their size and appearance are usually recognizably different from those of cigarette burns.
2. They may be prominent in darkly pigmented children who develop scarring and chronic hyperpigmentation.

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DROWNINGS

Kenneth W. Feldman, MD

Linda Quan, MD

INCIDENCE

— National Safety Council lists drowning as the fifth leading cause of accidental death in children under age 1 year and the second in children age 1 to 4 years.

— Crude mortality rate is 1.75 deaths/100 000 children.

1. Highest for youngest children, birth to age 4 years
2. Lowest for intermediate-age children, 10 to 14 years
3. Second peak in mortality during late adolescence

— Over 96% of drowning deaths are classified as accidental, 1.6% as homicidal, and 2.1% as undetermined.

— Younger children, birth to age 4 years, are the most frequently identified homicide victims (77%).

— Drowning from abuse or neglect is underreported in child fatality databases.

DESCRIPTION

— Drowning is a multifaceted injury.

1. Involves environmental risks, access to bodies of water, and victim risk factors or risk-taking behaviors.
2. Abusive or neglectful caregiver behaviors range from inadequate supervision to neglect to overt homicide (**Figures 14-1 to Figure 14-3**).
3. *Adequate supervision* is defined as being provided by an attentive, functional person not under the influence of drugs or alcohol; person must be proximate to the child and provide continuous supervision.



Figure 14-1. Up to one fourth of infants and toddlers who can cruise or walk can climb into a bath tub.

Figure 14-2. Unexplained frontal bruising that was accompanied by subgaleal hemorrhage.

Figure 14-3. Clean, occipital scalp laceration without abrasions or debris.

4. Intoxication of victims or caregivers contributes to drowning risk.
 - Common scenarios for unintentional drowning are age-related.
 - 1. Infants and young children:
 - A. Usually left unattended in a bathtub
 - B. Drowning is usually a silent event, but adults assume they'll hear infants in trouble.
 - C. Age 8 to 24 months is peak time for accidental bathtub drowning. Children this age can sit unsupported but cannot right themselves when immersed in water.
 - D. Families may believe an infant bath seat prevents immersion, but children can slide down the seat and sustain severe or fatal immersions (**Figure 14-4**).
 - E. Most infants and young children cannot climb into a standard bathtub on their own, but a few can (see **Figure 14-1**), so a history that the child climbed into a bathtub might be legitimate.
 - F. Young children can drown in a few inches of water, so any body of water is a hazard.
 - G. Inadequate supervision is a common factor in the drowning of young children.
 - H. Young children risk head-first immersions in toilets.
 - 2. Adolescents:
 - A. Usually attempting to swim in lakes or rivers when they drown from exhaustion.
 - B. Drowning may also result when a small boat or raft overturns.



Figure 14-4. A Plastic tub seat.

— Risk for drowning increases in children with neurologic conditions in which reduced judgment, physical limitations, or problem-solving difficulties either initiate the drowning or preclude them from saving themselves.

DROWNING AS CHILD ABUSE

— Drowning as a violent, overt assault is relatively infrequent and has subtle manifestations.

— The most common site for abusive immersion is the bathtub, but other sites include toilets, brooks, and swimming pools.

— For 51% of victims, reported submersion duration in nonabusive drownings is less than 1 minute; abused children usually have longer submersions.

— Starting point for evaluation is a comparison of children's developmental and behavioral skills with injury scenarios.

1. Usual accidental bathtub submersions involve victims age 8 to 24 months. Most infants younger than this lack sufficient sitting skills, and even the most neglectful caregivers are unlikely to leave infants alone in bathwater.
2. After age 2 years, most children's cognitive and motor skills are sufficiently developed, so they are less likely to sustain accidental fatal submersion.
3. During evaluation, consider specific behavioral and developmental skills of the child; illnesses, such as epilepsy or cerebral palsy, that could cause age-discrepant risks of submersion; and any inconsistencies with clinical findings or development.
4. Note if multiple, changing stories are provided.

— Like other asphyxial abuse, submersion may leave no physical signs specific to the abusive nature of the injury, but careful physical examinations are helpful.

1. Bruises, burns, and scars or pigment changes from past injuries may enable the identification of victims of chronic abuse.
2. Nutritional evaluations reveal chronic malnutrition and failure to thrive.

3. Acute bruises and scratches may indicate restraint as the child struggled against the submersion.
4. No series of infants and children with submersion injuries have had routine skeletal surveys performed and insufficient data exist to recommend for or against making routine these examinations for young submersion victims; however, several reported abusive submersion victims have had unexplained skeletal injuries at the time of drowning or subsequently, indicating a potential need for such examinations to be conducted on children under age 2 to 3 years (**Figures 14-5**).



Figure 14-5. Unexplained spiral femur fracture (arrow).

— Caregiver statements or confessions may enable investigators to conclude that abuse occurred.

— Statements from other adult observers, siblings, peers, or, in nonfatal cases, victims, may also indicate abuse.

— Chronic concerns about the families of drowned children are common.

— Scene observation is particularly meaningful when it comes from first responders.

1. Bathtubs may be observed to be empty and dry, too full for infants to bathe in, or filled with cold water.
2. The temperatures of children and the bathwater may suggest inappropriate delays in seeking care or false histories of injury timing.
3. There may be evidence of struggles in bathrooms or chaos and unsanitary conditions in homes.
4. Tub may be too high for infants or young children to climb into.
5. Caregivers' affects may be inappropriate to child's condition.

DROWNING IN FILICIDES AND ACCOMPANYING SPOUSAL MURDERS

— Children may be murder victims, at times accompanying parental suicides.

FALSIFIED DROWNING HISTORIES WITH PHYSICAL ABUSE

— Drowning may be falsely offered to disguise other abusive injuries.

— Caregivers intend to divert attention from fatal abusive trauma, such as closed head injuries, by giving accident history.

— Pay attention to the first responders' immediate scene observations.

1. If children drown while bathing, most reasonable caregivers will not take time to dry and dress the child before calling aid.
2. Extreme hypothermia may indicate a longer time from injuries to aid arrival or suggest children remained wet in a cool environment.
3. First responders usually are experienced with the range of caregivers' emotional responses to children's deaths. Discrepant behavior will strongly suggest caregiver involvement in children's injuries.

— Careful physical, radiographic, laboratory, and autopsy evaluations may reveal the abusive cause of death.

NEONATICIDE BY DROWNING

— Killing unwanted newborns has been practiced in many eras and societies, including the United States.

1. Perpetrators are usually young, unmarried primigravid women who have hidden their pregnancies from others or are in frank denial. The birth may come as a surprise and in private.

A. Ninety-five percent of births are outside of the hospital.

B. Some neonates die in the birth process, but more often, viable newborns are seen as unwanted objects and killed outright, left to die of neglect and exposure, or abandoned in public places.

2. Older married women who become pregnant extramaritally may dispose of the newborn to avoid detection.

— In either situation, drowning is the method of neonaticide.

1. As the newborn is delivered into the toilet or bathtub, the drowning may be seen as an unintended, accidental consequence of the unanticipated birth.

2. Prevention rests on better development of easy and legally blame-free means of giving up unwanted newborns.

— Assessing acute neonatal death situations

1. Obtain all available antenatal medical history data and order careful autopsies to identify overt trauma.

2. Be aware that findings such as skull fractures are often explained by claims that infants' heads struck hard surfaces during delivery (**Figure 14-6** to **Figure 14-8**).

3. Reviews are complicated when the infant has been informally disposed of or buried and was not discovered until decomposition had begun. The usual criterion indicating live birth—aerated lungs—may be complicated by gas-forming bacteria in the lungs and body.

4. Hemorrhages associated with broken bones or from head or visceral injuries can provide proof of active circulation after injuries, indicating live births.

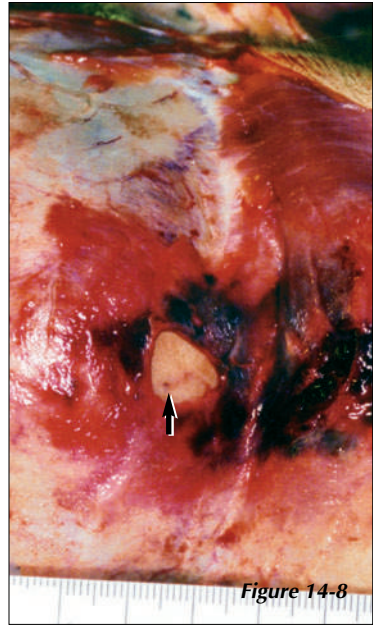
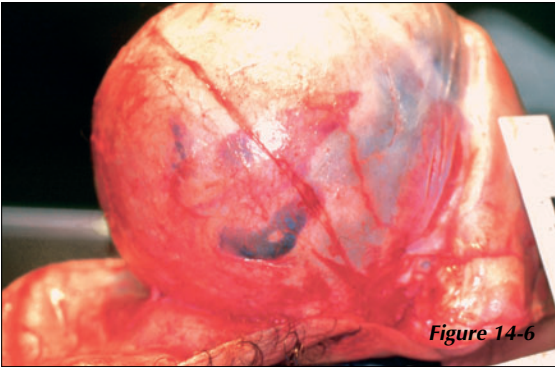


Figure 14-6. Healing fracture, linear right parietal and complex right parietal skull.

Figure 14-7. Radiograph of head with skull fracture.

Figure 14-8. Linear fracture of the outer table of his occipital bone (arrow) under the laceration. Abundant accompanying subgaleal and subperiosteal hemorrhages were observed.

5. If children were immersed in water after the onset of respiration, contents of that water (eg, bath salts, toilet cistern contents, and vegetable matter or diatoms from ponds or other bodies of water) may be found in the lungs or circulatory system.
6. Conduct scene observations, and take photographs.
7. Document sites of blood and birth fluids.
8. Recover placenta, noting its condition and the condition of severed cord, both grossly and microscopically.
 - A. Seek evidence of underlying placental diseases or infections, which may suggest stillbirth or natural causes of death.
 - B. Any evidence of cord injuries or tears suggests live birth and traumatic death.

DROWNING AS CHILD NEGLECT

- Child neglect is a more common contributor to drowning than abuse.
- Neglect is as prevalent in child injury deaths as are all types of physical abuse combined.
- Accidental immersions occur in bathtubs, natural bodies of water, pools, toilets, and 5-gallon buckets.
- Factors common among cases of bathtub drowning due to neglect include lower socioeconomic status, family disorganization, single-parent households, and multiple young children.
- The recent practice of underwater delivery at some obstetric centers could be considered medical system abuse/neglect of neonates, who can suffer significant morbidity.
- When judging whether caregivers' actions are neglectful, clinicians usually look for sustained patterns of care beneath community standards.
- Consider children's developmental need for protection, frequency of neglect, and degree or hazard of injury in judging the severity of neglect.
- Note parents' willfulness, social deviancy, and potential for remediation in reporting and management decisions.
- Manage borderline cases of neglect with public health nursing instead of protective services intervention.

— Focus less on past culpability than future risk.

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MEDICAL CONDITIONS

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CHILDHOOD CANCERS

— Cancer causes death in 9% of children age 1 to 4 years and 14% age 5 to 14 years.

— Leukemia and brain or nervous system tumors are the most common and occur at all ages.

1. Under age 4 years: neuroblastoma, eye tumors (eg, retinoblastoma), or renal malignancies.
2. Age 10 to 14 years: bone tumors or Hodgkin's lymphoma.
3. Age 15 to 19 years: germ cell or gonadal tumors, thyroid cancer, or non-Hodgkin's lymphoma.
4. Incidence of all cancers is highest among infants, declines until age 9 years, and increases again in adolescence.

RISK FACTORS

— Family history: Daughters of women treated with diethylstilbestrol (DES) are more likely to develop reproductive tract cancers in early adulthood (these women have all reached adulthood as of this writing, but the chemical's effect on the third generation is unknown); concerns have been expressed concerning whether children of parents who worked with pesticides show increased rate of kidney cancers.

— Genetic defects:

1. Down syndrome, neurofibromatosis, Beckwith-Wiedemann syndrome, and xeroderma pigmentosum linked to higher rates of cancer.
2. Mutations in cell cycle regulatory genes: Knudson's 2-mutation hypothesis.
 - Prior chemotherapy and ionizing radiation: Survivors of childhood cancer develop second cancers or cardiac complications related to chest irradiation or bleomycin treatment.
 - Immunodeficiency
 - Viral infections
 - Exposure to environmental contaminants
1. Carcinogens: radon, air pollutants, pesticides, hazardous chemicals (arsenic, asbestos, benzene, phthalates in plastics, formaldehyde, polychlorinated biphenyls [PCBs]), radiation, coal tar, and electromagnetic fields.
2. In proportion to body weight, children are exposed to higher levels of environmental chemicals.
3. Few definitive links exist between environmental toxins and childhood cancers, but more studies are underway.

CLINICAL CHARACTERISTICS

- Diagnosed at relatively early stage.
 - Survival rate for childhood cancers is better than it is for many adult cancers.
 - Children rarely die from therapy toxicity.
 - Death is related to the type and the location of the tumor and the degree of invasiveness.
1. Death occurs when cancer cells invade vital structures (brain, heart, lungs) or when the tumor burden overwhelms the body.
 2. Severe bacterial or fungal infections develop if bone marrow is completely invaded by malignant cells.
 3. Bone metastases and invasion of bone marrow and solid organs are painful and require large doses of opioid analgesics.

4. Final cause of death is often reported as cardiorespiratory failure.

INVESTIGATIVE FOCUS

- It is generally known if a child has cancer before death.
- Investigators must determine:
 1. Whether the child did not receive treatment for cancer with a good likelihood of survival because of parental refusal, inability to adhere to treatments, alternative healing practices, or lack of access to health care.
 2. Whether death was hastened by euthanasia.
 3. Whether caregivers failed to cooperate with the recommended care plan.

NONMALIGNANT BLOOD DISORDERS

HEMOGLOBINOPATHIES

- Most prevalent inherited disorders; incidence 1/600 live births.
- Sickle cell and α - and β -thalassemia syndromes are most common worldwide.
 1. Inherited as autosomal recessive genes.
 2. Amino acid substitutions cause abnormal hemoglobin synthesis or structural defects.

Sickle Cell Disease

- Group of syndromes varying in severity; includes sickle cell anemia (hemoglobin S), sickle cell–hemoglobin C disease (hemoglobin SC disease), and sickle cell–thalassemia (hemoglobin S– β thal).
- Deoxygenated hemoglobin S polymerizes, which causes red cells to sickle.
- Causes intermittent pain and ischemic injury to organs (ie, spleen, brain, lungs, bones).
- Children susceptible to encapsulated bacteria infections, fatal anemia, cerebrovascular accidents (strokes), intracranial bleeding, and death.
- Acute chest syndrome develops in those over age 3 years: triad of fever, chest pain, and new infiltrate on chest radiographs that can progress to respiratory failure and death.
- Chronic transfusions cause iron overload, leading to early death from heart failure.

— Bone marrow or stem cell transplantation curative for some.

1. Requires sibling with identical HLA type.
2. Stem cell transplantation may cause long-term or fatal acute complications.

Thalassemia

— Characterized by decreased or absent synthesis of α - or β -globin chains.

— Fetuses with hemoglobin Bart's hydrops fetalis grossly edematous or hydropic due to congestive heart failure induced by severe intrauterine anemia; most stillborn.

— β -thalassemia major: most severe form; diagnosed prenatally or at birth.

1. Causes severe anemia and splenomegaly, leading to abnormal expansion of bones and poor growth.
2. Death occurs from congestive heart failure or infections.
3. Frequent exposures to blood products cause iron overload and transfusion-associated infections or early death.

COAGULATION DISORDERS

— Cause death from hemorrhage in vital organs or in areas in which hemostasis is challenging, especially brain and gastrointestinal (GI) tract.

von Willebrand's Disease

— Autosomal disease causing deficiency of von Willebrand's factor.

— Types I and II: mild to moderate; characterized by bruising or mucosal bleeding.

— Type III: severe form; causes hemarthrosis and muscle hematoma.

— Major risk for patients: transfusion-acquired viral infections.

Hemophilia

— Usually caused by severe deficiency of coagulation factors VIII (hemophilia A) or IX (hemophilia B).

— X-linked inheritance.

Clinical Characteristics

- Mild cases: often undiagnosed until child undergoes significant trauma or surgery.
- Severe cases: bleeding with minimal trauma; muscle or joint bleeding several times a month.
- Death and injury due to transfusion-transmitted hepatitis or human immunodeficiency virus (HIV) and development of inhibitors to infusion treatment.
- Liver failure develops in combined hepatitis B and C infections.

CYTOPENIA

- Deficiency of blood cells (red, white, and/or platelets).
- Cells may be destroyed or their production reduced.
- Can be congenital or induced by environmental agents or infections.
- Often diagnosed only when patients have bleeding, anemia, or infections.
- Greater mortality in second and third decades.

ANEMIA

Diamond-Blackfan Syndrome

- Congenital hypoplastic anemia usually seen in early infancy with congenital anomalies, especially of head and upper limbs, in a quarter of patients.
- Most cases sporadic, but inheritance (dominant or recessive) figures in 10% of patients.
- High doses of chronic corticosteroid predispose to poor growth and opportunistic infections.
- Patients transfusion-dependent and can develop iron overload or refractory anemia.

Aplastic Anemia

- Severe cases occur when deficiencies in at least 2 blood cell types.

1. *Fanconi's anemia*: autosomal recessive form with congenital abnormalities, defective red cell production, and high risk for acute myeloid leukemia and some solid tumors.

2. Acquired forms seen with radiation exposure; drugs such as chloramphenicol, anti-inflammatories, and antiepileptics; viruses such as Epstein-Barr, hepatitis, and parvovirus; or immune diseases.

— Transfusions can produce alloantibodies that react with transfused blood products and destroy the cells. They can cause congestive heart failure, hemorrhage, and severe neutropenia that places children at risk for bacterial and fungal infections.

— Patients with aplastic anemia may develop leukemia, myelodysplastic syndromes, and solid tumors.

THROMBOCYTOPENIA

— Platelets destroyed by drugs, infection (for example, HIV), autoimmune disease, allergy, catheter or prosthesis, or disseminated intravascular coagulation.

— Impaired or ineffective platelet production in congenital or hereditary disorders (eg, thrombocytopenia-absent radius syndrome, Fanconi's anemia, Bernard-Soulier syndrome, Wiskott-Aldrich syndrome, May-Hegglin anomaly, or X-linked hereditary thrombocytopenia).

— Most common and severest life-threatening hemorrhagic events are intracerebral hemorrhages.

NEUTROPENIA

— Absolute neutrophil count (ANC) less than $1.0 \times 10^9/L$; in severe cases, ANC is $< 0.5 \times 10^9/L$.

— Caused by production defect or peripheral destruction.

— May be congenital or acquired, chronic or cyclic.

— Kostmann's syndrome: chronic congenital form, associated with severe systemic bacterial infections beginning in early infancy.

1. Frequent fevers, skin infections, stomatitis, and perirectal abscesses during the first month of life.
2. Infections disseminate to distant organs (eg, blood, meninges, peritoneum).
3. Cyclic neutropenia.

IMMUNODEFICIENCY

— Rare but children may die from bacterial, viral, or fungal infections, or from malignancies, because body has impaired ability to recognize and eliminate cancer cells.

— Includes severe combined immunodeficiency disease, Wiskott-Aldrich syndrome, Bruton's agammaglobulinemia, ataxia-telangiectasia syndrome, and DiGeorge syndrome.

— See **Table 15-1**.

CONGENITAL DEFECTS AND GENETIC DISORDERS

— From 3% to 5% of all newborns have a significant birth defect related to an identifiable genetic abnormality.

— In infants under age 1 year who die, congenital malformations are seen in 20% to 25% of all deaths; direct contributors to death are cardiovascular system malformation, neural tube disorders, and chromosomal conditions.

— Sudden death seen when underlying genetic disorder not previously suspected.

— See **Table 15-2**.

— Genetic disorders classified as chromosomal, single-gene, or polygenic (multifactorial).

CHROMOSOMAL DISORDERS

— Seen in 1/200 newborns.

— *Aneuploidy* (an extra or missing chromosome) seen in 1/300 newborns; many cause severe or fatal malformations.

— Down syndrome seen in 1/800 to 1/1000 newborns.

— Trisomies 13 and 18 cause more severe cognitive and physical defects; approximately 80% of children with these disorders do not live more than 2 years.

— Unbalanced chromosome defects of autosomes (chromosomes 1 through 22) or sex chromosomes occur in 10% of deaths.

1. Do not cause neurodegenerative or regressive developmental problems.
2. Most die of malformations of cardiovascular and respiratory systems.

Table 15-1. Immunodeficiency Disorders

DISEASE	CLINICAL CHARACTERISTICS
Wiskott-Aldrich syndrome	<p>Characterized by the triad of eczema, thrombocytopenia, and progressive immunodeficiency</p> <p>Patients suffer from severe hemorrhage, overwhelming sepsis, or lymphoreticular malignancy, which is the usual cause of death in childhood</p> <p>Recently identified as caused by mutation in Wiskott-Aldrich syndrome protein-encoding gene*</p> <p>Bone marrow transplantation has been curative in some cases when performed early, ie, prior to development of the immunodeficiency**</p>
Severe combined immunodeficiency disease	Hallmark symptoms are recurrent severe bacterial and viral infections, failure to thrive, and chronic diarrhea
Brutons agammaglobulinemia	<p>Recurrent bacterial infections after 6 months of age and found to have small or absent tonsils</p> <p>Serum immunoglobulin and B cells are extremely low or absent</p>
Ataxia-telangiectasia syndrome	<p>Progressive cerebellar ataxia, telangiectasia of the oculocutaneous tissue, and immunodeficiency</p> <p>Accompanied by delayed motor development</p>
DiGeorges syndrome	Characteristic facies, cardiac defect, parathyroid hormone deficiency, and variable immune deficiency

*Klein C, Nguyen D, Liu CH, et al. Gene therapy for Wiskott-Aldrich syndrome: rescue of T-cell signaling and amelioration of colitis upon transplantation of retrovirally transduced hematopoietic stem cells in mice. *Blood*. 2003; 101:2159-2166.

**Beard LJ, Toogood IR, Pearson CC, Ferrante A. Early bone marrow transplantation in an infant with Wiskott-Aldrich syndrome. *Am J Pediatr Hematol Oncol*. 1992;12:310-314.

SINGLE-GENE DISORDERS

— Typically diagnosed after neonatal period.

— Include cystic fibrosis, Duchenne type muscular dystrophy, Tay-Sachs disease, sickle cell disease, and osteogenesis imperfecta.

Table 15-2. Examples of Genetic Diseases That May Be Undiagnosed Before Death

GENETIC DISORDER	AGE OF DEATH	PATHOPHYSIOLOGY
Fatty acid oxidation disorders	Infancy/young childhood	Fasting state leads to secondary severe hypoglycemia, obtundation, apnea, seizures, shock, etc
Hypohidrotic ectodermal dysplasia	Infancy/young childhood	Hyperthermia caused by diminished sweating
Urea cycle defect	Infancy, rarely adolescence/adulthood	Acute hyperammonemia with cerebral edema
Idiopathic hypertrophic subaortic stenosis	Later childhood/adolescence	Hypertrophic cardiomyopathy with acute ischemia
Marfan syndrome	Adolescence/young adulthood	Aortic aneurysm with rupture
Ehlers-Danlos syndrome type IV	Adolescence/young adulthood	Acute arterial rupture (eg, leading to intra-abdominal hemorrhage)
Hereditary hemorrhagic telangiectasia	Adolescence/young adulthood	Pulmonary or brain hemorrhage secondary to arteriovenous malformation
Mitral valve prolapse	Adolescence/young adulthood	Acute cardiac arrhythmia
Epilepsy	Variable	Variable events
Long QT syndrome	Variable	Ventricular fibrillation; other arrhythmias

— Inborn errors of metabolism (IEMs): urea cycle defects, fatty acid oxidation disorders, glycogen storage diseases, mitochondrial disorders, and lysosomal storage diseases.

1. Fatty acid oxidation disorders not seen until age 1 to 3 years.
2. Often cause severe hypoglycemia and seizures in young children during illnesses associated with prolonged fasting.
3. Medium-chain acyl-coenzyme A dehydrogenase deficiency causes sudden or otherwise unexplained death.
4. Many IEMs in neonates cause acute acidosis, shock, hypoglycemia, or hyperammonemia.
5. Prevalence 1/7000 births, but some IEMs in the 1/15 000 to 1/50 000 range.

POLYGENIC (MULTIFACTORIAL) INHERITANCE

— Multiple genes underlie causation and act with environmental factors.

— Includes common forms of congenital heart disease and isolated disorders, those not associated with multiple malformations, and even more complex cardiac problems.

— Long QT group of syndromes.

1. Caused by mutations in potassium channel genes.
2. Produce abnormal repolarization of cardiac muscle that can lead to torsades de pointes, ventricular fibrillation, and sudden death.
3. Often inherited as autosomal dominant conditions, so elicit family history.

INFECTIOUS DISEASES

ACUTE RESPIRATORY INFECTION (PNEUMONIA)

— Leading cause of death in children under age 5 years.

AFRICAN TRYPANOSOMIASIS (SLEEPING SICKNESS)

— Parasitic disease transmitted by tsetse fly.

— Causes debilitating illness and mental suffering; usually fatal if untreated.

CHOLERA

- Severe bacterial diarrheal disease caused by virulent enterotoxigenic strains of *Vibrio cholerae*; spread via fecal-oral transmission.
- Relatively rare, but small, endemic outbreaks in vulnerable populations with poor sanitation cause significant morbidity and mortality.
- Causes explosive, watery, large, frequent stools, but no fever and rarely vomiting.
- May be mild, moderate, or severe; affected person may lose up to 400 mL of fluid/hour.
- Deaths confined to developing nations.
- Vaccine generally ineffective and seldom recommended.

DIARRHEAL DISEASES

- Worldwide, acute gastroenteritis causes more than 2 million deaths each year, mainly due to complications of dehydration; approximately 300 to 400 US deaths yearly.
 - Cause usually rotavirus; other pathogens bacterial, including enterotoxigenic *Escherichia coli serotype* 0157:H7, *Shigella*, and *Salmonella*; viral; and parasitic.
1. *Shigella* (shigellosis): often explosive, bloody diarrhea, severe electrolyte disturbance, seizures, and potentially death.
 2. *Salmonella*: enteric or typhoid fever.
 3. *Campylobacter*: infrequently acquired from chickens.
 4. *Yersinia*: rare even in developing nations.

DIPHTHERIA

- Caused by *Corynebacterium diphtheria*; creates false membrane that adheres to mucous membrane of the throat and releases toxin that damages heart and central nervous system (CNS).
- Death usually from respiratory obstruction.
- Prevalence almost undetectable in most Western nations and low in developing world; fatality rate, 5%.

EBOLA HEMORRHAGIC FEVER

- Caused by virulent strain of Filovirus family; fatal in 50% to 90% of patients.

— Transmitted via direct contact with or exposure to infected blood and body fluids.

— Hard to recognize or diagnose early because symptoms nonspecific and variable.

HIV/ACQUIRED IMMUNODEFICIENCY SYNDROME

— More than 5000 US children have died of acquired immunodeficiency syndrome (AIDS).

— HIV increases deaths from other infectious causes (eg, respiratory, GI, secondary and opportunistic CNS infections, and tuberculosis [TB]).

INFANT BOTULISM

— Neuroparalytic illness caused by *Clostridium botulinum*-contaminated products.

— Approximately 100 patients seen annually in US, most are infants under age 6 months.

— Increased muscle weakness and neurologic compromise (“floppy infant”) lead to apnea and sudden death.

INFLUENZA

— Small, localized epidemics and outbreaks cause death in children under age 4 years and the elderly.

— Maternally transferred antibodies do not protect very young children from yearly antigenic drifts in influenza A and B strains.

JAPANESE ENCEPHALITIS

— Prevalent throughout East Asia and Japan.

— Caused by a Flavivirus; transmitted via mosquitoes; incidence in direct proportion to mosquito population of region.

— Pigs bred for commercial meat production serve as vectors.

— Relatively nonspecific prodromes, then CNS manifestations mark severe phase.

— Fatal in 10% to 50% of patients.

LEISHMANIASIS

— Insect-borne disease caused by parasite *Leishmania donovani*.

- Tens of millions affected in tropics and subtropical areas of all continents, except Australia and Antarctica.
- Causes significant body mutilation and disfigurement.
- Cutaneous and visceral forms; in approximately 25% of patients, visceral form progresses to *kala-azar* (Indian for “black ailment”) in 2 to 6 months.
- Kala-azar is a chronic disease that causes general abdominal swelling, increasing pallor and weakness, severe malnutrition, and may lead to death; it is an opportunistic infection in HIV.

MALARIA

- Caused by *Plasmodium* parasite; transmitted by mosquitoes.
- Kills 1.1 to 2.7 million persons per year worldwide; major killer of children under age 5 years in sub-Saharan Africa.
- Infants of infected women at risk for low birth weight, malnutrition, and death.
- Emerging drug resistance.

MARBURG HEMORRHAGIC FEVER

- Caused by virus in Filovirus family; spread via insects to monkeys, then humans.
- Signs and symptoms seen after incubation of several years, but nonspecific.
- Hemorrhagic rash in severe phase, with death in 3 to 7 days.

MEASLES

- One of the most contagious viral diseases known to humans (**Figure 15-1**).
- Kills approximately 1 million children in developing world.
- Waning immunity in older children and high attack rates led Centers for Disease Control to recommend second booster dose for measles-mumps-rubella between ages 4 and 6 years.
- Potential for devastating outcomes among susceptible populations.
- Causes acute onset of high fever and rash, typically confluent with a characteristic spreading pattern, plus the three Cs (cough, corrhiza, and conjunctivitis) before an upper respiratory infection.



Figure 15-1. Measles covering back of child. Reprinted from CDC.

— Complications frequent; include meningoencephalitis, pneumonia, and otitis media.

— Subacute sclerosing panencephalitis

1. Fatal but extremely rare complication in young children.
2. Eight to 10 years from initial infection to progressive neurologic decline.
3. Severe debilitation and death in 1 to 3 years.

MENINGITIS

- Diagnosis carries significant psychological morbidity and potential medical sequelae.
- Pathogens include group B *Streptococcus*, *E coli*, *Listeria monocytogenes*, and other gram-negative vaginal flora from mothers.
- Most cases in infants under age 1 year and older teenagers and young adults.
- Meningitis due to *Cryptococcus neoformans* rare; causes serious illness or death mainly in patients with immunosuppressed HIV or cancer or in organ transplant recipients.

PERTUSSIS

- Commonly called whooping cough for sound of repeated hacking or staccato paroxysms.
- Mild symptoms in infected adults and older children allow disease transmission to unvaccinated or partially vaccinated infants.

POLIOMYELITIS

- Humans are the only known host of poliovirus.
- Transmitted via person-to-person contact, generally via oral-fecal route.
- Declared eradicated from the West, but few persistent outbreaks in endemic regions of Western Africa and South Asia.

RABIES

- Caused by virus transmitted through animal saliva; uniformly fatal after full onset.
- Usually from wild animal bites, ie, skunks, bats, foxes, and coyotes.
- Primarily an encephalitis; prodromes are headaches, anorexia, and difficulty swallowing.
- Unless urgent life-saving measures taken before virus reaches CNS tissue, patient develops fulminant delirium, bizarre behavior, confusion, and hydrophobia.
- Diagnosis strongly based on history of animal bite, classic clinical findings, and virus isolation from saliva or CNS tissue.

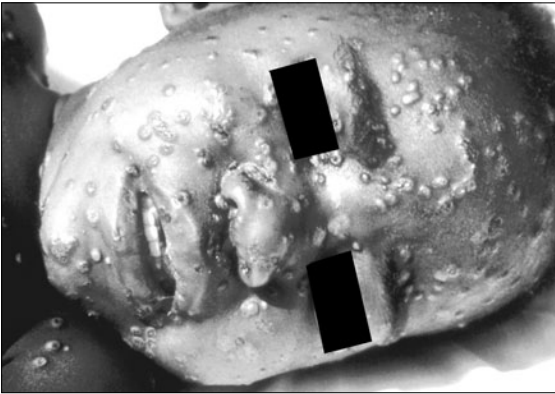


Figure 15-2. Smallpox. Reprinted from CDC.

— Rabies immune globulin and vaccine only effective soon after exposure.

SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

— First reported in China in 2003; case fatality ratio 10%.

— Caused by a coronavirus, primarily an animal virus that crossed the species barrier; spread through person-to-person contact.

SMALLPOX

— Caused by poxvirus, either variola major or minor, which only humans host.

— Produces fever, exhaustion, and rash of pus-containing vesicles; can lead to permanent scarring (**Figure 15-2**), blindness, and death.

— Last case of natural smallpox in the world occurred in Somalia in 1977.

— Potential of bioterrorism prompted recommendation that first responders receive smallpox vaccinations.

TETANUS

— Causes approximately a half million deaths annually; US incidence 0.03/100 000 people.

— More common in elderly persons with puncture wounds and lacerations.

- Infection follows contact between wound and contaminated soil.
- Most fatalities occur in neonates.
- Causes oral and facial rigidity (*trismus* and *risus sardonicus*), leading to difficulty swallowing, hyperextended bowing of the body, and painful spasms (**Figure 15-3**).

TB

- TB infection: positive skin test results, but no clinical signs of illness and a clear chest radiograph.
- TB disease: clear clinical symptoms and an abnormal chest radiograph.
- Leading infectious cause of death in adolescents and adults.
- Increased TB cases attributed to growth in HIV/AIDS cases and migration from endemic countries; nearly a third of world infected with latent TB.
- Newly diagnosed cases show multidrug resistance.

TYPHOID FEVER

- Potentially life-threatening infection caused by *Salmonella typhi*.
- Approximately 400 patients in United States annually; most acquire it in international travel.



Figure 15-3. Neonatal tetanus. Reprinted from CDC.

— Endemic in developing world; affects 12 to 13 million people each year.

— Spread via exposure to contaminated water and food or person-to-person contact.

— Causes sustained and unremitting fever for days to weeks and extreme weakness from loss of appetite.

— Complicated by anemia, intestinal rupture, and hemorrhage.

— Death rare in United States.

YELLOW FEVER

— Caused by virus of Flavivirus family; spread by mosquito bites to monkeys in tropical areas.

— Acute phase: nonspecific signs and symptoms (eg, fever, malaise, vomiting, abdominal pain, diarrhea).

— Toxic phase: approximately 50% of infected persons die in 10 to 14 days.

— Prevented by yellow fever vaccine, which is strongly recommended for travel to Yellow Fever Belt (ie, across middle of Africa and Amazon basin in South America).

OTHER MYCOTIC AND PARASITIC INFECTIONS

— Uncomplicated and rarely cause death in healthy children.

— Severe illness or death

1. From systemic complications in newborns, infants, and immunosuppressed patients.

2. From unusual exposure in endemic areas of the United States (eastern and central areas of Mississippi Valley, southwestern states) or other infested sites (caves, damp areas).

— Among fungi, systemic infections with *Candida* species, *Cryptococcus*, *Aspergillus*, and *Malassezia* cause most known fatal cases.

— Mostly seen in recent immigrants from regions endemic for helminthic infections.

— Acquired in summer from exposure to contaminated freshwater.

— *Acanthamoeba* causes eye and CNS infections in rare cases.

- Cryptosporidiosis causes persistent diarrhea of young children in developing nations.
- May occur in densely populated places (eg, hospitals, childcare centers, schools, swimming pools).

INFECTIONS AND MALNUTRITION

- Protein-calorie malnutrition (marasmic kwashiorkor) prevalent in developing nations; increases mortality from infectious diseases.
- Severely affects host's cellular and humoral immune responses, causing anergy, diminished secretory IgA production, and poor antibody responses to antigens in childhood vaccines.
- Combined effect is ineffective phagocytosis; complement activation needed to combat invading pathogens.
- Pathogens that affect malnourished states disproportionately include measles, *Mycobacterium tuberculosis*, *Salmonella*, *Listeria*, *coxsackievirus B*, *Pneumocystis*, and *Candida*.

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PEDIATRIC OPHTHALMOLOGY

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— Evaluation of the eye can offer a wealth of information to the child fatality review team. This review will help team members to better understand the process.

POSTMORTEM OCULAR EXAMINATION

— Clinical examination is limited in that the ocular interior cannot be seen once postmortem corneal clouding occurs (48 to 72 hours after death).

— Postmortem enucleation is particularly useful in child fatality reviews.

EXTERNAL EXAMINATION

— Carefully examine external periocular tissues.

— Note ecchymoses (ie, bruises) or petechiae.

1. Be careful when dating ecchymoses, as the loose eyelid skin lets blood accumulate, making a periorbital bruise look darker and causing differential rates of resorption in the lesion.
2. Ecchymoses do not necessarily imply trauma; periocular bruising occurs in leukemia, coagulopathy, and orbital neuroblastoma.
3. Petechiae are seen in strangulation, suffocation, any death associated with Valsalva's maneuver, and excessive crying.
4. Petechiae do not prove cause of death, need not be present to make diagnoses, and do not enable one to definitively distinguish between strangulation and suffocation.

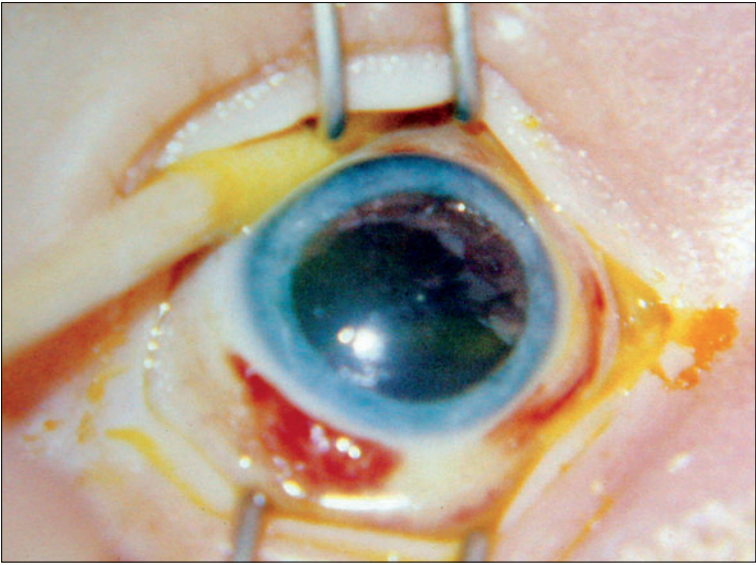


Figure 16-1. Subconjunctival hemorrhage in a child suffocated by the caregiver.

— Subconjunctival hemorrhage also occurs in strangulation, suffocation (**Figure 16-1**), normal birth, coagulopathy, leukemia, and conjunctivitis.

1. When due to birth, usually resolves in 2 weeks.
2. Massive bilateral subconjunctival hemorrhage with no bleeding disorder is seen in pertussis (whooping cough).

— *Scleral/conjunctival icterus* (yellow color to white of the eye; indicates hyperbilirubinemia) and foreign bodies indicate environment at time of death.

— Evert upper eyelid; inspect conjunctival recesses and fornices to identify and retrieve debris.

— Note gross anatomy of the iris, cornea, and pupil.

1. *Hyphema* (blood in the anterior chamber) usually indicates trauma.
2. Rare entities (eg, juvenile *xanthogranulomatosis*) can be associated with nontraumatic blood pooling.

3. Perform conjunctival sampling if metabolic or genetic disorders known to be associated with cellular inclusion are suspected (eg, *neuronal ceroid lipofuscinoses*).

ENUCLEATION

- May be part of autopsies in sudden unexplained infant death (SUID)
- 1. Done if concern about abusive head injury in child under age 3 years or other disorders associated with ocular abnormalities (eg, metabolic disease, chromosomal aberrations, cerebral malformation).
- 2. Eye examination useful in suspected accidental head injury, suffocation or strangulation, orbital or facial injury, drowning, poisoning, or with obvious or known eye abnormalities.
- Familial resistance to enucleation
- 1. If the clinical case is part of medicolegal investigation, as in suspected child abuse, specific consent for enucleation may not be needed, but given the known emotional barriers, obtain specific consent whenever possible.
- 2. Policy and law on enucleation vary with jurisdictions; know guidelines.
- 3. Note possible risks and harms of excluding the eye from investigations, including misdiagnosis and missed diagnosis.
- 4. Reassure families that enucleation does not alter postmortem appearance or involve cutting. Even without enucleation, because of the normal sunken appearance of the eye postmortem, funeral directors cover the eyeballs with special caps that restore the normal bulk beneath the lids and keep the lids shut.

BASIC PROCEDURES

- Perform 360-degree conjunctival peritomy at limbus (peripheral edge of cornea).
- Identify, isolate, and disinsert the 6 extraocular muscles.
- Cut the optic nerve.
- Push the enucleation scissors in a posterior direction, toward the apex of the orbit, while pulling the globe forward with toothed forceps to achieve maximal optic nerve section along with the globe and to prevent inadvertent cutting of the sclera.

— Once the eye is removed, fix it in formalin for at least 24 hours before sectioning, according to standard ophthalmic pathology techniques. Inadequate fixation leads to retinal detachment and fragmentation that alters analysis.

— Especially with suspected inflicted neurotrauma and metabolic disease, obtain adequate samples of the macula, optic disc, and peripheral retina.

1. Deposits in the macular ganglion cells may indicate inherited disorders (eg, Tay-Sachs disease).
2. Pattern of distribution of retinal hemorrhage may have diagnostic import.
3. Differentiate papilledema from optic nerve infiltration (eg, sarcoidosis, leukemia).

— Document all findings photographically immediately after globe is sectioned and prepared histologically.

— Normal infant and early childhood retinas have multiple random folds and a circumferential ridge at the edge (ora serrata); fixation artifact (Figure 16-2).

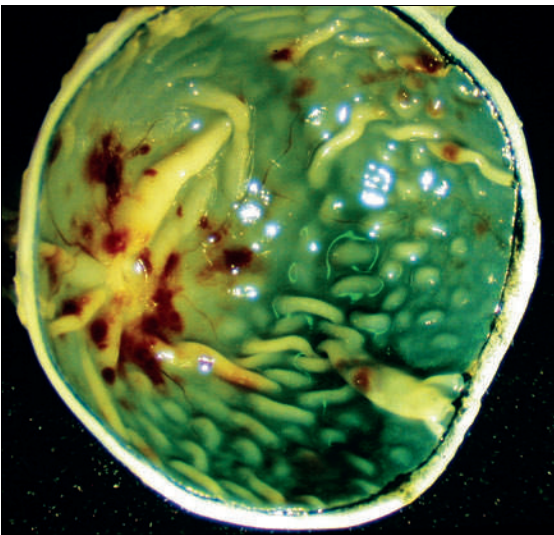


Figure 16-2. Postmortem photograph of formalin-fixed and sectioned globe demonstrating marked artifactual retinal fold. Note the random direction of the folds. The child is a victim of shaken baby syndrome (SBS) and has multiple retinal hemorrhages, which in this case are concentrated particularly around the optic nerve.

REMOVING ORBITAL TISSUES

- Abusive head injury plus repetitive severe acceleration-deceleration with or without head impact may cause bleeding into orbital tissues.
- In SUID, particularly when child abuse is possible, remove the entire orbital contents as an undisturbed block of tissue with the globe still attached.
 1. Use a transconjunctival-intracranial approach.
 2. After you remove the brain, unroof the orbit and isolate the entire orbital contents by stripping the periosteum from the orbital walls.
 3. Disinsertion is needed at the edges of the inferior orbital fissure.
 4. Fix in formalin for at least 72 hours, and then section the specimen.
 5. Separate the globe from the orbit, then do the usual globe sections.
 6. Perform serial axial sectioning of the orbital tissue block.
 7. If there is no direct blunt orbital trauma or orbital fracture (ie, blow-out fracture), finding blood in the orbital fat, extraocular muscles, or cranial nerve sheaths suggest abusive trauma with repetitive acceleration-deceleration.

VITREOUS SAMPLING

- Vitreous sampling is useful in drowning to help to discriminate among saltwater and freshwater immersion, disorders of sodium metabolism, poisoning, and so forth.
 - Use a 5-mL syringe with an 18-gauge needle inserted through the pars plana, located 2 to 3.5 mm (depending on child's age) behind the limbus.
 - Note that this procedure can disrupt the retina, especially if the globe is pierced in the wrong place or too much vitreous fluid is taken.
 - Avoid this technique unless the indication is clear, the chance of obtaining useful information is high, and the retinal examination is relatively less important.
 - Do not take samples before enucleation; may cause softening of the globe and make enucleation difficult.

OPTIC NERVE EXAMINATION

- Examine the optic nerve in suspected abusive head injury.

— Note subdural and subarachnoid hemorrhage, but nonspecific findings also occur in accidental head injury and other disorders (eg, severe bacterial meningitis).

— Recall that optic nerve sheath hemorrhage of shaken baby syndrome (SBS) victims may be discontinuous or absent.

— Retinal hemorrhage can occur even with no intracranial hemorrhage.

DIFFERENTIAL DIAGNOSIS

SBS

— Ocular examination is a key element when inflicted neurotrauma with repetitive severe acceleration-deceleration with or without blunt-impact head injury is suspected.

— Hemorrhagic retinopathy is of particular diagnostic significance.

— Describe the number, location, pattern, and type of retinal hemorrhages to assess diagnostic significance.

1. The presence of few intraretinal or preretinal hemorrhages in the posterior pole is a nonspecific pattern seen in coagulopathy, increased intracranial pressure, infection (eg, *meningococemia*), *osteogenesis imperfecta*, and other disorders.
2. Perivascular hemorrhages, especially with perivascular lymphocytic infiltration, are seen in vasculitis.
3. Massive hemorrhage throughout retina—including preretinal, subretinal, and intraretinal hemorrhage and hemorrhage extending to the ora—is often a sign of SBS (**Figure 16-3**).

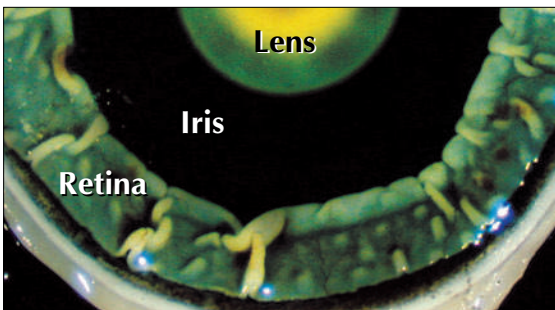


Figure 16-3. Ora serrata with retinal hemorrhages in SBS case.

4. Hemorrhage of ora serrata is more common in abusive than in nonabusive trauma.
 5. Retinal hemorrhage after accidental head injury is uncommon; when seen after severe life-threatening accidental head injury, hemorrhages are few and confined to posterior pole.
 6. Subretinal hemorrhage very rare.
- Traumatic macular retinoschisis
1. Infant's and young child's vitreous tissues are firmly attached to macula, so aggressive acceleration-deceleration may split the retina and cause blood to pool in the cavity.
 2. Only internal limiting membrane is usually pulled away, but splitting occurs at any level (**Figure 16-4**).

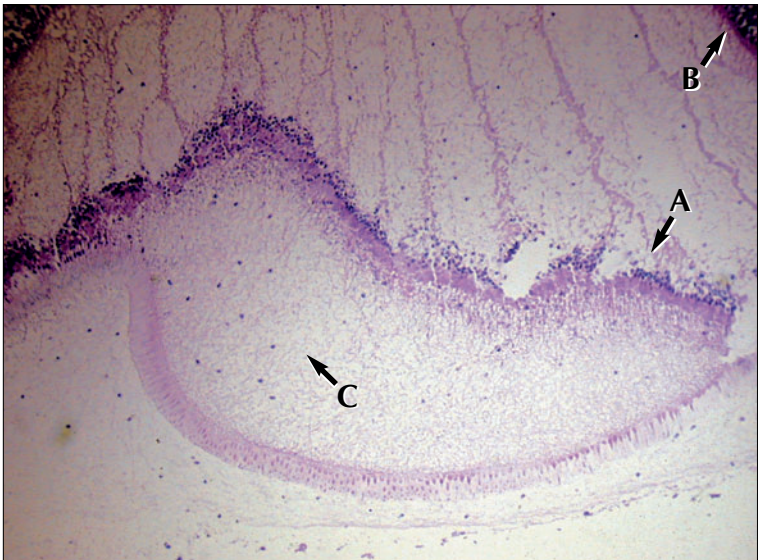


Figure 16-4. Histological section (hematoxylin-eosin) of retinoschisis in SBS case. Note the marked splitting of the retina in the direction of arrows A and B resulting in widening of the retina. There is also a schisis (ie, splitting of the retina) that separates the photoreceptor layer with accumulation of serous fluid in the created cystic space (arrow C). The retina is also focally detached from the underlying retinal pigmented epithelium (not pictured).

3. Vitreous tissue may still be attached at cavity edges, which show hemorrhagic rim or raised retinal fold.
4. May be loss of retinal pigmented epithelium under the fold.
5. At autopsy, domed schisis cavity may collapse, so lesion resembles crater delimited by paramacular fold.
6. Folds readily differentiated from normal fixation artifact by circular orientation in the posterior pole.
7. Entire retina focally detached by the vitreoretinal traction during trauma; must be distinguished from artifactual retinal detachment, when there is no blood or fluid in the subretinal space.

— Child victims of abusive head trauma may have other clinical symptoms that explain the retinal hemorrhage.

— Seizures, cardiopulmonary resuscitation, hypoxia, and anemia rarely cause retinal hemorrhage in children in typical SBS age range (usually under age 3 years); when they do, only a few preretinal and intraretinal hemorrhages are found in the posterior pole.

— Other differentiating signs: (1) systemic findings (eg, high blood pressure, extremely low hemoglobin levels); (2) exudates, which are almost always seen in hypertension; and (3) nerve fiber layer infarcts, which are usually associated with anemia.

— Retinal hemorrhage rarely caused by Valsalva's maneuver; usually only preretinal hemorrhage confined to macula.

— Glutaricaciduria type I, a metabolic disorder with features similar to SBS, may cause intraretinal or preretinal hemorrhages in the posterior pole.

— Little or no evidence suggests retinal hemorrhage caused by childhood immunizations or vitamin C deficiency.

TERSON'S SYNDROME

— Occurrence of intracranial blood with retinal or vitreous hemorrhage, or both.

— Important finding with history of accidental trauma, which otherwise might explain intracranial (eg, subdural) hemorrhage in young child with retinal hemorrhage.

- Very uncommon in children.
- Not associated with severity of hemorrhagic retinopathy seen in most childhood abusive acceleration-deceleration head injuries (for example, SBS).

HEMORRHAGIC RETINOPATHY IN NORMAL BIRTH

- Most important differential diagnosis in infants with extensive hemorrhagic retinopathy is normal birth.
- Superficial intraretinal hemorrhage (clinically called flame-shaped hemorrhage) usually resolves within a week and is always gone after 2 weeks.
- Deeper intraretinal hemorrhage (dot or blot hemorrhage) usually resolves within 1 month; rarely lasts over 6 weeks unless blood in fovea.
- Birth hemorrhage far more common after spontaneous vaginal delivery and vacuum extraction than other delivery modes.
- Subretinal hemorrhage from birth is unusual; retinoschisis never observed.
- Most important: rule out primary retinal pathologic condition as cause of retinal hemorrhage.
- Disorders such as retinal necrosis from infection (eg, cytomegalovirus) or retinal schisis of genetic origin (eg, X-linked juvenile retinoschisis) readily diagnosed.
- Clinical correlation with antemortem ophthalmic examination findings especially useful.

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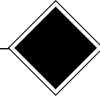
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