The Future of Trauma Care

Is it a river of dreams?

Or an endless torrent of challenge?

How we got here
Trauma systems
Healthcare
Where we need to go
Population management
Collaborative research
Prevention

J. J. Tepas III MD, FACS, FAAP
Jobs, Jobs, Jobs!
Elder Poverty
Social Security   but no health coverage

AMA
AMERICAN MEDICAL ASSOCIATION

Socialized Medicine!
Regulate Doctors’ Fees

Poor health of conscripts
Enlarged labor force –GM 1950
Korean Conflict

• Air Ambulances
• Return to Larrey (MASH)

• Vascular Repair
• ARF (Acute Renal Failure)
Artisastra (250 BCE)

Shalyahara
"The hospital shall keep all patients, men and women, until they are completely recovered. All costs are to be borne by the hospital whether the people come from afar or near, whether they are residents or foreigners, strong or weak, rich or poor, employed or unemployed, blind or sighted, physically or mentally ill, learned or illiterate. There are no conditions of consideration and payment; none is objected to or even indirectly hinted at for non-payment. The entire service is through the magnificence of Allah, the generous one."
Kerr-Mills Act (1960) gave states grants for elderly poor

ElderCare (AMA) expanded Kerr-Mills coverage

BestCare (Aetna) premium subsidies

Wilbur Mills’ “Three layerd Cake”

Medicare Part A – hospitalization
Medicare Part B – physicians fees
Medicaid – state shared coverage of poor

Socialized Medicine!
Regulate Doctors’ Fees
American Medicine’s Finest Hour?

Hospitals: “Allowable” plus 2%

Doctors: “Usual and customary” ????

- Hospitals and nursing homes empowered to assign “fiscal intermediates”
- 80% picked BCBS!

For-profit nursing homes: allowable plus 7.5%

All of a sudden an aspirin cost $10/pill!
From this point on, cost control!!!

CPI 79.7% rise
Hospital costs 237% rise!

**Chrysler:**
- $600 Million for healthcare
- More than for steel and rubber
- Dermatologists twice pay of GPs
  and 25% more than chest surgeons
- Inpatient maternity twice as long as average
- Podiatrists: one toe at a time!
Vietnam Conflict

Air Ambulances unopposed

ARF solved (Shires/Moyer)

New problem: Danang lung
Civilian Trauma Systems
Does a hemorrhoidectomy really need an open heart pump?

Diagnosis Related Groups
“It’s hard to believe that once there was a time—even in this century—when retirement was nearly synonymous with poverty, and older Americans died in our streets.”

WJC, 9/22/93

1,342 pages of undecipherable technical jargon

Harry and Louise take to the airwaves

*Republicans: against employer mandate, favor individual mandate!*

1996 HIPAA – limit coverage denial
1997 SCHIP – uninsured children
Evolution of a Trauma System

**Determine Need**

- Establish Authority
- Define Criteria
  - Franchise ➤ Accountability
- Verify ➤ Designate
- Manage:
  - Ongoing needs assessment
  - Fiscal Solvency
  - Outcomes

Injury still the *major childhood killer*

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Number of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>25000</td>
</tr>
<tr>
<td>Congenital</td>
<td>5000</td>
</tr>
<tr>
<td>Cancer</td>
<td>1000</td>
</tr>
<tr>
<td>Cardiovasc</td>
<td>1500</td>
</tr>
<tr>
<td>Infection</td>
<td>2000</td>
</tr>
<tr>
<td>Respiratory</td>
<td>2500</td>
</tr>
</tbody>
</table>

Number of Deaths

Injury: 25,000
Congenital: 5,000
Cancer: 1,000
Cardiovascular: 1,500
Infection: 2,000
Respiratory: 2,500
What do we have now?

- Fee for service
- Managed Care
- Managed competition
- Uncontrolled cost
- Pseudo standards of care
- Complexity hiding transparency
Over The Last Twenty Years

- Documentation
- Expectation
- Administration

Cost vs. Service

- Payment
- Profit
- Inefficiency
- Bill
- Obfuscation
- Insurers
Low Income Pool STC 1115 Medicaid Waiver

IGTh= capable hospitals, Selected by some basis “contribute” $436.9M

FMAP draw = $563.1M

$1 B LIP

Special LIP $98.8M

LIP 4:
$501M to IGTh (14.6% allocation)
$300M non IGTh

LIP 5: $40M

BTL $60M

Comment:
1. Very simplistic
   • Does not address exemption/buyback ratio
   • Does spread the pain somewhat
   • Implies that that much IGT is available and the rest would be used for exemption/buybacks “outside the model.

Change:
Special LIP 1.5% cut
LIP5 33% cut
Allocation 14.6%
What have we lost?

- Leadership
- Sense of mission
- Public Trust?
Where we are:

Last Year

- 129.8 million ED visits
- $2.9 trillion spent on healthcare (up 3.8%) now 18% GDP
- $26 billion spent by Medicare on readmissions
- $1 trillion projected drug expenses.
The Numbers

- 70% of cost consumed by 10% with chronic disease.
- One of three terminal patients use up all savings.
- 40% percent of Medicare $ used in last month of life (cost of TSA for 1 year)
Leapfrog estimates that up to 440,000 American die each year from preventable hospital errors. “We are burying a population the size of Miami every year from medical errors that can be prevented,” says Leah Binder, president and CEO at Leapfrog. “A number of hospitals have improved by one or even two grades, indicating hospitals are taking steps toward safer practices, but these efforts aren’t enough.”

Leapfrog added two new measures to the Fall survey: Catheter-Associated Urinary Tract Infections and Surgical Site Infections for the Colon. Combined, these infections result in 18,000 annual deaths, according to the organization. In total, 28 measures of publicly available hospital safety data were used to calculate a hospital’s overall safety rating. The scores are available at hospitalsafetyscore.org.
FAILURE IS NOT AN OPTION

“They” cannot do it without us. “They” would like to ‘contract’ our services. We are the providers of care. We are the drivers of quality. If we lead in quality, our services will be recognized and valued. If we do not engage, we will become a commodity.
Time For A Paradigm Change

• Uncontrolled System Complexity
• Proliferating Subspecialty Silos
• Workforce Shortage
Blind Men Designing A Unicorn

Purchasers (public and private)
  Control cost

Consumer
  Navigate a jungle

Insurers (private)
  Must avoid risk pool pollution

Clinicians
  Must address reimbursement cuts and improve clinical quality

- Co-pay
- Co-insurance
- Deductible
- Cap
Cuts to Existing FFS System
• Market basket reductions
• DHS cuts
• Nonpayment for anything *preventable* or *unnecessary*.

Transform Existing System
• Bundled Payments
• Innovation Center Demonstrations
• Accountable Care Organizations

Track 1

Track 2
A few details
The Future of Pediatric Trauma Care

Are there really barriers to success?

- Trauma Systems
- Research
- Brain Care
- Prevention

These are the pillars of success!
Horizontal Database

Patient X

ED → Trauma Service → Brooks Rehab → BSCIP

Pre-Hosp

DHSMV

Expert Analysis JPICS

PI
Trauma Systems

“If you build it, they will come” DOES NOT APPLY!

Wrong mix
Dilution of experience
Duplication of expense

58 L1; 44 PTRC
24 L2; 21 PTRC
65; 41 out
14 New PTC
Research

CER (Death Panels)
Multi-institutional Studies
Basic Science
Geo-mapping

Care of the Child with TBI

HTS Data
240 doses in 22
patients with severe
TBI (within 96 hours of injury)

<table>
<thead>
<tr>
<th>Method</th>
<th>Method</th>
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<tbody>
<tr>
<td>N = 118</td>
<td>6/16</td>
</tr>
<tr>
<td>4% HTS</td>
<td>No Response</td>
</tr>
<tr>
<td>22%</td>
<td>4%</td>
</tr>
<tr>
<td>Mean Decrease</td>
<td>Mean Decrease</td>
</tr>
<tr>
<td>6.2 ± 8.2</td>
<td>8.5 ± 7.6</td>
</tr>
</tbody>
</table>

Pedestrian Crash Density 2002-2004

Legend
- Incident
- St. Johns River
- Atlantic Ocean
- Donal co.
- Density
- Level
- Low
- Medium
- High
- Very High

αII-Spectrin is a part of the TBI degradome
Traumatic Brain Injury

- Incidence: 200/100,000 population
- Severe TBI: 50,000 cases/year
- Mortality: 30% (1 person every 30 minutes)
- Many survivors demonstrate long term disability

Narayan, 2002
What happens to the brain cells after TBI?
Traumatic Brain Injury

• *Excitatory Imbalance*
• *Perfusion Anomaly*
  • ICP/CPP
  • BBB permeability - autoregulation
• *Pro-inflammatory Cytokine Cascade*

*Immediate receptor blockade*
*Pre-emptive management of S.I.R.S.*
Biomarker Mapping

Cell Type ~ Neuron or Glial
Process – Necrosis or Apoptosis
Cell locus-body, axon or synapse
**Injury Control:** The Surgical Perspective

**In Practical Terms:**
- Understanding the global stress response
- Orchestrating multiple disciplines
- Optimizing recovery:
  - Aggressive neurocare
  - Precise fluid management
  - Effective ventilator care
  - Adequate nutritional care

<table>
<thead>
<tr>
<th>Paralytic</th>
<th>Abx</th>
<th>Steroid</th>
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<tbody>
<tr>
<td>Analgesic</td>
<td></td>
<td>Pressor/Pent</td>
</tr>
<tr>
<td>Sedation</td>
<td></td>
<td>Ulcer Prophylaxis</td>
</tr>
<tr>
<td>Seizure Prophylaxis</td>
<td></td>
<td>Diuretics</td>
</tr>
</tbody>
</table>
PASS A SPUD!

**Paralytics:** Norcuron 0.1mg/kg  
**Analgesic:** MSO4 0.1mg/kg  
**Sedation:** Versed 0.1 mg/kg  
**Seizure Rx:** Fosphentoin/Phenobarb - load and measure  
**Antibiotics:** Carefully!  
**Steroids:** SCI protocol ???  
**Pressors/Pent:** Dopamine 3-20/Pentobarb. 0.5-5mg/hr  
**Ulcer prophylaxis:** Carafate, not Zantac  
**Diuretics:** HTS/Mannitol 0.25-1 gm/kg
Tier 1 Optimizing Homeostasis

Sx/Findings: TBI/CHI
- GCS never <8
- CT findings: no intervention
- HA, emesis, obtunded

Therapeutic goals
- Oxygenation
- Perfusion
- Nutrition

Metrics
- CBC, BMP, Coags,

Risk
- Worsening clinically, missed injury

Tools
- Careful clinical observation, ?Repeat CT
Tier 2 Treating CNS Dysfunction

Sx/Findings: TBI/CHI
- GCS not 15
- CT findings: intervention indeterminate
- Obtunded, confused, perserverating, “frontal”

Therapeutic goals
- Sedation
- Analgesia
- Seizure Pro

Oxygenation
Perfusion
Nutrition (? How)

Metrics
- SaO², CBC, BMP, Coags, I&O, Urine, Levels

Risk
- Ongoing neuronal injury

Tools
- Careful clinical observation,
  Repeat CT, Tube feeds, i.v. pumps,
  monitors, phentoin, Midazolam, morphine (fentanyl), foley

Risk:
- Established
- Device
- Disease
Tier 3 CNS Rescue

Sx/Findings: TBI/CH
- Persistent coma
- CT findings: intervention – monitor craniotomy
- Neuro deficit

Therapeutic goals
- ICP/CPP Sedation Oxygenation
- CMR Analgesia Perfusion
- BBB/autoReg Seizure Pro Nutrition (P)

Metrics
- SaO², CBC, BMP, Coags, I&O, ICP, CPP, EEG

Risk
- Neuronal injury progressing to neuronal death (DI, stroke, etc), sepsis, VAP

Tools
- Careful clinical observation
- Repeat CT, Tube feeds, i.v. pumps, monitors, ventilation, pressors, HTS, Mannitol, Pent. Phentoin, foley

Risk:
- Established
- Device
- Disease
# Critical Management of TBI

## Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SaO²</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>IV</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Analges/Sed</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Foley</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tube feeds</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vent</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICP/EVDD</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTS/Man</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press/Pent</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
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</table>

## Therapies

<table>
<thead>
<tr>
<th>Therapy</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
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<tbody>
<tr>
<td>Paralytics</td>
<td>✓</td>
<td></td>
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<tr>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Seizure Rx</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
<td>Careful!</td>
</tr>
<tr>
<td>Steroids:</td>
<td></td>
<td></td>
<td>Rarely!</td>
</tr>
<tr>
<td>Pressors/Pent</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ulcer pro.</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diuretics</td>
<td></td>
<td>✓</td>
<td>✓</td>
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**Rescue Craniectomy?**
Brain Care

LONG TERM FOLLOW UP
NEURO-COGNITIVE SURVEILLANCE
"CONCUSSION TRAINING"
Imaging: *How To Decide?*

- Ultrasound established in BTT
  - Sonography: First-line imaging study
  - Initial resuscitation phase of care
- BTT in children managed nonoperatively
- Can FAST predict need for laparotomy?
Clinical Data (n=94 children)

- Age (mean) 11.3 years
- M : F ratio 44 : 50
- ISS (mean) 21
- FAST (median) 10.5 minutes
- Mortality 12.8%
FAST: Sens = 33%, Spec = 95%

All FIF Positive

FAST Positive

n = 5

Laparotomy 

n = 1

Conservative Treatment

n = 4

FAST Negative

n = 89

Laparotomy 

n = 2

CT 

n = 19

Nothing Further 

n = 68


FAST: Sens = 33%, Spec = 95%
Sometimes the child will tell you!
Non-op management –
They can measure blood pressure at K-Mart.
YOU need to exclude peritonitis!
THE GUT
What Parents Should Know About CT Scans for Children:
Medical Radiation Safety

What is an X-ray?
X-rays are invisible beams of ionizing radiation that pass through the body and are altered by different tissues to create 2-dimensional images of many organs.

What is a CT scan?
CT scans use x-rays generated from a source that is rotated around the body to create 3-dimensional pictures of the body. CT studies can provide critical information for the care of your child, but obtaining the images results in more radiation exposure for the study than a single X-ray.

How much radiation is used in these exams?
We are all exposed to small amounts of radiation daily from soil, rocks, building materials, air, water, and cosmic radiation. This is called naturally occurring background radiation. The radiation used in X-rays and CT scans has been compared to background radiation we are exposed to daily. This comparison may be helpful in understanding relative radiation doses to the patient.

<table>
<thead>
<tr>
<th>Radiation source</th>
<th>Days background radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>1 day</td>
</tr>
<tr>
<td>Chest X-ray (single)</td>
<td>1 day</td>
</tr>
<tr>
<td>Head CT</td>
<td>up to 8 months</td>
</tr>
<tr>
<td>Abdominal CT</td>
<td>up to 20 months</td>
</tr>
</tbody>
</table>

image gently™
www.imagegently.org
Proposed Algorithm

- Abdominal wall or lower chest bruising.
- Abdominal pain or tenderness.
- Low blood pressure – not shock.

Yes

CT Scan

Yes

No

1. Positive Ultrasound
2. Increased AST/ALT > 200/125.
3. Hematuria > 5 RBC/hpf.

No

Observe

Pediatrictraumasociety.org
As Low As Reasonably Achievable

BAT
- Stable
  - Tender
    - Non Tender
  - Distracted
    - FAST
      - Multiple or severe?
        - Non Specific Fluid
          - Non Renal Injury?
            - CT
              - As Reason Asserts

- Unstable
  - OR

Later

Acutely

A
L
A
R
A

As Low As Reasonably Achievable

A
L
A
R
A

A
L
A
R
A
The Triumph of Reason Over Ritual

Is the patient stable?
- Y
- N

Free Air on Cxr?
- Y
- N

Peritonitis?
- Y
- N

Is the belly tender?
- Y
- N

Bleeding in the belly?
- Y
- N

Patient distracted?
- Y
- N

Clinical Evaluation

FAST

CT

e=expeditious

d=delayed

END
Prevention

How to educate
Who to educate
When to educate
The Future ?
P.P.A.C.A. Abides

- Coverage
- Quality
- Appropriateness
- Patient experience
  - HCAPHS
  - Public Reporting

- Cost
- Confusion Concern

- Choosing Wisely Best Practices

- Engagement
- Evaluation
Bottom Line

We are all in this together!