Pediatric Hand Burns

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Disclosure of Financial Relationships

ēzalife, LLC
Equity and ownership interests, royalties, consultant, executive role

Impact Vitals, Inc.
Equity and ownership interests, royalties, consultant, executive role

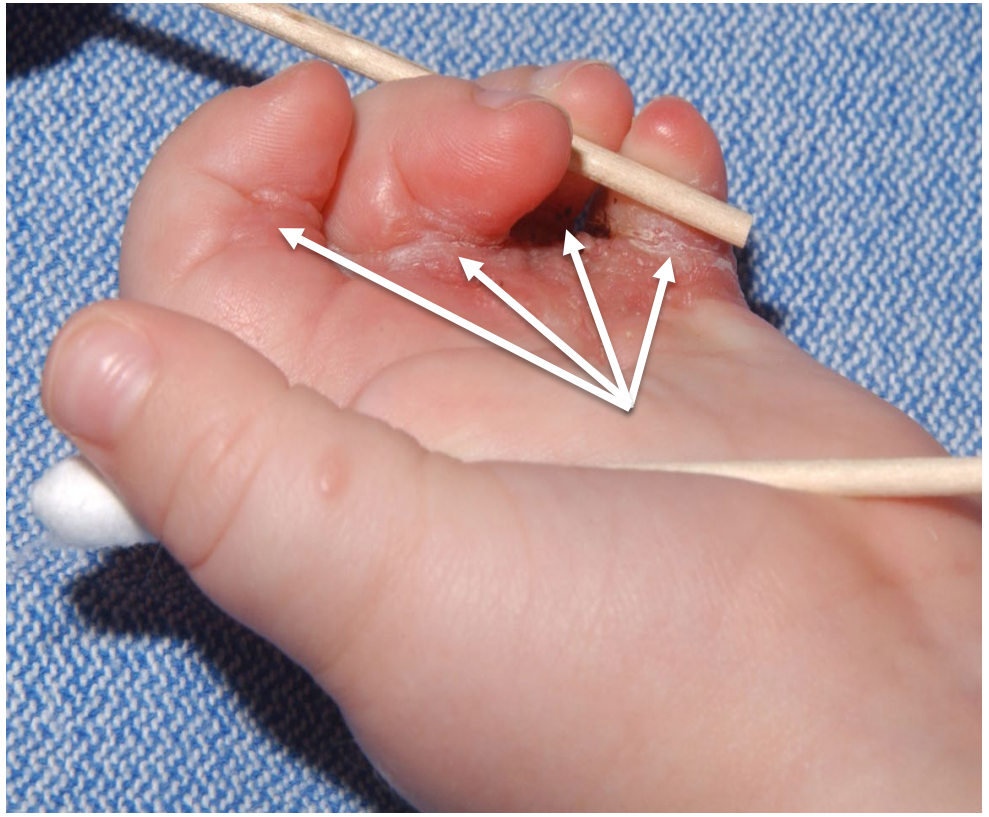
These financial relationships have been mitigated and there is no conflict of interest for Accredited Continuing Education

Pediatric Considerations

- Burns are a leading cause of hand injury
- Innately curious, lack awareness of danger
- Learn through tactile exploration
- Skin and sensation
  - Cutaneous sensation, pressure sense
  - Elasticity of the dorsal skin
  - Stability of palmar skin and fascia
- Biomechanical Forces
  - Power of the flexor tendons

Pediatric Considerations

- Hand burns are common
  - Risks: impaired function, growth/dev.
  - Hypertrophic scarring: psychosocial
- ABA Referral Criteria
  - Partial thickness, age ≥ 2, > 10% TBSA
  - Burns of face, hands, feet genitalia, perineum, major joints
  - Full thickness burns
  - Electrical (lightening)/chemical burns
  - Special: infant, trauma/NAT, etc.



Severe burn scar contractures all four fingers after two failed operations at an OSH

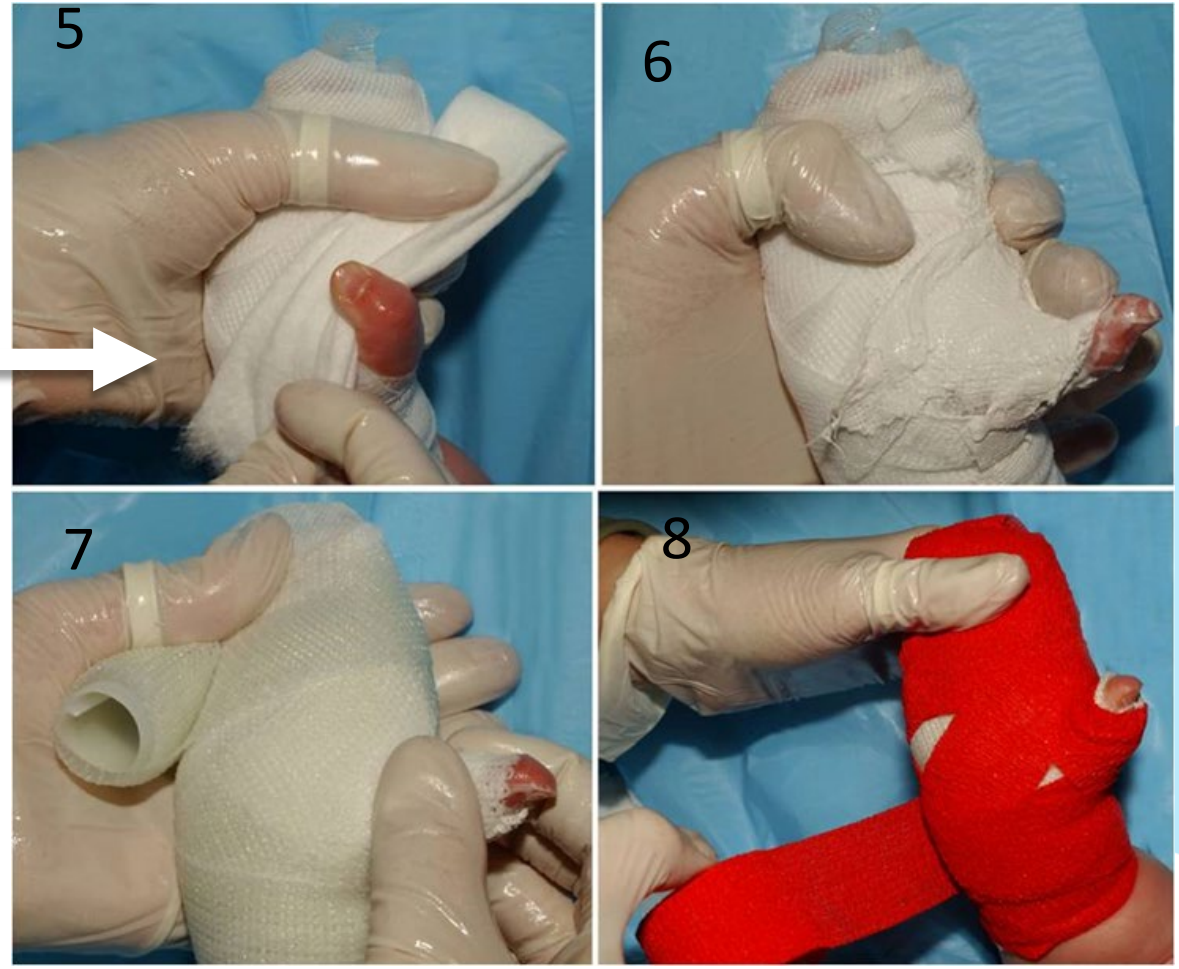
ED and Outpatient Management

- Pre-medicate for pain
  - Small burn (1-2%)
    - Intra-nasal fentanyl (1.5 mcg/kg/dose)
    - PO acetaminophen + oxycodone
  - Moderate size burn (>3 - 4%)
    - Conscious sedation or OR
  - Avoid NSAIDs if considering surgery
- Manage anxiety
  - Child-Life
  - Anxiolytic
    - Lorazepam

ED and Outpatient Management

- Blisters
  - If FLAT, leave them INTACT
  - If RAISED, then window and debride with fine scissors
- Dressings
  - TAO or Bacitracin in a non-adherent gauze dressing
    - ✓ Inexpensive, easy to apply/remove; change once or twice per week
    - ✓ Switch to Nystatin (almost healed) at 7-10 days
  - If deep, switch an active silver dressing with silicone adhesive (Mepitel AG or UrgoTul AG/Silver) once drainage slows or stops
- Soft casting technique to immobilize hand/fingers/thumb

Dressing Hand Burns

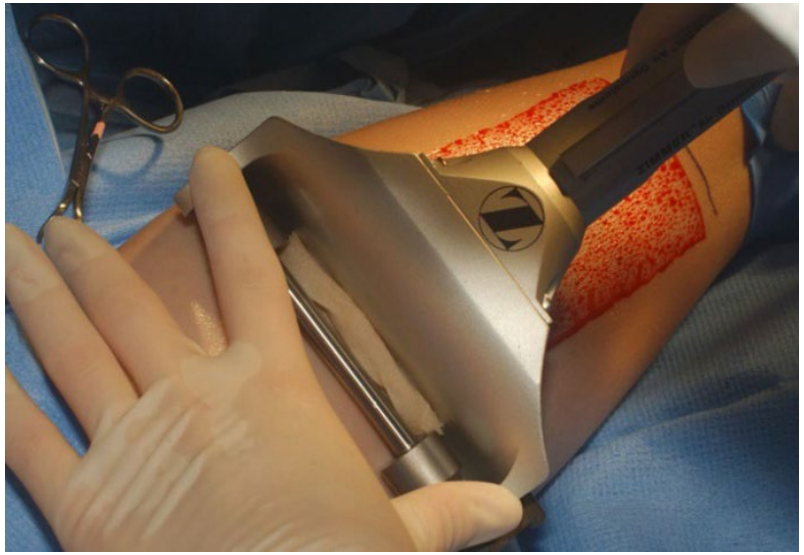


The “14 Day Rule" to Prevent Burn Scar Contractures and Preserve….

- Age-appropriate activities
  - Fine motor skills
  - Developmental/gross motor skill acquisition
- Activities of daily living
  - Self feeding
  - Handwriting
- Normal motor development, growth spurts:
  - 2-3 years old, girls/boys
  - 8-13 years old, girls
  - 10-15 years old, boys

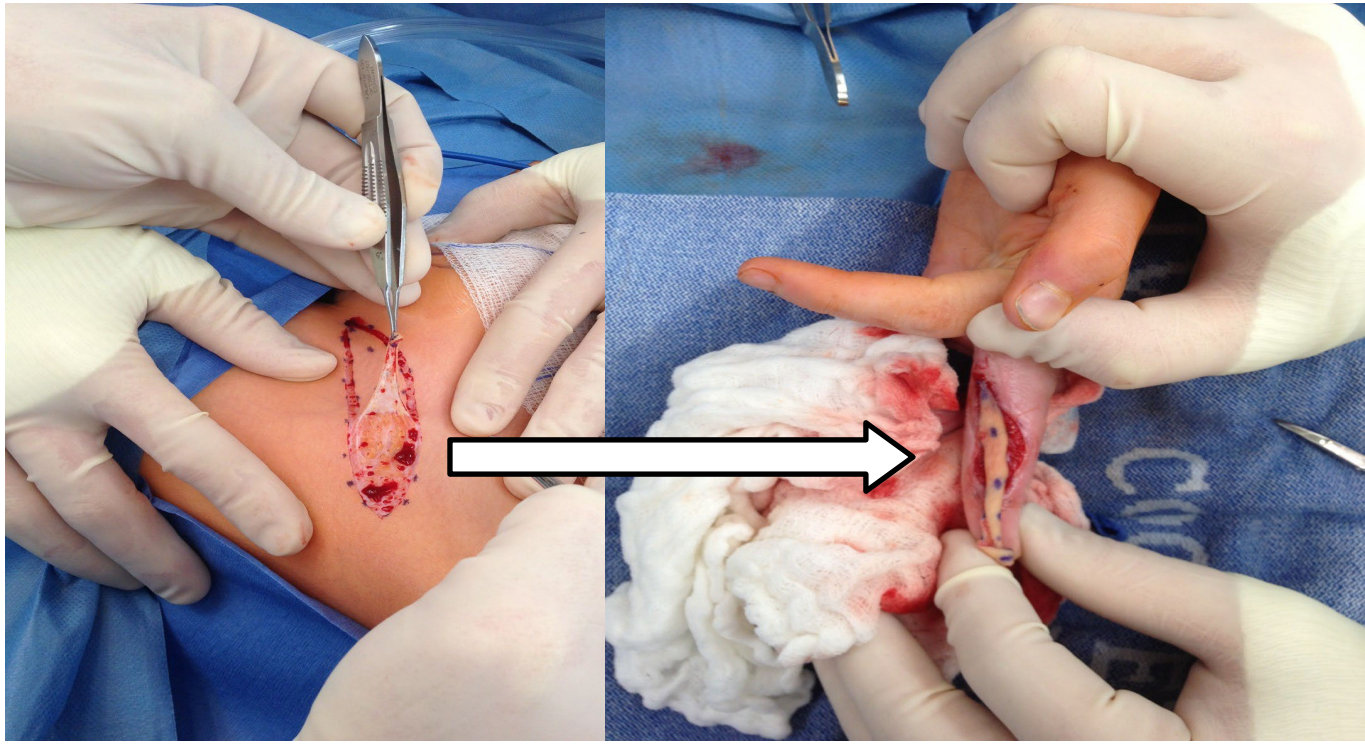
Split Thickness Skin Grafts

- For dorsal, deep partial to full thickness burns to hands
- Donor sites: upper arm/thigh/buttock
- 0.007 – 0.0085 inch thickness, unmeshed
- Fibrin glue, Steri-strips
- May use in combination w/ FTSGs



Full-Thickness Skin Grafts

- Palmar full thickness burns
- Donor sites:
  - Soft, flexible skin, color match
  - Non-hair bearing
- Minimal tension on graft
  - 5-0 chromic/plain gut for palms
  - 6-0 chromic/plain gut for fingers
- Soft casting for 10-12 days + 10 days
- Lotion QID, garments q3mo, 1-2 yrs



Examples of Hand Burns and Their Management

Heat Contact Type Injuries

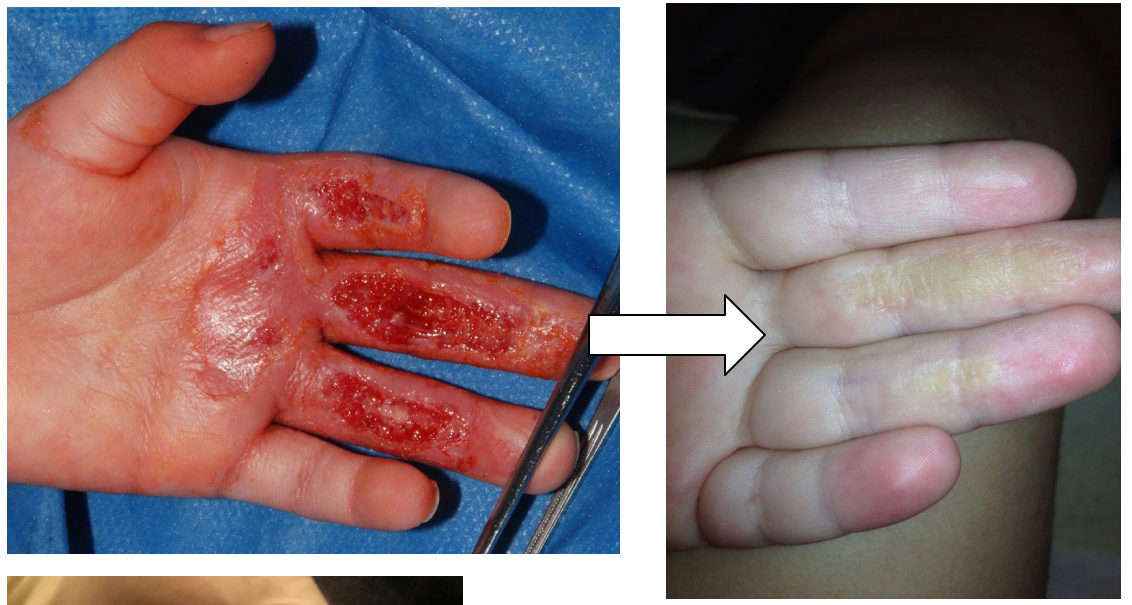
- Most common cause of hand burns among children
  - Firepits (hot coals)
  - Stovetops and ovens
  - Glass fronted gas fireplaces
  - BBQs
  - Curling irons
  - Clothing irons

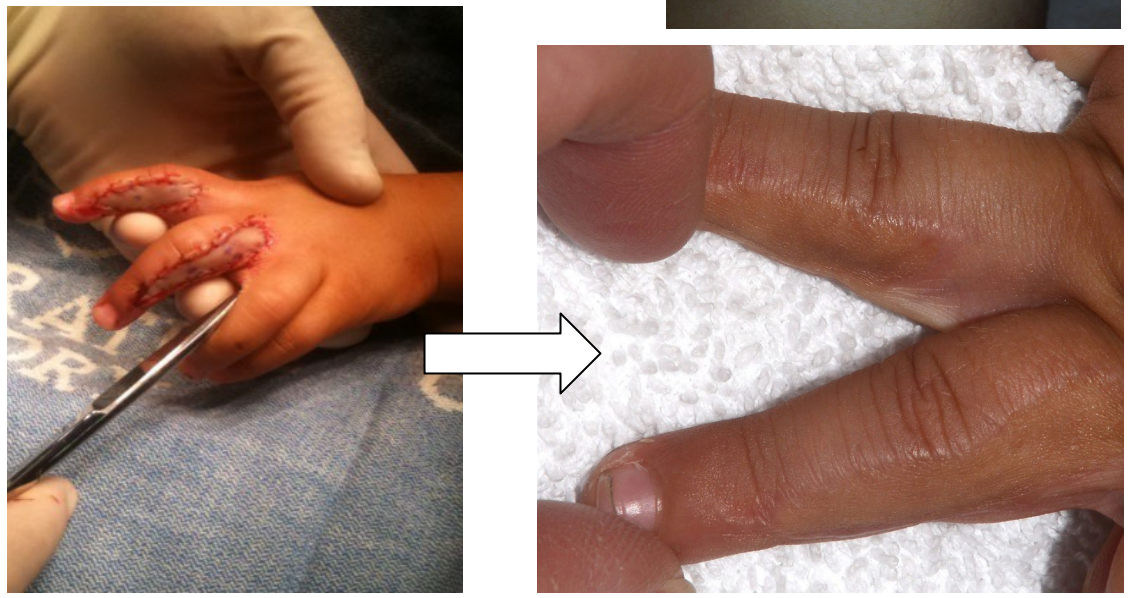
Fell into campfire

Clothing iron

Friction Type Injuries

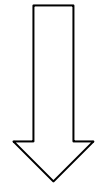
- Causes
  - Treadmills
  - Vacuum Cleaners
- Usually very deep
  - Exposed tendons/joint capsules
  - Neurovascular bundles
- Areas of concern
  - Flexion contractures, which pull on landmarks
  - Proximal and distal palmar creases





Electrical Type Injuries

- Low voltage ≤ 1000 volts
  - 2nd and 3rd degree burns
  - If ECG normal, no further evaluation
- High voltage > 1000 volts
  - 3rd and 4th degree burns
  - Check ECG for arrhythmias



High Voltage – Powerline

According to the AAW there have been 33 cases of fractal wood burning-related deaths since 2017, representing a stunningly high mortality rate of ~71%

Scald Type Injuries

- Spill or flow pattern scald burns
  - Caused by
    - Reaching for coffee, tea, soup, ramen
    - Hot showers (patients with epilepsy)
- Immersion pattern scald burns
  - Caused by
    - Accidental submersion vs. NAT
- Injury Prevention Tips:
  - Children out of the kitchen
  - Hot liquids high and away from counter edge
  - Pots and pans on rear burners
  - Your water heater ≤ 120 degrees F

Don't put child on countertop or chair next to stove!

Flow pattern scalds

Immersion pattern scald

Hand Burns at CHCO from 2016-2022

2707 children ages 0-18 yrs with burns to the hand(s) managed in outpatient and/or inpatient settings

	Operative Patients (N=170, 6.3%)
Chemical	3 (1.8%)
Scald	8 (4.7%)
Contact	47 (27.6%)
Electrical	3 (1.8%)
Fire/Flame	24 (14.1%)
Grease	7 (4.1%)
Road Rash/Friction	74 (43.5%)
Unspecified	2 (1.2%)
Other	2 (1.2%)

Nolan MM, et al., *J Burn Care Res 2023;44(4): 955-62*

Characteristics of Surgical Patients

	Operative Population
Age (years)	3.92 (4.19)
Gender	
Male	109 (64.1%)
Female	61 (35.9%)
Race	
White	102 (60.0%)
Black	11 (6.5%)
Hispanic	38 (22.4%)
Asian	6 (3.5%)
Native American Indian	1 (0.06%)
More than One	3 (1.8%)
Other	9 (5.3%)

170 pts required skin grafting

Seen as Outpatient First	Operative Population
Yes	132 (77.6%)
No (Admitted from ED)	38 (22.4%)
ED Disposition (n=38)	
PICU	14 (14.7%)
Floor	24 (25.3%)

Nolan MM, et al., *J Burn Care Res 2023;44(4): 955-62*

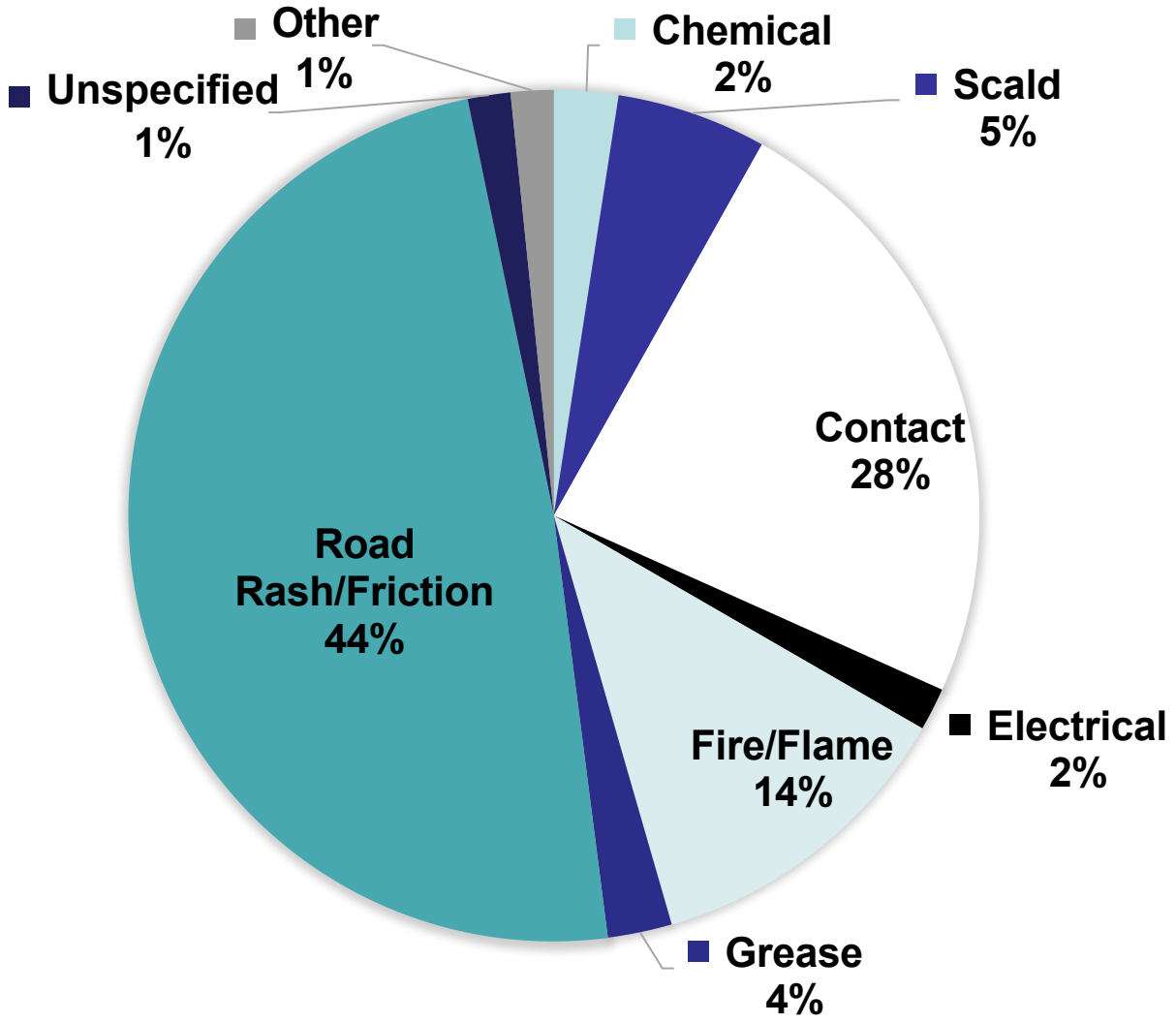
Characteristics of Surgical Patients

	Operative Population
Time from Burn Injury to First Clinic Visit (days)	4.26 (4.15)
Number of Clinic Visits Before Skin Grafting	1.99 (1.16)
1st Primary Dressing Layer	
Antibiotic Impregnated	87 (51.18%)
Nystatin Impregnated	12 (7.06%)
Active silver	58 (34.12%)
Unknown	13 (7.65%)
Outer Dressing	
Soft Dressing	53 (31.18%)
Soft cast	110 (64.71%)
Unknown	7 (4.12%)

Nolan MM, et al., *J Burn Care Res 2023;44(4): 955-62*

Mechanisms of Full Thickness Burn Injury Requiring Surgery

Mechanism	Operative Population (n=170)
Chemical	3 (1.8%)
Scald	8 (4.7%)
Contact	47 (27.6%)
Electrical	3 (1.8%)
Fire/Flame	24 (14.1%)
Grease	7 (4.1%)
Road Rash/Friction	74 (43.5%)
Unspecified	2 (1.2%)
Other	2 (1.2%)
TBSA	
Average (SD)	4.09 (9.84)
Median (Range)	1 (0.75, 69)



Nolan MM, et al., *J Burn Care Res 2023;44(4): 955-62*

Operative Data

	Operative Population
Average Time from Burn Injury to Skin Graft	11.76 (5.57)
Number of Operations Needed Total (debridement/grafting)	1.54 (1.41)
Type of Operation	
Split Thickness Graft	43 (25.3%)
Full Thickness Graft	119 (70.0%)
Both ST and FT Graft	8 (4.7%)
Time to 1st Post Op Visit	12.9 (2.75)
Incomplete Graft Take	7 (4.12%)
Second Operation	0
Post-Op Infection	1 (0.59%)
Prophylactic Fluconazole	58 (34.9%)

Nolan MM, et al., *J Burn Care Res 2023;44(4): 955-62*

Patients with Delayed Presentation

7 patients initially presented with burn scar contractures

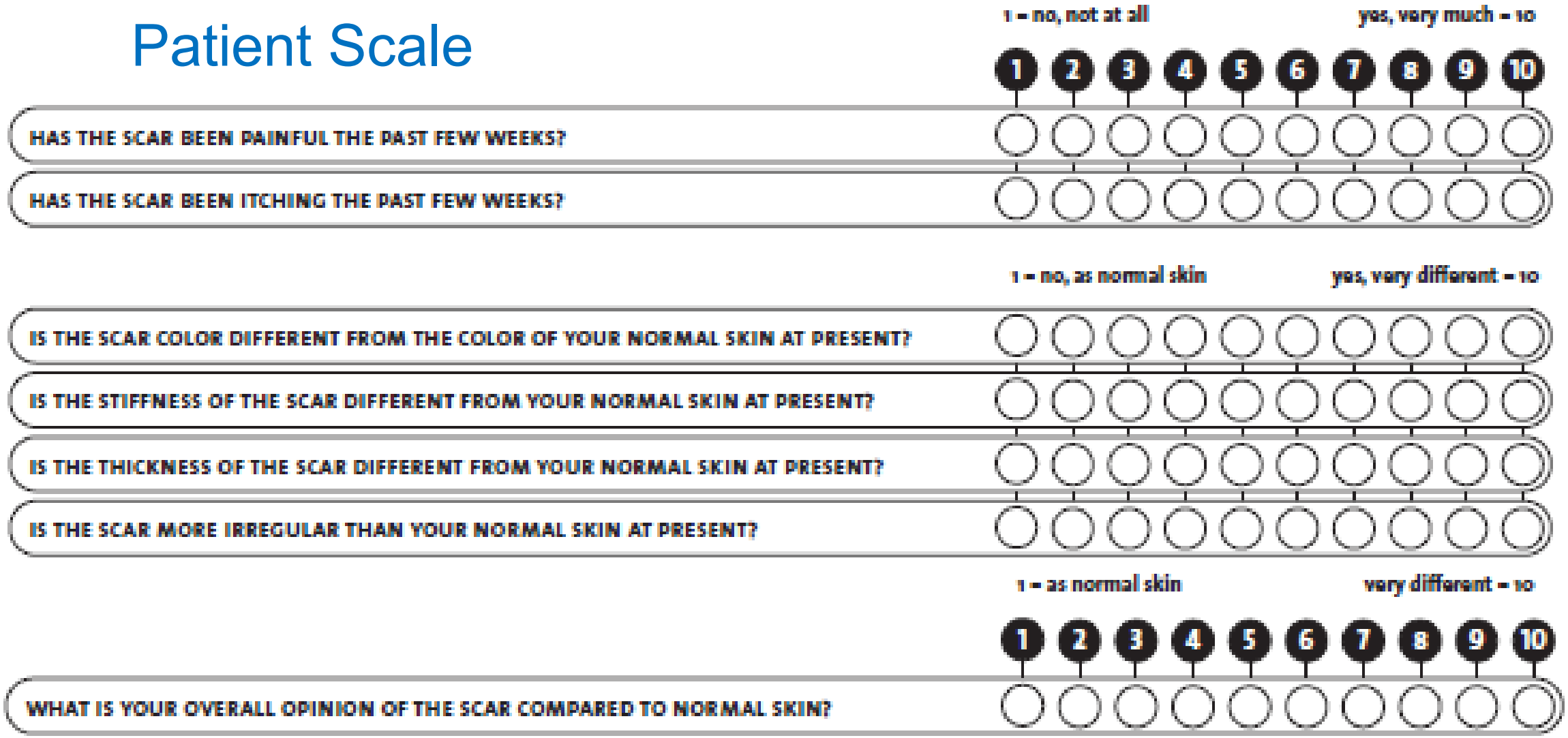
	Total Patients (n=7)
Time from Burn Injury to Burn Clinic Presentation	1.5 months – 4 years
Initially Managed by Non-Burn Clinician*	6 (85.7%)
Hospitalized for Burn	1 (14.3%)
Burn Mechanism	
Heat Contact	6 (85.7%)
Road Rash/Friction	1 (14.3%)

**Data on initial management missing for one patient seen 4 years after burn*

Nolan MM, et al., *J Burn Care Res 2023;44(4): 955-62*

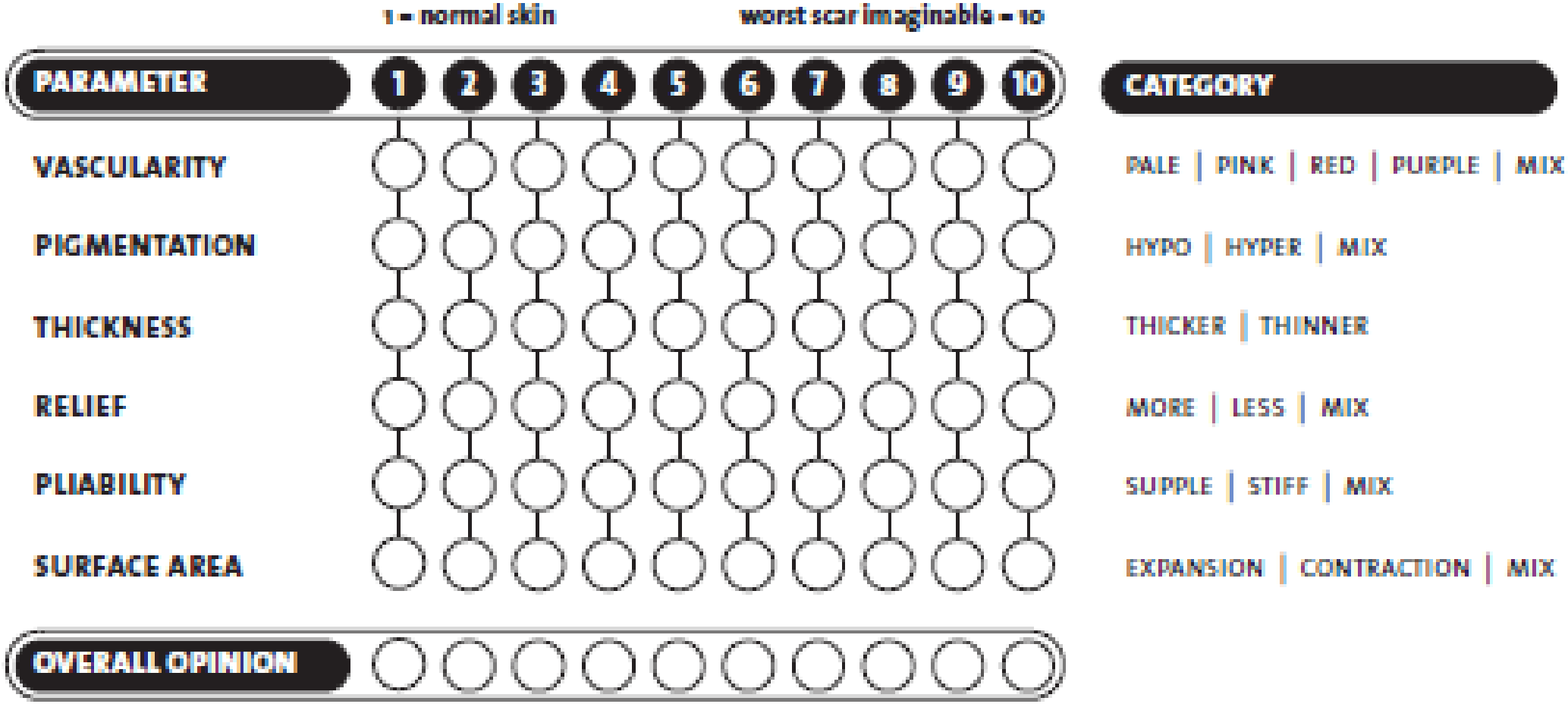
The Patient and Observer Scar Assessment Scale (POSAS)

Patient Scale



The Patient and Observer Scar Assessment Scale (POSAS)

Provider Scale



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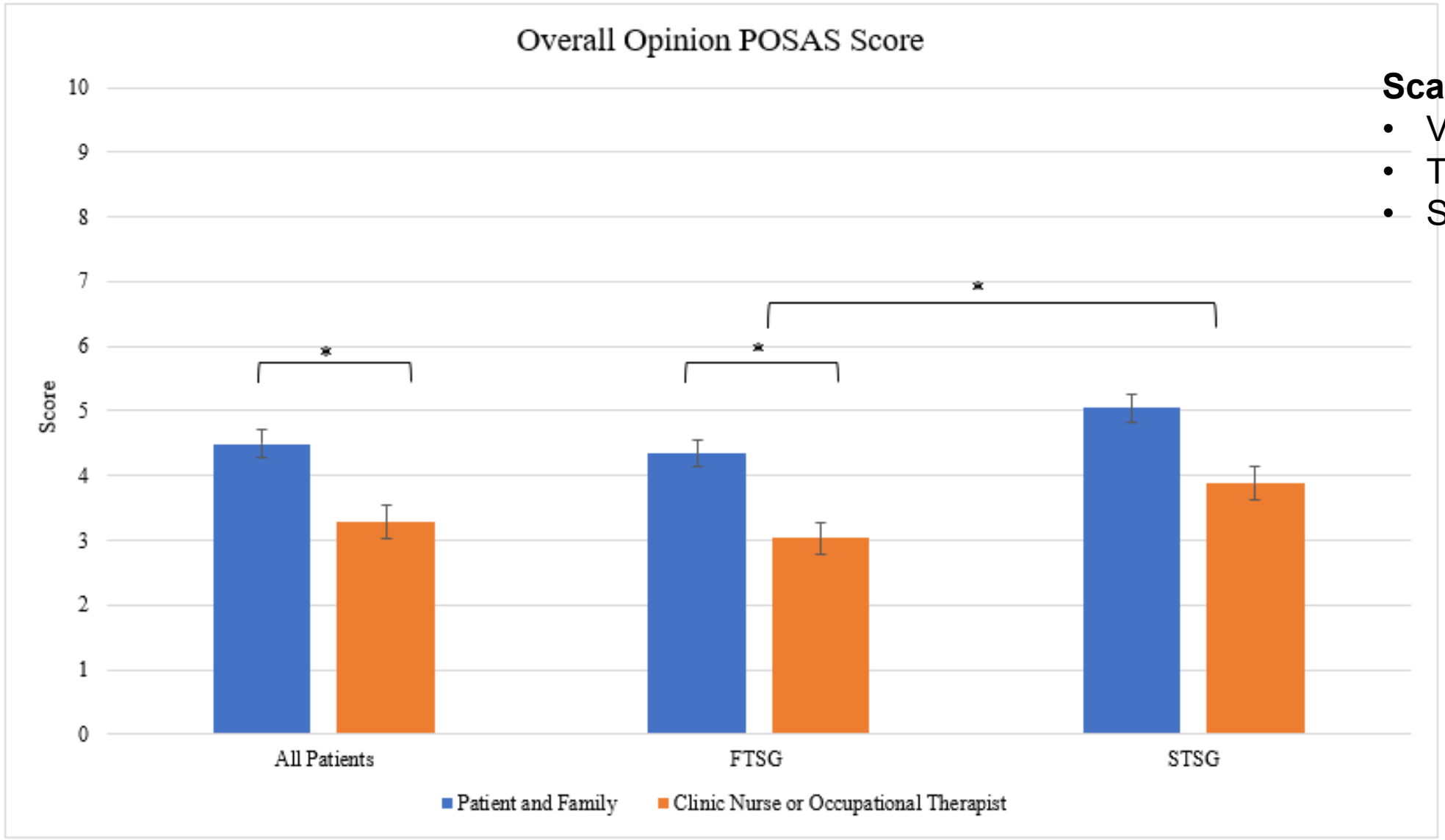


Scar Quality

- Visual (e.g. color)
- Tactile (e.g. pliability)
- Sensory (e.g. pain, itch)

Nolan MM, et al., *J Burn Care Research;* e-pub ahead of print Dec. 2022

**Denotes $p<0.05$*

Key Points for Managing Pediatric Hand Burns

- Know your center's limitations (keep vs. refer)
- Critically evaluate the circumstances (be skeptical)
- Outpatient mgmt.
  - ~ 95% heal without surgery, however…..
  - Position and serially cast in extension
  - Frequency of dressings and primary layer must match wound needs
- Parent education (hydration, high cal/protein diet, no baths)
- Scar management
  - Lotion massage and pressure garments +/- gels or putty
  - Nap time and nighttime splinting if needed
  - Long term follow up (1 - 2+ years)

Thank You!

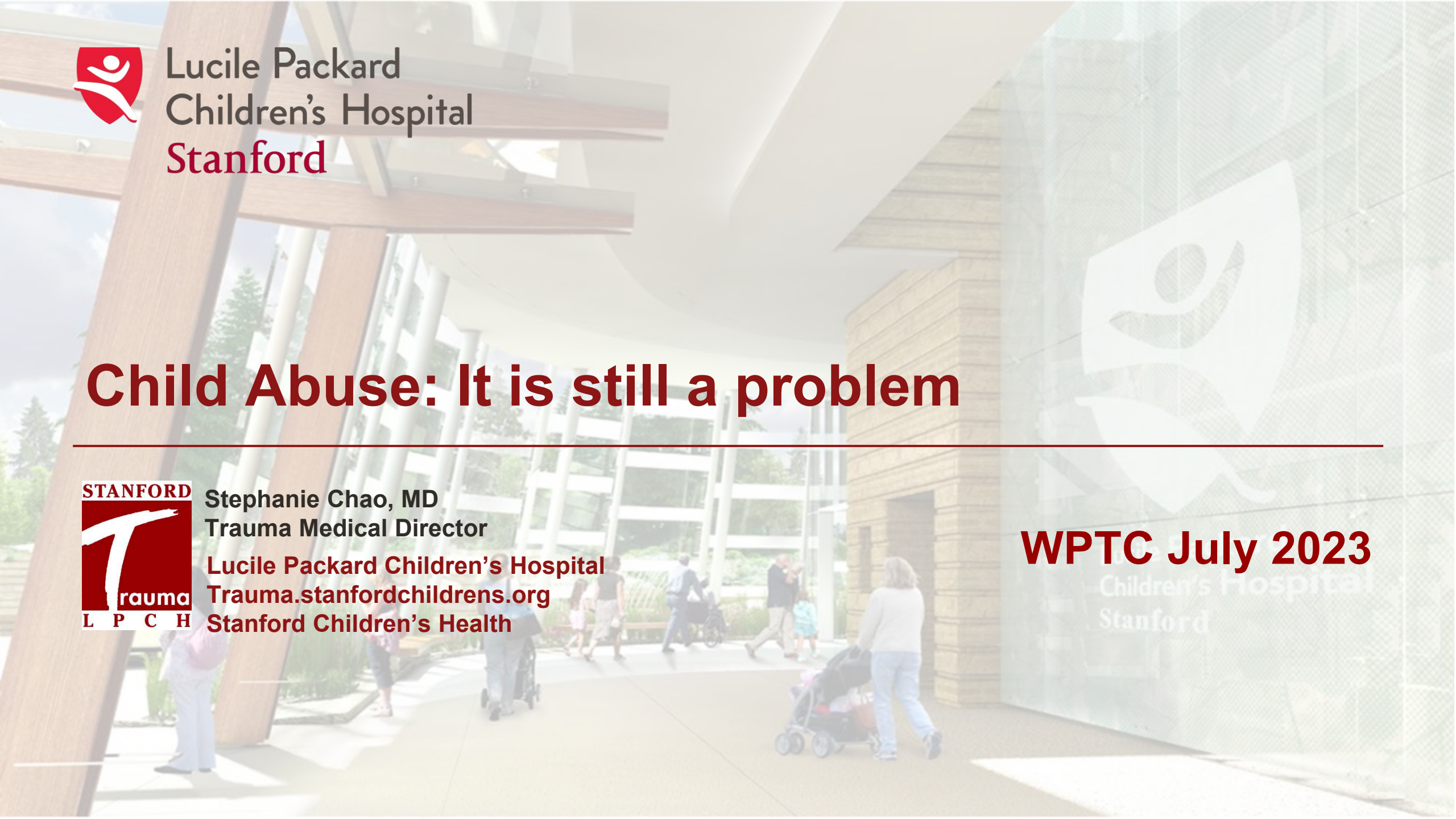
- Patient transfers
  720-777-8838
- Burn clinic (Monday - Friday)
  720-777-6604
- Burn Camps Programs
  720 777-8295

Children's Hospital Colorado
No ordinary camps
Burn Camps Program

Improving the Lives of Burn-Injured Children

https://www.youtube.com/watch?v=z8ciPi-YzDE

https://www.youtube.com/watch?v=MvuZylre7ck



Lucile Packard Children's Hospital Stanford

Child Abuse: It is still a problem

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Stanford Children's Health

WPTC July 2023

Disclosures

I have no disclosures.

Why am I wearing a CAM boot?

a) I was one of the 12% that fought off a polar bear and won
b) Katie Russell and I both really wanted to moderate the APP Panel talk, but she won the brawl
c) I wanted to test my own trauma system

d) None of the above

Background on Child Abuse and NAT

Definition of Child Abuse & Neglect:

"Any recent act or failure to act on the part of a parent or caregiver which results in death, serious physical or emotional harm, sexual abuse or exploitation"

(The Federal Child Abuse Prevention and Treatment Act (CAPTA) (42 U.S.C.A. § 5106g))

An act of COMISSION or OMISSION that results in harm to a child

COMISSION: words or overt actions that cause harm, potential harm, or threat of harm

OMISSION: failure to provide for child's basic need or to protect from harm or potential harm

Sources: https://www.cdc.gov/violenceprevention/childmaltreatment/index.html
https://www.cdc.gov/violenceprevention/childabuseandneglect/index.html

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OMISSION: failure to provide for child's basic need or to protect from harm or potential harm

- Physical neglect
- Emotional neglect
- Medical/dental neglect
- Educational neglect
- Supervisory neglect
- Exposure to violence environments

Sources: https://www.cdc.gov/violenceprevention/childmaltreatment/index.html
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Child maltreatment includes all types of abuse and neglect of a child under the age of 18 by a parent, caregiver, or another person in a custodial role that results in harm or potential for harm:

- Emotional abuse: behaviors that harm a child's self-worth or emotional well-being
- Sexual abuse: inducing or coercing a child to engage in sexual acts
- Neglect: failure to meet a child's basic physical and emotional needs
- Physical abuse: use of physical force against a child

Sources: https://www.cdc.gov/violenceprevention/childmaltreatment/index.html
Fortson BL, et al (20160) Preventing child abuse and neglect: A technical package for policy, norm, and programmatic activities. Atlanta, GA. National Center for Injury Prevention and Control, CDC

Background on Child Abuse and NAT

- In 2015, **683,000** children experienced either abuse or neglect in the United States and **1,670** children died due to either neglect or abuse

- Younger children are the most vulnerable
  - Children under **5** account for **>80%** of all child abuse, children under **3** account for nearly **75%** of cases

- Estimated annual societal cost $103 billion
- Total lifetime burden is $592 billion (estimated in 2018)

Sources: https://www.cdc.gov/violenceprevention/childmaltreatment/index.html
Sheets et al, 2013: Sentinel Injuries In Infants Evaluated for Child Physical Abuse
Kim et al, 2016: Nonaccidental Trauma in Pediatric Surgery

Up to 1 in 4 children have been the victim of abuse or neglect

Abusive Head Trauma

- Abuse is third leadng cause of TBI among US children, behing MVA and falls
- Leading cause of brain injury and death in children under 2 yo
- Case rate fatality is nearly 20%
- 2/3 of children with abusive head trauma have long term disability
- Long-term development of behavioral or functional problems:
  - Conduct disorders
  - Poor academic performance
  - Decreased cognitive functioning
  - Anxiety or depression
  - Social and relationship deficits

Sources: Kellogg ND. Evaluation of suspected child abuse. Pediatrics 2007;119:1232

Preventing ACEs could reduce a large number of health conditions.

UP TO

21 MILLION
CASES OF DEPRESSION

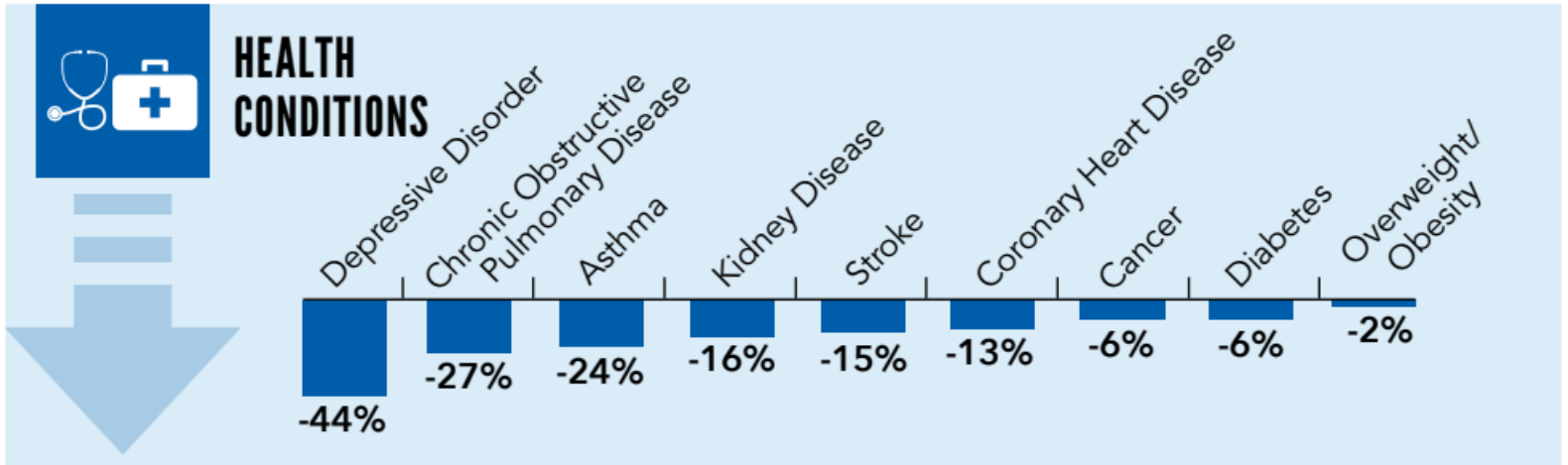
UP TO

1.9 MILLION
CASES OF HEART DISEASE

UP TO

2.5 MILLION
CASES OF OVERWEIGHT/OBESITY

Potential reduction of negative outcomes in adulthood



Characteristics of Victims and Risk Factors

- *Child abuse affects children of all ages, genders, ethnicities, and SES groups*
- Male:female similar rates, but boys have a higher fatality rate

Individual Victim Risk Factors

- Children younger than 4yo
- Fatal abuse is more common in children <2 years
- Children with disabilities or special needs that increase caregiver burden (developmental delay, mental health, chronic physical dependency)

Characteristics of Victims and Risk Factors

Risk factors for infant maltreatment:

- Maternal smoking
- ≥2 siblings
- Low infant birth weight
- Unmarried mother
- Domestic violence in home
- Chronic medical conditions
- Prolonged NICU stays

Risk Factors for Perpetration

Caregivers with …

- drug or alcohol issues
- mental health issues
- who don't understand children's needs
- who were abused or neglected as children
- young or single parents or parents with many children
- low education or income
- experiencing high levels or economic stress
- who use spanking and other forms of corporal punishment for discipline
- who are not a biological parent

Family Risk Factors

- Families that have household members in jail or prison
- Families that are isolated from and not connected to other people (extended family, friends, neighbors)
- Families experiencing other types of violence, including relationship violence
- Families with high conflict and negative communication styles

Community Risk Factors

Communities with …

- high rates of violence and crime
- high rates of poverty and limited educational and economic opportunities and high unemployment rates
- easy access to drugs and alcohol
- where neighbors don't know or look out for each other and there is low community involvement among residents
- few community activities for young people
- housing and where residents move frequently
- where families frequently experience food insecurity

Is this a global problem?

- Nearly 3 in 4 children - or 300 million children - aged 2–4 years regularly suffer physical punishment and/or psychological violence at the hands of parents and caregivers
- One in 5 women and 1 in 13 men report having been sexually abused as a child aged 0-17 years.
- 120 million girls and young women under 20 years of age have suffered some form of forced sexual contact.

UK Agency Reports

- 1.50% of children were estimated to have been referred to social services for abuse (excluding neglect and intimate-partner violence); the rate for all social welfare referrals for children (<18 years) in 2007 was 4.96% per year
- 0.84% of all social welfare referrals were estimated to have been investigated for abuse; 2.77% of children were investigated in 2007
- 0.30% of children started on a child-protection plan in 2007 (previously child protection registration); reports according to primary reason were: neglect 44%, physical abuse 15%, multiple 10%, psychological abuse 23%, and sexual abuse 7%

Gilbert et al. Burden and Consequences of Child Maltreatment in High Income Countries. Lancet 2009; 373: 68–81

Agency reports in Canada

- 2.15% of children were investigated in 2003
- 0.47% of children remained suspicious
- 0.97% of children were substantiated; primary reasons were: neglect 38%, physical abuse 23%, psychological abuse 23%, and sexual abuse 9%

Gilbert et al. Burden and Consequences of Child Maltreatment in High Income Countries. Lancet 2009; 373: 68–81

Agency reports in Australia

- 3.34% of children were referred in 2002–03
- 0.68% of children were substantiated; primary reasons were: neglect 34%, physical abuse 28%, psychological abuse 34%, and sexual abuse 10%

Gilbert et al. Burden and Consequences of Child Maltreatment in High Income Countries. Lancet 2009; 373: 68–81

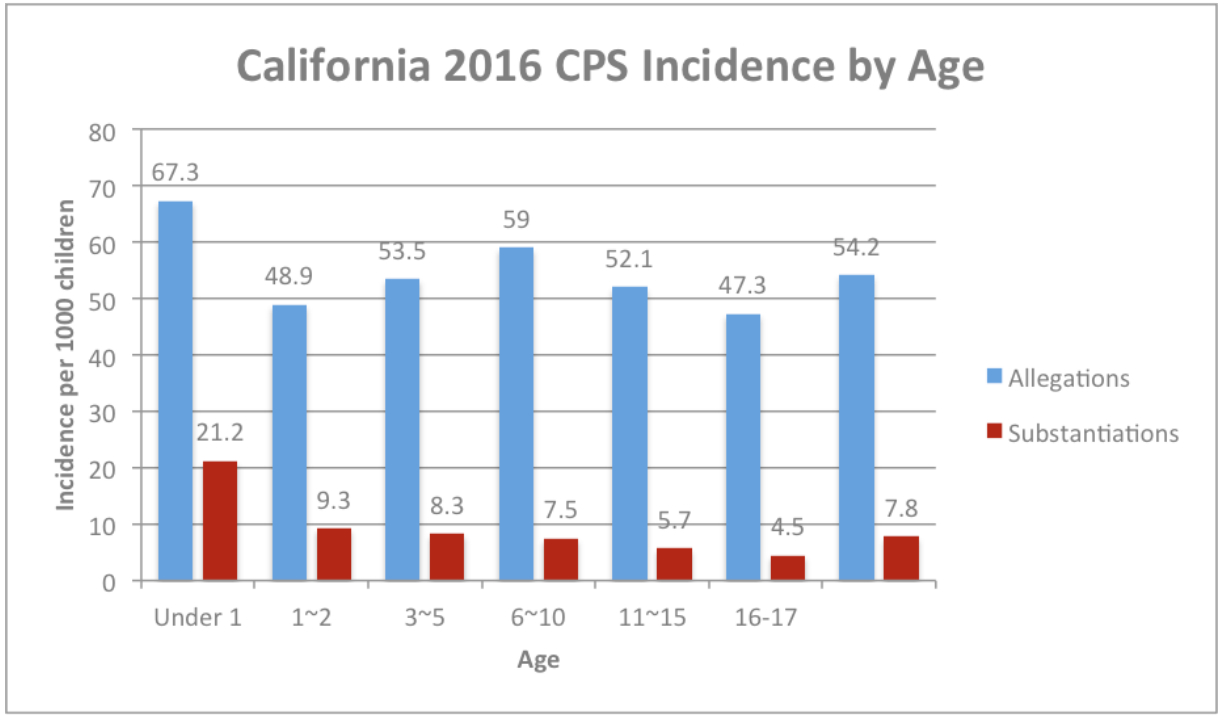
Agency reports in USA

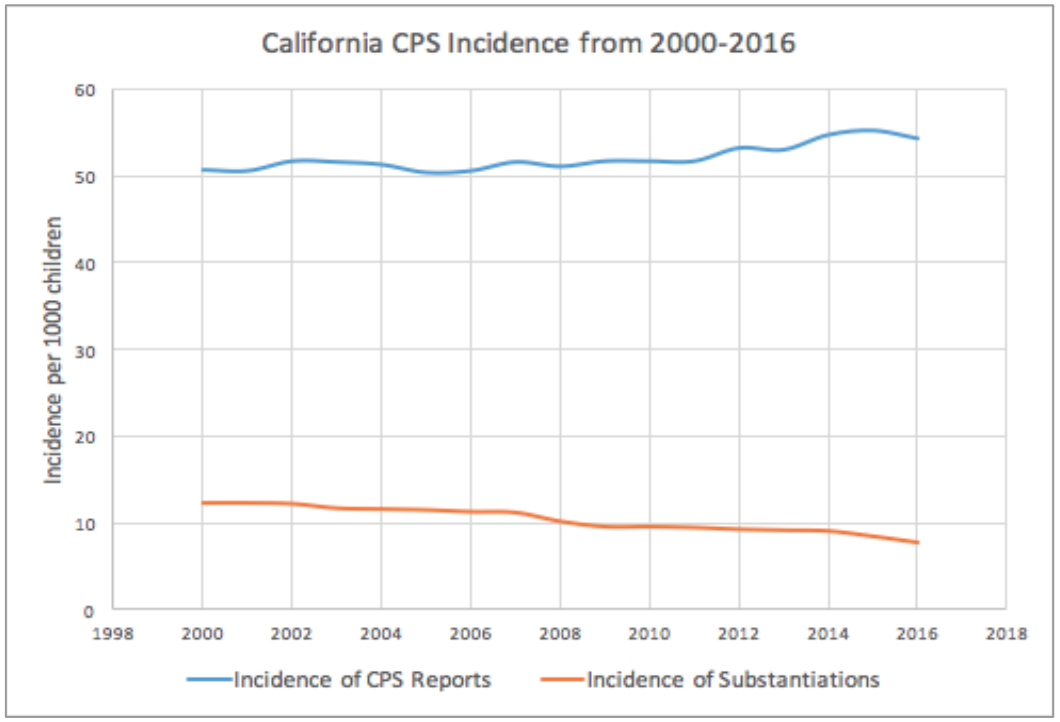
- 4.78% of children were investigated in 2006

- 1.21% of children were substantiated in 2006; primary reasons were: neglect 60%, physical abuse 10%, multiple 12%, psychological abuse/unknown 11%, and sexual abuse 7%

Gilbert et al. Burden and Consequences of Child Maltreatment in High Income Countries. Lancet 2009; 373: 68–81

Incidence Trends & Breakdowns in California



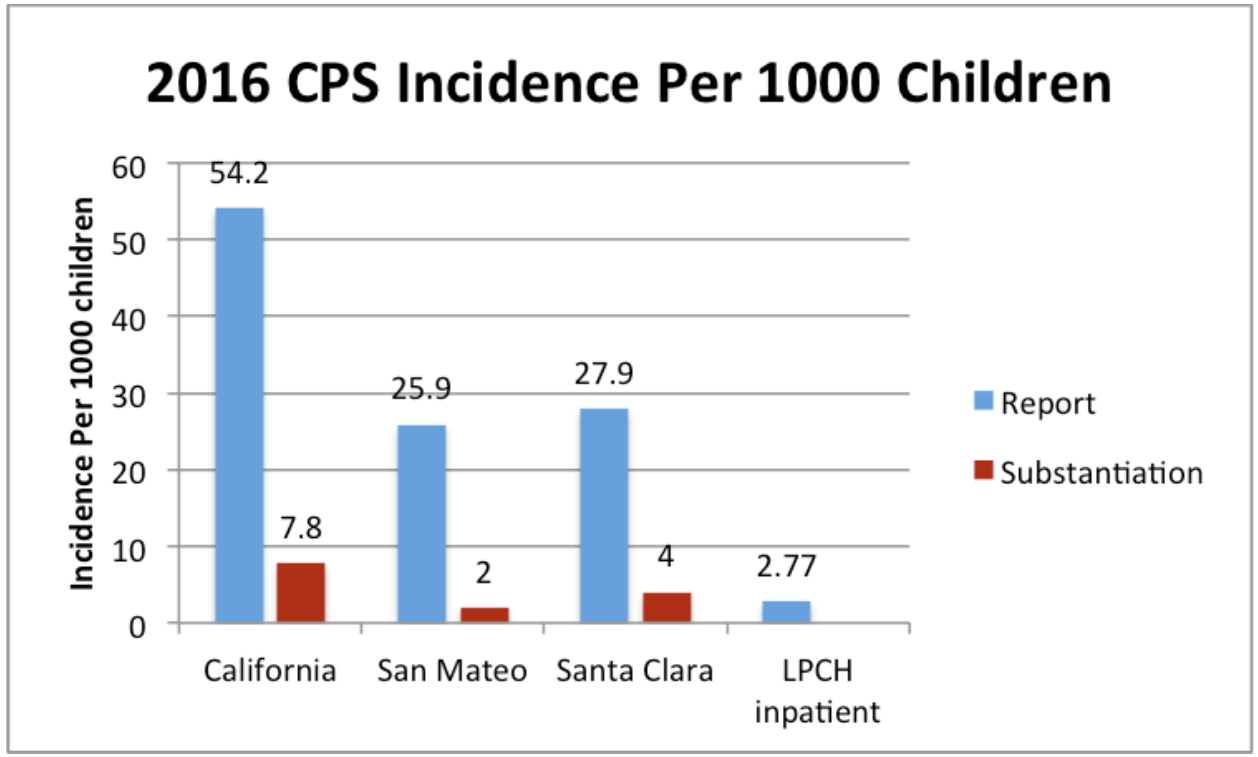


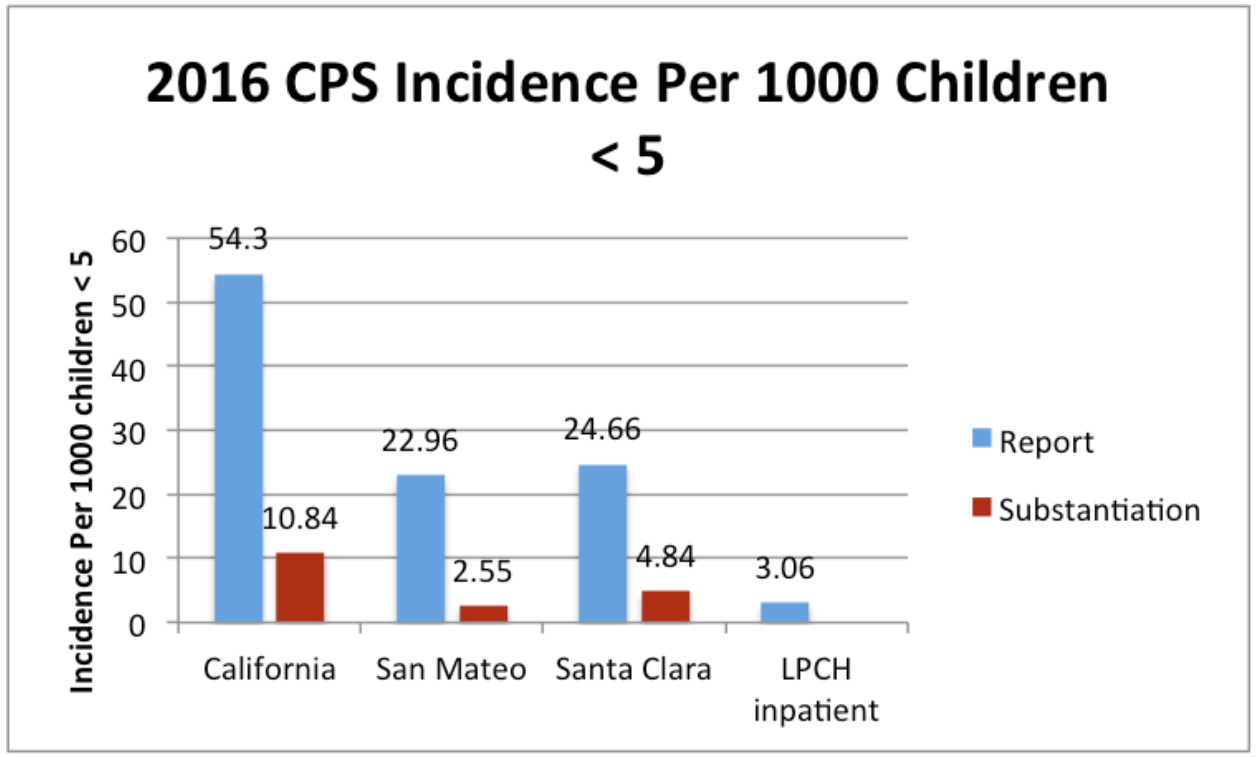
- Children under 1 have the highest allegation incidence as well as percentage of substantiation.

- Incidence of CPS reports increased by 3.6 per 1000 children from 2000-2016, while incidence of substantiations decreased by 4.5 per 1000 children.

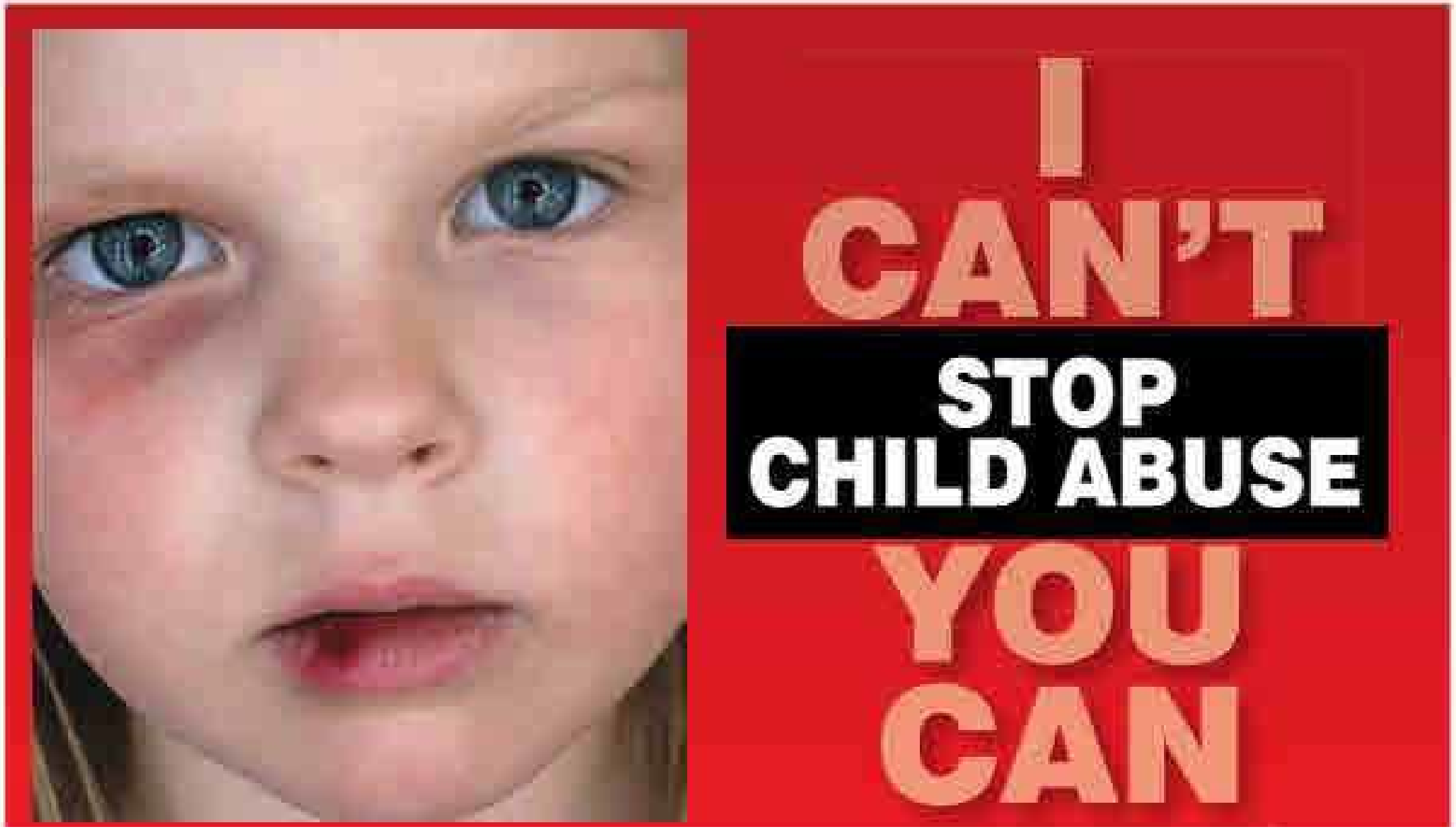
Source: http://cssr.berkeley.edu/ucb_childwelfare/RefRates.aspx

CPS Report Rate by County





- **73.4%** of LPCH inpatient CPS reports are on children under 5.
- Children under 5 are statistically at higher risk of abuse and less likely to be reported from schools.


I
CAN'T
STOP
CHILD ABUSE
YOU
CAN

Historical Indicators of Abuse

- No/vague explanation for injury
- Important details change dramatically
- Explanation inconsistent with child's physical/developmental capability
- Different witnesses with different stories
- Injury due to inadequate supervision
- Delay in seeking care
- Previous history of inflicted injury

Indicators and Injuries Suggestive of Abuse

- Fractures, bruising, burns or oral injuries in children < 6 months
- TEN-4: Injuries to the Torso, Ears, Neck in pts < 4 years old
- FACESp: Frenulum tear, Angle of the jaw, Cheek, & Eyelid bruise, Subconjunctival hemorrhage, patterned injuries
- Burns are patterned, widely separated (especially bilateral), or in different stages of healing
- Burns in unusual areas, such as the backs of hands, torso or buttocks
- Genital bruises, tears, or bleeding
- Failure to thrive

Recognizing Sentinel Injuries

- 4 out of 5 NAT deaths could have been prevented with earlier recognition of NAT

TABLE 1 Putative Sentinel Injuries

Candidate Injuries	Age at Risk, mo	ICD-9-CM Codes	Source
Bruising	<6	920–924	Harper et al[27]; Sugar et al[26]
Burns	<6	940–949	DeGraw et al[36]; Hicks and Stolfi[37]
Oropharyngeal injury	<6	873.6–873.7	Thackeray[22]; Maguire[38]
Femur/humerus fracture	<12	812, 820–821	Leventhal et al[25]; Scherl[39]; Strait[40]
Radius/ulna/tibia/fibula fracture	<12	813, 823, 824	Leventhal et al[25]; John[41]
Isolated skull fracture	<12	800–804[a]	Deye et al[42]; Wood[33]; Laskey[43]
Intracranial hemorrhage	<12	800–801, 803–804, 851–853[a]	Wood[17]; Trokel[18]; Kemp[44]
Rib fracture(s)	<24	807.0, 807.1, 807.4	Rubin et al[12]; Maguire[45]
Abdominal trauma	<24	863–869	Lindberg et al[9,46]; Trokel[28]
Genital injury	<24	922.4, 878	Carpenter[47]
Subconjunctival hemorrhage	<24	372.72	Sheets et al[24]; DeRidder[48]

[a] ICD-9 codes that signify skull fracture with intracranial hemorrhage (eg, 804.2) were included in the group with intracranial hemorrhage, not with subjects who have isolated skull fractures.

Sources: Jenny C et al. JAMA 1999;282:621-6
Sheets et al, 2013: Sentinel Injuries In Infants Evaluated for Child Physical Abuse
Kellogg ND. Evaluation of suspected child abuse. Pediatrics 2007;119:1232
Lindberg DM. Pediatrics. 2015;136(5)

NACHRI Guidelines (Three Level System)

(Framework for self assessment to set goals for growth & development within the context of its community's needs)

	BASIC	ADVANCED	EXCELLENCE
Structure & Staffing	Medical Leadership ✓	Child Protection Team:	Besides prev. requirements:
	Administrative Coordination ✓	Full-time medical director ✓	Education + Research Capabilities ✓
Functions	Social Work Services ✓	Administrative unit + additional Staff ✓	Additional medical professionals ✓
	Regular meetings ✓	Meetings to review cases ✓	Advanced diagnostic and treatment services ✓
Administrative Investment	Mental health professional upon referral ✓	Coordination with community agencies ✓	Accredited fellowship + Multicenter trials ✓
		Likely to receive referrals ✓	Regional leader in SCAN ✓

source: https://www.childrenshospitals.org/

5.7 Assessment of Children for Nonaccidental Trauma—TYPE II

Applicable Levels

LI, LII, LIII, PTCI, PTCII

Definition and Requirements

All trauma centers must have a process in place to assess children for nonaccidental trauma.

Additional Information

The process should demonstrate evidence of integration with child protective service, child advocacy center, etc.

Measures of Compliance

Nonaccidental trauma protocols/policies

4.26 Child Abuse (Nonaccidental Trauma) Physician—TYPE II

Applicable Levels

PTCI, PTCII

Definition and Requirements

Level I and II pediatric trauma centers must have either a physician on the medical staff who is board-certified or board-eligible in child abuse pediatrics or a physician with special interest in child abuse (nonaccidental trauma) who provides expertise to the trauma center.

Additional Information

The purpose of this role is to provide leadership in addressing the needs of children with nonaccidental trauma. This leadership includes the development of relevant policies and procedures and, where necessary, inpatient assessment and care.

Refer to Appendix A for details on board certification and board eligibility.

Measures of Compliance

- Roles and responsibilities of the child abuse physician
- Evidence of board certification, board eligibility, or qualifications of the child abuse physician

MultiCare
BetterConnected

NON-ACCIDENTAL TRAUMA (NAT) SCREENING and MANAGEMENT GUIDELINE (Inpatient and Outpatient)

"Red Flag" History of Present Injury

- No history or inconsistent hx
- Changing history
- Unwitnessed injury
- Delay in seeking care
- Prior ED visit
- Domestic Violence in home
- Premature infant (< 37 weeks)
- Low birth weight/IUGR
- Chronic medical conditions

"Red Flag" Physical Exam Findings Infant

- Torn frenulum
- FTT (weight, length, head circumference)
- Large heads in infants (consider measuring of OFC in children < 1 yr)
- Any bruise in any non-ambulating child - "if you don't cruise you don't bruise"
- Any bruise in a non-exploratory location {especially the TEN region-Torso (area covered by a standard girl's bathing suit), Ears and Neck} < 4yrs old (TEN-4)
- Bruises, marks, or scars in patterns that suggest hitting with an object

"Red Flag" Radiographic Findings

- Metaphyseal fractures (corner)
- Rib fractures (especially posterior) in infants
- Any fracture in a non-ambulating infant
- An undiagnosed healing fracture
- SDH and/or SAH on neuro-imaging in young children, particularly in the absence of skull fracture < 1 year

Recommended evaluation in cases of suspected physical abuse

Note: If patient presents at any MHS Hospital other than Mary Bridge Children's Hospital, with "Red Flag" findings, please call the MBCH Emergency Department at (253) 403-1418 to arrange transfer for complete NAT workup.

↓

Laboratory

General for most patients:

- CBC & platelets; PT/PTT/INR (if concern of low/falling Hgb, repeat in am with retic)
- CMP
- Lipase
- Urinalysis – Dip, send for microscopic

If fractures are present:

- Phos
- PTH
- Vit D 25-OH

Evaluation of Suspected Child Abuse Pathway

Provider Education - Tips for Speaking with Parents:

- Clearly state your role as an advocate for the child
- Use a neutral tone and avoid accusatory or confrontational statements
- Notify parents that physical abuse is a consideration in the trauma work up of their child
- Invite parents to step out of the room so you can interview the child/adolescent alone.
- Explain that abuse can exist in the absence of physical examination findings.
- Explain that you need help assessing the child/adolescent for safety or possible abuse, and introduce the need for other agencies.
- Inform parents if you need to contact police and/or child protective services; however, it is not necessary to tell parents if you are concerned that notifying them would increase the risk to the child/adolescent or if CPS/Law Enforcement Agency (LEA) requests that you don't inform the family.
- Explain your duty to report concerns, and explain your concerns to family members.
- Remind the family that you will be present and available throughout the process.

Definitions:

- *Child abuse/maltreatment* refers to either acts of *commission* (deliberate or intentional inflicted injury, also referred to as non-accidental trauma) or *omission* (failure to provide for a child's needs resulting in harm or injury, also referred to as neglect).
- *Nonaccidental trauma* and child abuse are often used interchangeably. It is important to note that the intentionality refers only to the action of the caregiver (hence the term non-accidental trauma), not the consequences of the action.
- *Abusive head trauma (AHT)*: an injury to the skull or intracranial contents of a baby or child due to intentional abrupt impact and/or violent shaking. Unintentional injuries resulting from negligent supervision, gunshot, and stabbing or penetrating trauma are excluded from this definition.

References:

1. Emergency Department Clinical Pathway for Evaluation and Treatment of Children with Concern for Physical Abuse. Posted: September 2018, Revised: April 2020 The Children's Hospital of Philadelphia.
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4. Flaherty EG, Perez-Rossello JM, Levine MA, et al. Evaluating children with fractures for child physical abuse. Pediatrics. 2014;133(2):e477-e489. doi:10.1542/peds.2013-3793
5. Christian CW; Committee on Child Abuse and Neglect, American Academy of Pediatrics. The evaluation of suspected child physical abuse [published correction appears in Pediatrics. 2015 Sep;136(3):583]. Pediatrics. 2015;135(5):e1337-e1354. doi:10.1542/peds.2015-0356
6. Wood JN, Kakeye O, Feudtner C, Mondestin V, Localio R, Rubin DM. Development of guidelines for skeletal survey in young children with fractures. Pediatr 2014;134:45-35
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8. Escobar, Mauricio (Tony) A, et al. "Physical Child Abuse." Pediatric Surgery NaT, American Pediatric Surgical Association, 2019. APSA Webapp, www.pedsurglibrary.com/apsa/view/Pediatric-Surgery-NaT/829478/all/Nonaccidental_Trauma.

Back to Page 1

Stanford Children's Health | Lucile Packard Children's Hospital Stanford

Who is Required to Report?

A teacher
An instructional aide
A teacher's aide or assistant at public or private school
An employee of public school
An administrative officer or supervisor of child welfare and attendance of any school
An administrator of day camp, public or private
An administrator or employee of a public or private youth center, youth recreation program, or youth organization
An administrator or employee of any organization whose duties require direct contact and supervision of children
Any employee of the state or county education system whose duties bring them into contact with children on a regular basis
A licensee, administrator, or employee of a licensed community care or child day care facility
A Head Start program teacher
A licensing worker or licensing evaluator
A public assistance worker
An employee of a child care institution including foster parents, group home personnel, and personnel of residential care facilities
A social worker, probation officer, or parole officer
An employee of a school district police or security department
Any person who works in a child abuse prevention program in any school
A district attorney investigator, inspector, or local child support agency caseworker
A peace officer
A firefighter (except volunteers)
A psychological assistant
A marriage, family, and child therapist trainee
An unlicensed marriage, family, and child therapist intern
A state or county public health employee
A coroner
A medical examiner or anyone who performs autopsies
A commercial film and photo processor
A child visitation monitor
An animal control officer or humane society officer
A clergy member or religious practitioner
A custodian of records of a clergy member
Any employee of any police department, county sheriff's department, county probation department, or county welfare department
An employee or volunteer of a Court Appointed Special Advocate program
An alcohol or drug counselor
A Commercial Computer Technician
A physician, surgeon, psychiatrist, psychologist, dentist, resident, intern, podiatrist, chiropractor, licensed nurse, dental hygienist, optometrist, marriage, family and child counselor, clinical social worker
Any EMT, paramedic, or other certified person


SOMETIMES THINGS CAN BE
STOP
WRONG WAY
DO NOT ENTER
A LITTLE CONFUSING
imgflip.com

Variations in CPS reporting mandates across states

Child abuse and neglect are defined by Federal and State laws

State laws define both civil and criminal statutes

- Traveling to and from school
- Remaining at home unattended for a reasonable amount of time
- Remaining in a vehicle if the temperature inside the vehicle is not or will not become dangerously hot or cold

Child Welfare Information Gateway. (2022). Definitions of child abuse and neglect. U.S. Department of Health and Human Services, Administration for Children and Families, Children's Bureau. https://www.childwelfare.gov/ topics/systemwide/laws-policies/statutes/define/

Parental Substance Abuse

- Prenatal exposure of a child to harm due to the mother's use of an illegal drug or other substance
  - (15 States and the District of Columbia)
- Manufacture of a controlled substance in the presence of a child or on the premises occupied by a child
  - (12 States)
- Allowing a child to be present where the chemicals or equipment for the manufacture of controlled substances are used or stored
  - (4 States)
- Selling, distributing, or giving drugs or alcohol to a child
  - (9 States and Guam)
- Use of a controlled substance by a caregiver that impairs the caregiver's ability to adequately care for the child
  - (9 States)

Child Welfare Information Gateway. (2022). Definitions of child abuse and neglect. U.S. Department of Health and Human Services, Administration for Children and Families, Children's Bureau. https://www.childwelfare.gov/ topics/systemwide/laws-policies/statutes/define/

Is physical discipline a CPS reportable offense?

Physical discipline of a child, as long as it is reasonable and causes no bodily injury to the child, is an exception to the definition of abuse.

17 states: Arkansas, California, Colorado, Florida, Georgia, Indiana, Minnesota, Mississippi, Missouri, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Texas, Utah, and Washington

Child Welfare Information Gateway. (2022). Definitions of child abuse and neglect. U.S. Department of Health and Human Services, Administration for Children and Families, Children's Bureau. https://www.childwelfare.gov/ topics/systemwide/laws-policies/statutes/define/

“This was just a simple accident. That family is so sweet. There is no way this was anything but an accident”

TABLE 1. Comparison of Patients of a Single Episode of NAT to Patients of Recurrent Episodes of NAT

	Single-Episode NAT (n = 1,519)	Recurrent-Episode NAT (n = 53)	*p*
Male	52% (791/1,519)	66% (35/53)	0.05
Race			0.02
White	65% (980/1,519)	83% (44/53)	
Black	25% (378/1,519)	13% (7/53)	
Other	11% (161/1,519)	4% (2/53)	
Pediatric trauma center	69% (1,054/1,519)	87% (46/53)	0.008
Mortality	9.9% (151/1,519)	24.5% (13/53)	0.002

Deans et al. 2013 JTACS 75(1):161-165
Lane et al. 2002. JAMA 288(13):1603

“Something just feels a little off to me….”

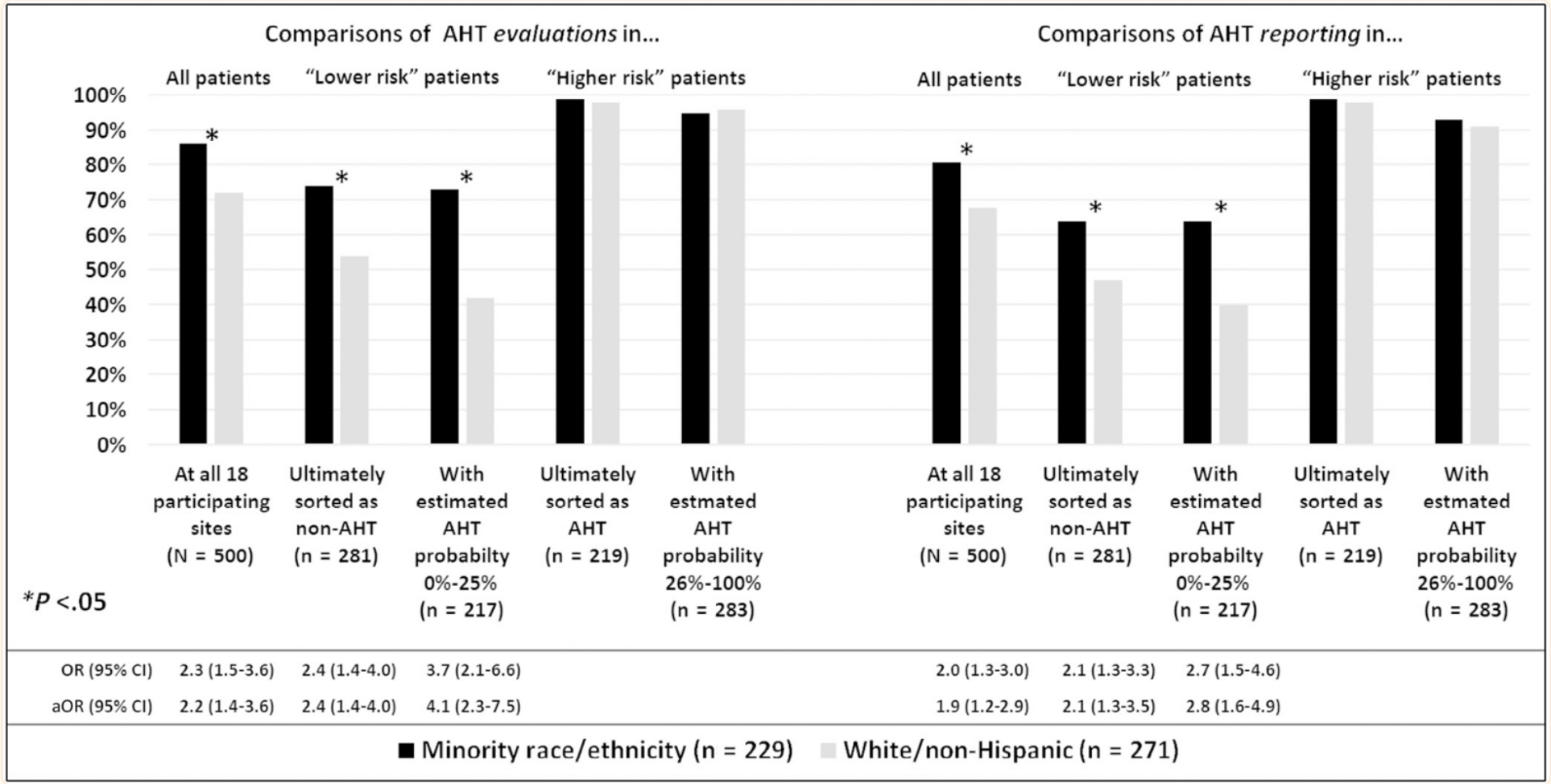
Table 4. Point-Estimated Relative Risks of Obtaining a Skeletal Survey by Race*

Type of Injury	Weighted Percentage		Relative Risk (95% Confidence Interval)
	Minority	White	
Accidental injury			
Age, <12 mo (n = 128)			
Private insurance			
Skeletal survey appropriate	49.4	32.7	1.51 (1.01-2.01)
Skeletal survey not appropriate	16.6	9.0	1.84 (0.90-2.78)
Medicaid or no insurance			
Skeletal survey appropriate	51.2	34.3	1.49 (0.92-2.06)
Skeletal survey not appropriate	17.7	9.6	1.83 (0.85-2.81)
Age, ≥12 mo (n = 125)			
Private insurance			
Skeletal survey appropriate	77.7	28.4	2.73 (1.44-4.02)
Skeletal survey not appropriate	41.6	7.5	5.53 (2.89-8.16)
Medicaid or no insurance			
Skeletal survey appropriate	78.9	30.0	2.63 (1.23-4.04)
Skeletal survey not appropriate	43.3	8.0	5.39 (2.41-8.36)
Indeterminate injury			
Age, <12 mo (n = 37)			
Private insurance			
Skeletal survey appropriate	69.6	53.3	1.31 (1.00-1.61)
Skeletal survey not appropriate	31.9	18.9	1.69 (0.92-2.45)
Medicaid or no insurance			
Skeletal survey appropriate	71.1	55.1	1.29 (0.95-1.63)
Skeletal survey not appropriate	33.5	20.1	1.67 (0.87-2.48)
Age, ≥12 mo (n = 20)			
Private insurance			
Skeletal survey appropriate	89.1	48.3	1.84 (1.11-2.57)
Skeletal survey not appropriate	62.6	16.1	3.90 (1.72-6.08)
Medicaid or no insurance			
Skeletal survey appropriate	89.8	50.2	1.79 (1.05-2.54)
Skeletal survey not appropriate	64.3	17.1	3.77 (1.48-6.05)
Abusive injury			
Age, <12 mo (n = 60)			
Private insurance			
Skeletal survey appropriate	93.5	87.8	1.07 (0.99-1.14)
Skeletal survey not appropriate	74.8	59.6	1.25 (0.91-1.60)
Medicaid or no insurance			
Skeletal survey appropriate	94.0	88.6	1.06 (0.98-1.14)
Skeletal survey not appropriate	76.1	61.3	1.24 (0.90-1.58)
Age, ≥12 mo (n = 18)			
Private insurance			
Skeletal survey appropriate	98.1	85.5	1.15 (0.98-1.32)
Skeletal survey not appropriate	91.4	54.7	1.67 (0.93-2.41)
Medicaid or no insurance			
Skeletal survey appropriate	98.2	86.4	1.14 (0.98-1.30)
Skeletal survey not appropriate	91.9	56.5	1.63 (0.93-2.32)

*Derived from a logistic regression model across different levels of the covariates, to account for varying proportions of children having a skeletal study performed.

Deans et al. 2013 JTACS 75(1):161-165
Lane et al. 2002. JAMA 288(13):1603

Pediatric Brain Injury Research Network (PediBIRN)



Hymel et al. J Pediatr. 2018 Jul; 198: 137–143.e1.

A REPORTER AT LARGE
AUGUST 7 & 14, 2017 ISSUE

WHEN SHOULD A CHILD BE TAKEN FROM HIS PARENTS?

In family court, judges must decide whether the risks at home outweigh the risks of separating a family.

By Larissa MacFarquhar

Racial disparities occur at nearly every major decision-making point along the child welfare continuum

Relative to white children, African American children …

- spend more time in foster care (U.S. Government Accountability Office, 2007a)
- are less likely to reunify with their families (Lu et al., 2004
- less likely to receive services (Garcia et al., 2016)
- are more likely than other children to be removed from their homes (Maguire-Jack et al., 2020)
- are more likely to experience a termination of parental rights (TPR) (Wildeman et al., 2020)

Need for *Universal* Screening Programs

- Elimination of unconscious racial/ethnic biases of mandated reporters
  - Minority and uneducated families are more likely to be suspected of NAT
  - African American and Hispanic children are over represented in CPS reports
- Many children are the victims of repeated violence
  - Approximately 30% of identified NAT victims have had previous abusive injuries that were missed
  - **Sentinel injuries: minor injuries, often missed injuries, preceding more serious injury presentation**
  - 25% mortality rate in patients subjected to recurrent NAT

Sources: Ricci et al. Child Abuse Negl. 2003;27:271-283
Sheets et al, 2013: Sentinel Injuries In Infants Evaluated for Child Physical Abuse
Kellogg ND. Evaluation of suspected child abuse. Pediatrics 2007;119:1232
Lindberg DM. Pediatrics. 2015;136(5)

UPitt Model: Universal screening in ED

Table 5. A comparison of the injuries identified in the preintervention and intervention periods

Clinical scenarios	Noncruising infant <12 mo of age with a fracture(s)	Infant <6 mo of age with a bruise(s)	Infant 6-11.9 mo of age not yet cruising with a bruise (s)[a]	Children <2 y of age reported to Child Protective Services for concerns of physical abuse (who did not meet other clinical scenarios)	Total number of unique children identified with injuries which were concerning for abuse
Preintervention	0	1	2	7	10
Intervention	8	10	6	22	44[b]

[a]Other than a single bruise to a bony prominent after an age-appropriate trauma (eg, child 8 mo of age with a bruise to the forehead after a fall off a bed).
[b]There are 2 children with both a fracture and a bruise.

Rosenthal et al Journal of the American Medical Informatics Association, 2019, Vol. 26, No. 10

RCT

Table 2. Compliance with American Academy of Pediatrics Guidelines in Each of Five Clinical Scenarios in the Three Study Groups[a]

Time period	Baseline/preintervention			RCT-Control			RCT-Experimental		
Compliance	Fully compliant	Partially compliant	Not compliant	Fully compliant	Partially compliant	Not compliant	Fully compliant	Partially compliant	Not compliant
Not yet cruising infant <12 months of age with a fracture	78% (38/49)	16% (8/49)	6% (3/49)	78% (18/23)	4% (1/23)	17% (4/23)	81% (26/32)	6% (2/32)	13% (4/32)
Infants <6 months of age with bruise(s)	81% (13/16)	6% (1/16)	13% (2/16)	90% (19/21)	0	10% (2/21)	90% (19/21)	0	10% (2/21)
Infants 6–12 months not yet cruising with a bruise(s)	84% (16/19)	16% (2/19)	0	86% (6/7)	14% (1/7)	0	88% (7/8)	12% (1/8)	0
Infants <12 months of age with a non-motor vehicle-associated intracranial hemorrhage	100% (18/18)	0	0	100% (14/14)	0	0	100% (14/14)	0	0
Children <2 years of age reported to Child Protective Services for concerns of physical abuse[b]	96% (22/23)	0	4% (1/23)	100% (16/16)	0	0	100% (13/13)	0	0
Overall compliance in children who met one or more clinical scenarios[c]	84% (83/99)	10% (10/99)	6% (6/99)	86% (49/57)	3.5% (2/57)	10.5% (6/57)	89% (65/73)	3% (2/73)	8% (6/73)

[a]Children who met more than 1 clinical scenario (e.g., bruise and fracture) are included in each relevant category.
[b]Scenario 5 only requires completion of skeletal survey so partial compliance is not an option.
[c]Unique children who met any clinical scenario.

Suresh et al. Journal of the American Medical Informatics Association, 2018, Vol. 0, No. 0

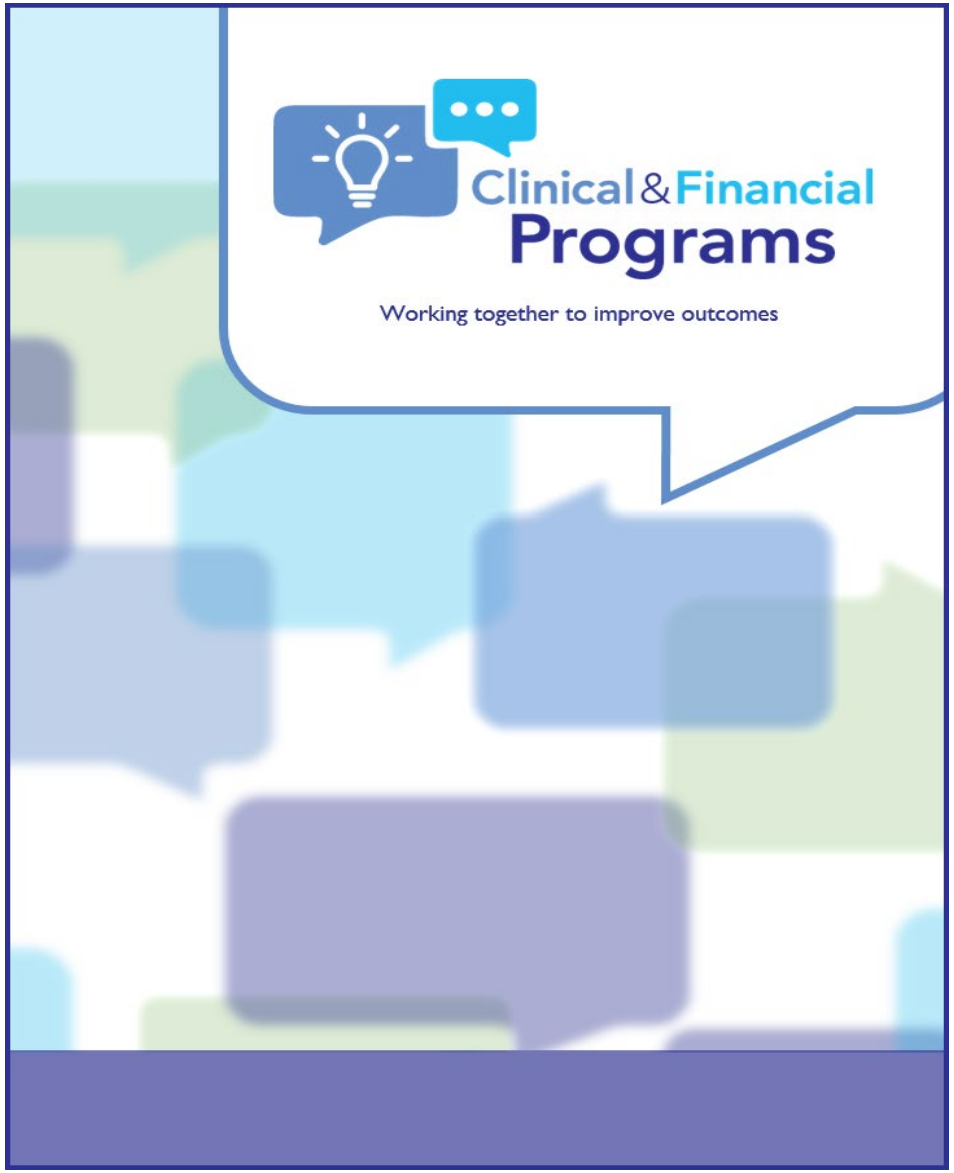
Universal screening for ALL admissions

At Stanford Children's Health

Nora is a twenty-month-old child who arrives at the ED with rib fractures sustained at home. A nurse completes a required documentation screening for abuse.

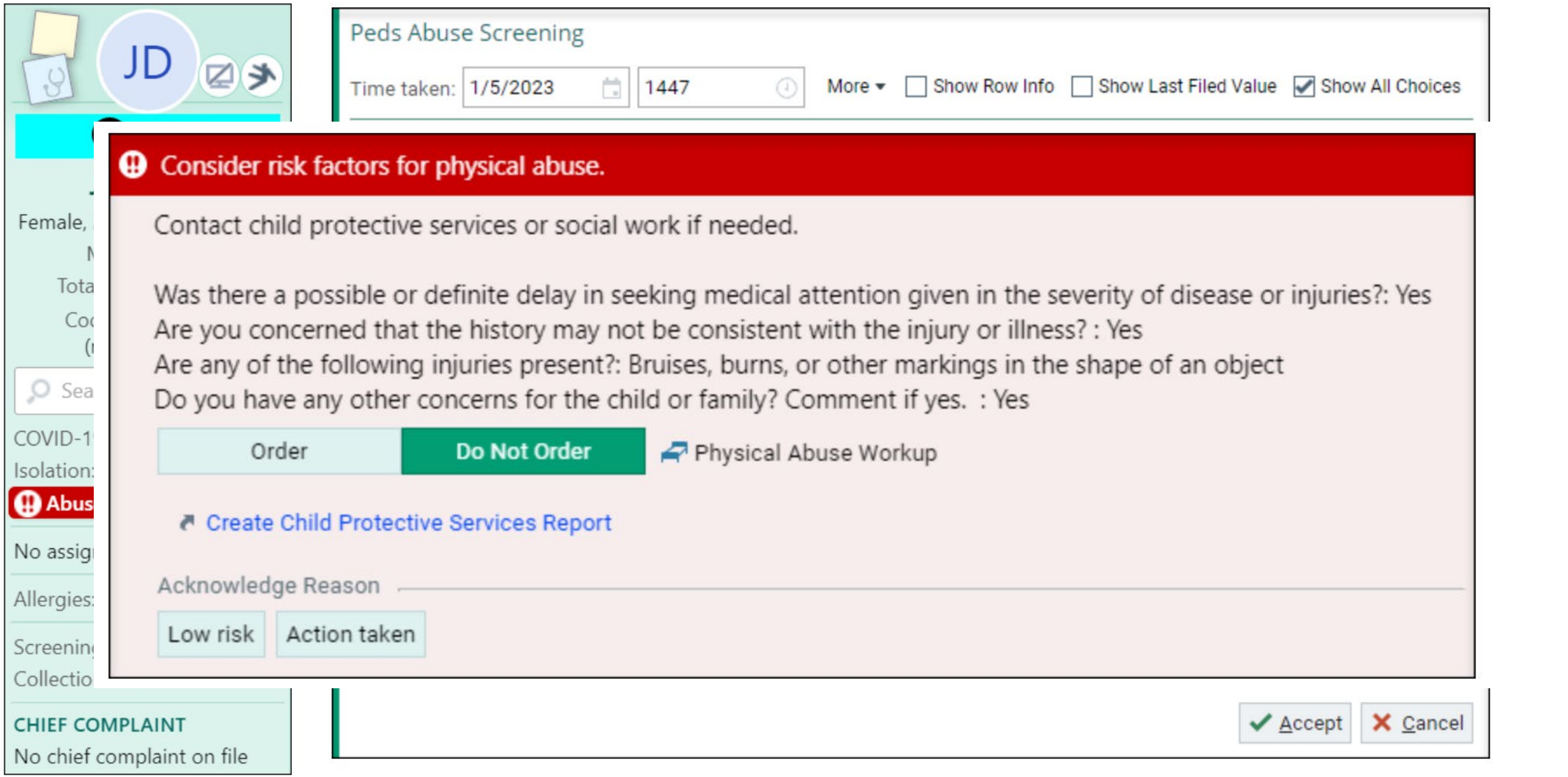
Epic Foundations Build for Child Abuse Screening

- Based on TEN-4 FACESp
- Expert Panel convened
- Best Practices
- BPA alert



UW Health

Stanford Children's Health


JD
Female,
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Isolation:
Abus
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Allergies:
Screenin
Collectio
CHIEF COMPLAINT
No chief complaint on file
Peds Abuse Screening
Time taken: 1/5/2023 1447
More
Show Row Info
Show Last Filed Value
Show All Choices
Consider risk factors for physical abuse.
Contact child protective services or social work if needed.
Was there a possible or definite delay in seeking medical attention given in the severity of disease or injuries?: Yes
Are you concerned that the history may not be consistent with the injury or illness? : Yes
Are any of the following injuries present?: Bruises, burns, or other markings in the shape of an object
Do you have any other concerns for the child or family? Comment if yes. : Yes
Order
Do Not Order
Physical Abuse Workup
Create Child Protective Services Report
Acknowledge Reason
Low risk
Action taken
Accept
Cancel


EVERY
child deserves to grow
up feeling safe and
LOVED

Acknowledgements

- Anneke Claypool, PhD candidate, Urvi Gupta BA candidate, Linda Zuo, MS candidate
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- Scott Skiles, LCSW, ED SW Manager
- Pamela Shime, JD, Stanford Medicine
- Harise Stein, MD
- Jody Winzelberg, AuD, Administrative Director of Patient and Family Services

The Dichotomy of Drowning (and More!)

Lisa Nichols, MBA, BSN, CCRN-K

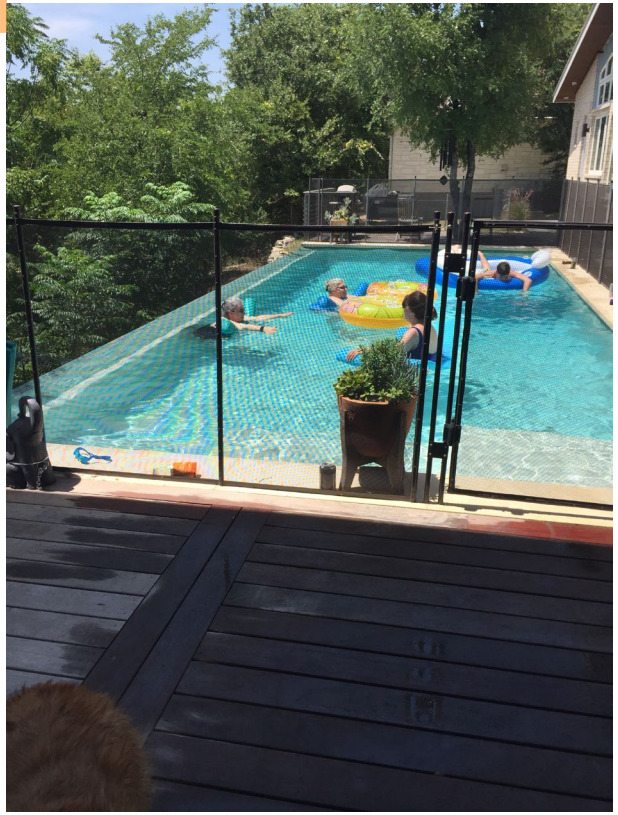
President of the Pediatric Trauma Society (PTS)

Trauma Program Manager—Wolfson Children's Hospital

Objectives

- 1. Illustrate the dichotomy of “non-trauma” drowning patients and injury prevention drowning prevention programs.

- 2. Discuss differences in trauma programs defining “What is a pediatric trauma patient” across the US.



JCMF
Children's Charities
Promoting water safety for children around the world

PTS
pediatric trauma society

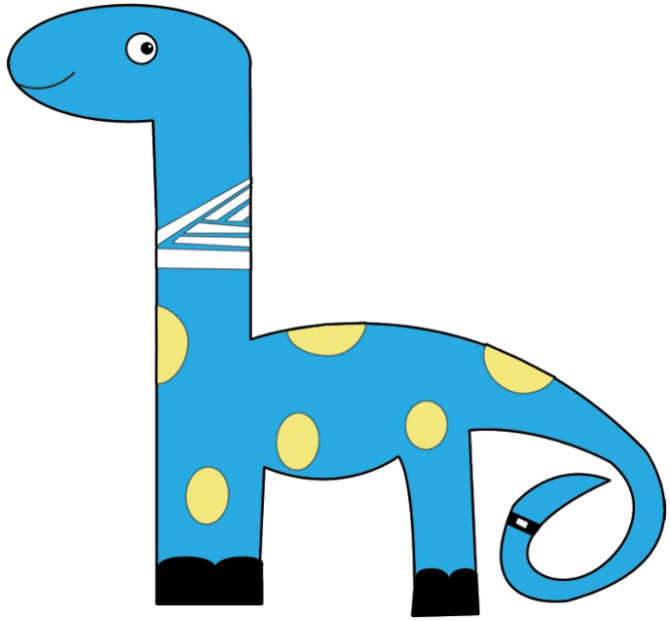
PTS Guidelines Committee

Current guideline working groups:

- BCVI
- ED Thoracotomy
- C-Spine in the Obtunded Patient
- PTSD Screening
- Thoracic/Abdominal Imaging
- Pediatric Hangings and Drownings

PTS Guidelines HUB

the one stop shop for pediatric trauma guidelines



Meet Sam the Dino! The NEW PTS Guidelines HUB Avatar, designed by a young artist

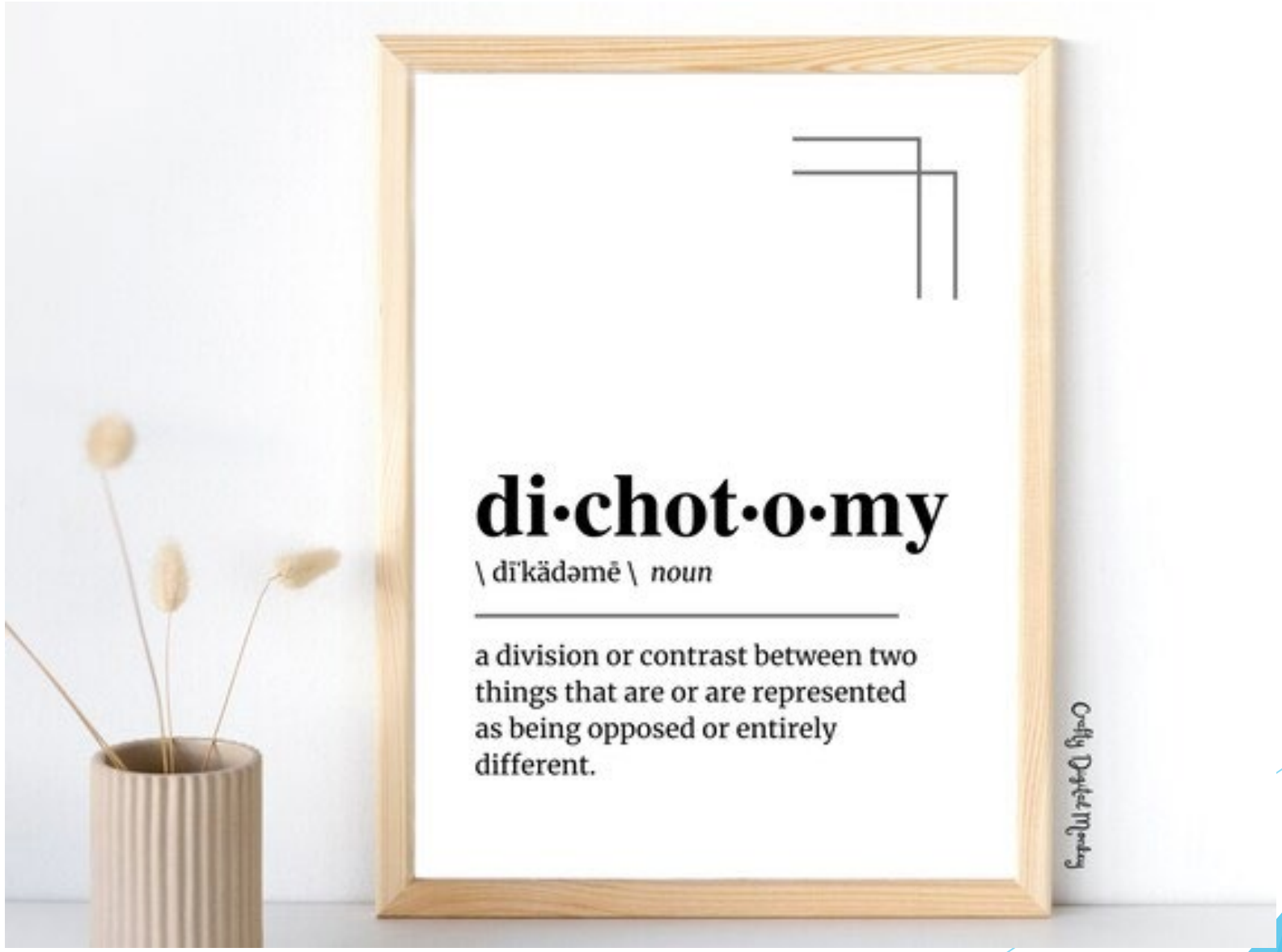
Is a drowning victim a trauma patient?

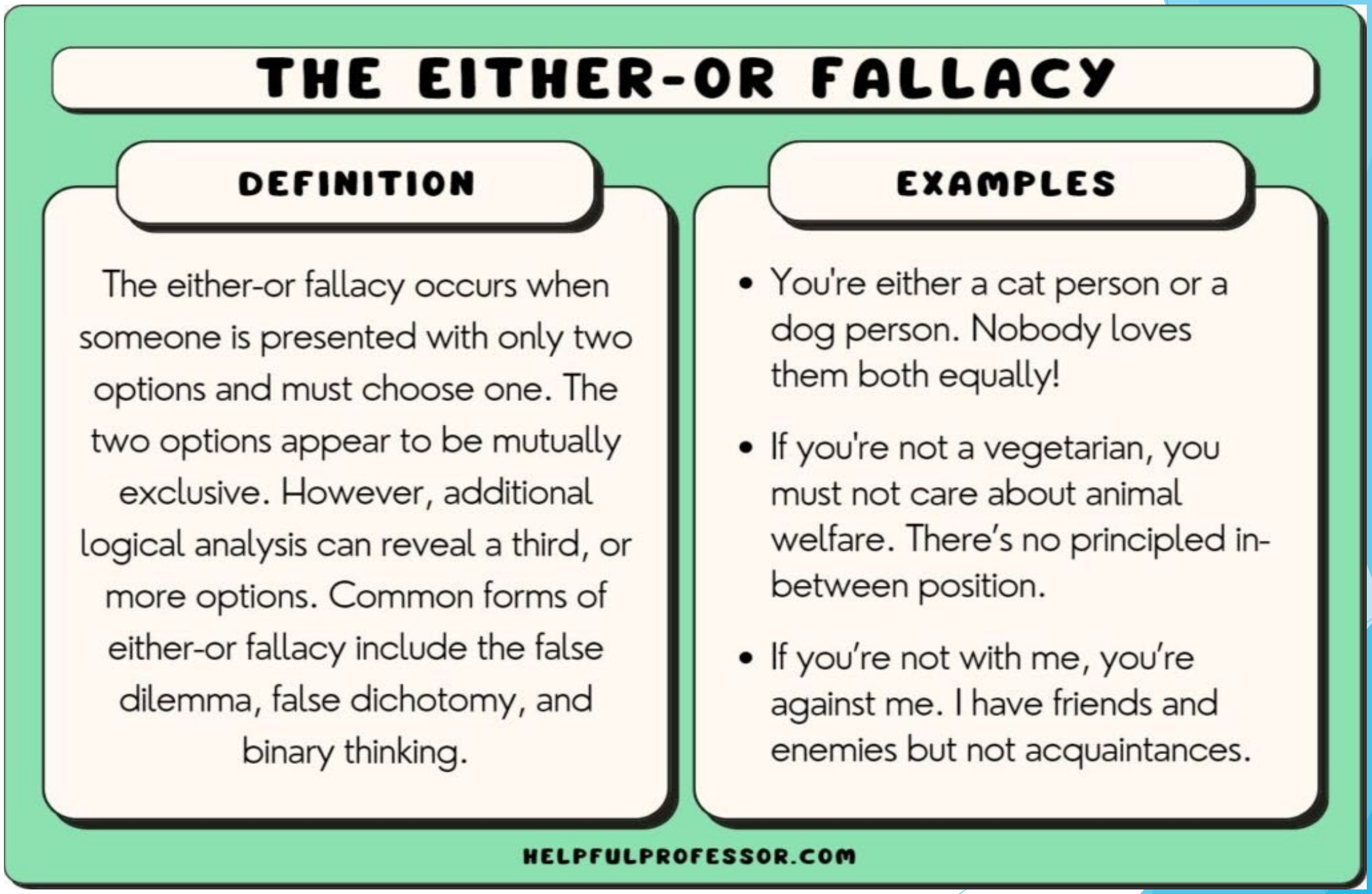
- Leading cause of death for children ages 1-4 years
  - IMPORTANT!
- Should they be a trauma activation?
- Are hangings included as trauma?
- What about suffocations?
  - Co-sleeping
  - Too many blankets
- Left in a hot car?
- Button batteries? Any other foreign bodies?

Yet, how many of the above have pediatric injury prevention initiatives or prevention statements?

PTS
pediatric trauma society
A Voice for the Injured Child

Dichotomy defined…





https://helpfulprofessor.com/either-or-fallacy-examples/

What is a “trauma” patient?

- Trauma is a “surgical disease”

J Trauma Acute Care Surg. 2014 Aug;77(2):219-25. doi: 10.1097/TA.0000000000000363.

Trauma remains a surgical disease from cradle to grave

Shannon N Acker [1], Robert T Stovall, Ernest E Moore, David A Partrick, Clay Cothren Burlew, Denis D Bensard

Affiliations + expand

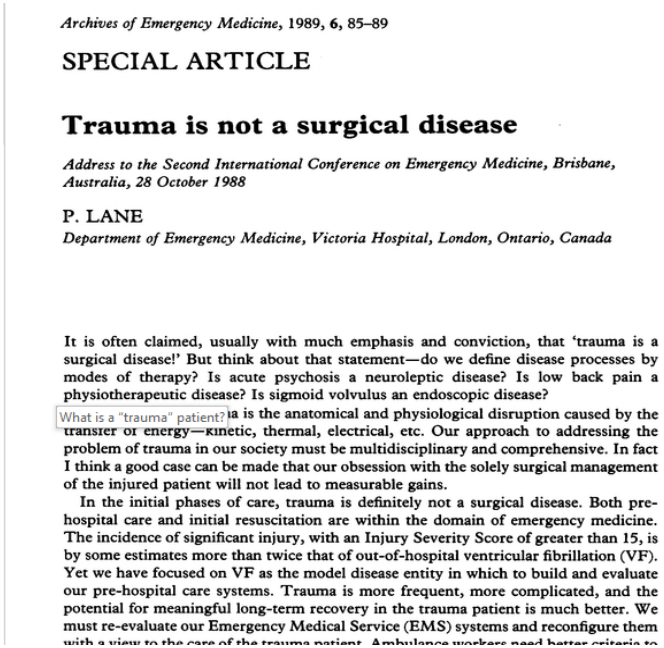
PMID: 25058245 DOI: 10.1097/TA.0000000000000363

Abstract

Background: A dramatic rise in nonoperative management of many blunt and some penetrating traumatic injuries has occurred during the past four decades. This trend has lead some to suggest that trauma is no longer a surgical disease. We questioned what role the trauma surgeon plays in the care of the injured patient. We hypothesized that surgical intervention and judgment are still often required in both injured children and adults.

What is a “trauma” patient?

- NTDB definition
  - Lengthy algorithm to better define
- Medical trauma diagnosis
  - When an outside set of forces or influences results in pain, injury, serious illness, medical procedures, or surgery.



Archives of Emergency Medicine, 1989, **6**, 85–89

SPECIAL ARTICLE

Trauma is not a surgical disease

Address to the Second International Conference on Emergency Medicine, Brisbane, Australia, 28 October 1988

P. LANE

Department of Emergency Medicine, Victoria Hospital, London, Ontario, Canada

It is often claimed, usually with much emphasis and conviction, that ‘trauma is a surgical disease!’ But think about that statement—do we define disease processes by modes of therapy? Is acute psychosis a neuroleptic disease? Is low back pain a physiotherapeutic disease? Is sigmoid volvulus an endoscopic disease?

What is a "trauma" patient?

...a is the anatomical and physiological disruption caused by the transfer of energy—kinetic, thermal, electrical, etc. Our approach to addressing the problem of trauma in our society must be multidisciplinary and comprehensive. In fact I think a good case can be made that our obsession with the solely surgical management of the injured patient will not lead to measurable gains.

In the initial phases of care, trauma is definitely not a surgical disease. Both pre-hospital care and initial resuscitation are within the domain of emergency medicine. The incidence of significant injury, with an Injury Severity Score of greater than 15, is by some estimates more than twice that of out-of-hospital ventricular fibrillation (VF). Yet we have focused on VF as the model disease entity in which to build and evaluate our pre-hospital care systems. Trauma is more frequent, more complicated, and the potential for meaningful long-term recovery in the trauma patient is much better. We must re-evaluate our Emergency Medical Service (EMS) systems and reconfigure them with a view to the care of the trauma patient. Ambulance workers need better criteria to

Leading Causes of Unintentional Injury Death, 2020

	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	All Ages
1	Unintentional Suffocation 1,024	Unintentional Drowning 425	Unintentional Mv Traffic 319	Unintentional Mv Traffic 476	Unintentional Mv Traffic 6,741	Unintentional Poisoning 20,938	Unintentional Poisoning 21,943	Unintentional Poisoning 18,078	Unintentional Poisoning 15,030	Unintentional Fall 36,508	Unintentional Poisoning 87,404
2	Unintentional Mv Traffic 72	Unintentional Mv Traffic 284	Unintentional Drowning 117	Unintentional Drowning 91	Unintentional Poisoning 6,664	Unintentional Mv Traffic 7,929	Unintentional Mv Traffic 6,031	Unintentional Mv Traffic 5,421	Unintentional Mv Traffic 5,942	Unintentional Mv Traffic 7,480	Unintentional Fall 42,114
3	Unintentional Drowning 34	Unintentional Suffocation 118	Unintentional Fire/Flame 60	Unintentional Poisoning Unintentional Other Land Transport 52	Unintentional Drowning 593	Unintentional Drowning 611	Unintentional Fall 625	Unintentional Fall 1,282	Unintentional Fall 3,140	Unintentional Unspecified 4,839	Unintentional Mv Traffic 40,698
4	Unintentional Poisoning 17**	Unintentional Hot Object Or Substance 75	Unintentional Suffocation 38		Unintentional Other Land Transport 184	Unintentional Fall 359	Unintentional Drowning 568	Unintentional Drowning 569	Unintentional Suffocation 827	Unintentional Poisoning 4,618	Unintentional Suffocation 6,768
5	Unintentional Natural/ Environment 15**	Unintentional Pedestrian, Other 54	Unintentional Other Land Transport 33	Unintentional Hot Object Or Substance 45	Unintentional Fall 152	Unintentional Suffocation 195	Unintentional Suffocation 273	Unintentional Suffocation 438	Unintentional Unspecified 664	Unintentional Suffocation 3,723	Unintentional Unspecified 6,265
6	Unintentional Fire/Flame Unintentional Unspecified 8**	Unintentional Natural/ Environment 43	Unintentional Firearm 22	Unintentional Suffocation 33	Unintentional Firearm 129	Unintentional Other Spec., Classifiable 181	Unintentional Hot Object Or Substance 238	Unintentional Unspecified 358	Unintentional Hot Object Or Substance 651	Unintentional Hot Object Or Substance 1,385	Unintentional Drowning 4,589
7		Unintentional Firearm 40	Unintentional Pedestrian, Other 18**	Unintentional Firearm 30	Unintentional Hot Object Or Substance 100	Unintentional Other Land Transport 175	Unintentional Other Spec., Classifiable 214	Unintentional Hot Object Or Substance 315	Unintentional Drowning 639	Unintentional Drowning 941	Unintentional Fire/Burn 3,036

Drowning is:

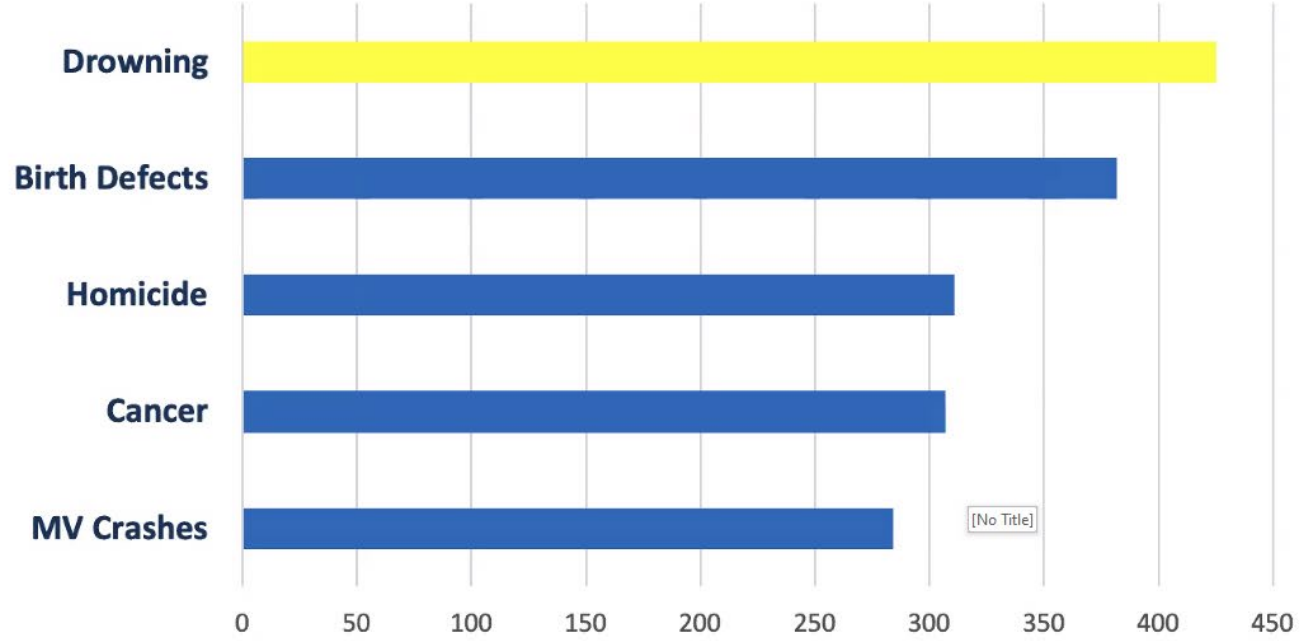
- 1st in 1-4 yo
- 2nd in 1-14 yo
- 5th in all ages

- ~4,000 / year

NDPA
NATIONAL DROWNING PREVENTION ALLIANCE

PTS
pediatric trauma society

Deaths among Children 1-4 years, 2020



WISQARS 2020 Data from National Vital Statistics System

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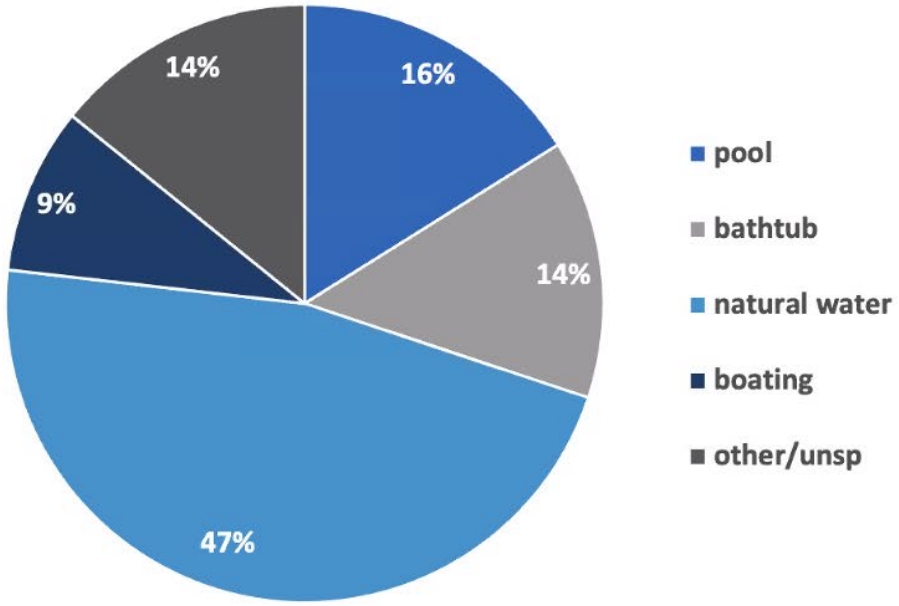
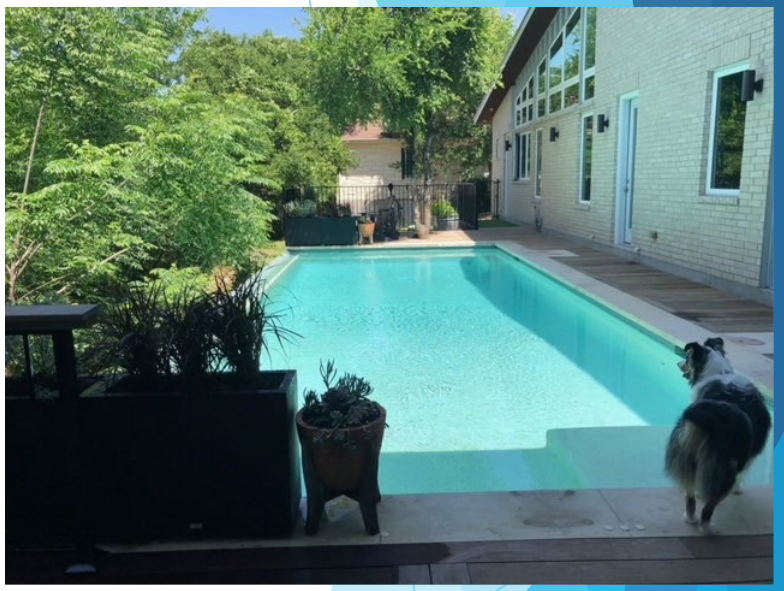
pediatric trauma society

Proportion of Fatal Drowning by Setting





National Vital Statistics System V90, V92, W65-W74; all ages; 2020

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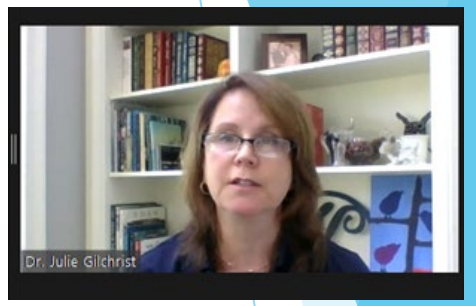
National Data for Drowning



Dr. Julie Gilchrist—

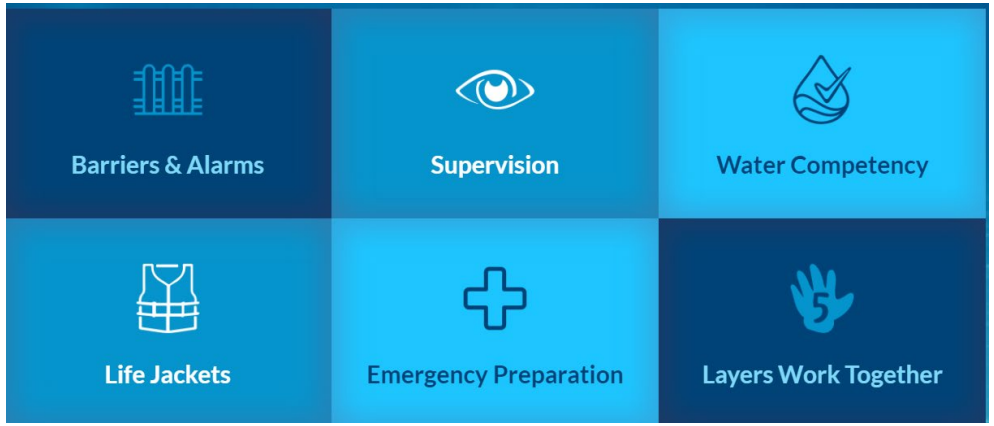
- National Electronic Injury Surveillance System
- National Vital Statistics System

"Don't have as much state/local level information as ED data is collected by the CDC as national information, so harder to breakdown state by state or by community." Gilchrist (NDPA, 2023)

- Drowning prevention takes a champion in each community
- 60% of drownings occur in 5-6 states but may travel!

5 layers of prevention: NDPA (National Drowning Prevention Alliance)

- 1. Barriers and Alarms—4 sided fences, self-latching gates, pool safety covers, alarm systems
- 2. Supervision—close, constant, capable adult as water watcher
- 3. Water competency—not just proper strokes, but skills to protect themselves in water
- 4. Life Jackets—when used appropriately and when you are not expecting to be in the water
- 5. Emergency Preparation (CPR, calling 911, and basic water rescue skills)



National Statistics—Non-fatal Drowning

Nonfatal Drowning by Disposition

Disposition	Average Annual Estimate	Percent	Rate per 100,000
Treated and released	5036	59.1%	1.73
Hospitalized or transferred	2912	34.2%	----
Total	8525	100.0%	2.90

***For every child who dies, another 7-8 are treated in the Emergency Department**

National Electronic Injury Surveillance System All Injury Program, 2016-2020

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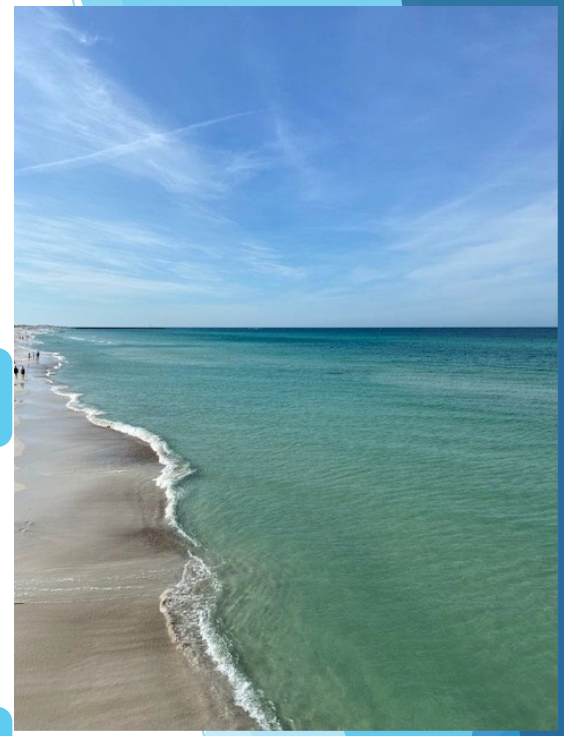
Florida State Data



Data pulled from Florida Charts website

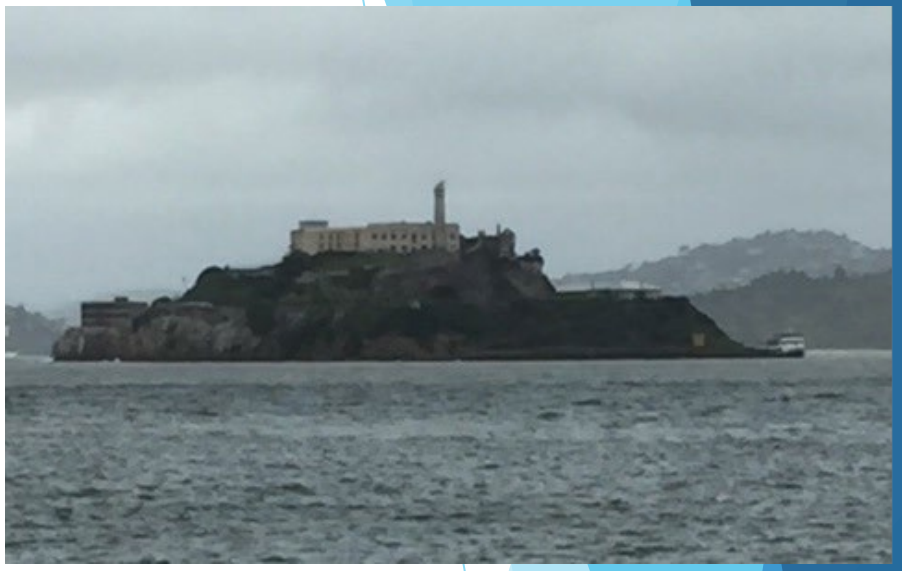
- Used tables and information from the Florida Charts website that shows information on non-fatal hospitalizations, non-fatal emergency department visits, and the injury dashboards
- 625 records age 15 yrs or less
- January 2021-December 2022

Pulled from EMS records

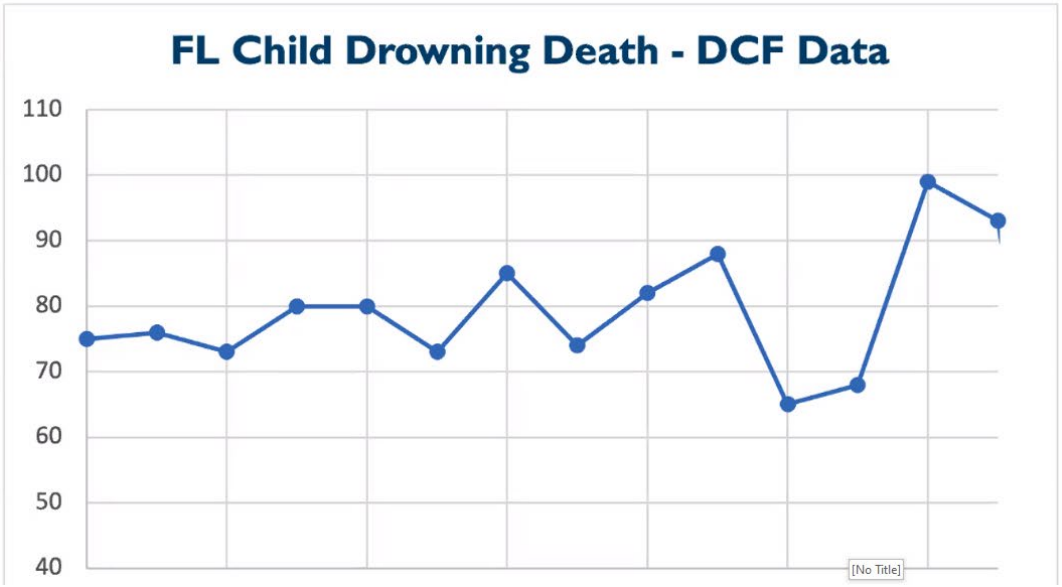
- 620 records age 14 years or less
- January 2021-December 2022

Nothing specific on where, type of water, what happened…outcome??

Hmmmm…



State Level Fatal Drowning Data: Example



2016-2021 Data

Not Scientific, but Interesting

Trauma Center/State	Data collected	Submitted to state	Other
Children's Pittsburgh/ PA	Internally	Only if an injury	
All Kids/ FL	Internally	No	Not fully abstracted, but in the registry for count, outcomes
Jane Weis/ PA	No	Only if an injury	
Children's/ MN	Yes	Yes	Collected same as other trauma data
Texas Children's/ TX	Yes	Yes	Separate state registry--Emergency team enters data
Cincinnati/ OH	Yes	Yes	
Nationwide/ OH	Yes	Yes	
Children's National/ DC	No	Only if an injury	
St. Louis/ IL and MO	No	Only if an injury	
Sanford/ SD	Yes	Yes?	Not fully abstracted unless injury identified
Cook Children's/ TX	Yes	Yes	Trauma Injury Prevention Coordinator enters in data--separate state registry
Dell Children's/TX	Yes	Yes	Trauma Research Coordinator enters in data—separate state registry
Phoenix/ AZ	No	Only if an injury	
UNC/ NC	Yes	Yes	In trauma registry
Wolfson/ FL	No	Only if an injury	State EMS data

So are we trying to prevent?

- Asked Pediatric Nurse Leaders—
  - How many of you DO NOT have a drowning prevention initiative within your injury prevention program?
    - 7 answered they “DO NOT” (over 100 members)
- How effective are these injury prevention efforts?
- Safe sleep initiatives
  - Submissions for PTS Annual Meeting
  - Single institution studies

We NEED better data!

So now what?

- WHO recommended that all countries create a Water Safety Action Plan which addresses the nation's drowning problem
  - US Water Safety Action Plan—in development (completion in 2024)
    - California released their own
    - AAP, American Red Cross, Boy Scouts of America, Make the Minute Matter, NDPA, Safe Kids Worldwide, The ZAC Foundation, USA Swimming Foundation, YMCA of the USA
    - Addressing gaps in water safety research
      - Focus on evidence-based strategies and data along with infrastructure to support implementation of recommendations (6 workgroups):
        - **One US Workgroup—Data/Public Health Surveillance**
    - **5 countries completed action plans list "Data Driven Priorities" within their plans**

We know data collection!!!

ACS tqip TRAUMA QUALITY IMPROVEMENT PROGRAM

PTS pediatric trauma society A Voice for the Injured Child

Next up…

- Emotional Safety in Pediatrics
  - Association of Child Life Professionals (ACLP)

References

- Centers for Disease Control and Prevention (CDC) Drowning Prevention https://www.cdc.gov/drowning
- National Drowning Prevention Alliance (NDPA) ndpa.org
- https://helpfulprofessor.com/either-or-fallacy-examples
- Acker SN, Stovall RT, Moore EE, Partrick DA, Burlew CC, Bensard DD. Trauma remains a surgical disease from cradle to grave. J Trauma Acute Care Surg. 2014 Aug;77(2):219-25. doi: 10.1097/TA.0000000000000363. PMID: 25058245.
- https://emj.bmj.com/content/6/2/85: Trauma is not a surgical disease; Emergency Medicine Journal Address to the Second International Conference on Emergency Medicine, Brisbane, Australia, 28 October 1988
- https://Joshtheotter.org--Big thank you to Blake and Kathy Collingsworth!!
- https://emotional-safety.org/emotional-safety-in-pediatrics/

QUESTIONS?

6th ANNUAL MEETING

Save the Date

November 1-4, 2023

Sheraton New Orleans | New Orleans, LA

PEDIATRICTRAUMASOCIETY.ORG

Pediatric Trauma Society
A Voice for the Injured Child

Operative Management of High Grade Liver Injuries Who, When, How, and Why

David M Notrica, MD FACS FAAP

v.

Ronald Steward, MD FACS, etc. ect. ect

Trauma Medical Director
Phoenix Children's Hospital

Associate Professor of Surgery
Mayo Clinic College of Medicine

Associate Professor of Child Health
University of Arizona College of Medicine

The man
The myth
The legend

Who is Ronny Stewart?

“Mr ACS”

Dr Ronald Stewart

Williams Township's Ronnie Stewart making a name in AMA motocross - lehighvalleylive.com

- Surgical residency at the University of Texas Health Science Center at San Antonio
- Trauma and Surgical Critical Care Fellowship at the University of Tennessee Health Science Center in Memphis

- In 1993, he established and built University Health System's trauma program.
- 1999 he was awarded the Faculty Member of the Year Award from The University Health System
- Dr Witten B. Russ Chair in Surgery (Chair of the Department of Surgery)

- >20 years on the American College of Surgeons (ACS) Committee on Trauma (COT)
- American College of Surgeons Medical Director of Traum a Programs

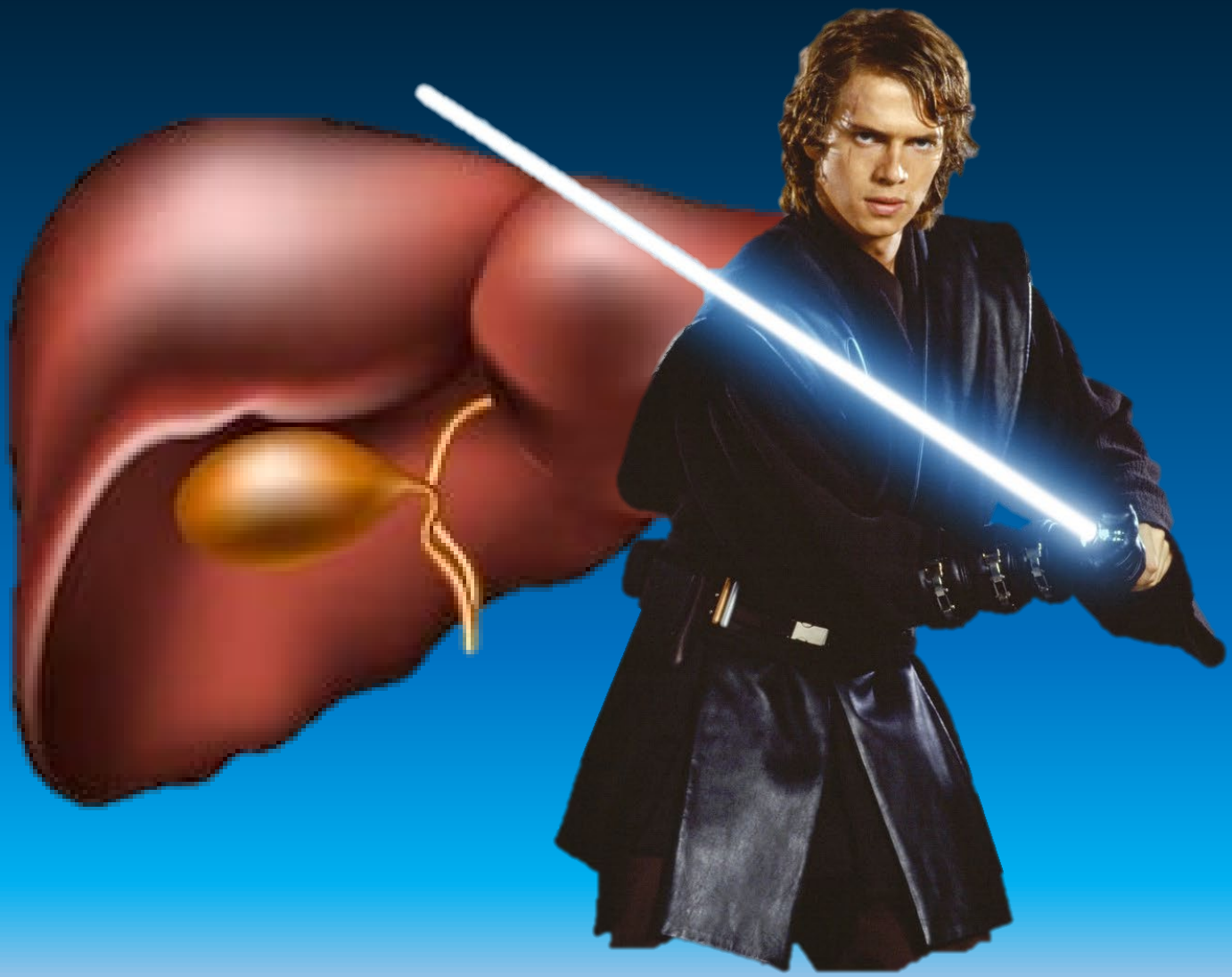
- Presidential Award for Clinical Excellence (2004)
- Distinguished Alumnus of the UTHSCSA School of Medicine (2005)
- Leonard Tow Humanism in Medicine Award (2007)
- Past President of the Southwestern Surgical Congress
- Spearheaded a plan to implement a National Trauma Act on Plan
- Worked to lead an approach to firearm injury prevention collegial, professional and substantive dialogue all points of view

What Ronny is going to tell you…

Operating on children is wrong

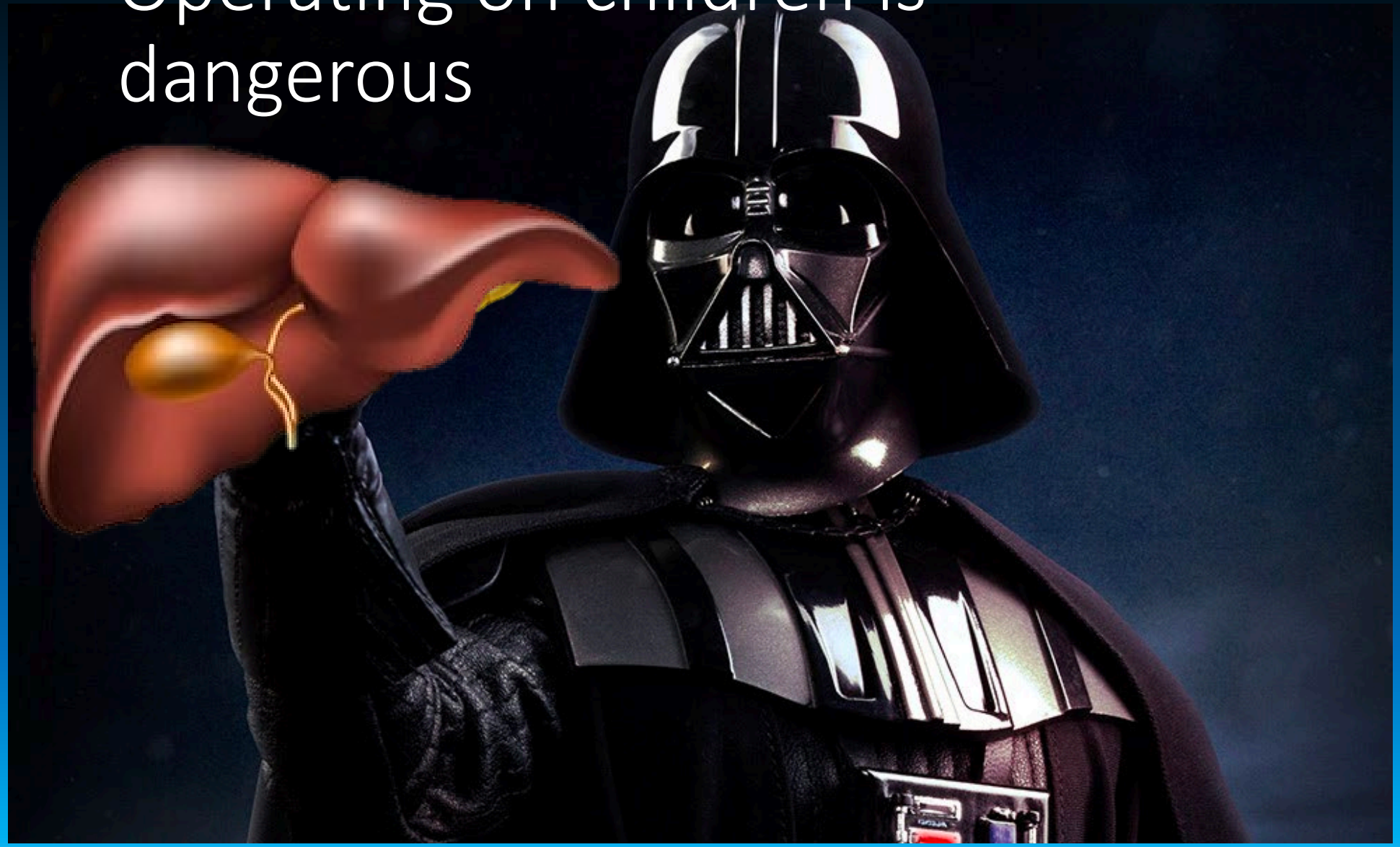
Don’t mess with the liver (or spleen, or pancreas….)

Trauma Surgeons
- The guardian's of children's organs



Only Forces of Evil operate on Children

Operating on children is dangerous



Clearly

- This is not a picture you will ever see….

Failing to ever operate on liver trauma will cost lives

National Organization of Traumatologists Conference On Opposition to Liver Surgery (NOT-COOLS)

Background

- Evolution of management for blunt liver and spleen injuries

- Operative →Nonoperative management (NOM)

- High-grade injuries increasingly NOM
- Holmes et al failure rate 5%
- ATOMAC studied 500 liver injury patients

Results: How often do they Fail?

Overall
7%

Liver
7.4%

52%
Bleeding

Spleen
8.3%

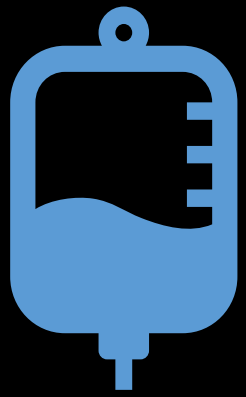
54%
Bleeding

ATOMAC
Pediatric Trauma Research Network

Operations among 1000 pts

Procedure	Patients (n=69)
~~Splenectomy~~	19
~~Intestinal Resection~~	14
~~Intestinal Repair~~	13
Hepatorrhaphy	10
~~Pancreatectomy or Reconstruction~~	9
Packing	8
Drain Placement	6
~~Mesenteric Repair~~	6
~~Splenorrhaphy~~	3
~~Diaphragm Repair~~	3
~~Diagnostic Only~~	3
Hepatectomy	1

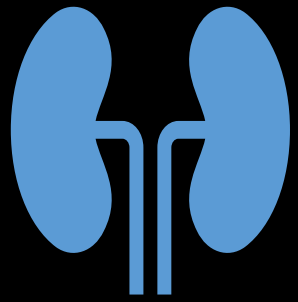
Why do we operate on liver injury?



Bleeding

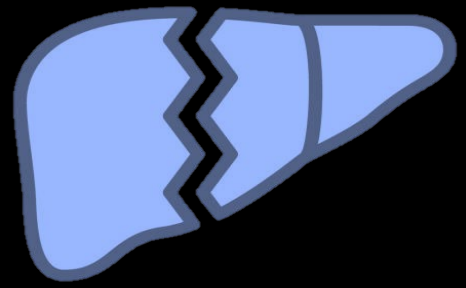
Peritonitis

Bile leak



Compartment syndrome

Blood, bile, ascites



Retained non-viable liver

Fever

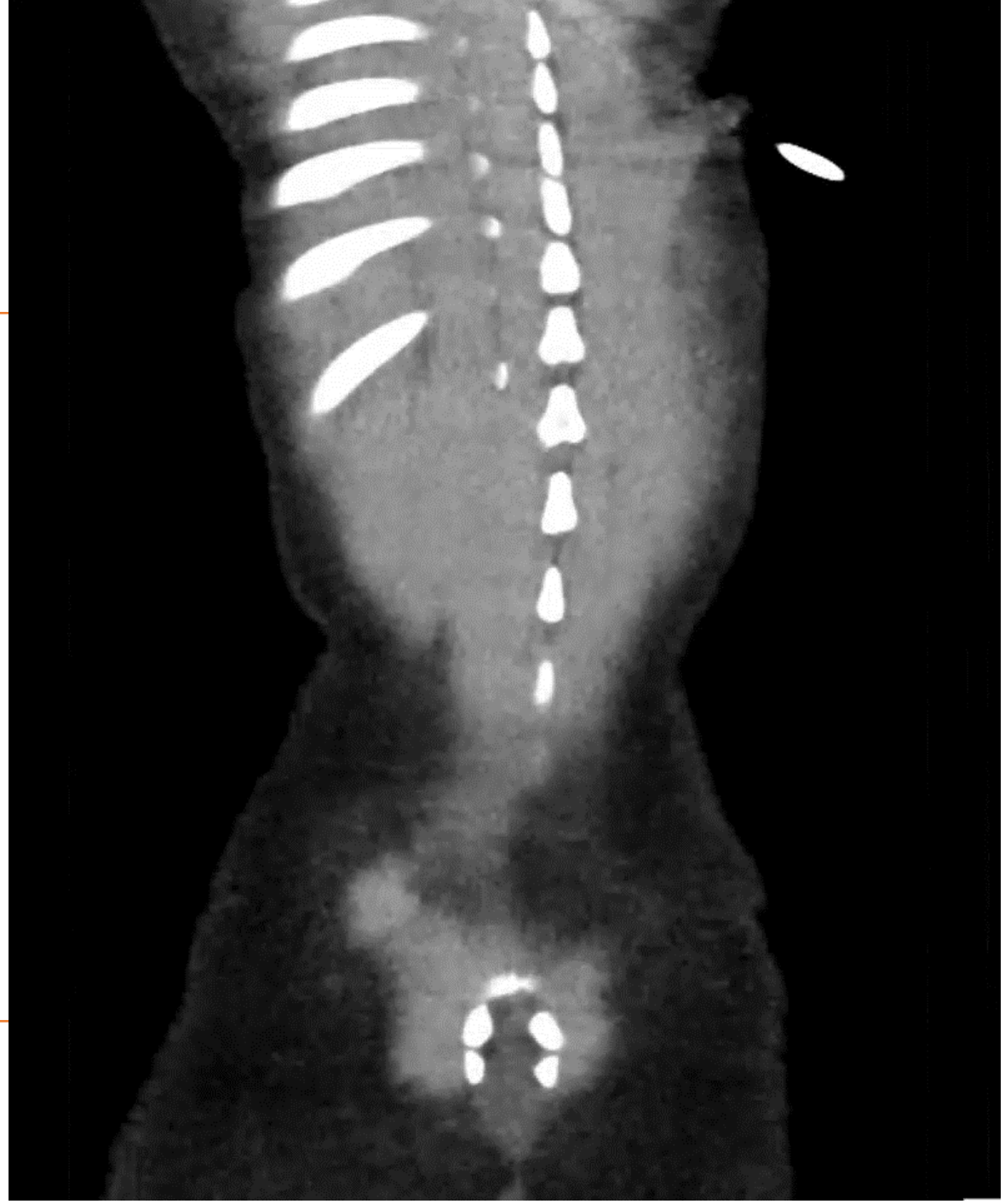
Bleeding --
When do we do Operative on Liver Injury?

Well……

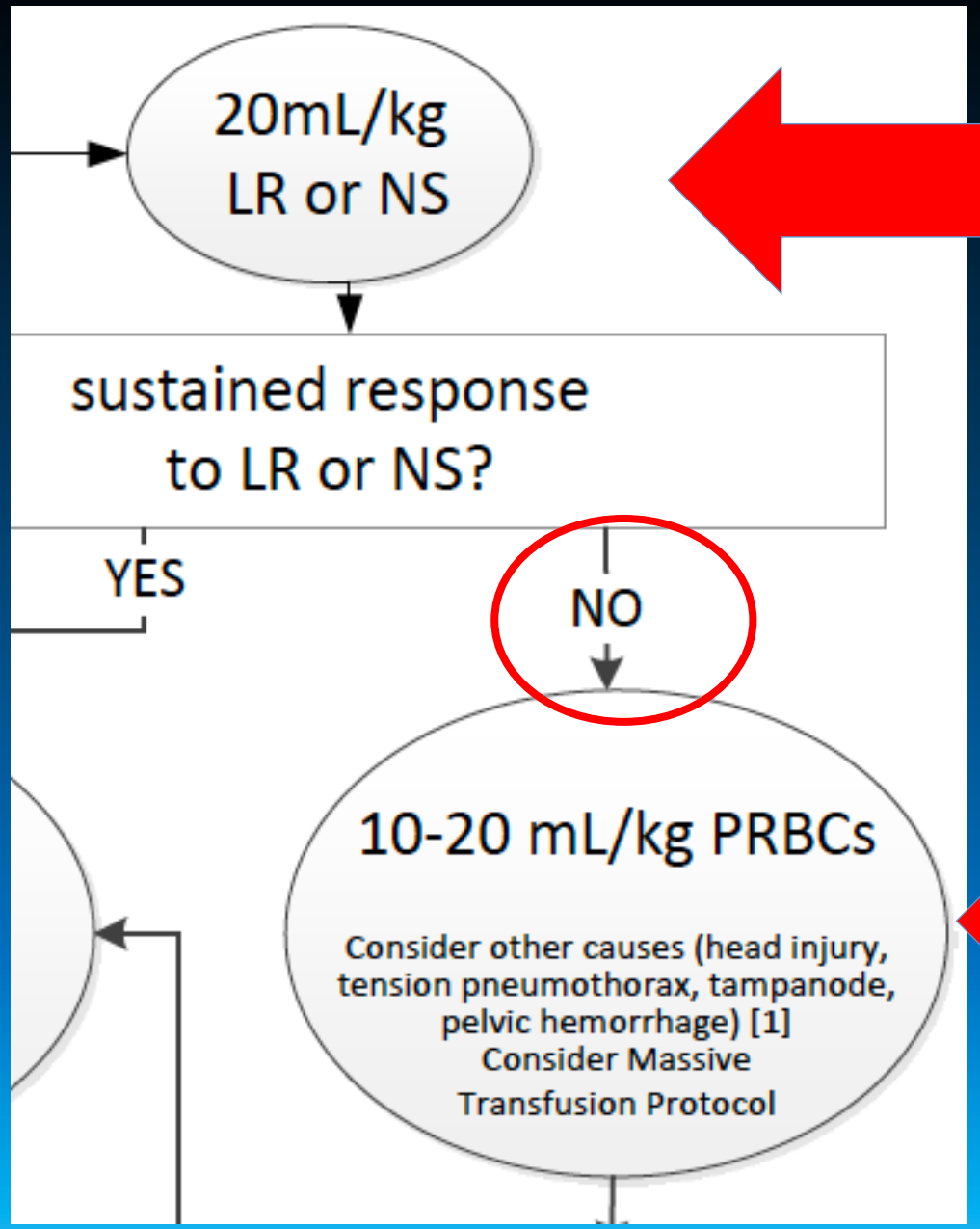
It’s *not* based on grade

Bad Injury

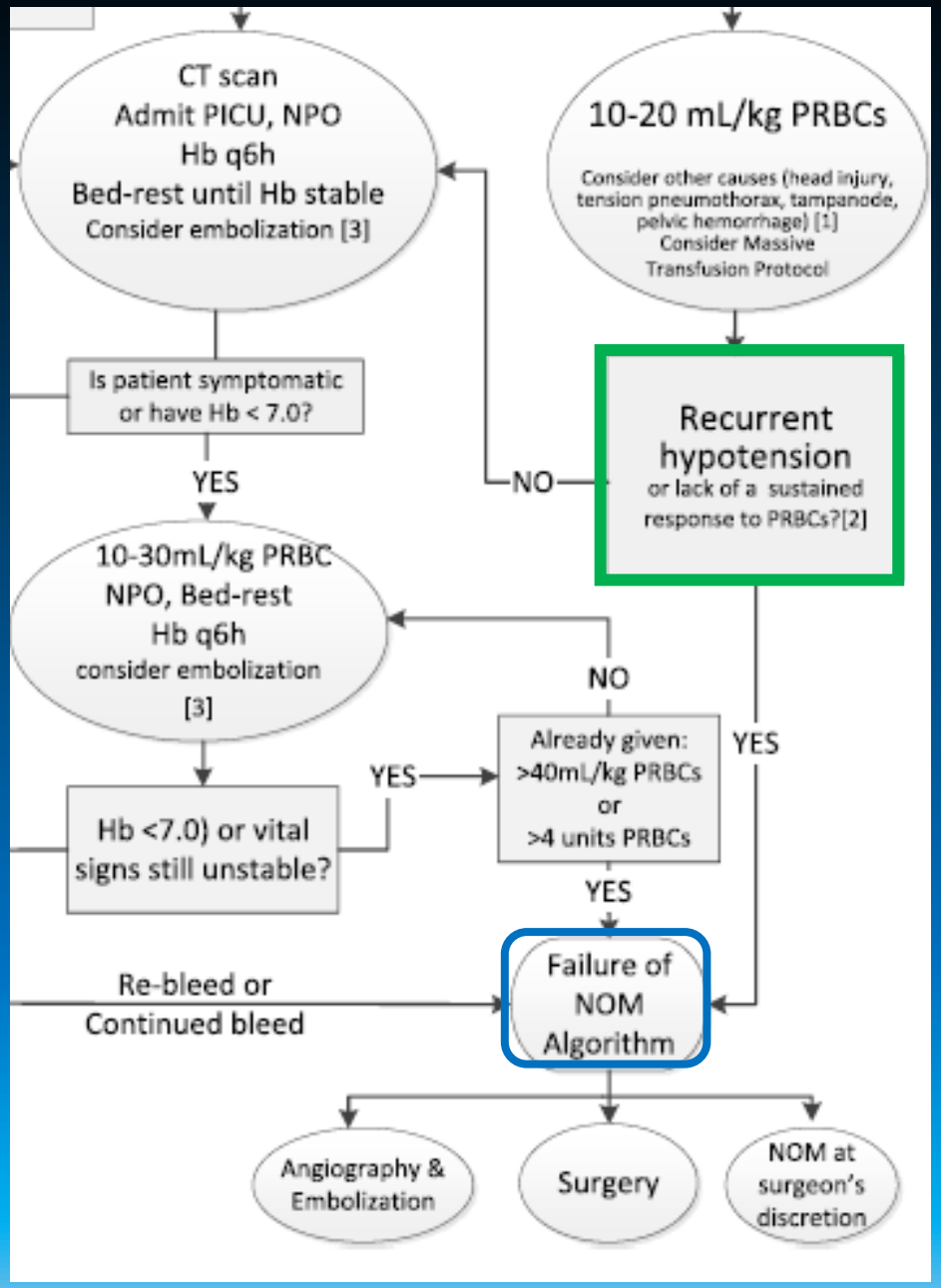
- No blush
- Fails NOM?



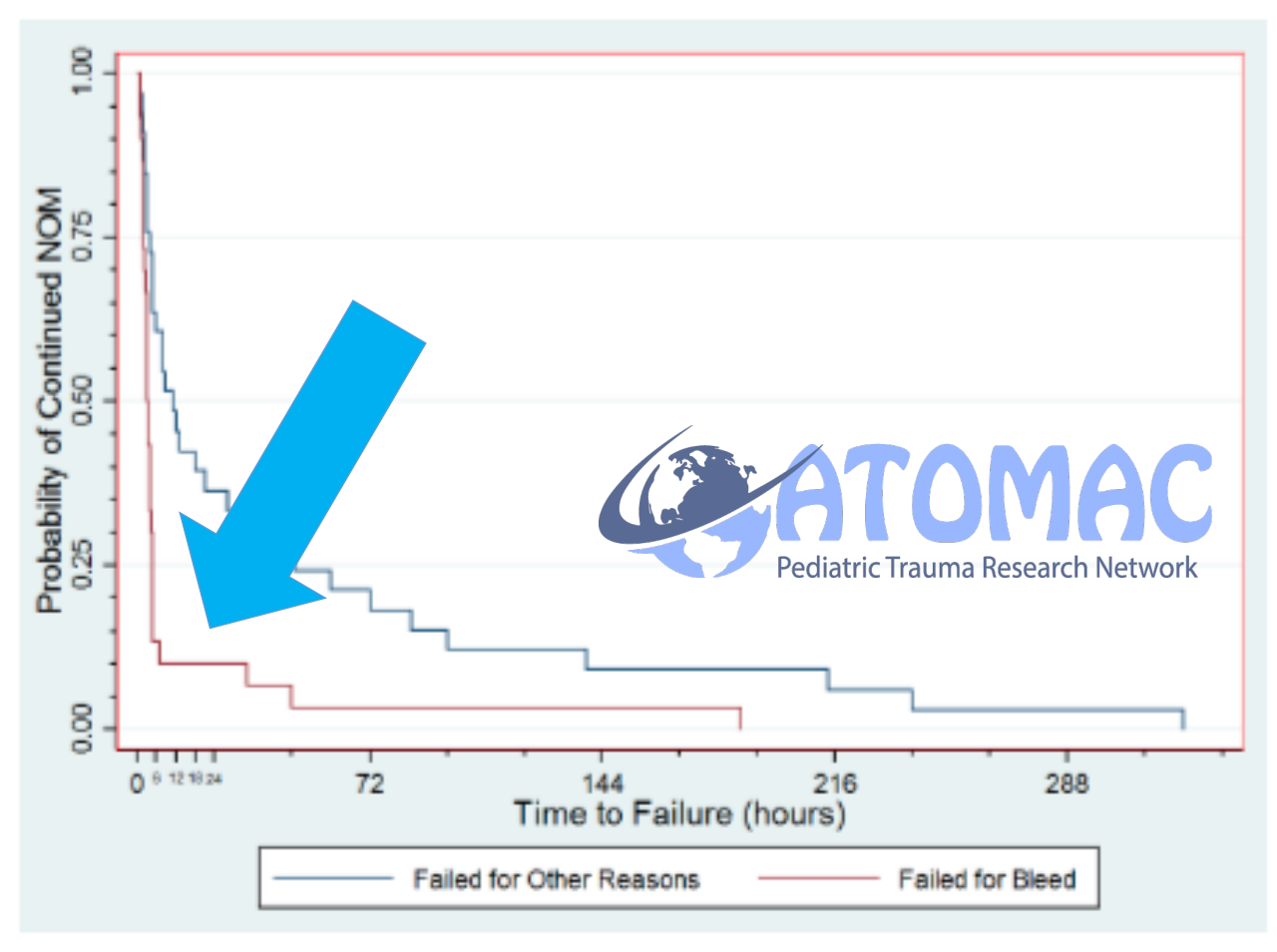
ATOMAC Guideline

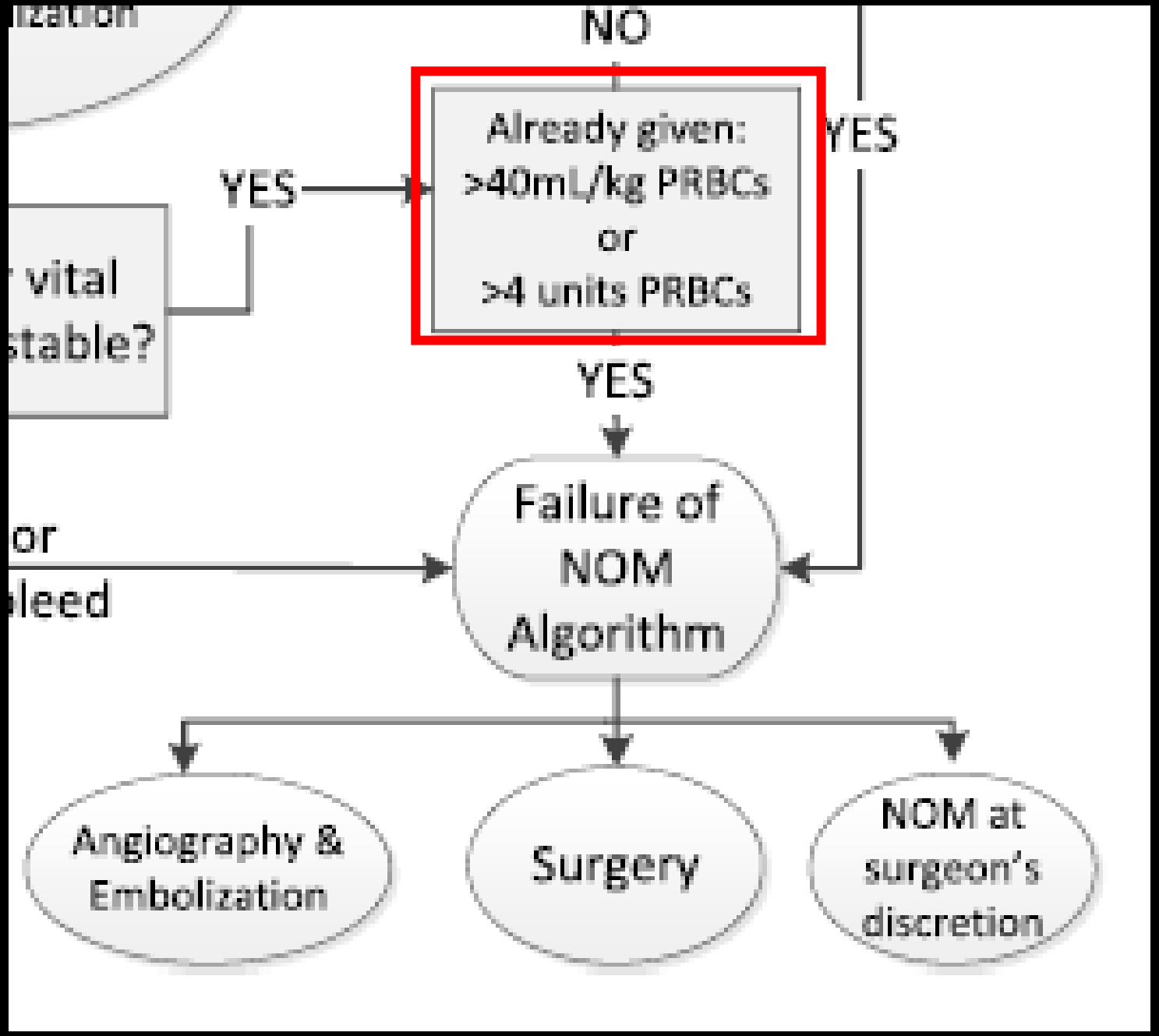


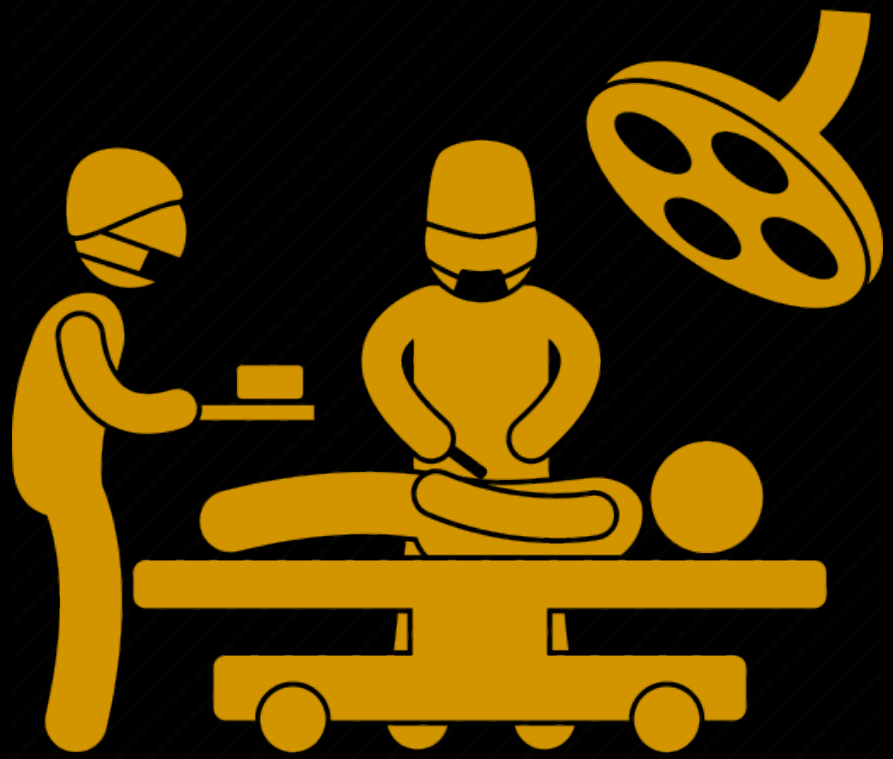
Failure in the ED



Some children do fail




NO
Already given:
>40mL/kg PRBCs
or
>4 units PRBCs
YES
YES
YES
vital
stable?
or
bleed
Failure of
NOM
Algorithm
Angiography &
Embolization
Surgery
NOM at
surgeon's
discretion



Other reasons for operative management

Non-operative management of Liver Trauma

- Biliary complications
  - Incidence is 2.8% and 7.4% of NOM liver trauma

Biliary complications

- Elevated Bili
- Abdominal Pain

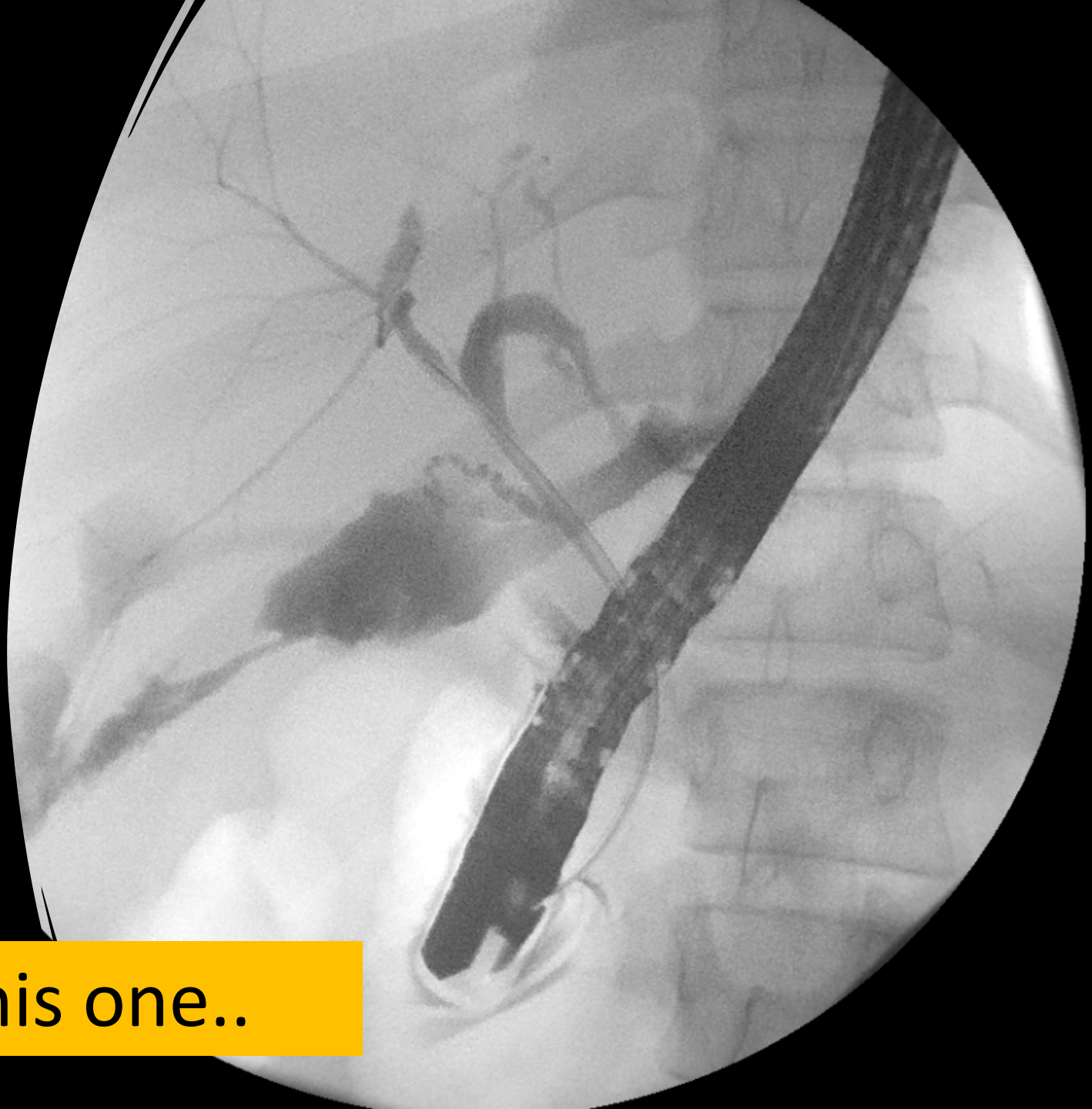
- The presence of a well-defined lesion with low attenuation lesion
  - Suggests a biloma
  - While we could….. ☹
  - Percutaneous drainage if symptomatic

NOT-COOLS may win this one..

Bile Leak

Treatment for bile leak

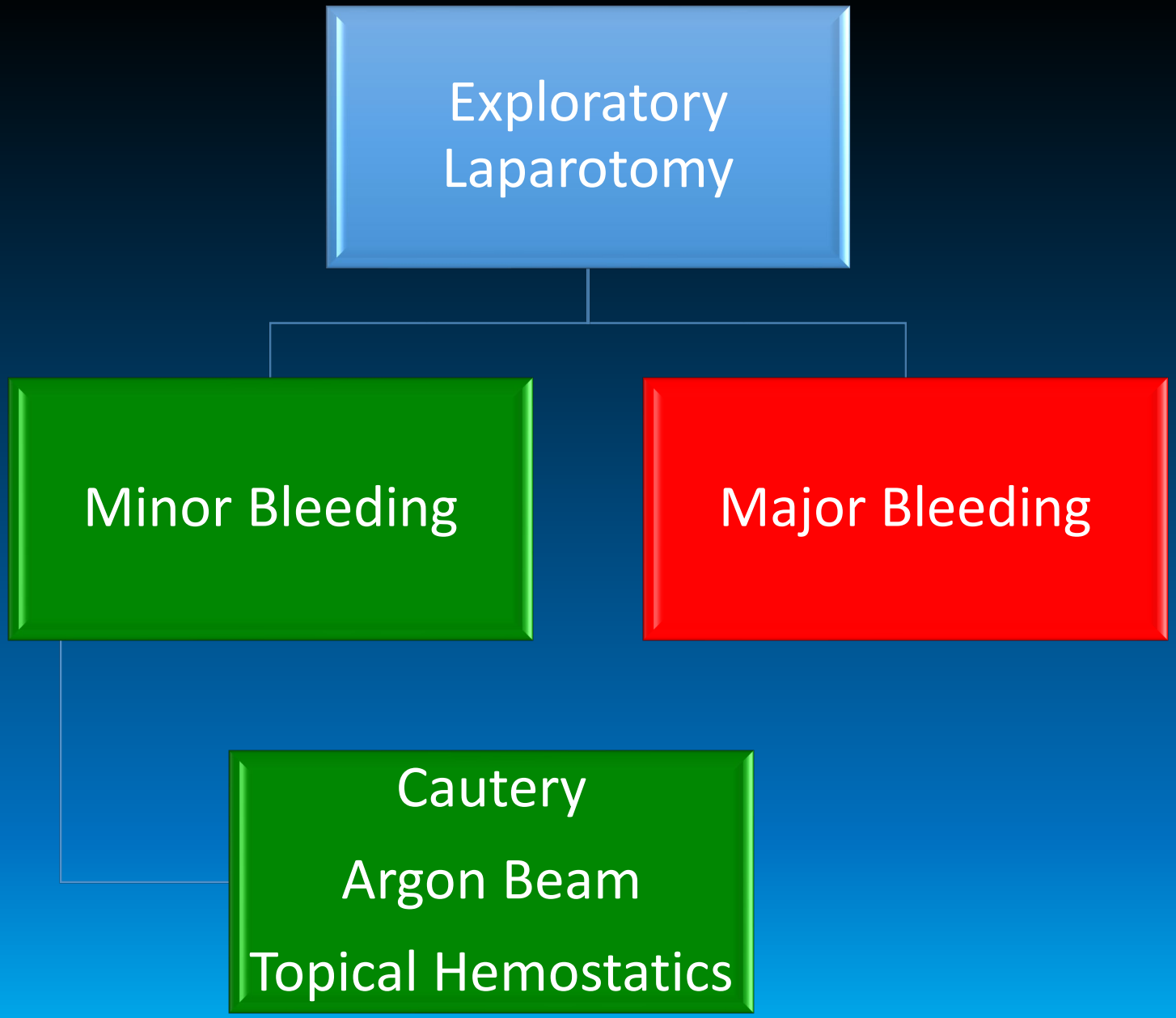
- ERCP with biliary stent placement
  - Resolves 90%–100% of cases
  - Biliary stents superior to sphincterotomy alone



NOT-COOLS may win this one..

Admittedly….
In pediatric Trauma, operative management is rare

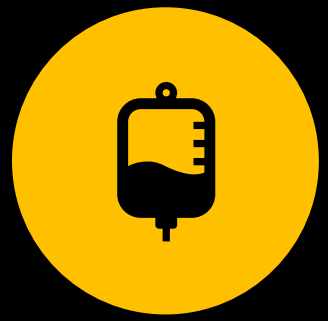
- Here’s what you need to know if you operate


Exploratory Laparotomy
Minor Bleeding
Major Bleeding
Cautery
Argon Beam
Topical Hemostatics

STEP 1

MIDLINE INCISION

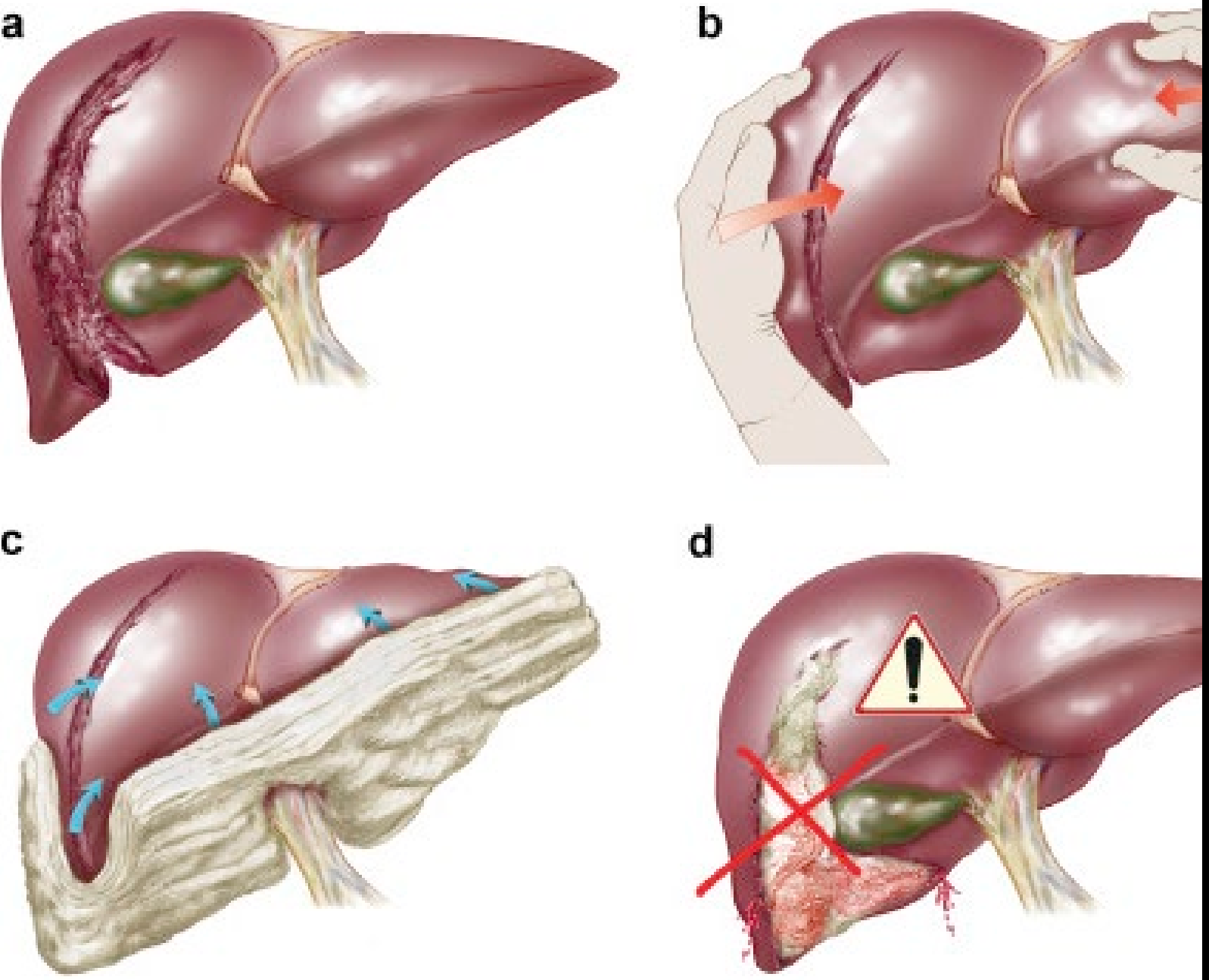
PACK THE ABDOMEN



RESUSCITATE WITH BLOOD PRODUCTS

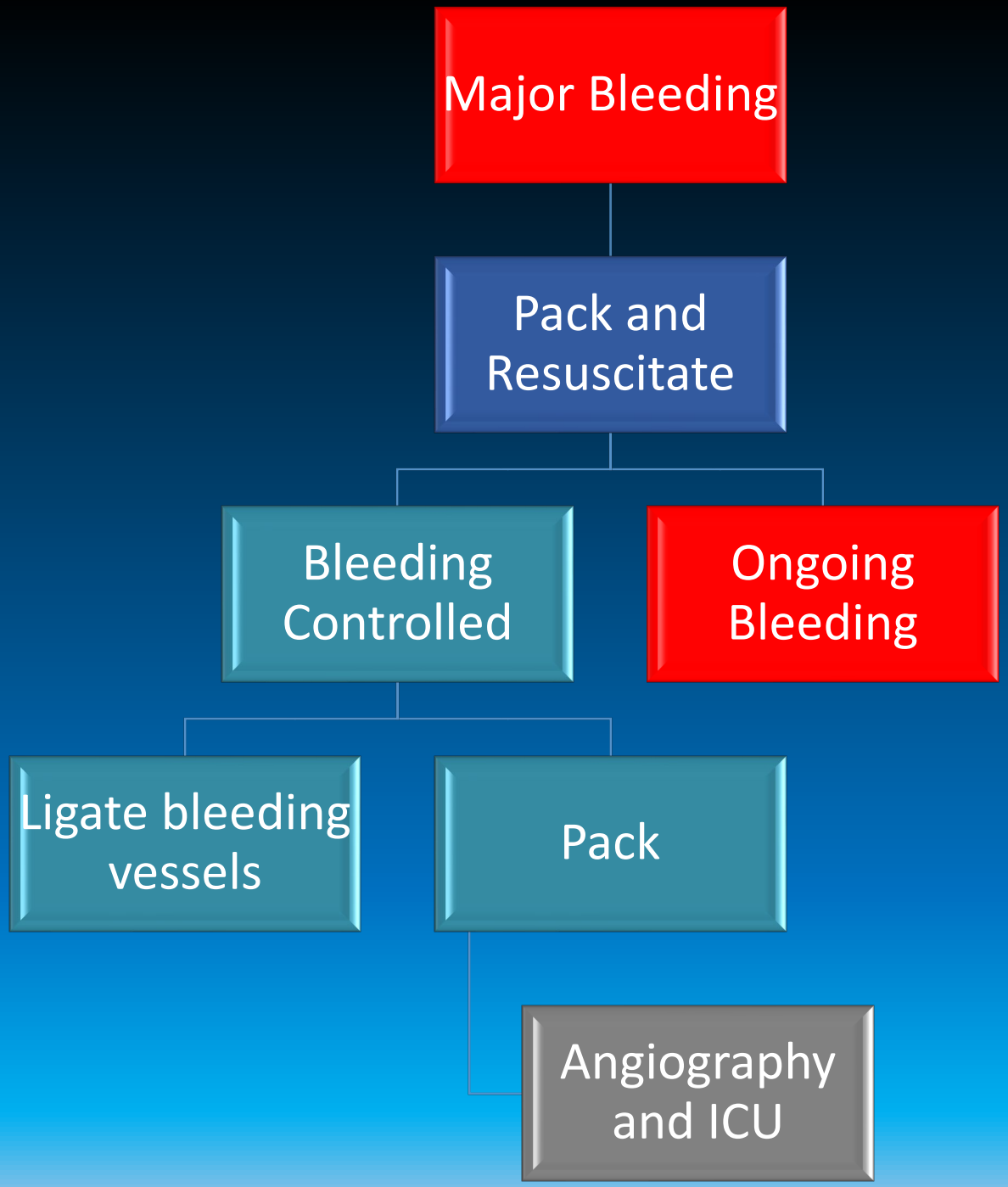
ACTIVATE MASSIVE TRANSFUSION PROTOCOL (IF NOT ALREADY DONE)

Salomone Di Saverio, MD FACS,FRCS (Eng)



STEP 2

- How to pack the liver
- Re-create the liver
- Push the pieces back
- Liver must be mobilized first


Major Bleeding
Pack and Resuscitate
Bleeding Controlled
Ongoing Bleeding
Ligate bleeding vessels
Pack
Angiography and ICU

Delayed Laparotomy

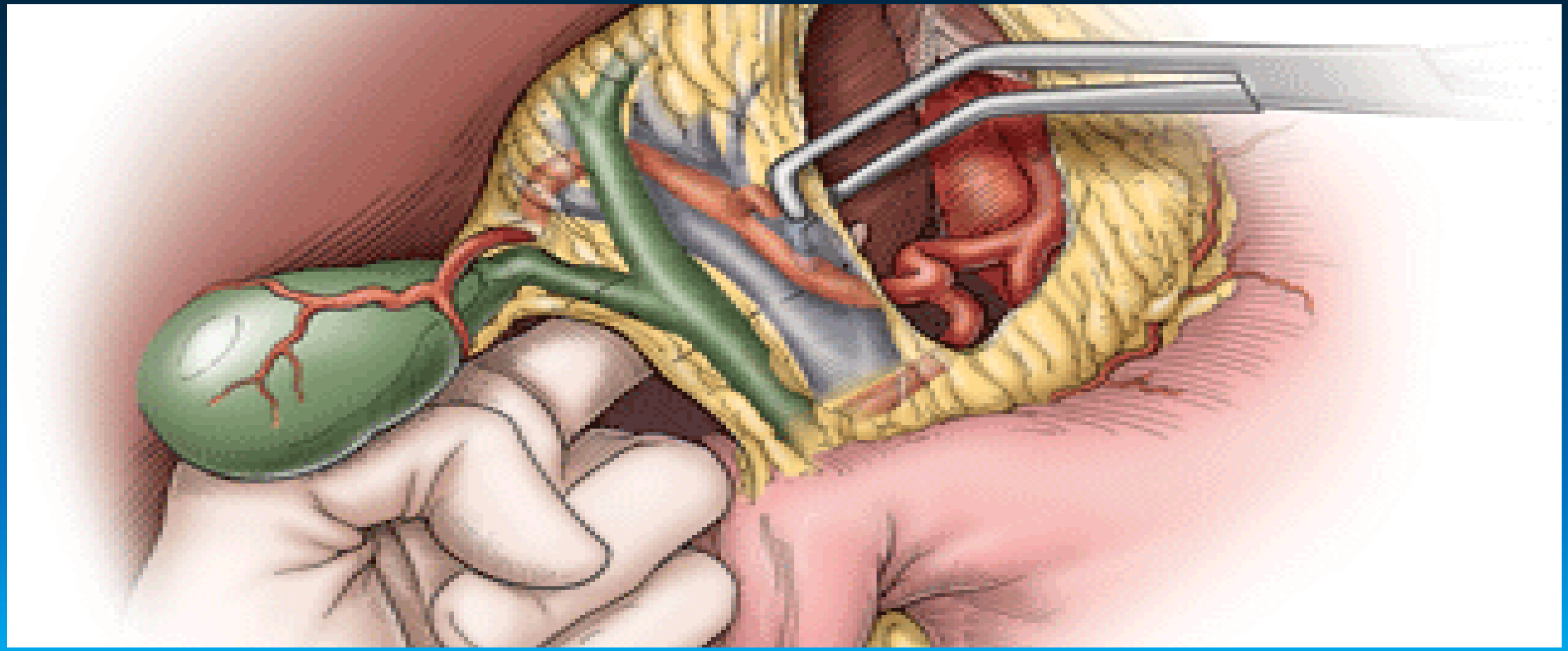
- Remove Packs 48 hours
- Debride dead liver
- Look for other injuries
- Consider omental Packing
- Drain any bile leak

Pack and Resuscitate

Ongoing Bleeding

Pringle Maneuver

Pringle Manever



Pringle Maneuver

Bleeding Controlled

Selective artery ligation

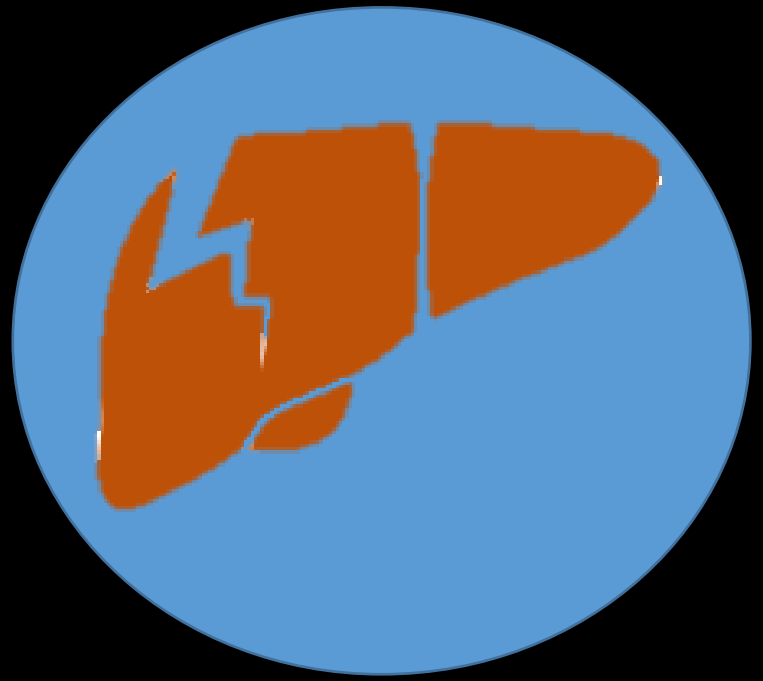
Consider embolization

Pringle Maneuver

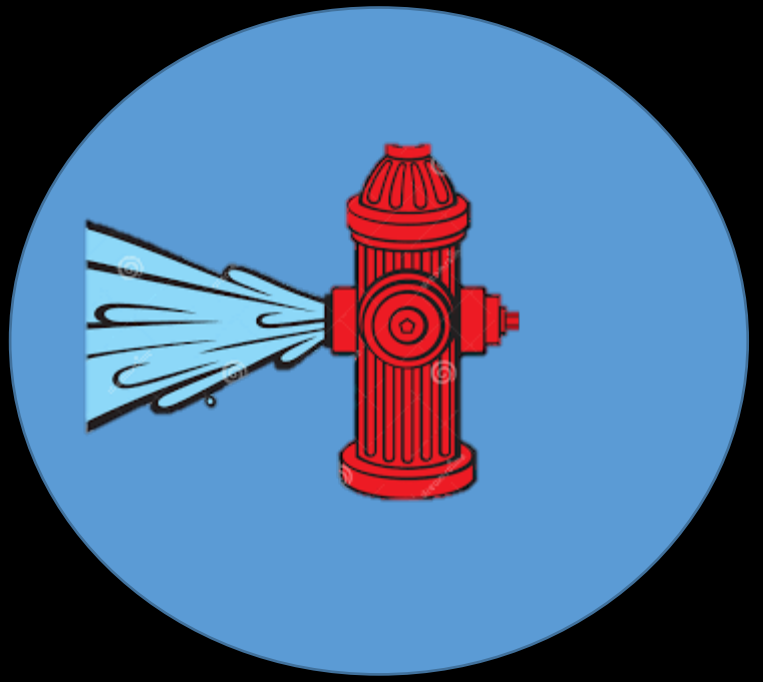
Bleeding NOT controlled

IVC Injury

How to identify Retrohepatic IVC injuries:



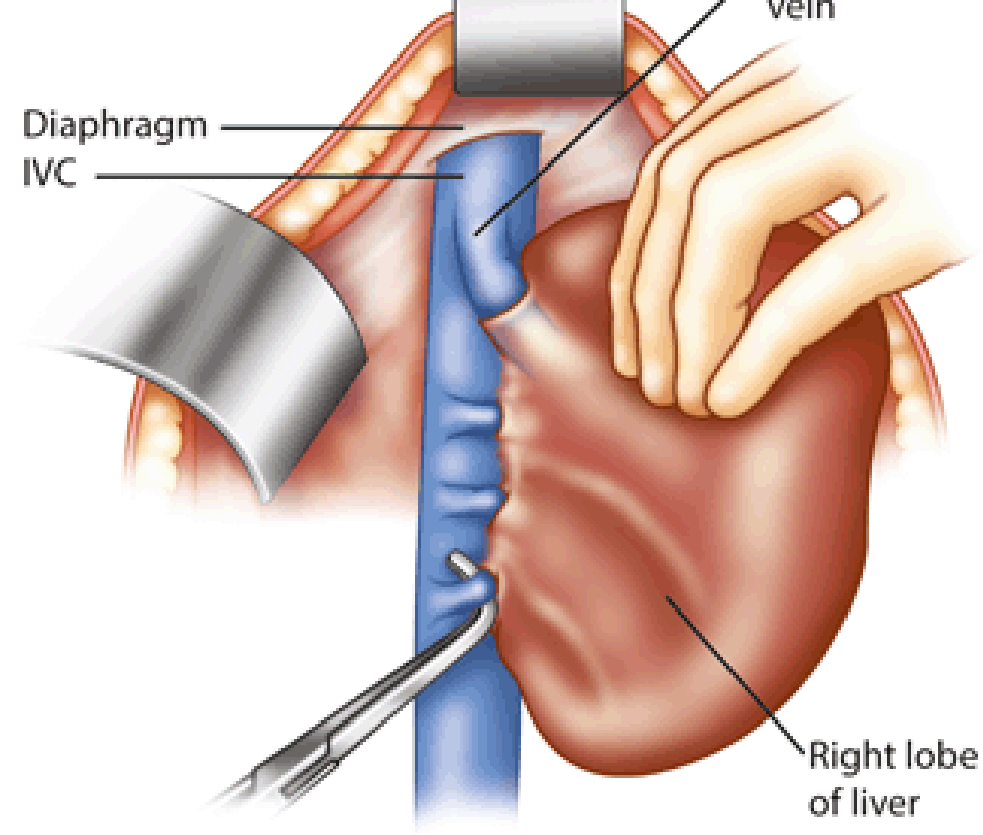
FAILURE OF MANUAL COMPRESSION AND THE PRINGLE MANEUVER TO CONTROL BLEEDING FROM THE LIVER

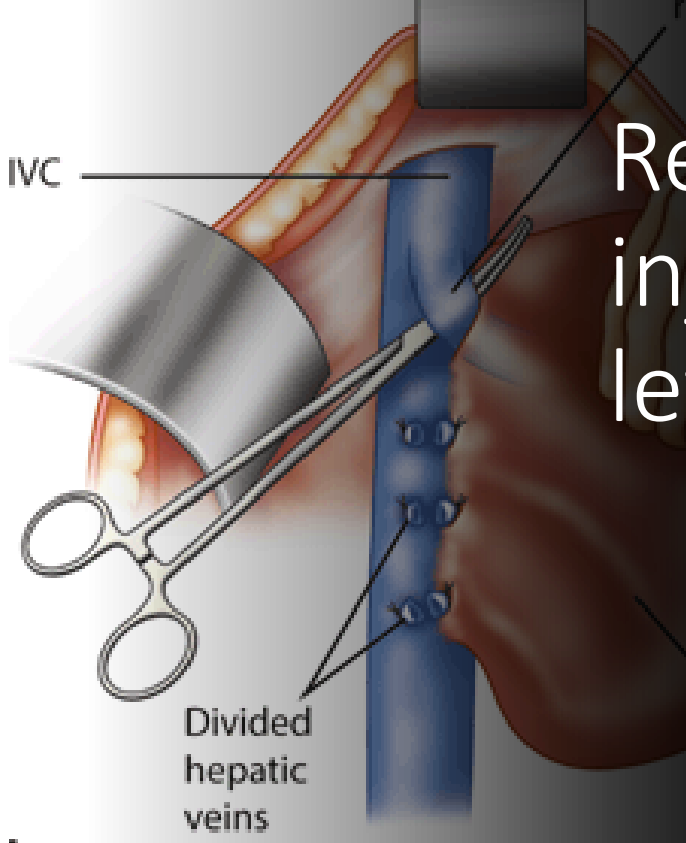


DARK BLOOD THAT CONTINUES TO WELL UP FROM BEHIND THE LIVER DESPITE THESE MANEUVERS

So you have a retohepatic cava injury

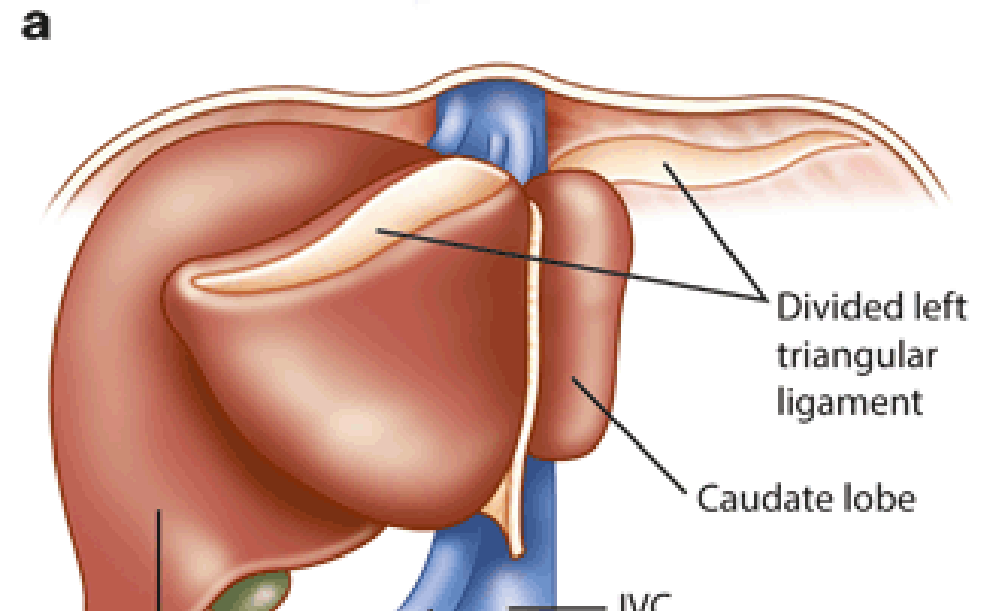
- What now?

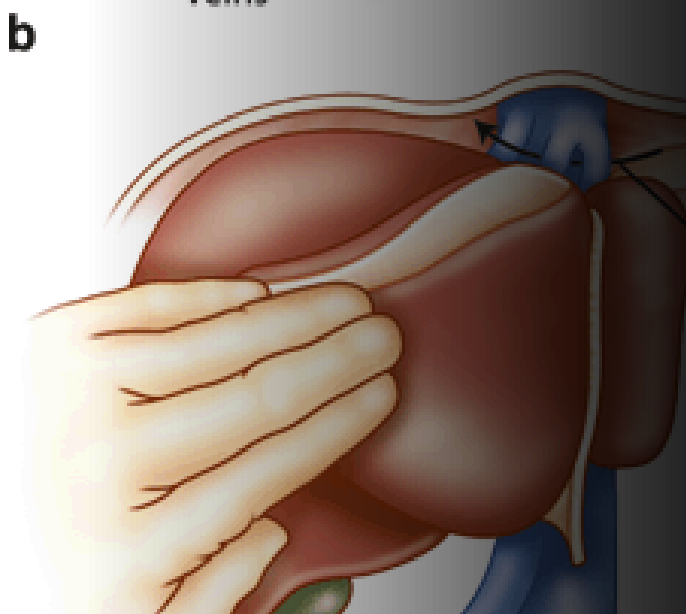


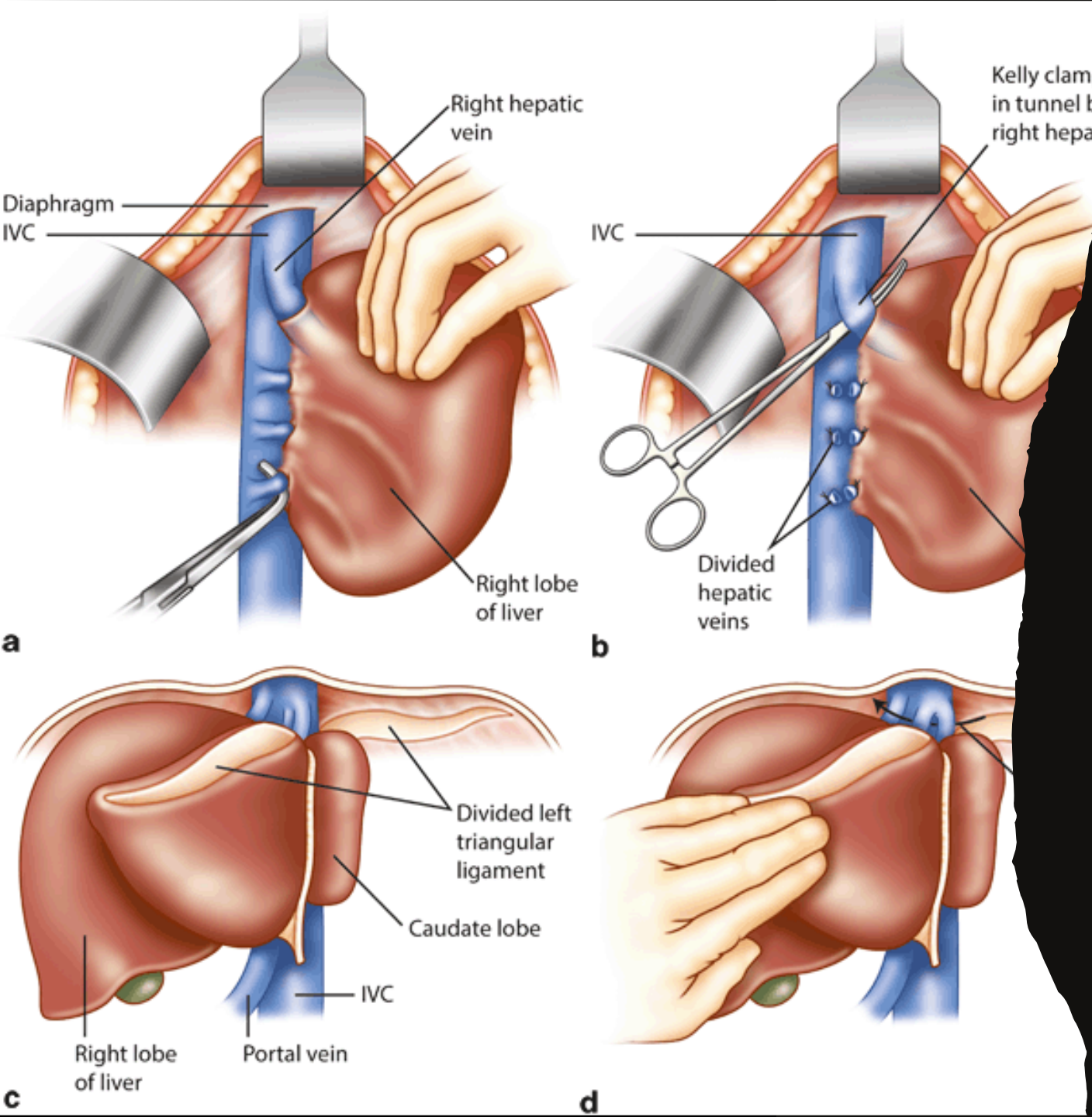


Retrohepatic IVC injuries are often lethal

- Ideal initial management for the bleeding retrohepatic hematoma is packing
- If bleeding cannot be controlled with packing
- Expose…







Retrohepatic IVC injuries are often lethal

- Exposure of the Retrohepatic IVC
  - subcostal extension
  - Add a median sternotomy to gain suprahepatic IVC control
  - Hepatic vascular exclusion if necessary

Suprahepatic IVC

- The intra-abdominal IVC
  - short
- Intrathoracic IVC injuries
  - intra-pericardial
  - present as pericardial tamponade

Damage Control

The patients with IVC injuries
- Acidotic
- Coagulopathic
- hypotensive

These injuries are rare

Patients often have multiple injuries

Damage Control

- Patient will not tolerate time-consuming repairs
- Requires a rapid decision
  - ? damage control procedure v. definitive repair
- Abandon a repair that is taking longer than expected and convert to a damage control

Damage Control

Damage control techniques include:

- Ligation
- Shunting
- Packing (for retrohepatic injuries)

Basic Rules

Packing controls 98% of operative liver injuries

Be prepared for the 2% of outliers

Plan: Pack, Pringle, Total vascular exclusion, postop angiograph

Complete the surgery in <1 hr

“Flailing and indecision lead to death” -David Feliciano

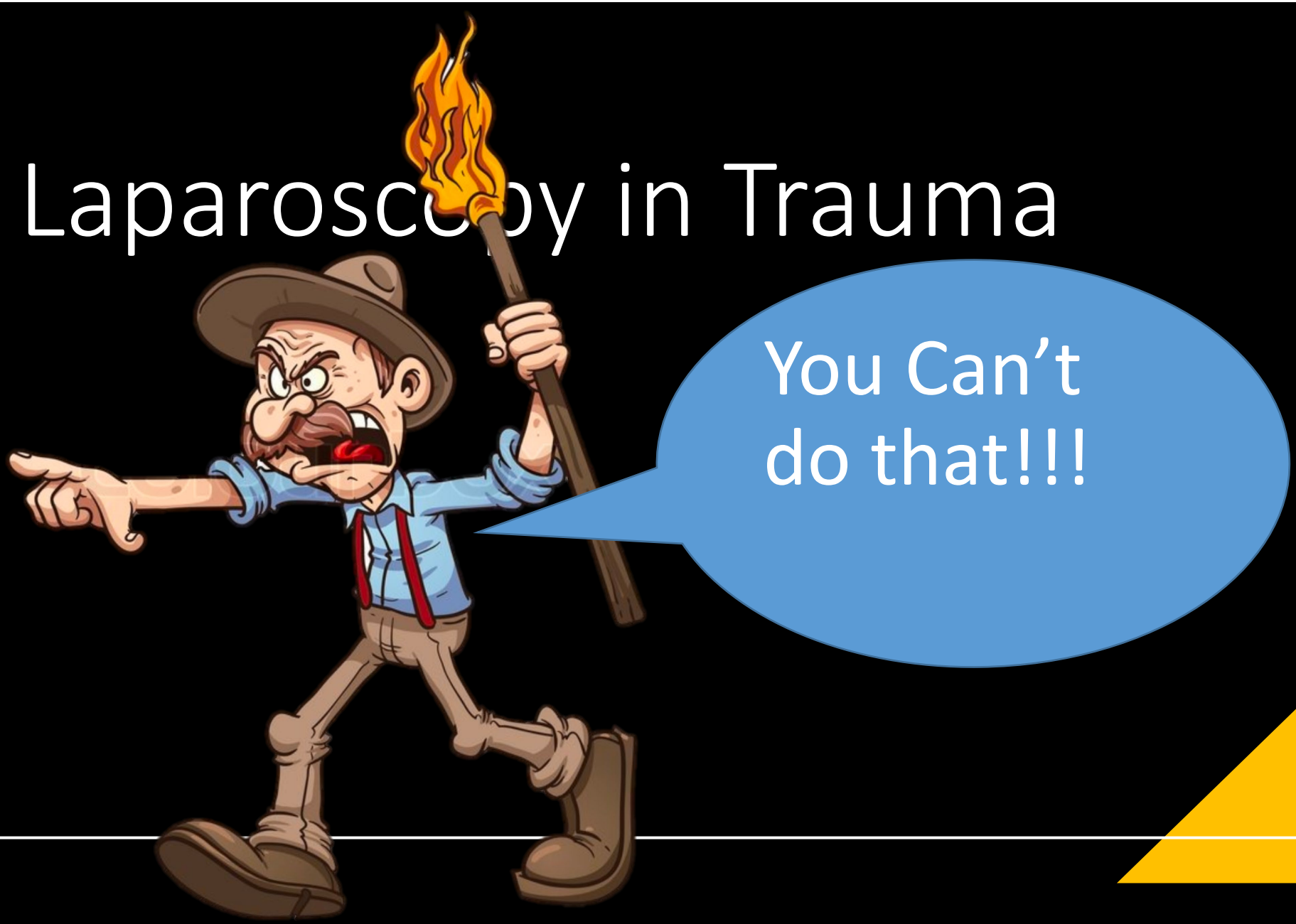
IVC Repair

- Reoperation
- This venorhhaphy must be re-done with a vein patch or graft.
- The IVC is too narrow and will thrombose.
- Surgery can be re-done later.

What about surgery for the stable patients?

- Manage complications

Laparoscopy in Trauma



Laparoscopy in Pediatric Trauma

10 Pediatric Trauma Centers

April 2013 through January 2016

An unplanned secondary analysis

ATOMAC

Pediatric Trauma Research Network

Pediatric Laparoscopy

- 1000 patients, 500 liver injuries in children
- (7%) patients underwent abdominal surgery
  - 3.5% for bleeding 3.4% for peritonitis
- 84% initially underwent a laparotomy
- 16% underwent an initial laparoscopy

Pediatric Laparoscopy

- All laparoscopy patients were hemodynamically stable
- Median time to laparoscopy was 42 hours after injury [IQR: 8, 96]
  - Peritonitis was most common reason
  - 1 of these was 22 hours post laparotomy
  - 2 (20%) converted to laparotomy
- In Phoenix, laparoscopic washout and drain is a common alterative to percutaneous drainage alone

Conclusion

- Most liver injuries don’t require surgery
- Have a pre-defined plan for what constitutes non-operative failure
- Have an operative plan for liver trauma
- Packing is first line treatment; Resuscitate with blood; consider stopping.
- Still bleeding - pringle; expose IVC (last resort)
- Delayed surgery (>48hrs) is often appropriate:
  - Exploration for peritonitis/bowel injury
  - Peritonitis/Fever/Compartment syndrome
  - Washout of pelvis
  - Control or drainage bile leak
  - Debride devitalized liver
  - Avoid re-starting liver hemorrhage

Thank you

PHOENIX CHILDREN'S Hospital

Pro-Con Debate: Management of Grade 5 Liver Injuries: Nonoperative Management

Ronald M. Stewart, MD FACS

UT Health San Antonio

July 12, 2023

UT Health San Antonio

University Health System

Disclosure

- Nothing to Disclose

The Committee on Trauma


Western Pediatric Trauma Conference


Fairmont
SONOMA MISSION INN & SPA

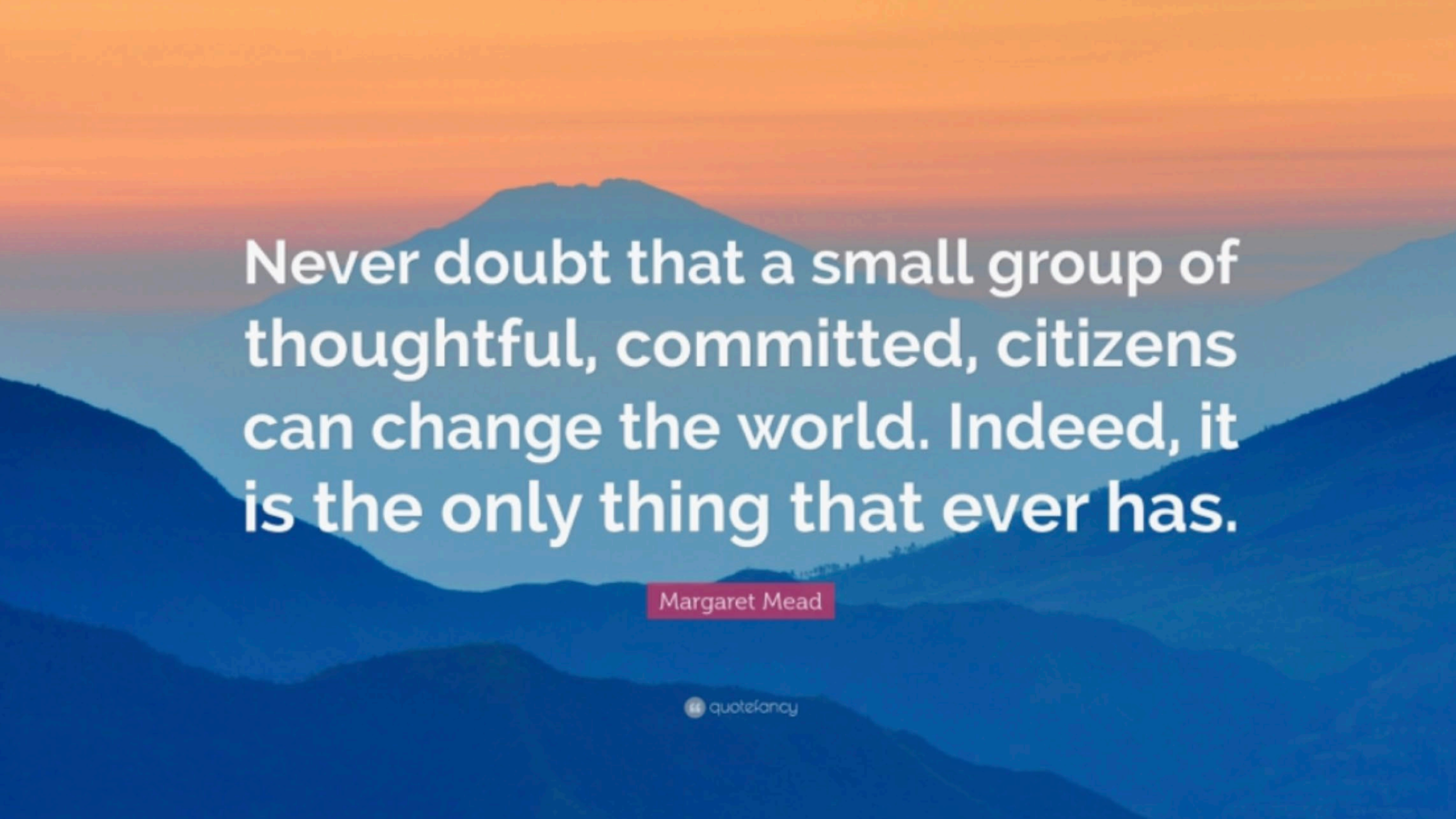

Fairmont
SONOMA MISSION


the girl & the fig
COUNTRY FOOD WITH A FRENCH PASSION


Fairmont
SONOMA MISSION INN & SPA


The Path Forward
Equality vs. Equity vs. Social Justice
REALITY
EQUALITY
EQUITY
SOCIAL JUSTICE


Thank You!!
WESTERN PEDIATRIC TRAUMA CONFERENCE
WESTERN PEDIATRIC TRAUMA CONFERENCE


Never doubt that a small group of thoughtful, committed, citizens can change the world. Indeed, it is the only thing that ever has.
Margaret Mead
quotefancy

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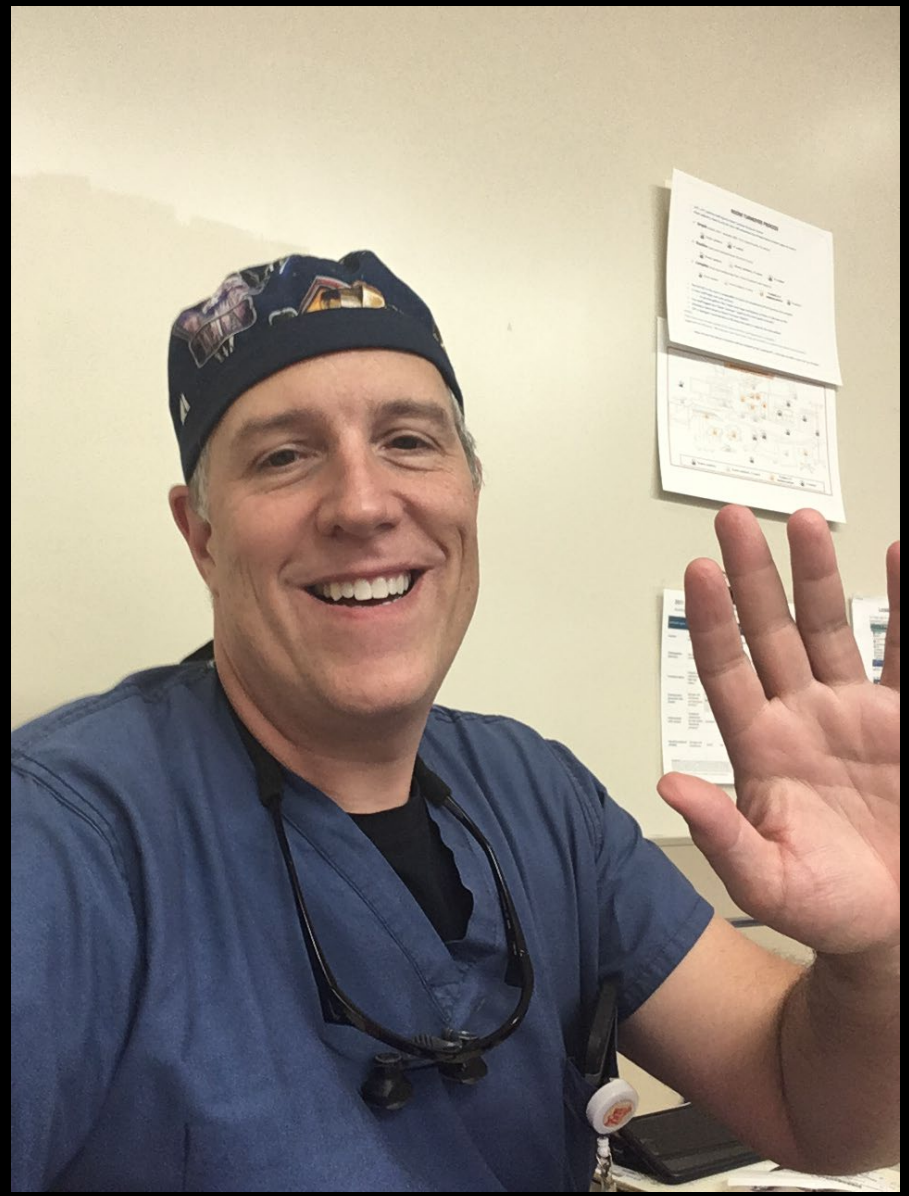
Dr. David M. Notrica

- Co-founder of Western Pediatric Trauma Conference
- Internationally recognized Pediatric Surgeon
  - Focus on Pediatric Trauma Care
  - Expert on Pediatric Liver Trauma
- Leader of Phoenix Children's Pediatric Trauma Program
- Founder of ATOMAC
- Approximately 90% of WPTC Attendees are from Phoenix Children's ☺

Google Scholar

David M Notrica

Phoenix Children's Hospital
Verified email at phoenixchildrens.com




PHOENIX CHILDREN'S
Hippie

ANNALS OF SURGERY
Vol. 221, No. 6, 744–755

Nonoperative Management of Blunt Hepatic Trauma Is the Treatment of Choice for Hemodynamically Stable Patients

Results of a Prospective Trial

Martin A. Croce, M.D.,* Timothy C. Fabian, M.D.,* Paul G. Menke, M.D.,†
Lynda Waddle-Smith, R.N.,* Gayle Minard, M.D.,* Kenneth A. Kudsk, M.D.,*
Joe H. Patton, Jr., M.D.,* Michael J. Schurr, M.D.,* and F. Elizabeth Pritchard, M.D.*

From the Presley Regional Trauma Center, Departments of Surgery and Radiology,† University of Tennessee-Memphis, Memphis, Tennessee*

Timothy Fabian

Professor of Surgery, University of Tennessee
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trauma

FOLLOW

TITLE	CITED BY	YEAR
Transfusion of plasma, platelets, and red blood cells in a 1: 1: 1 vs a 1: 1: 2 ratio and mortality in patients with severe trauma: the PROPPR randomized clinical trial JB Holcomb, BC Tilley, S Baraniuk, EE Fox, CE Wade, JM Podbielski, ... Jama 313 (5), 471-482	2114	2015
Enteral versus parenteral feeding. Effects on septic morbidity after blunt and penetrating abdominal trauma. KA Kudsk, MA Croce, TC Fabian, G Minard, EA Tolley, HA Poret, MR Kuhl, ... Annals of surgery 215 (5), 503	1502	1992
Prospective study of blunt aortic injury: multicenter trial of the American Association for the Surgery of Trauma TC Fabian, JD Richardson, MA Croce, JS Smith, G Rodman, PA Kearney, ... Journal of Trauma and Acute Care Surgery 42 (3), 374-383	972	1997
Nonoperative management of blunt hepatic trauma is the treatment of choice for hemodynamically stable patients. Results of a prospective trial. MA Croce, TC Fabian, PG Menke, L Waddle-Smith, G Minard, KA Kudsk, ... Annals of surgery 221 (6), 744	678	1995
Blunt carotid injury. Importance of early diagnosis and anticoagulant therapy. TC Fabian, JH Patton Jr, MA Croce, G Minard, KA Kudsk, FE Pritchard Annals of surgery 223 (5), 513	601	1996

Nonoperative management of blunt liver and spleen injury in children: Evaluation of the ATOMAC guideline using GRADE

David M. Notrica, MD, James W. Eubanks III, MD, David W. Tuggle, MD, Robert Todd Maxson, MD, Robert W. Letton, MD, Nilda M. Garcia, MD, Adam C. Alder, MD, MSCS, Karla A. Lawson, PhD, Shawn D. St Peter, MD, Steve Megison, MD, *and* **Pamela Garcia-Filion, PhD, MPH,**
Phoenix, Arizona

Google Scholar

David M Notrica

Phoenix Children's Hospital
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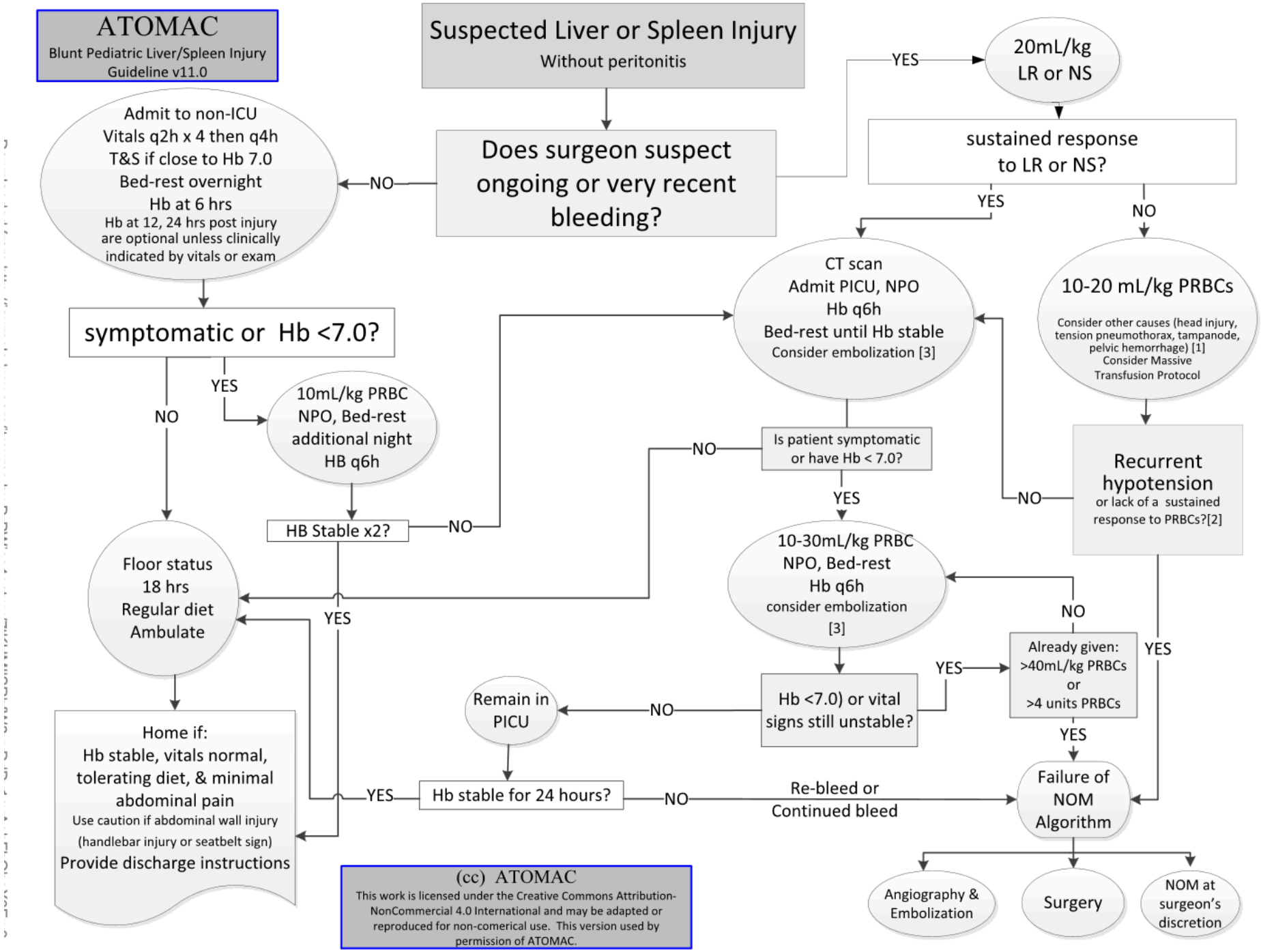
FOLLOW

TITLE	CITED BY	YEAR
Current management of pectus excavatum: a review and update of therapy and treatment recommendations D Jaroszewski, D Notrica, L McMahon, DE Steidley, C Deschamps The Journal of the American Board of Family Medicine 23 (2), 230-239	275	2010
Nonoperative management of blunt liver and spleen injury in children: evaluation of the ATOMAC guideline using GRADE DM Notrica, JW Eubanks III, DW Tuggle, RT Maxson, RW Letton, ... Journal of Trauma and Acute Care Surgery 79 (4), 683-693	145	2015
Blunt traumatic occult pneumothorax: is observation safe?—results of a prospective, AAST multicenter study FO Moore, PW Goslar, R Coimbra, G Velmahos, CVR Brown, ... Journal of Trauma and Acute Care Surgery 70 (5), 1019-1025	135	2011


ATOMAC
Blunt Pediatric Liver/Spleen Injury Guideline v11.0
Suspected Liver or Spleen Injury
Without peritonitis
Does surgeon suspect ongoing or very recent bleeding?
NO
Admit to non-ICU
Vitals q2h x 4 then q4h
T&S if close to Hb 7.0
Bed-rest overnight
Hb at 6 hrs
Hb at 12, 24 hrs post injury are optional unless clinically indicated by vitals or exam
symptomatic or Hb <7.0?
NO
YES
10mL/kg PRBC
NPO, Bed-rest
additional night
HB q6h
HB Stable x2?
NO
YES
Floor status
18 hrs
Regular diet
Ambulate
Home if:
Hb stable, vitals normal, tolerating diet, & minimal abdominal pain
Use caution if abdominal wall injury (handlebar injury or seatbelt sign)
Provide discharge instructions
YES
20mL/kg
LR or NS
sustained response to LR or NS?
YES
NO
CT scan
Admit PICU, NPO
Hb q6h
Bed-rest until Hb stable
Consider embolization [3]
10-20 mL/kg PRBCs
Consider other causes (head injury, tension pneumothorax, tampanode, pelvic hemorrhage) [1]
Consider Massive Transfusion Protocol
Is patient symptomatic or have Hb < 7.0?
NO
YES
Recurrent hypotension
or lack of a sustained response to PRBCs?[2]
NO
YES
10-30mL/kg PRBC
NPO, Bed-rest
Hb q6h
consider embolization [3]
Hb <7.0) or vital signs still unstable?
NO
YES
Remain in PICU
Already given:
>40mL/kg PRBCs
or
>4 units PRBCs
NO
YES
Hb stable for 24 hours?
YES
NO
Re-bleed or Continued bleed
Failure of NOM Algorithm
Angiography & Embolization
Surgery
NOM at surgeon's discretion
(cc) ATOMAC
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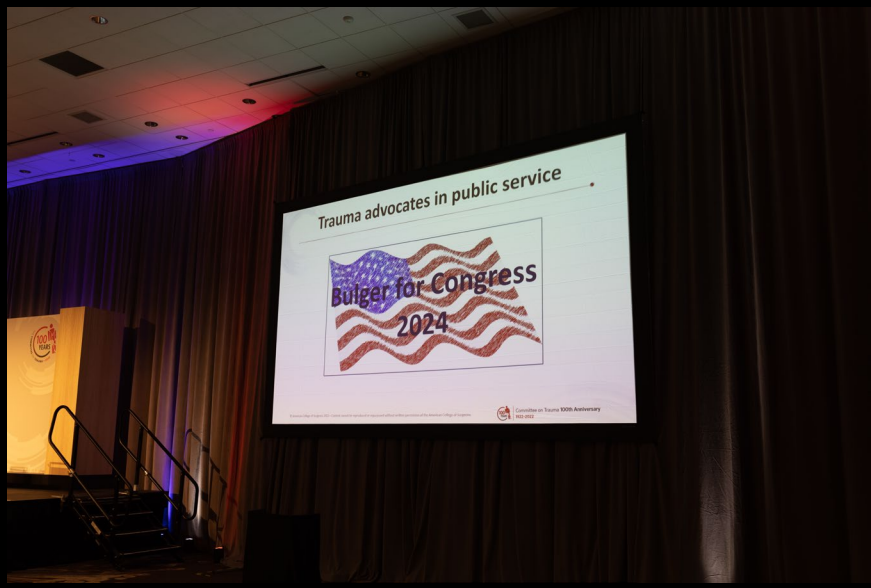
Pediatric Surgeons of Phoenix


100
100
100


Trauma advocates in public service
Bulger for Congress
2024

We hold these truths to be self evident, that all patients with abdominal trauma shall be treated based on their clinical condition, not their Grade. Those without signs of shock or peritonitis do not require an emergency operation, regardless of Grade, especially children and infants. If the injury looks "really bad," ie an AAST Grade 5 Injury, Fear not, for the patient may be ok if you do nothing more than watch them improve.

Don't just do something, stand there, and strongly consider following one of Dr. Notrica's nonoperative guidelines, for they are numerous and readily available. Be aware: Sometimes this is simnple, but sometimes not.

Nonoperative Solid Organ Management

- Spleen – less complex
- Liver
- Kidney

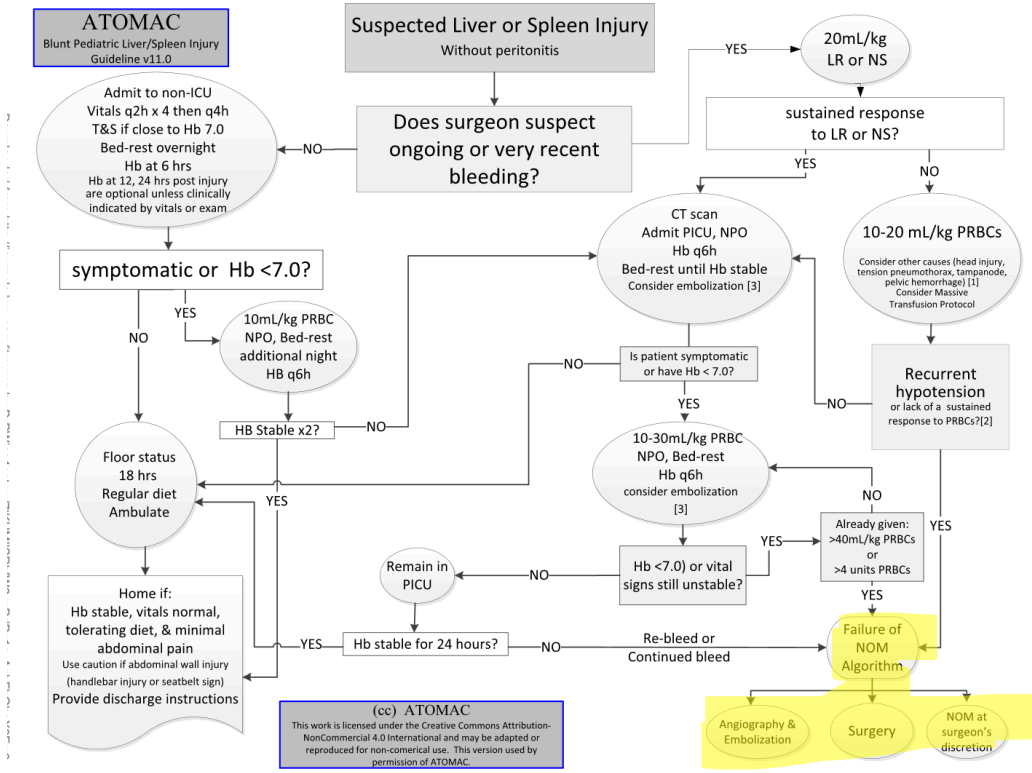
Almost All Blunt Liver Injuries Managed Nonoperatively

Nonoperative Management of Severe Liver Injuries in Children (And Adolescents and Adults)

- Inclusive, multidisciplinary, multimodal with clear understanding of capability
  - Surgeons, pediatric ICU team, pediatric emotional support, hybrid operating room, interventional radiology, advanced interventional GI, complex liver surgical team, ie liver transplant
- Often complex – sometimes more complex than operative management
- Upfront discussion with parents/family early in care
  - Informed discussion regarding nonoperative approach
  - General discussion regarding potential need for interventions
    - Percutaneous and endoscopic interventions
    - Operative intervention
    - Discussion of likely time course of therapy—sometimes a relatively long process
    - Individualized based on anatomy
    - Complex and sometimes gray– goals of discussions are for common understanding and shared goals and when to proceed with operative management

Common Challenges of Managing Severe Liver Trauma Nonoperatively

- Rare
- Ongoing bleeding/Risk of ongoing bleeding
- High energy mechanism associated with risk of other complex, often rare injuries
  - Occult cervical spine injury
  - Blunt vascular injury including blunt aortic injury
  - Occult hollow visceral injury
  - Gallbladder rupture/avulsion
- Bile leak from intrahepatic biliary tree
- Hemobilia
- Child and family emotional support



Our Experience

- Inclusive, interdisciplinary care allows extension of non-operative management of high-grade liver injury
- Ongoing bleeding can usually be safely managed with angioembolization as can hemobilia when present
- Bile leak is common and can be identified early with HIDA
  - Percutaneous drainage of bile leak can prevent bile peritonitis
  - ERCP with transphincteric stent reduces bile leak
  - External and internal drainage often needed with operative as well as nonoperative management

Registry Review of Experience Grade 5 Liver Injuries over 5 years (5 for 5)

- 15 children and adolescents (< 18 years of age)
  - 11 children
  - 4 adolescents
  - 8 male, 7 female
- 13 blunt injuries, 2 penetrating
- 9 had exploratory laparotomy (60% -- 100% of penetrating, 54% blunt)
  - 5 of these had combined angiography (4 with intervention)
- 6 treated without laparotomy
  - 3 with intervention
- Median Length of Stay – 19 days
- No deaths

Nonoperative Management

- Initial approach for all patients with blunt liver injury who respond to resuscitation and do not have peritonitis
- Complex and critically ill group of children
- About ½ of children and adolescents with blunt injury treated without exploratory laparotomy
- Multidisciplinary, multimodal care allows safe management of high grade liver injury


Thank You!

Prometheus bound: Evolution in the management of hepatic trauma—From myth to reality

H. Leon Pachter, MD, *New York, New York*