Hypotensive Resuscitation For PROLONGED EVACULATION

Time is the Enemy

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Why???

Prevent “Iatrogenic” Exsanguination

Reduce Coagulopathy and Organ Failure

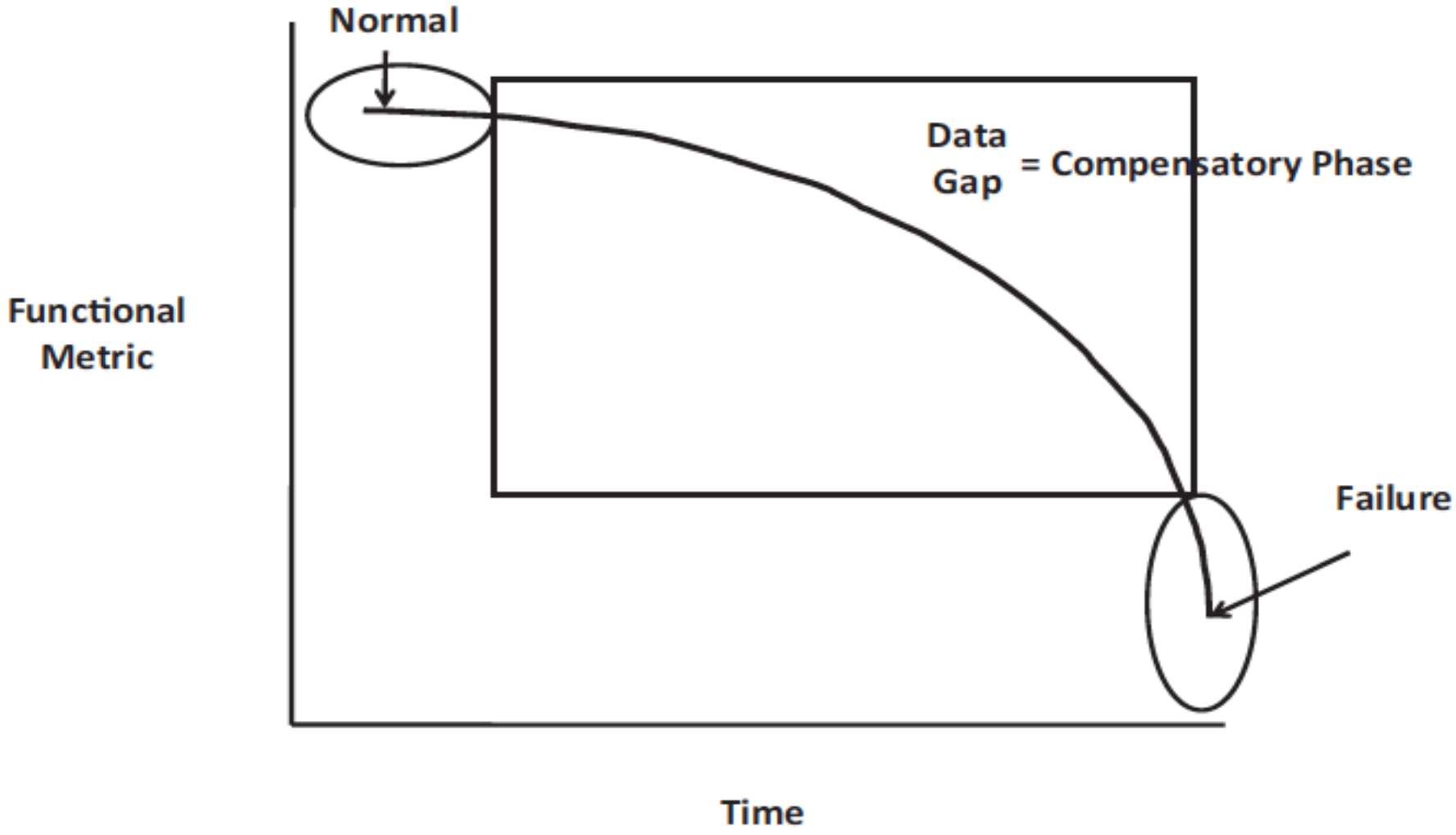
Trade-Off

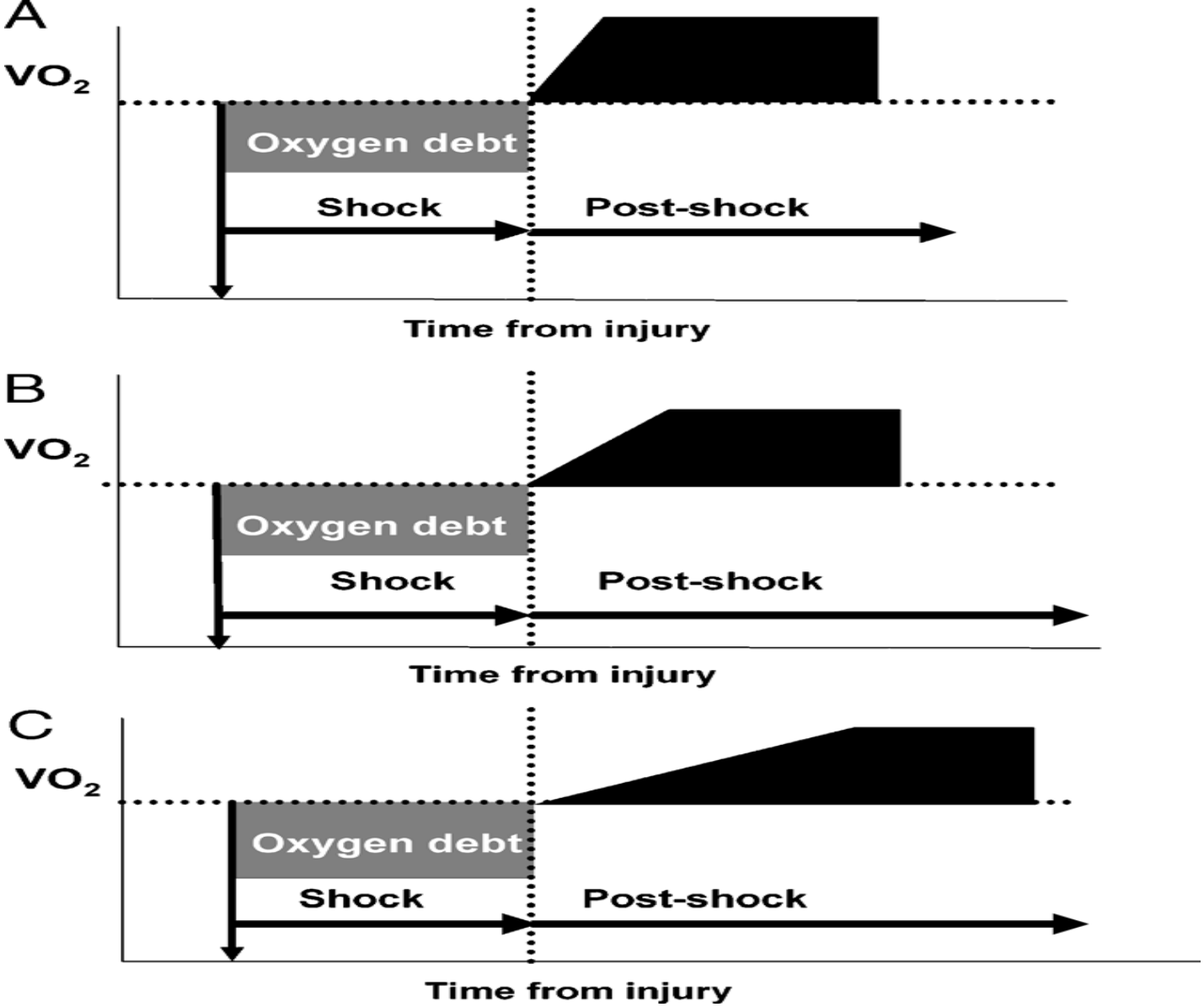
Sudden Cardiovascular Collapse

Irreversible Shock

Worsening Organ Failure

Worsening of TBI


Normal
Data
Gap
= Compensatory Phase
Functional
Metric
Failure
Time



Makes Me Nervous About Hypotensive Resuscitation (Prolonged)

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IMMEDIATE VERSUS DELAYED FLUID RESUSCITATION FOR HYPOTENSIVE PATIENTS WITH PENETRATING TORSO INJURIES

WILLIAM H. BICKELL, M.D., MATTHEW J. WALL, JR., M.D., PAUL E. PEPE, M.D., R. RUSSELL MARTIN, M.D., VICTORIA F. GINGER, M.S.N., MARY K. ALLEN, B.A.,

Table 2. Systemic Arterial Blood Pressure and Laboratory Findings on Arrival at the Trauma Center in Patients with Penetrating Torso Injuries, According to Treatment Group.*

VARIABLE	IMMEDIATE RESUSCITATION (N = 309)	DELAYED RESUSCITATION (N = 289)	P VALUE
Systolic blood pressure (mm Hg)	79±46	72±43	0.02
Hemoglobin (g/dl)	11.2±2.6	12.9±2.2	<0.001
Platelet count ($\times 10^{-3}$/mm^3)	274±84	297±88	0.004
Prothrombin time (sec)	14.1±16	11.4±1.8	<0.001
Partial-thromboplastin time (sec)	31.8±19.3	27.5±12	0.007
Systemic arterial pH	7.29±0.17	7.28±0.15	0.46
Serum bicarbonate concentration (mmol/liter)	20±10	20±11	0.82

The Journal of TRAUMA® Injury, Infection, and Critical Care

Hypotensive Resuscitation during Active Hemorrhage: Impact on In-Hospital Mortality

Richard P. Dutton, MD, MBA, Colin F. Mackenzie, MD, and Thomas M. Scalea, MD

ORIGINAL ARTICLE

Hypotensive Resuscitation Strategy Reduces Transfusion Requirements and Severe Postoperative Coagulopathy in Trauma Patients With Hemorrhagic Shock: Preliminary Results of a Randomized Controlled Trial

C. Anne Morrison, MD, MPH, Matthew M. Carrick, MD, Michael A. Norman, MD, Bradford G. Scott, MD, Francis J. Welsh, MD, Peter Tsai, MD, Kathleen R. Liscum, MD, Matthew J. Wall, Jr., MD, and Kenneth L. Mattox, MD

Big Differences/Questions

- Civilian Urban Trauma Centers
- Good EMS Systems: Rapid response and transport
- Damage Control Resuscitation
- Massive Transfusion Protocols

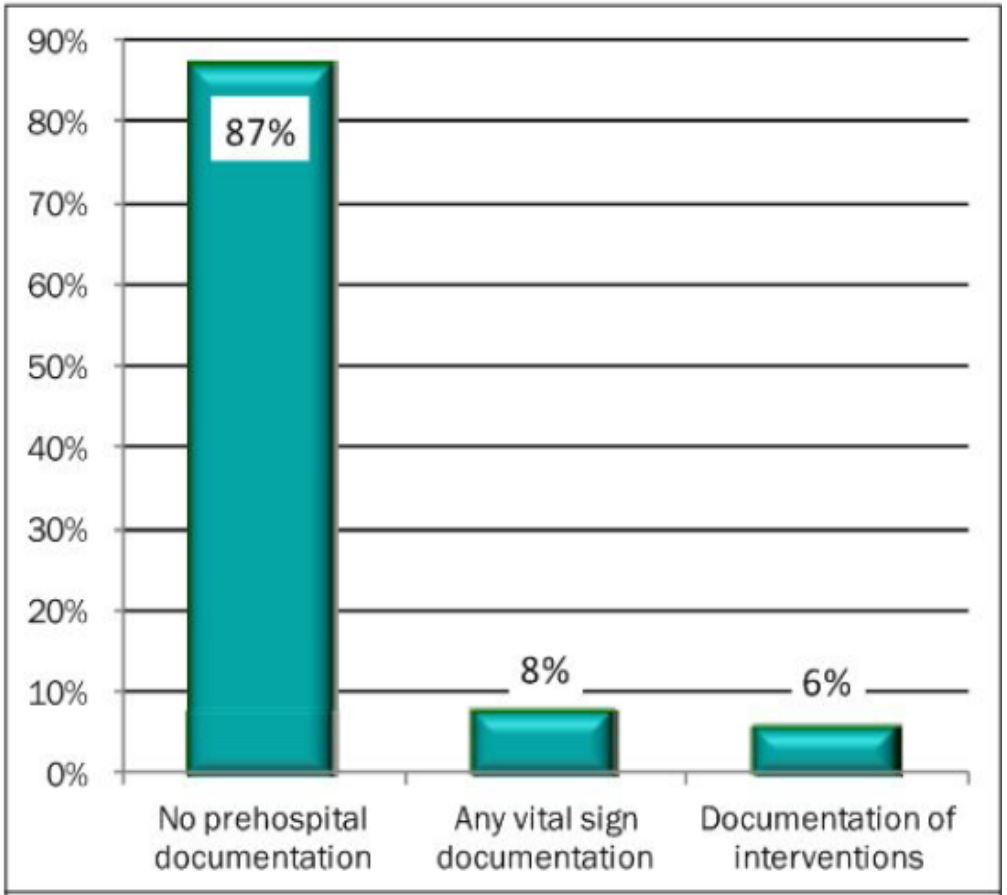
- Probably Why Hypertonic Saline Trial Showed No Difference

Field Issues Impact on Execution

- Following Mental Status
  - TBI vs. Concussion vs. Analgesic effects
  - Need Minimal Coronary and Cerebral Perfusion Pressure
    - Once under it very difficult if not impossible to recover
- For pulse character: What about pain, bradycardic paradox
- Compressible vs. Noncompressible Hemorrhage
  - Penetrating, Blunt, Blast
- Lung Injury and Hypoxemia
- Oxygen Debt Prior to Injury (physical activity)
- Even with In-Field Blood or Plasma what about Blood Pressure Overshoot?

Knowledge and Technology GAPS

We Don't Know What We Don't Know: Prehospital Data in Combat Casualty Care



Prehospital documentation of combat traumatic injuries from August 2007 through March 2010 (n=4,382).
Source: US military Joint Theater Trauma Registry.

COL Brian J. Eastridge, MC, USA
LTC Robert Mabry, MC, USA
COL Lorne H. Blackbourne, MC, USA
CAPT (Ret) Frank K. Butler, MC, USN

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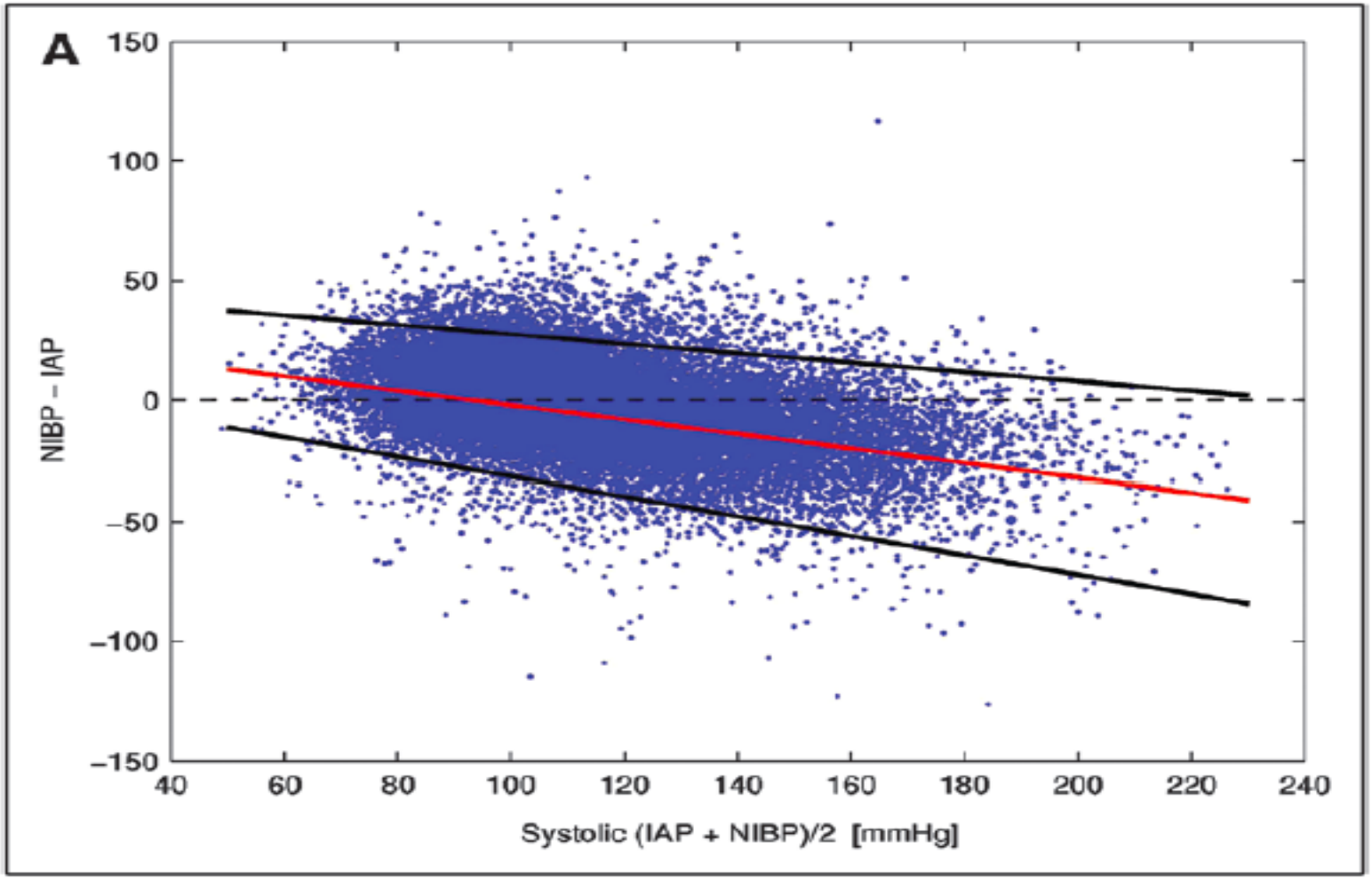
Methods of Blood Pressure Measurement in the ICU*

Li-wei H. Lehman, PhD[1,2]; Mohammed Saeed, MD, PhD[1,2,3]; Daniel Talmor, MD[4];
Roger Mark, MD, PhD[1,2]; Atul Malhotra, MD[5]



Radial Pulse Character Relationships to Systolic Blood Pressure and Trauma Outcomes

TABLE 1. Percentages, Means, Confidence Intervals, and Measures of Association by Radial-pulse-character Group

Variable (Dichotomous)	Normal*	Weak*	OR
Mortality	8/312 = 3% (1%–5%)	8/28 = 29 % (15%–47%)	15.2
Blunt trauma	289/313 = 93% (90%–96%)	21/29 = 72% (54%–84%)	5.2
Intubated	44/312 = 14% (11%–18%)	16/29 = 72% (38%–72%)	7.5
ICU admission	98/292 = 34% (28%–39%)	16/22 = 73% (53%–87%)	5.3
Delayed capillary refill time	6/310 = 2% (1%–4%)	16/28 = 57% (39%–74%)	67.6
Variable (Continuous)	**Normal**	**Weak**	**R^2**
First field SBP (mm Hg)	128 (125–130) $n = 307$	102 (90–114) $n = 26$	0.08
Lowest field SBP	117 (115–120) $n = 308$	84 (74–94) $n = 23$	0.14
First SBP in ED	130 (127–132) $n = 307$	99 (89–110) $n = 20$	0.10
Lowest SBP in ED	112 (108–115) $n = 181$	99 (87–110) $n = 13$	0.02
Field pulse (beats/min)	98 (95–101) $n = 247$	109 (96–121) $n = 22$	0.02
Respiratory rate (breaths/min)	20 (19–21) $n = 282$	19 (15–23) $n = 20$	0.00
Prehospital fluids (mL)	305 (274–339) $n = 298$	757 (533–1075) $n = 27$	0.07

What Would We Need for a Balanced Approach

- New Methods of Hemostasis
- High fidelity Vital Sign Monitor
  - Continuous NIBP
- Metabolic Monitoring
  - StO2, , Lactate, HRV, VO2
- Small volume-Blood-Plasma
- New Metabolic Therapies