Injury Evaluation

How to form a forensic opinion

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Medical Consultations
The usual process and a little bit more

Gather information
• Q & A – the story – “presenting complaint”
• Additional information
• Background re psychosocial circumstances

Examine (search for and record findings, interpret)
Investigate and consult others
Test hypotheses (heuristics) to reach “medical diagnosis”
Deduce /Conclude “medical opinion”
Recommend “medical treatment” / intervention
Forensic Paediatric Medical Practice

Interface between medicine, the law and forensic science
Primarily = presenting medical evidence for use in legal settings
Paediatric forensic medicine is NOT scaled down adult forensic medicine

The work = medical consultations with a focus on the causes for a child’s injury, condition or circumstances.

Outputs = medico-legal reports, rape kits, testimony in court
Causes for a child’s injury, condition, circumstances

Trauma
- What type, size, direction of mechanical force?
- Other “damaging” contacts – eg heat, chemicals, poisons, radiation,
- When?

If trauma – accidental, non-accidental or self inflicted?
If not trauma – then what? ALWAYS consider alternative possibilities
- Medical conditions that might be confused with abuse

Psychosocial situation must be evaluated for all cases
What is an injury?

Damage or harm done to or suffered by a person or thing

Causative event -> Resulting pathology
(cause)                                  (outcome)

Damage to the body (and psychological damage)

Legal definition: violation of another’s rights for which the law allows an action to recover damages
What is trauma?

A deeply distressing or disturbing **experience**

A physical **injury** or an **emotional response** to a terrible event

A severe injury usually caused by a violent attack or accident
Severe emotional or mental distress caused by an experience
An event or situation that causes great disruption or suffering
What is a wound?

An injury to living tissue caused by a cut, blow or other impact

Skin? Breakdown in the protective function of the skin
Psychological (pride and feelings)
Muscle tears, fractures, burns
The process of injury evaluation

Listen
Look
Record
Think
• (sometimes repeat above and order tests)
Share information and opinion
Listen: gather information

What is reported to have happened?
How EXACTLY did it happen?

Document: verbatim quotes

Ask:
- understand the mechanism of injury
- understand the circumstances surrounding the injury
  (how, where, when, what, who, and why?)
Look: Examine- search for injury

Cooperation and compliance is important: Build rapport
Lighting and privacy. Good examination environment
Top to toe (uncover)
In orifices
Move limbs? Tenderness.
Palpate / touch
Smell
Observe interactions
Record

Documentation: quality is extremely important

Describe injury
• Location on body - near landmarks
• site, size, shape & pattern
• colour, contour, contents, edge
• surrounds, swelling, debris, discharge
• Tenderness
• Stage of healing. Eg scab, scar

Body diagrams are an adjunct to a good description
Photographs are good practice (good forensic standard)
Think

Interpret what you see
Classify type of wound or injury

Injury Causation – background concepts
• Was injury caused by NAI?
• Was injury caused by an accident
• Was injury self inflicted?
• Is this in fact not an injury but a medical condition confused with abuse
Think

All forensic medical opinions must consider matters related to injury

- Mechanism
- Forces
- Timing
- Circumstances
Share information and deductions

Telephone conversations and telehealth consultations
Case conferences
Written medico-legal reports
Letters to other professionals
Testimony in court
Narratives, Descriptions & Tests

The story...
  • how someone tells you their story is important
  • how you tell their story is also important

Wound /injury description must be detailed & accurate
Search for additional injury must be thorough with sensible use of medical tests
Search must include consideration of alternative causes

Avoid / minimise BIAS
Classifying wounds

- Bruise
  - Petechiae
  - Ecchymoses
- Abrasion
  - Brush abrasion = Graze
  - Linear scratch abrasion = scratch
- Laceration
- Incised wound
- Puncture wound
- Crush injury
  - Chop (mixture incision and crush)
- Burn
  - Scald
    - Immersion
    - Flow
    - Splash
    - (steam)
  - Contact burn
  - Radiant heat burn
  - Flame burn
  - Chemical burn
  - Frost bite / chilblain
- Firearm
- Blast injury
Clinical competency

Acquire
• Knowledge
• Skills
• Attitudes
• Networks
• Judgement
  • Includes sensible use of referral pathways
  • Courage
  • Integrity
  • Wisdom

BE ACCURATE
• Objective
• Impartial
• Well informed
• Thorough

Go the extra mile
• Offer advice to improve the trajectory of child’s life
• Don’t hold back
• Be specific – suggest time frame for intervention
Background knowledge

Know about anatomy
Know about types of trauma and biomechanics of injury
Know about children’s response to trauma (e.g., bone physiology, the impact of trauma on the developing brain)
Know about the epidemiology of accidental and non-accidental trauma
Sometimes child abuse is bleeding obvious
Sometimes child abuse is harder to detect
Sometimes child abuse can be misdiagnosed
Sometimes child abuse can be missed
Sometimes people fail to act

1000 reasons... not one of them good enough....

8 year old boy
3 visits to ED, 3 admissions
dental trauma / genital trauma
Father’s hand trauma = ++
Documented + NO ACTION

VULNERABLE CHILDREN POLICY = every Victorian hospital

RCH – CLINICAL PRACTICE GUIDELINES + SCAN MEETINGS
Sometimes it is not “spelled out” for Child Protection and the courts

The medically fragile child

7% Victorian children have a disability
• Strong association with low SES
• Higher % live outside capital cities
• 15.7% special health care needs
• 9.3% dependent on medications
• 9.5% require services
• 4.1% functional limitations

• Recognised vulnerability but inexpert or ineffective action
• Shared Language - NB SHARED UNDERSTANDING
Sometimes every one is an expert!

Human bite marks

• 2 opposing arcs
• Child bite? Adult bite?
  Size = imprecise “science”
  • 2.5 cm vs 3.0 cm
• Small = child
• Forensic odontologist = expert
• Impressions of alleged offender’s teeth might match impressions of bite
• NB Collect swab for DNA

• Welsh CP Systematic Review Group : Bites
Sometimes …
It takes a credentialed expert to determine cause(s) of injury

Recognise limits of expertise

CONSULT WISELY
Health, police and CP professionals advised “Do NOT ask for a forensic opinion from someone with no forensic expertise”
Sometimes ‘knowledge’ is updated

Eg Oral trauma in children

- Teeth
- Gums
- Mucosa
- Tongue
- Palate

- Frenulum
  - Welsh Child Protection Systematic Review Group

- Torn frenulum

http://www.utahmountainbiking.com/firstaid/pics/lacfren1.jpg
Sometimes we need to remember that accidents happen!
Paediatric Forensic Medicine

Evaluation of injury
Could this be assault?

Requires knowledge of

- Epidemiology / public health medicine
- Ecology of child abuse
- Systems theory
- Forensic knowledge of injury types and patterns (bruises, burns, abrasions, fractures etc)
- Forces and tissue responses to trauma
- How to
  - Describe injury
  - Formulate opinion
Requires knowledge of child and adolescent sexual assault and sexualised behaviour

Australia - unwanted sexual encounters
5% of teenagers - most recent sex was unwanted.
15.9% - because they were drunk, females (17.6%) males (13.9%).
6.1% - because using recreational drugs, males (6.9%) females (5.4%).
12.6% - because they were pressured, females (13.9%) males (11%).
2% - because pressured by friends, males (2.9%) females (1.2%).

Ability to differentiate child abuse from medical conditions confused with abuse & accidental injury?

Requires knowledge of paediatric medicine and trauma?
Familiarity with congenital conditions, paediatric medical conditions, accidental injury in children and ability to recognise patterns of injury associated with abuse.
Paediatric Forensic Medicine

- Requires FORENSIC SKILLS
- What are these skills?
  - Do things that others cannot do
  - Use “special” equipment such as a colposcope and camera
  - Examine injuries
  - Document injuries and examination findings
  - Interpret laboratory results
  - Collect forensic samples
  - Write reports
Paediatric Forensic Medicine

Requires ability to interpret test results
Requires ability to recognise patterns of inflicted injury
Requires ability to recognise accidental injury eg immersion scalds
Paediatric Forensic Medicine

Requires knowledge of the law and court procedures

- Competency (to testify / consent)
- Age of consent (legislation varies)
  - Most common = 16
  - Age difference between partners – some jurisdictions
    - Heterosexual vs same sex
- Sexual Assault (jurisdictional variation+++)
- Penetration – definitions vary
- Criminal charges and penalties vary
- Age of criminal responsibility = 10 yrs (mens rea)
- Indigenous issues (Koori court)
- Diversionary sentencing
Paediatric Forensic Medicine

Requires a journey of self improvement / QA
Do I know the latest research?
Do I understand the evidence?
Do
  • I read the child abuse literature (including journals)?
  • I search the child abuse websites?
  • I belong to child abuse list-servs?
  • I ask experts?
  • I attend child abuse conferences?
    • Eg, I know that I cannot reliably age bruises based on their colour
    • Eg, I know the difference between a laceration and an incised wound

Am I well informed and wary?
Do I watch out for known dangers?
Requires reflection on work practices

DO I
- collate information well?
- examine well?
- document thoroughly and accurately?
- think logically?
- demonstrate my reasoning?
- express myself clearly?
- know about writing medical reports?

Do I know how to present evidence?
- To carers
- To Child Protection workers and police
- In written reports
- In court
- At case conferences
THINKING about Forensic Medicine

Collate all evidence
Demonstrate good logic and reasoning
Avoid bias
Beware fallacies of logic
Evaluate evidence
Form an opinion
Present opinion to others
What is “an evidence base”?

I need to know

- What forms of evidence exist (categorisation)
- Where to look for answers
  - How to conduct searches
  - How to analyse data / info
- How to think about the results (interpret)
- How to develop an opinion ie THINK
- How to present all forms of evidence so others can understand
Hypothesis testing
What questions am I asking?

• Skin – what is it?
• Bones – what is it?
• Trauma – is it or isn’t it?
• Bone pathology, physiology, metabolism – is it relevant?
• Effect of trauma / healing / time of injury
• DDX including NONTRAUMATIC conditions
• How do I tie it all together?
PFM - What do we want to know?

• Does injury exist? (What pattern/type)
• When did it happen?
• Are there other injuries? (Bone / otherwise)
• What forces are likely to have caused it/them?
• Does the ‘explanation’ account for the injury?
• If not, why not? What might better explain it?
Decision-making in CLINICAL medicine

First premise
Second premise +......
Inference
Conclusion
Hypothesis testing
Conclusion
Decision-making in FORENSIC medicine

First Premise
Second Premise
Inference
Conclusion
Test hypotheses
Pursue diagnosis & exclude alternative diagnoses
Demonstrate reasoning
Conclusion = opinion
How do you determine likelihood?

Has it happened before? (ie, is it possible?)

Does it happen often? (ie, is it common?)

Is there congruence with examination & investigation results? (ie, is the story entirely in keeping with ...If not, why not?)

Does solid data enable statistical prediction of diagnosis? (odds ratios = rare in this field!)

Can you recognise WHEN you use heuristics / fuzzy logic?
What are heuristics?

Cognitive strategies to find answers. “the study of search”

1. Representativeness heuristic (pattern recognition)
2. Anchoring and adjustment heuristics
   Prior beliefs or knowledge leads you to ‘expect’ an outcome. Base point = X and you move after results
3. Simulation heuristic
   the more easily you can imagine a scenario, the more upset you are by it (greater value to you)
<table>
<thead>
<tr>
<th>Categorise information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact</td>
<td>something that has really occurred or is the case</td>
</tr>
<tr>
<td>Circumstances</td>
<td>the 5 “Ws” and “H”</td>
</tr>
<tr>
<td>Speculation</td>
<td>conjectural consideration of a matter</td>
</tr>
</tbody>
</table>
Assign value

Probative value: the weight of evidence submitted to prove something.

In law, probative value of evidences or facts refers to their tendency to prove the existence of other facts or issues in trials

NB: Understand potential for error
   eg. misinterpretation of child’s comment
   eye witness accounts

In medical decision-making - this frequently occurs but is often unconscious
Reasoning

Deduce
When an argument claims that the truth of its premises guarantees the truth of its conclusion, it is said to involve a DEDUCTIVE inference

A (must) \rightarrow B

Infer
When an argument claims merely that the truth of its premises make it likely or probable that its conclusion is also true, it is said to involve an INDUCTIVE inference

A (might) \rightarrow B
The language of logic

A *premise* is a statement that is assumed to be true
- and from which a conclusion can be drawn.

A *proposition* is a statement which is either true or false

*Inference* is the act of thinking (reasoning) that passes from one proposition, statement, or judgment considered as true to another whose truth is believed to follow from that of the former.

A categorical syllogism is a deductive argument containing three statements: two premises and one conclusion.
An example

Premise
- All children are precious

Premise
- Baby B is a child

Inference
- therefore

Conclusion
- Baby B is precious
Fallacies of logic

a fallacy is a technical flaw which makes an argument unsound or invalid.

1. Reductio ab absurdum
2. Fallacies of relevance
3. Fallacies of presumption
4. Fallacies of ambiguity
Stats in Court

Appropriately reference current knowledge and explain consensus
Must understand Bayesian probability
Always apply statistics appropriately

An Intuitive Explanation of Bayes' Theorem Eliezer S. Yudkowsky http://yudkowsky.net/rational/bayes
BEWARE
• Prosecutor’s fallacy
• Defense Attorney’s fallacy
• Conditional probability fallacy / confusion of the inverse
• Base rate fallacy

GET IT RIGHT
OR DON’T GO THERE.....

Interpretation of Statistical Evidence in Criminal Trials

The Prosecutor’s Fallacy and the Defense Attorney’s Fallacy*

William C. Thompson† and Edward L. Schumann†

In criminal cases where the evidence shows a match between the defendant and the perpetrator on some characteristic, the jury often receives statistical evidence on the incidence rate of the “matching” characteristic. Two experiments tested undergraduates’ ability to use such evidence appropriately when judging the probable guilt of a criminal suspect based on written descriptions of evidence. Experiment 1 varied whether incidence rate statistics were presented as conditional probabilities or as percentages, and found the former promoted inferential errors favoring the prosecution while the latter produced more errors favoring the defense. Experiment 2 exposed subjects to two fallacious arguments on how to interpret the statistical evidence. The majority of subjects failed to detect the error in one or both of the arguments and made judgments consistent with fallacious reasoning. In both experiments a comparison of subjects’ judgments to Bayesian norms revealed a general tendency to underutilize the statistical evidence. Theoretical and legal implications of these results are discussed.

INTRODUCTION

Crime laboratories often play an important role in the identification of criminal suspects (Saferstein, 1977; Schroeder, 1977; Giannelli, 1983). Laboratory tests

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Hidden assumptions assume shared values and beliefs, therefore AVOID these words

Disclosure
Assumes the statements are factual
“He disclosed that she hurt him”

Victim
Assumes something bad happened to this person
“The victim wept after the alleged assault”

Offence
Assumes crime has been committed
“She said that the perpetrator raped her”
Assumptions and ‘medical truisms’

• If you hear hoof-beats think of horses not zebras
  • Common things occur commonly (and conversely...)

• Ockham’s razor (Plurilatus non est ponenda sine necessitate)

• The rule of parsimony (all symptoms are due to one complaint)
• If a test result surprises you, repeat the test before taking action
• If a test result is unlikely to change the management of a patient, don’t do the test.
• Rare manifestations of common diseases > common manifestations of rare diseases
• 1st priority in DDX = diseases you cannot afford to miss

• Values and bias – eg, People are inherently ‘good’
  sometimes poverty makes people do bad things...

How useful are these things when evaluating a particular child’s situation?
Diagnostic certainty

Ask... “How certain do I need to be?”

The spectrum of confidence....

• What is certain? What is impossible?
• What is probable?
• What is possible?
• I don’t know...

These 2 overlap
Therefore Beware

Veracity of information is rarely known
- Including information from medical, police and statutory agencies

Subspecialist-proffered “forensic” opinion
- Radiologists depend on info on request form
- Neurosurgeons not expert in minor head injury

Geneticists – clinical diagnostic opinion based on less diagnostic certainty + ‘wait and see’
  eg OI