6. EXPECTATIONS
(Of hospital for EMS)
RESUSCITATION
“Resuscitation” is the most misrepresented concept of the 20th Century
REALLY
Recent Internet Survey

EMS ERRORS
As perceived by Trauma Centers
(December 2015)
Stay & Play vs Load & Go
Perceived Errors by EMS-1

- Not many errors – Most of the time --- EXCELLENT
- Over estimation of burns
- Use of Tourniquets
- Attempted Surgical Airway
Perceived Errors by EMS-2

- Too long at scene
- Needle Thoracentesis
- Too MUCH Crystalloid
- Incomplete communication
- Overuse of spine boards
### Things that:  

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*Note: The list is not exhaustive and may vary depending on the context and specific medical practices.*
This lecture only contains a few of the many EMS controversies.
Con-tro-ver-sy

- prolonged public dispute, strife, argument, debate, wrangle, or contention
- disputation concerning a matter of opinion.
Controversy

- Allows for an orderly evaluation of different points of view
- ALWAYS should be welcomed
Controversy

• Every controversy should lead to a research protocol to produce data
• Future directions based on data
Historic Concept

• “Get the patient in shape so that surgery will be tolerated”

• This is an URBAN LEGEND

(Abandon this concept)
Resuscitation
(Raise the BP)
Raise the BP - Resuscitate

- How?
  - Drugs, fluids, blood, MAST
- Why?
- What happens?
- Is hypotension bad?
- Is hypotension good?
Specific Controversies
Pre-Hospital Transportation
Stay & Play

vs

Load & Go
Pre-Hospital Transportation

- Indications debated
- Interventions debated
- Ground vs air
- Basic vs advanced
- Just who should supervise
Red Lights & Sirens
Ambulance Diversion
Ambulance Diversion

• Why is it done?
• Who profits from diversion?
• Does it benefit patients?
• What happens to patients diverted from trauma centers?
Air Ambulance Transport
Retrospective Meta-analysis of transport times of patients transported by either helicopter or ground based EMS
- Activation time, response time, scene time and transport time(s) defined
- 155,179 patient records evaluated
Helicopter Scene Transport of Trauma Patients with Nonlife-Threatening Injuries: A Meta-Analysis

Bryan E. Bledsoe, DO, FACEP, A. Keith Wesley, MD, FACEP, Marc Eckstein, MD, FACEP, Thomas M. Dunn, PhD, Michael F. O’Keefe, MS

Background: Helicopters have become a major part of the modern trauma care system and are frequently used to transport patients from the scene of their injury to a trauma center. While early studies reported decreased mortality for trauma patients transported by helicopters when compared with those transported by ground ambulances, more recent research has questioned the benefit of helicopter transport of trauma patients. The purpose of this study was to determine the percentage of patients transported by helicopter who have nonlife-threatening injuries.

Methods: A meta-analysis was performed on peer-review research on helicopter utilization. The inclusion criteria were all studies that evaluated trauma patients transported by helicopter from the scene of their injury to a trauma center with baseline parameters defined by Injury Severity Score (ISS), Trauma Score (TS), Revised Trauma Score (RTS), and the likelihood of survival as determined via Trauma Score-Injury Severity Score (TRISS) methodology.

Results: There were 22 studies comprising 37,350 patients that met the inclusion criteria. According to the ISS, 60.0% [99% confidence interval (CI): 54.5–64.8] of patients had minor injuries. According to the TS, 61.4% (99% CI: 60.8–62.0) of patients had minor injuries. According to TRISS methodology, 69.3% (99% CI: 58.5–80.2) of patients had a greater than 90% chance of survival and thus nonlife-threatening injuries. There were 25.8% (99% CI: –1.0–52.6) of patients discharged within 24 hours after arrival at the trauma center.

Conclusions: The majority of trauma patients transported from the scene by helicopter have nonlife-threatening injuries. Efforts to more accurately identify those patients who would benefit most from helicopter transport from the accident scene to the trauma center are needed to reduce helicopter overutilization.

Key Words: Helicopter, Trauma, Prehospital, Overtriage, Overutilization.

J Trauma. 2006;60:1257–1266.
Air Ambulance Issues

- Indications ?
- Used for SEVERE injuries ?
- Time benefit ?
- Survival benefit ?
- Transplant organ recovery ?
- Safety ?
Air Ambulance Issues

- No use guidelines
- >50% patients <24 hr in EC
- INCREASES EMS time
- DECREASES Survival
- Costs > by 20%
- Decreased organ recovery
IS HEMS Safe??

- 264 deaths since 1972
- 35 deaths in 2008
- Per capita the second deadliest occupation
- Greater than 800 services flying today
  - Voluntary guidelines
  - No mandatory NVG or flight path following
Proposed Safety Rules

- Specific indication for USE
- Increased weather minimums and crew rest requirements
- Use of formal dispatch and flight following procedures
- Terrain and crash avoidance systems
- Flight risk evaluation and training programs
“Procedures”
Needle Chest Decompression
Needle Chest Decompression

- Recommended in tension pneumothorax
- No studies to support this practice
- Known complications
- Reported deaths
- Should be analyzed
Action

- Increased complications
- Increased death
- NOT a good splint
- No extra value in pelvic fractures
CHEST TUBES in the Ambulance?
Crycothyroidomy
Crycothyroldomy

- Broad community variation
- Overuse to Underuse
- Unclear as to just when, and why
Hypothermia for Spinal Cord Injury
Hypothermia-Spinal Cord Injury

- ONE single case
- Highly publicized
- 2 liters of a cold crystalloid will not decrease temperature
- Hypothermia in trauma patients has other drawbacks
Cervical Collars
The Reality of it all
the so-called
“in line stabilization”
What is known about Collar stabilization.

• Collars will limit head motion

• In healthy INTACT volunteers.
Internal Decapitation

- Complete, through and through dissociation from front to back
- Ligament Rupture
- Soft Tissue Rupture
Dissociative injuries are susceptible to traction forces
Secondary!!! High cervical quadriplegia

17 Y/O, FEMALE, HIGH ENERGY MVA
Why do these injuries happen?
Acceleration-deceleration
Human Trials

NBDL database
Hypothesis: collar creates distraction?
INTERNAL DECAPITATION
CPR in trauma
Drawing of BLOOD in the ambulance?
EMS ULTRASOUND?
Trauma Lab Panel
Lab Panel

- CBC – no help
- Metabolic panel – no help
- Clotting studies – not needed
- ABGs – maybe
- T&C – yes
- Blood in urine - yes
New ARMY field Tourniquet
Intravenous Hemostatic Drugs?

Did not work out
? Topical Hemostatic Agents ?
“new” topical hemostatic agents still not proven
Crystalloid Fluids (EMS, EC, OR)
Crystalloids
NS, LR, others

- Cause fluid overload
- Cause ARDS
- Cause coagulopathy
- Cause inflammatory response
- Cause immunomodulation
- INCREASE Death & complications
Recognize the patient in need of EMS or EC, or OR “Intervention”

…and who does **NOT** need it
Less than 4% of ALL trauma patients actually need or benefit from “Resuscitation” (Whatever that is) REALLY
More than 90% of ALL trauma patients need NO “Resuscitation”
Walter Cannon
TRAUMATIC SHOCK

WALTER B. CANNON

BY

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OF THE MECHANICAL FACTORS OF ESOPHAGUS,

AND SIMILAR CHANGES IN PAIN, SHOCK,

FEE AND BAG.

SURGICAL MONOGRAPHS

UNDER THE EDITORIAL SUPERVISION OF

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D. APPLETON AND COMPANY

NEW YORK   LONDON

1923
"The injection of a fluid that will increase blood pressure has dangers in itself. Hemorrhage may not have occurred to a marked degree because the blood pressure has been too low to overcome the obstacle offered by a clot."

Cannon – World War I
Less Resuscitation is Best

WWI lessons

• Cannon – JAMA
• “It is wasteful of time, resources and people to give fluid prior to operative control of hemorrhage.”
WW II
Office of the Surgeon General
Office of the Surgeon General, U. S. Army

WWII lessons

• 2 reports
• “BP should not be elevated and fluid not given till operative control of bleeding”
• Do not pop the clot and loose precious blood
1954-1960
CPR
External Cardiac Compression (Elan, Safar, Kouwenhoven)
Fluid 3:1 Rule

- DALLAS
- Original studies
  - Shires, 1963
- Described three isotope model
- Showed extracellular repletion with crystalloid essential for survival

So? Does it work for trauma?
Not Really
The Three to One Rule

• Original studies
  – Shires, 1963

• Described three isotope model

• Showed extracellular repletion with crystalloid essential for survival
Fluid 3:1 Rule

- Developed in “controlled hemorrhage” model
- NEVER tested in people
- Pre-dated EMS and Trauma Systems
- Became “doctrine” without any class I, II, or III data
RESUSCITATION?

Historic Assessment

A - ALL IVs FULL Flow
B - BP higher than normal
C - Chart Looks good

NOW Call Surgeon
HISTORIC

AMAZING

-Patient’s surgery DELAYED until “resuscitated” in EMS, EC, or ICU

This is a NO NO
• Vietnam experience
• Approach to hypotension was 2 large caliber IVs
• Give crystalloid as rapidly as possible.

And NEW Problems happened
Resuscitation Courses

ATLS
ACLS
PALS
(12 others)

Almost identical curriculum
Teach ABCs
Encourage FLUID bolus
Lots of Urban Legends
(Until October 2012)
“Fill the tank”
“Fluid Challenge”

Commonly quoted phrases
Residual, quiet continuing questions

(Did not join bandwagon)
1960s “aggressive fluid administration in uncontrolled hemorrhage resulted in increased mortality”

Permissive Hypotension

- 1980s and 1990s - rodent & swine models of hemorrhagic shock

- Aggressive fluid resuscitation in uncontrolled hemorrhage resulted in increased mortality & morbidity
1994
BIG BOMB
Mattox
Keeping the BP low saves lives – Do NOT POP the CLOT
Permissive Hypotension

- 1994 – 1st clinical evaluation of fluid restriction in uncontrolled hemorrhage

Permissive Hypotension
(Bickel et al)

- 598 patients with penetrating torso injury & systolic BP ≤ 90 mmHg in prehospital setting

- Patients randomized to receive high-volume fluids, or fluids delayed until patient in OR
Permissive Hypotension

• Results:
  – Group Divisions
    • Delayed: n=289
    • Standard fluids: n=309
  – Survival:
    • Delayed: 70%
    • Standard fluids: 62%
  – Complications:
    • Delayed: 23%
    • Standard fluids: 30%

Statistical Significance
Other studies supportive
In-Theater Combat Mortality*

*Slide from Dr. Jane Alexander, DARPA
In-Theater Combat Mortality*

Killed in Action (KIA) in Iraq

12.2%

(Averaged 20% for all wars since Crimean War)

WHAT WAS DIFFERENT IN IRAQ?

*Source – USUHS Symposium March 26, 2004
Redefine RESUSCITATION
Abandon use of Sphygmomanometer
Mental Status

Presence of a pulse
Hypotensive Resuscitation

What BP PEAK is BEST?
What BP Target is BEST?

<80/-

Higher POPS the CLOT
Function of the EC in the “hypotensive” trauma patient
Bypass the EC for the OR
Wave to the patient as they go from ambulance bay to the OR or ICU
NOVEL NEW CONCEPT RAPID OPERATION
EARLY (immediate) aggressive operative (or critical care) intervention
NOVEL NEW FLUID POLICY
Permissive Hypotension

- **Elevation of BP** to pre-injury levels (absent definitive hemostasis) is associated with:
  - Progressive and repeated re-bleeding
  - Hypoxemia from excessive hemodilution
Major NEW Lesson

• Replace blood loss with (FRESH) blood
• Match blood with FFP (1:1)
• For each unit of blood – give 1 unit of platelets (1:1:1)
• RESTRICT crystalloid
Hurdsfield, ND
January 15, 1992
Both arms severed in farm accident
Teen's savvy saves arms torn off in farm accident

HURDSFIELD, N.D. (AP) — A teenager's arms were torn off in a farm accident, but he used a pencil clenched in his teeth to telephone for help and surgeons were able to reattach the limbs, relatives said.

John Thompson underwent surgery at a Minneapolis hospital Saturday. His condition was upgraded from critical to serious but stable, a nursing supervisor said Tuesday.

"His life is still in danger. The doctors are hoping for is that he'll get the use of his arms," said his sister, Kim Blotter. "They don't think his hands will be of use."

Thompson, 18, a senior at Bowdon High School, was home alone grinding feed for pigs Saturday when he got caught in a tractor's power take-off unit. It ripped his right arm off at the shoulder and his left arm off near the elbow. Thompson staggered about 400 yards to his home.

"John tried to get in one door and couldn't," said Lynn Thompson, an uncle. "So he went into the garage and opened the door to the house with his mouth." He kicked in the door to the den, where he picked up a pencil with his teeth and used it to telephone a nearby cousin.

Then he waited for help in the bathroom so he wouldn't bleed on the carpets, the family said.

He remained conscious and probably didn't bleed to death because of shock and the irregular shape of his wounds, Blotter said.

"The ambulance driver found the arms and packed them up," Lynn Thompson said.

The boy's parents, Larry and Karen Thompson, have talked to John, who is kept sedated.
“He did not bleed to death...because he was in shock.”

--Sister of boy with two severed arms
Future Controversies
NEW FIELD Drugs

- Create HYPOTENSION
- Freeze Dried Plasma
- TXA
- Clot busters for STEMI & Stroke
Endovascular Balloons & Stents

- Adaptation of new wave of vascular control & therapy
- Readily adaptable to field and EC use, under surgical supervision
- Balloons & Clamps
Pre-Hospital Damage Control

- Permissive hypotension
- Special new foams & compressors
- Endovascular balloon control
- Do no new harm
  - Harm was done by many early EMS interventions
Pelvic Fixators

• No real evidence to decrease bleeding
• No survival advantage
• Have complications of their own
• No advantage over sheet wrap
Arterial embolization of Pelvic Fx

- 85% bleeding is venous
- Arteriogram usually shows only minor bleeding
- No real EBM to support this tactic
- Often over rated
Trauma Urban Legends

Helicopter as 1st Responder

• Logic for WAR zone
• NO data to support civilian use
• < 40 miles/minutes INCREASE death rate
• 10X the cost of ground ambulance
• Advertising gimmick
• Significant overuse
Trauma Urban Legends

**Interosseous Fluid Infusion**
- Cruel form of iatrogenic trauma
- No data to support tactic in children or adults
- Based on logic the fluid increases BP and elevation of BP increases survival
Trauma Urban Legends

Stabilization at Scene

• Stay & play vs load and go
• Time should be < 5 minutes
• Leads to over treatment
• For critical patients, need an OR, not playing with toys in field or EC
• Fallacy of European system
EM supervision of Trauma EMS

- EMS QA of trauma is a mandatory function of the trauma system
- State, Trauma System, & Trauma center responsibility
- EMS directors often distant from EMS program
- On line & off line supervision
Trauma Urban Legends

Field Rapid Sequence Intubation
• Requires sedation & paralysis
• Frequently overused as an ego trip
• Ties hands of EC surgeons
• Rarely QAed by trauma service
• Should be eliminated
Needle Thoracic Decompression

• Diagnosis of tension pneumothorax is extremely rare
• Needle thoracostomy can cause significant iatrogenic injury
  – Systemic air embolism
  – Pulmonary hematoma
  – Vascular injury
Trauma Urban Legends

Golden Hour

- Term coined by R A. Cowley
- Marketing ploy
- Multiple population based studies, not ONE has found the golden hour
- Time as independent variable probably does NOT influence outcome
CPR for Trauma

- Not intubated - NO survivors after 4 minutes
- Intubated - NO survivors after 10 minutes
- When God puts his hands on, take yours off - recognize death
- CPR a societal HOAX
Trauma Urban Legends

**Esophageal Obturator Airway**

- Interesting concept
- Huge sales market (6 years)
- Esophageal tears common
- 100% aspiration with removal
- NO demonstrated survival advantage
Trauma Urban Legends

Pericardiocentesis

• In ATLS & ACLS courses
• Creates MORE iatrogenic SW of the heart than saves
• Blood often clotted
• SHOULD BE ABANDONED
Surgeons in Field Response

- Misuse of surgery training
- NO data to support this logic
- Probably NO MDs in field should be the rule
- Too much time on hands if surgeons go romping in the field
Rapid Infusers

- 4 types sold
- Logic is to increase BP
- Contributes to cyclic hyper resuscitation and fluid overload
- Required by ACS VRS (bad)
- Makes a nice coat rack
CT of Chest for ACUTE Trauma

- Does NOT provide any useful information which is NOT present on initial chest X-ray
- Leads to other tests
- Blind knee jerk ordering
- Over read by radiologist
- Helical CT even more confusing
Rule

Do not order any test unless the results of that test are going to influence decision making.
rVIIa for Post Trauma Bleeding

- No real prospective randomized studies
- Reported results very mixed with barely marginal differences
- Extremely expensive
- Science needs to be worked out
Clamping of Chest Tubes

• Demonstrates TOTAL lack of knowledge regarding pleural anatomy and physiology
• Only indication-anticipating autotransfusion
• Every chest tube clamping = mandatory QA and required explanation
Splenic Preservation in Adults

- OPSS extremely over rated
- Death from late hemorrhage from spleen still exists
- Splenectomy in adults extremely well tolerated
- Vaccines also over rated in non immunologic compromised patients
Trauma Urban Legends

Subxyphoid Pericardial Window

- Why use an abdominal incision for a chest injury ???
- DUMB concept
- NO prospective randomized studies to support use
- Technical ego trip
- Creates NEW problems
Cardiac Contusion

- Excessively overused term
- No real definition
- Term should be replaced with “blunt cardiac injury, with….”
- Range of cardiac injury not understood or described
Steroids in Spinal Cord Injury

• ALL studies showed NO functional benefit
• Many sponsored by drug firms
• Complications of steroids common
• USE should be immediately STOPPED
NOVEL NEW EVALUATION
Abandon use of Sphygmomanometer
Mental Status

Presence of a pulse
Near Infrared Spectroscopy
...but the question remains?
And

FINALLY

Real life data
Prospective Randomized Research

- Entry – Trauma - BP <90/- in EC
- Exclude: Head injury, >40 yrs
- In the OPERATING ROOM
  - Keep BP mean at 50 mm/Hg
  - Keep BP mean at 65 mm/Hg
“There is nothing more difficult to take in hand, nor perilous to conduct, nor more uncertain in its success than to take the lead in introduction in a new order of things....
...for the innovator has for enemies, all those who have done well under the old and lukewarm defenders those who might do well under the new.”
Disclaimer

• 97.3% of the material presented in this talk is gospel true
• 2.7% was stated merely for effect
You, the listener, do not know which is truth, and which is hyperbole.