MEDICAL ASPECTS OF TRAUMA

Toxic Stress and Health
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Disclosure slide

• I have no actual or potential conflict of interest in relation to this program/presentation.
Intersection of Trauma, Medicine and Law
What trauma looks like
What trauma looks like
What trauma looks like
What trauma looks like
Trauma and the developing child

A. Trauma
   a) Definitions of trauma - changes
   b) Concept of toxic stress
   c) Role of neuroendocrine-immune network

B. The developing body
   a) Trauma’s impact on the immune system
   b) Trauma’s impact on health

C. The developing brain
   a) Development and Neuroscience 101
   b) Trauma’s impact on brain development
Stress

Positive
Brief increases in heart rate, mild elevations in stress hormone levels.

Tolerable
Serious, temporary stress responses, buffered by supportive relationships.

Toxic
Prolonged activation of stress response systems in the absence of protective relationships.

CHILD / INDIVIDUAL STRESSORS

- Abuse, neglect, chronic fear state
- Other traumas
  - natural disasters
  - accidents and illness
  - exposure to violence
- Disabilities / chronic disease

PARENTAL / FAMILY STRESSORS

- Parental dysfunction
  - substance abuse
  - domestic violence
  - mental illness
- Divorce / single parenting
- Poverty
Adverse Childhood Experiences Study

• > 17,000 middle-aged, middle class Californians

• Retrospective assessment of childhood adversity:
  • 10 Categories – abuse, neglect and household dysfunction

• Associations with adult physical, behavioral, and mental health status
ACE Studies

- Increased prevalence and risk for:
  - Smoking.
  - Severe obesity.
  - Physical inactivity.
  - Depressed mood.
  - Suicide attempts.

- Increased as number of childhood exposures increased.
ACE Studies

• More Surprising!!!
• Despite a healthy lifestyle, further studies show greater risk in:
  • Cardiovascular risk.
  • Cancer.
  • Rheumatoid arthritis.
• These illnesses were never associated with childhood trauma before.
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Neurobiology of Trauma

Hypothalamic-Pituitary-Adrenal Axis (HPA)

- Stress activates axis.
- Peripheral release of epinephrine and cortisol.
- Stimulates multiple areas of body and immune system.
Trauma

• Stress and the tiger
  • Bodies designed to respond to stress
  • Adrenalin and cortisol help us run from tiger or hide
  • Threat of short duration
BUT...when the tiger lives in your home, neighborhood or life
CORTISOL

Toxic stress

Other body systems

Immune system

Gene expression (epigenetics)

Inflammatory response

Infection fighting (antibodies)
Impact of toxic stress on immune system

- Developing system is chronically pressed into action
  - Too much cortisol suppresses immunity, increasing risk of infection
  - Inflammatory response persists after it is no longer needed
Physical effects of trauma

• Physical health effects on children
  • Somatic perception gets impaired
    • Headache, stomachache
  • Elevated cortisol impacts inflammation
    • Asthma – inflammatory component
    • Metabolic syndrome – obesity, insulin resistance, diabetes, cardiovascular disease
    • Cancer risk elevated
  • Infection fighting function impaired
    • Higher risk of infection
    • Autoimmune disorders
Overview

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Interlude on Neurodevelopment

- Brain starts as single cell – develops into ten billion organized cells
  - Neurogenesis (nerve growth).
  - Migration (nerve movement).
  - Synaptogenesis (nerve connections).
  - Neurochemical differentiation (chemical connections).
Neuron density over time

The brain organizes in a “use dependent” fashion.
Genes give us the range; what is expressed is due to environment.
There are windows of sensitivity and vulnerability.
True for nurturing environment and toxic stress.
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Trauma happens when the tiger lives in your home, neighborhood or life.
Neurobiology of Trauma

Hypothalamic-Pituitary-Adrenal Axis (HPA)

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- Stimulates multiple areas of brain.
Neurobiology of Trauma

Amygdala

- Amygdala: Input from sensory, memory and attention centers
- Emotional memory system = The brain’s alarm system
Neurobiology of Trauma

Hippocampus

- Interface between cortex and lower brain areas.
- Major role in memory and learning.
  - The brain’s file cabinet or search engine.
Neurobiology of Trauma

- Frontal cortex
  - Executive function
    - Impulse control
    - Working memory
    - Cognitive flexibility
Clinical Implications of Trauma

- Traumatized children
  - Amygdala hypertrophy:
    - Alarm turned on – not able to take input from other areas to quiet alarm
  - Hippocampus atrophy
    - Difficulty with learning and memory
  - Frontal cortex
    - Shut down of executive function – impulse control, working memory and cognitive flexibility
Teen arrested for violent street fight
<table>
<thead>
<tr>
<th>AGE</th>
<th>IMPACT ON WORKING MEMORY</th>
<th>IMPACT ON INHIBITORY CONTROL</th>
<th>IMPACT ON COGNITIVE FLEXIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant / toddler / pre-schooler</td>
<td>Difficulty acquiring developmental milestones</td>
<td>Frequent severe tantrums</td>
<td>Easily frustrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aggressive with other children</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attachment may be impacted</td>
<td></td>
</tr>
<tr>
<td>School-aged child</td>
<td>Difficulty with school skill acquisition</td>
<td>Frequently in trouble at school and with peers for fighting and disrupting</td>
<td>Organizational difficulties</td>
</tr>
<tr>
<td></td>
<td>Losing details can lead to confabulation, viewed by others as lying</td>
<td></td>
<td>Can look like learning problems or ADHD</td>
</tr>
<tr>
<td>Adolescent</td>
<td>Difficulty keeping up with material as academics advance</td>
<td>Impulsive actions which can threaten health and well-being</td>
<td>Difficulty assuming tasks of young adulthood which require rapid interpretation of information: ie, driving, functioning in workforce</td>
</tr>
<tr>
<td></td>
<td>Trouble keeping school work and home life organized</td>
<td>Actions can lead to involvement with law enforcement and increasingly serious consequences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confabulation increasingly interpreted by others as integrity issue</td>
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</tbody>
</table>
35 month old kicked out of preschool

- Severe tantrums
- Hurts other kids, damages furniture
- Very short attention span
- Obese, eats all the time
- Not toilet trained
- Won’t sleep
<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>CENTRAL CAUSE</th>
<th>SYMPTOM(S)</th>
</tr>
</thead>
</table>
| Sleep     | Stimulation of reticular activating system        | 1. Difficulty falling asleep  
2. Difficulty staying asleep  
3. Nightmares |
| Eating    | Inhibition of satiety center, anxiety              | 1. Rapid eating  
2. Lack of satiety  
3. Food hoarding  
4. Loss of appetite |
| Toileting | Increased sympathetic tone, increased catecholamines | 1. Constipation  
2. Encopresis  
3. Enuresis  
4. Regression of toileting skills |
“The Baby is Fine”, Best baby ever!

• 22 month old
• Very quiet, never cries
• Stays where put – not getting into everything
• Serious looking baby
• Hides in corner of exam room
Jana’s new school failure

- Depressed
  - Was bubbly – now not.
  - Pulling back from friends
- Cutting
- Says she is ugly
- Meds not help

- Find out later about ongoing sexual abuse
Dissociative Continuum

- Infants & young children not capable of fighting or fleeing
  - Early stress: infants manifest precursor form of hyperarousal
    - Limited way to express distress to caretaker
Dissociative Continuum

• Defeat response
  • Dissociation describes mental mechanisms of
    • disengaging from the external world
    • attending to stimuli of the internal world
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>MORE COMMON WITH</th>
<th>RESPONSE</th>
<th>MISIDENTIFIED AS AND/OR COMORBID WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissociation (Dopaminergic)</td>
<td>• Females&lt;br&gt;• Young children&lt;br&gt;• Ongoing trauma/pain&lt;br&gt;• Inability to defend self</td>
<td>• Detachment&lt;br&gt;• Numbing&lt;br&gt;• Compliance&lt;br&gt;• Fantasy</td>
<td>• Depression&lt;br&gt;• ADHD inattentive type&lt;br&gt;• Developmental delay</td>
</tr>
<tr>
<td>Arousal (Adrenergic)</td>
<td>• Males&lt;br&gt;• Older children&lt;br&gt;• Witness to violence&lt;br&gt;• Inability to fight or flee</td>
<td>• Hypervigilance&lt;br&gt;• Aggression&lt;br&gt;• Anxiety&lt;br&gt;• Exaggerated response</td>
<td>• ADHD&lt;br&gt;• ODD&lt;br&gt;• Conduct disorder&lt;br&gt;• Bipolar disorder&lt;br&gt;• Anger management difficulties</td>
</tr>
</tbody>
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Trauma Responses: Adaptive and Protective When in Threatening Situation

- Same bodily functions and behaviors may be maladaptive when children are removed from the stressor
- When not examined within the context of past traumas can be misinterpreted as pathologic
Foster care alumni postcard project. http://www.fostercarealumni.org/postcard_project/viewpostcards.htm