




## **Eastern Association for the Surgery of Trauma**

### **Advanced Practitioners in Trauma Workshop**

**January 10, 2012  
Disney's Contemporary Resort  
Lake Buena Vista, Florida**

**Workshop Faculty:**

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John Osborn, MSc*



## EAST AP Workshop

### Fundamentals of Health Care Economics

John B. Osborn, M.Sc.  
Administrator  
Mayo Clinic Trauma Centers

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### Objectives

- Describe supply & demand as it relates to health care services
- Define the current health care market
- Understand how health care is currently financed
- Define basic concepts: e.g., direct costs, indirect costs, margin, etc.
- Discuss role of the individual provider in optimizing financial outcomes

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### Basic Concepts in Health Economics

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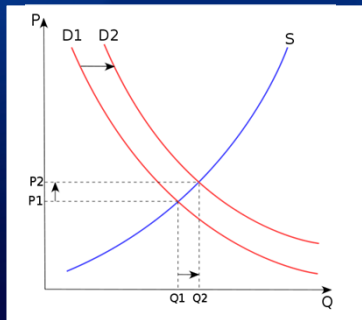
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## Microeconomics 101



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## Health Economics, Brutally Summarized

- I enjoy good health, and I want my health to be as good as possible for as long as possible
- I start life with a finite stock of health. Over time, my stock of good health naturally decreases.
- Medical care can increase my stock.
- My *demand* for medical care is based upon my *desire for good health*



Grossly simplified from Grossman (1972), J Pol Econ 80:2\*  
\* not for the faint of heart

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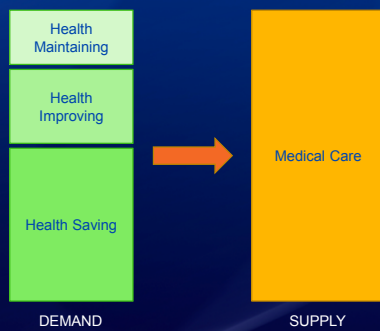
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## Health Economics, Brutally Summarized



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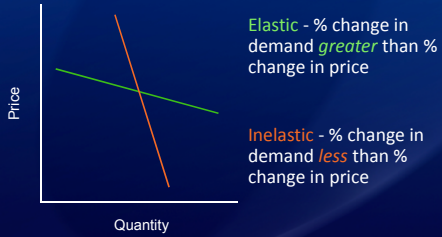
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## Microeconomics 201

- Elasticity: how much demand or supply changes in response to a change in one of its drivers



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## Health Economics, Continued

- The demand for health care is inelastic - a 1% increase in price results in a 0.17% decrease in demand
  - Patients will seek care much more on the basis of their desire for good health
- The demand for health insurance, however, is elastic – a 1% increase in premium results in a 1.8% decrease in enrollment
  - Consumers are more sensitive to increases in the cost of their coverage



Ringel et al (2005), *The Elasticity of Demand for Health Care*, RAND Health

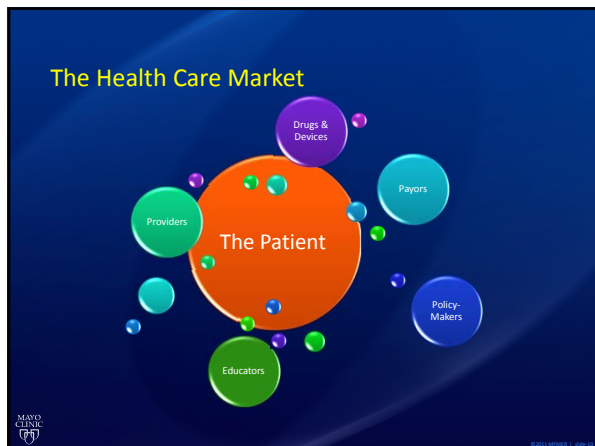
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## The Health Care Market



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- ### Health Care Finance
- In the United States, health care is financed by a *third-party payer* system
    - Consumers minimize their individual risk of expense by purchasing insurance
    - Insurers pool the risk of their subscribers and set premiums to cover expected expenditures
  - Rapidly increasing health care expenditures have spawned the development of insurance schemes designed to manage cost
    - Manage the market (HMO)
    - Provide incentives (PPO)

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- ### Health Care Finance
- Three primary third-party payment models
    - Conventional fee-for-service plans
    - Health Maintenance Organizations
    - Preferred Provider Organizations
  - Hybrid models have developed
    - Point-of-Service plans
    - Health savings accounts

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### Health Insurance Options

- Conventional Fee-for-Service (FFS) Plan
  - Providers reimbursed for services provided, at contracted levels
  - Beneficiaries choose provider
  - May or may not include cost-sharing
- Health Maintenance Organization (HMO)
  - Prepaid, fixed-fee health coverage
  - Providers are employed or contracted
  - Beneficiaries receive all care “in-network”



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### Health Insurance Options

- Preferred-Provider Organization (PPO)
  - Fee-for-service coverage
  - Providers agree to contractual discounts
  - “Non-network” care is subject to greater cost-sharing by beneficiary
- Point-of-Service (POS) Plan
  - Either pre-paid or fee-for-service
  - Beneficiaries designate their own “primary provider” from among “participating” providers
  - Greater out-of-pocket expense for care from “non-participating” providers



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### Health Insurance Options

- High-Deductible Health Plans with Savings Option (HDHP/SO)
  - Deductible at least \$1,000
  - Eligible for Health Savings Account (HSA) or Health Reimbursement Arrangement (HRA)
    - HSA: beneficiary-funded, portable
    - HRA: employer-funded, tied to employment
  - Emerging product in past few years



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## Health Insurance Options

- Insurance Terminology
  - Premium
    - Annual payment for coverage under plan
  - Deductible
    - Annual out-of-pocket expense before coverage benefits begin
  - Co-payment
    - Fixed out-of-pocket cost for certain covered services
  - Co-Insurance
    - Out-of-pocket cost for certain covered services, at a fixed percentage of the charge



REUTERS/REUTERS

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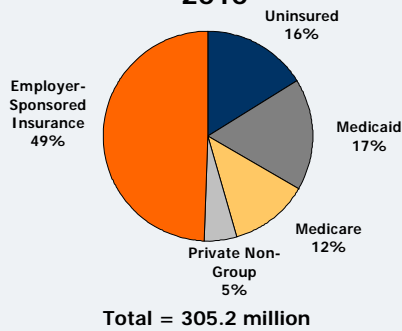
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## Health Insurance Coverage in the U.S., 2010



\* Medicaid also includes other public programs: CHIP, other state programs, military-related coverage. Numbers may not add to 100 due to rounding.  
SOURCE: KCMU/Urban Institute analysis of 2011 ASEC Supplement to the CPS.




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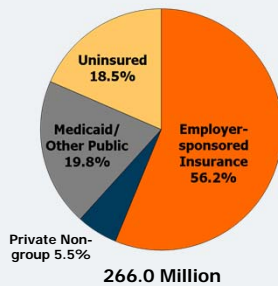
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## Health Insurance Coverage of the Nonelderly Population, 2010



SOURCE: KCMU/Urban Institute analysis of 2011 ASEC Supplement to the CPS.




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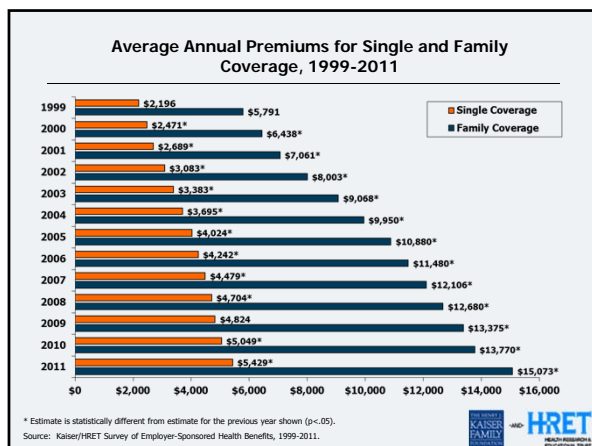
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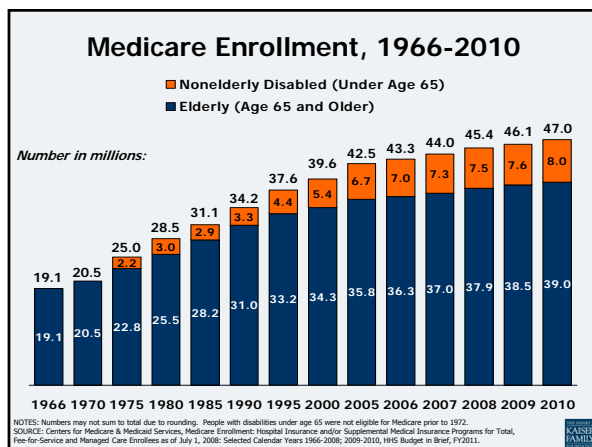
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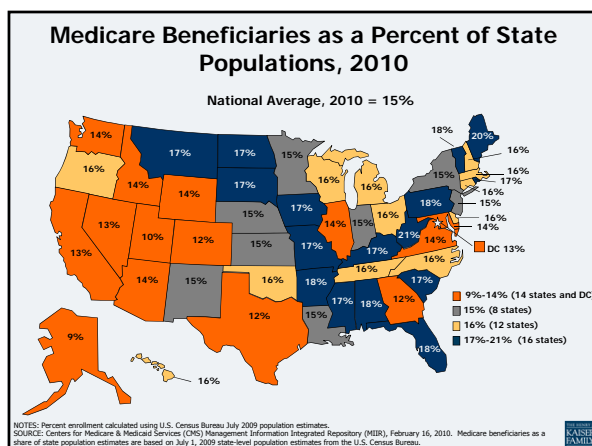
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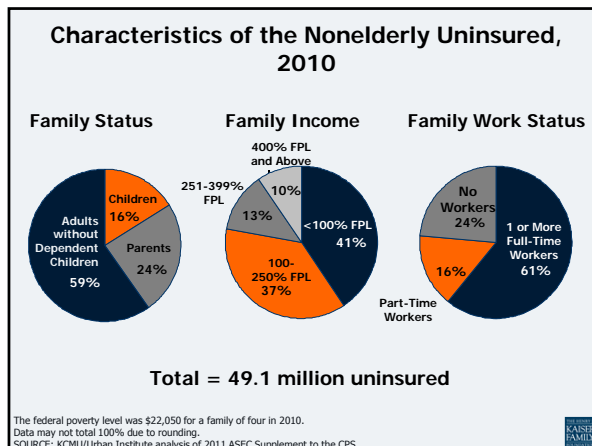
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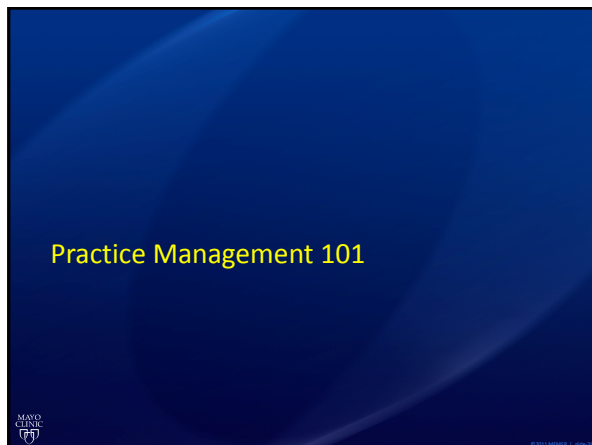
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### Practice Management

- The magic formula:  

$$\text{Revenue} - \text{Expense} = \text{Income (Loss)}$$
- Provider revenue is generated by billing for professional fees
- Hospital revenue is generated by billing for facility fees
- Expenses are incurred by doing business
  - Salaries & Benefits
  - Supplies
  - Services
  - Rent & Overhead

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### Practice Management

- Costs can be classified as *direct* or *indirect*
  - Direct costs are the result of the provision of a specific service (e.g. office visit)
    - Provider Salary
    - Supplies
  - Indirect costs are the result of activities that impact all services (e.g. operating costs)
    - Rent
    - Utilities



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### Professional Fees



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### Practice Management

- Professional fees for provider services are billed in discrete units, based on the service provided
  - Described by Current Procedural Terminology (CPT) codes, each with
    - Defined Medicare reimbursement rate
    - Defined Relative Value Units (RVU)
- CPT codes fall into two categories
  - Evaluation & Management (E&M)
  - Procedural



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### Practice Management

- E&M coding is driven by documentation
  - H&P
  - Complexity of medical decision making
- OR
- Total time, with >50% spent counseling
- An MD and an NPPA can “combine” elements of documentation to satisfy higher E&M code requirements
- An MD and an NPPA **cannot** combine time



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### Practice Management

- Procedural CPT codes describe discrete components of an operation
  - CPT 49000 – exploratory laparotomy
  - CPT 38100 – splenectomy, total
- A surgical procedure triggers a **global period**
  - The payment includes post-operative professional services (hospital visits, etc.)
  - No E&M codes can be paid during a GSP – hospital visits, etc.



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### Practice Management

- Critical Care billing is independent of the GSP
- Applies to trauma resuscitation and post-operative surgical critical care
- Active evaluation & management of critical illness or injury, requiring frequent assessment, manipulation, and direct personal management by the provider
  - Acutely impaired vital organ system(s)
  - High probability of sudden, clinically significant or life threatening deterioration
- Billed exclusively on time spent providing care described above



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### Practice Management

- NPPA providers can bill independently of physicians
- A physician note within the same Medicare specialty will typically trump an NPPA note
- NPPA providers billing independently are reimbursed at 85% of the physician fee schedule
- NPPA providers employed by a physician may bill “incident to” that physician’s services and be reimbursed at 100% of the physician fee, provided that strict supervision requirements are met



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### Hospital Billing



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### Practice Management

- Hospital revenue is generated by facility and technical fees
  - Hospital bed
  - Nursing
  - Tests
- Medicare reimbursement is based upon diagnosis, and is paid in a lump sum, regardless of actual cost or utilization (“DRG payment”)
- DRG payment is only influenced by markers of acuity or complexity (CC, MCC)



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### Practice Management

- Medicare DRG Payments

Base Payment \* Relative Weight  
[+ DSH + IME]

- 2011 Base Payment = \$5164.11

DRG	Title	Weight	Payment
799	Splenectomy w MCC	4.9434	\$25,528.26
800	Splenectomy w CC	2.5874	\$13,361.62
801	Splenectomy wo CC	1.5586	\$8,048.78



Source: Centers for Medicare & Medicaid Services, www.cms.gov

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### Practice Management

- MCC? CC? WTF?
  - MCC = major complication/comorbidity
  - CC = complication/comorbidity
- Evidence in the record of specific conditions that will increase acuity will increase hospital reimbursement
- Each DRG has a standard mean length of stay, severity index, and mortality rate
- Outcomes data will increasingly be publically available and benchmarked against other providers



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### Practice Management

- Consider the following:

82 yo WF altered mental status, shaking chills, fevers, decr UO, T = 103, P = 124, R = 34, BP = 70/40 persistent despite 1 L NS, on Dopamine, pO<sub>2</sub> = 78 on non-rebreather, pH = 7.18, pCO<sub>2</sub> = 105, WBC = 17,500, left shift, BUN = 78, Cr = 5.4, CXR – Right UL infiltrates, start Cefipime, Clinda, Tx to ICU. May have to intubate – full resusc.

- What is the diagnosis?



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## Practice Management

Principal Diagnosis	Chills and Fever	Sepsis
Secondary Diagnoses	Altered mental status <i>Nothing else code-able from available documentation</i>	Septic Shock Acute Respiratory Failure Aspiration Pneumonia Acute Renal Failure (or AKI) Respiratory Acidosis Metabolic Encephalopathy
Medicare MS-DRG	864 Fever w/o CC/MCC	871 Septicemia or severe Sepsis w/o MV 96+ hrs w MCC
APR-DRG	722 Fever	720 Septicemia & Disseminated infection
APR-DRG Severity Illness	1 – Minor	4 – Extreme
APR-DRG Risk of Mortality	1 – Minor	4 – Extreme
Medicare MS-DRG Rel Wt	0.8276	1.9074
National Mortality Rate (APR Adjusted)	0.04%	62.02%



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The cry of administrators everywhere...

This is why good documentation matters!



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## The Use of CT Scan in the Trauma Bay

Riad Cachecho, MD, MBA  
Crozer Chester Medical Center

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### Objectives

- Principles and concepts of computed tomography
- ATLS/EAST guidelines
- Review normal CT anatomy
- Review traumatic abnormalities in the head, face, spine, chest, abdomen and pelvis

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### Computed Tomography Scan

- Converts 2 D images to 3 D images
- Cross sectional vs. Spiral (helical)
- Single slice vs. 168 slice
- Speed
- Resolution

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## The Risk of Radiation

- One mSv (Sievert) may increase lifetime cancer risk by about 1/25,000\*.
- Data extrapolation from Hiroshima
- Pediatric population\*\*
- Adult population\*\*\*
- Pan scans\*\*\*\*

\* US Nuclear Regulatory Commission

\*\* D.J. Brenner et al: Estimated risk of radiation induced fatal cancer from pediatric CT:ARRS, 2000

\*\*\* B.A. Gaines: Intra-abdominal solid organ injury in children: diagnosis and treatment, JOT, 67 (2) S135, 2009

\*\*\*\* T.A. Laack et al: Comparison of trauma mortality and estimated cancer mortality from CT during initial evaluation of intermediate risk trauma patients, JOT, 70 (6): 1362, 2011

\*\*\*\*\* A. Tillou et al: Is the pan-CT for blunt trauma justified? A prospective evaluation, JOT, 67 (4): 779, 2009

\*\*\*\*\* O. Chan: Primary CT survey for major trauma, BJS, 96 (12): 1377, 2009

## The Risk of Radiation

- Chest radiogram 0.1 mSv (milli Sievert)
- Head CT 1.5 mSv
- Abdomen CT 5.3 mSv
- Chest CT 5.8 mSv
- Chest/abd/pelvis CT 9.9 mSv

## ATLS/EAST Guidelines

### Head CT Scan

- Mild TBI: GCS 14-15
  - 3% will evolve to severe TBI.
  - EAST recommends CTH
- Moderate TBI: GCS 9-13
  - 40% abnormal CT, 8% surgery
  - CTH indicated
- Severe TBI: GCS 3-8
  - CTH indicated

## ATLS/EAST Guidelines

Cervical Spine CT Scan  
NEXUS\* Guidelines

- Depressed mental status: Drugs, alcohol, TBI, premorbidity, psych.
- Distracting injury
- Midline neck tenderness
- Neurological deficit

\*National Emergency X-Radiography Utilization Study (JAMA 2000)

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## ATLS/EAST Guidelines

Abdominal CT Scan

- Blunt abdominal trauma in stable patients
  - Unreliable examination
  - Tender abdomen
  - Abdominal wall contusion
- Blunt trauma in unstable patients
- Penetrating abdominal trauma

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## Indications of Chest CT Scan

- Thoracic aortic injury
- Thoracic spinal injury
- Ruptured diaphragm
- Pulmonary contusion
- Rib fracture

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### Indications of Chest CT Scan

- Mechanism
- S & S of severe thoracic trauma
- Abnormal chest radiograph

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### ATLS/EAST Guidelines

#### Thoraco-lumbar Spine CT Scan

- Insufficient evidence
- Scan obtained as part of chest and abdomen CT
- Nexus criteria + mechanism

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### Indications for Facial CT Scan

- No indicated as a routine in the trauma bay
- Usually performed at this stage for convenience
- Indicated for facial exsanguination

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## Pediatric Trauma

- Use clinical judgment
- Consider risk of traumatic mortality Vs. radiation exposure
- Consider observation
- Consider your resources

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## Head, Face & Cervical Spine

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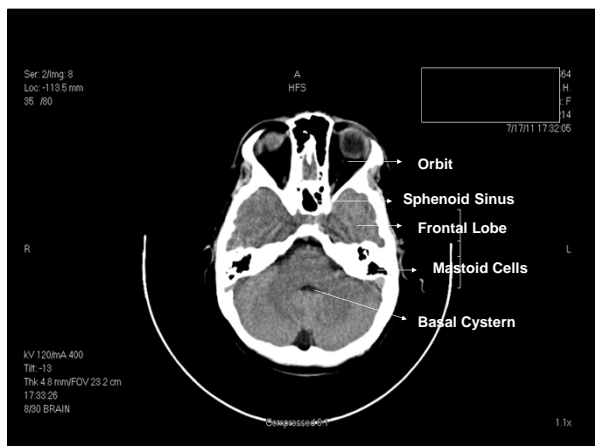
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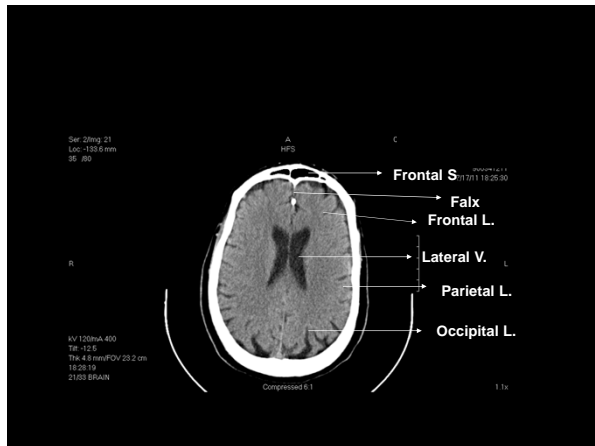
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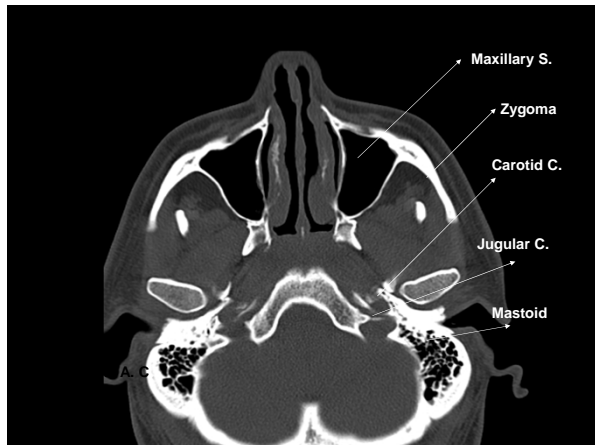
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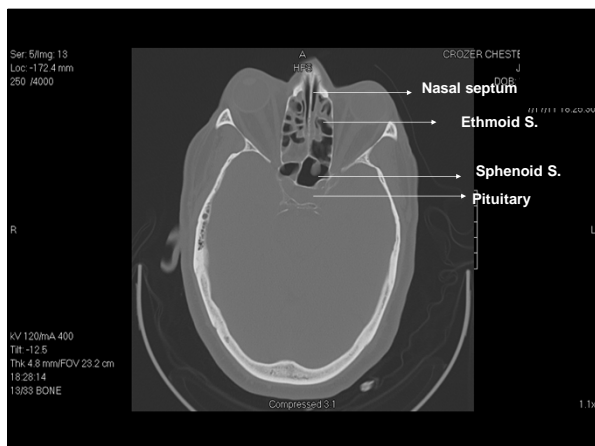
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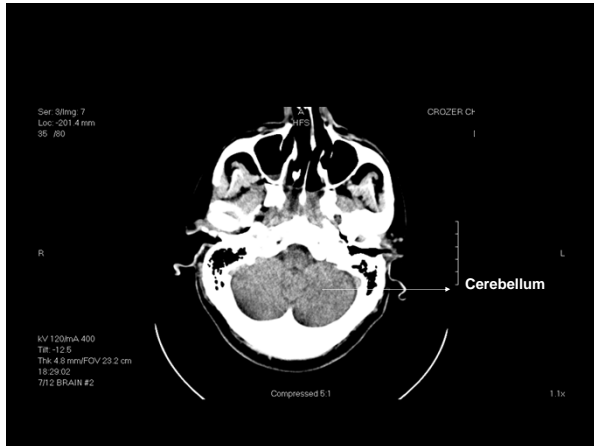
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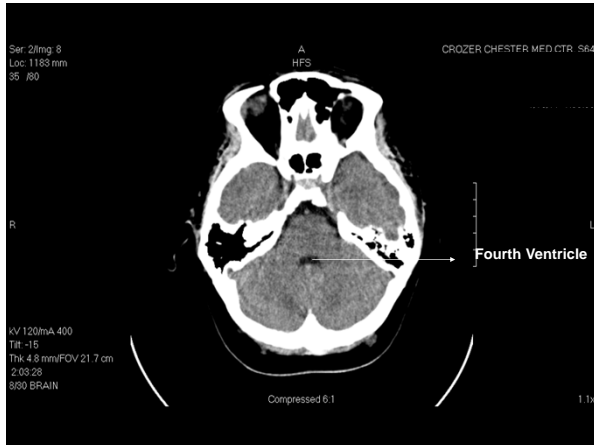
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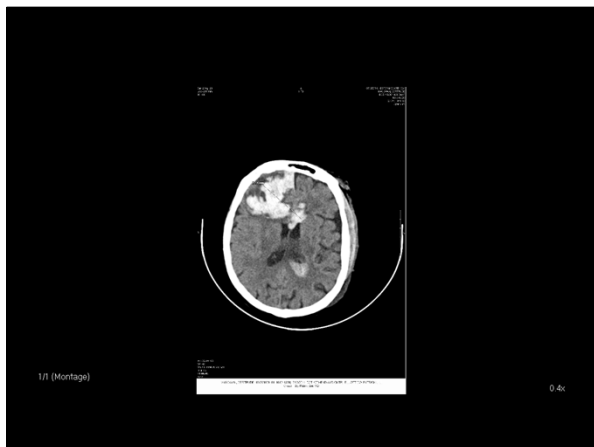
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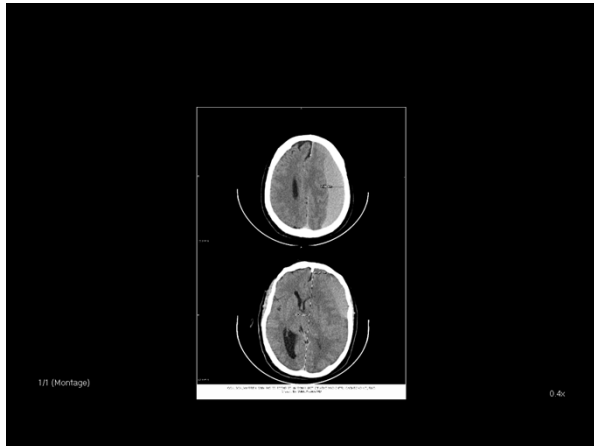
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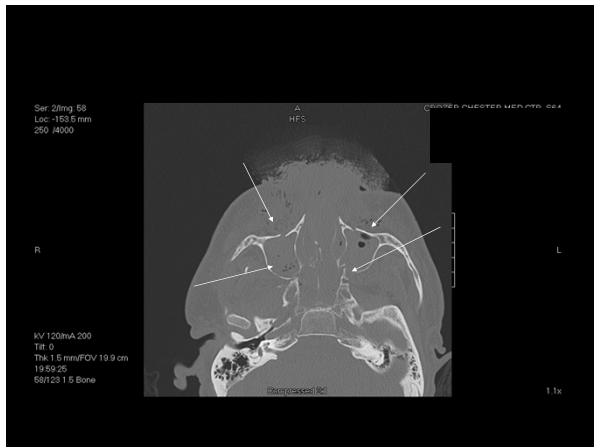
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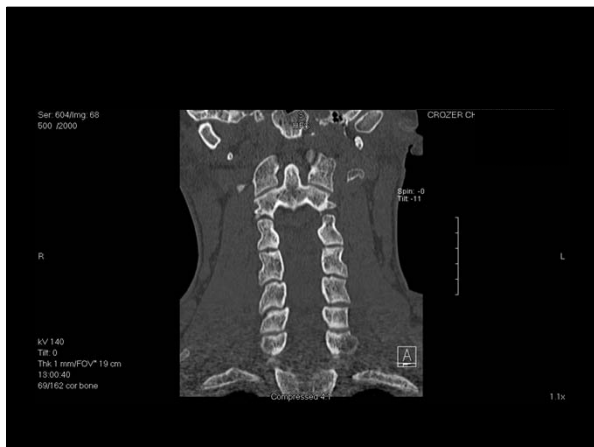
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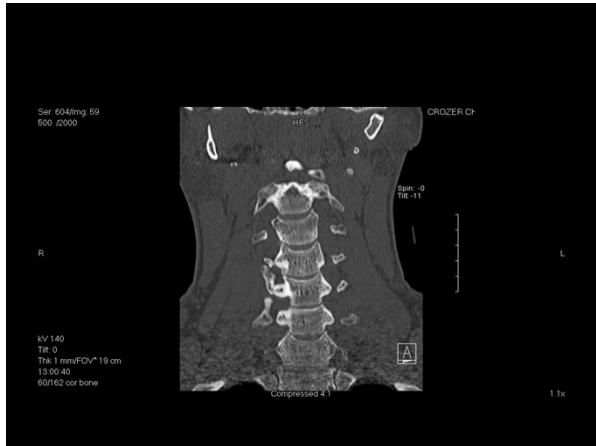
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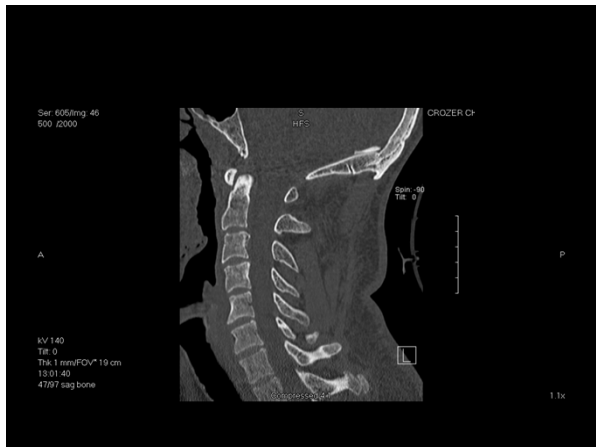
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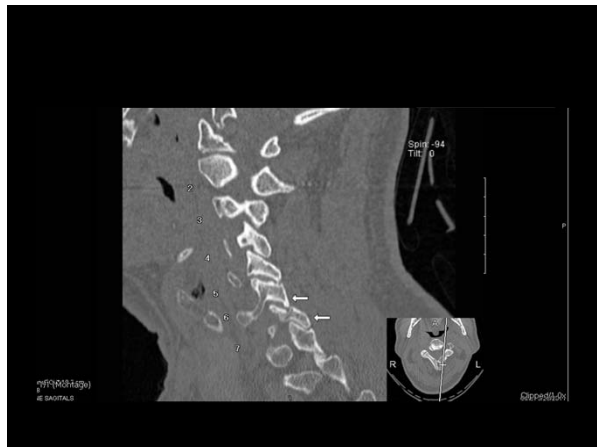
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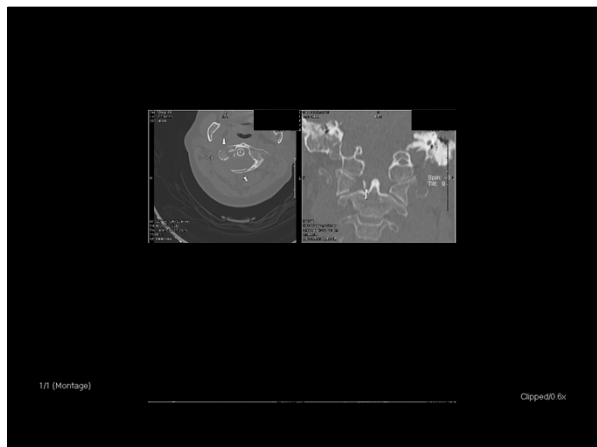
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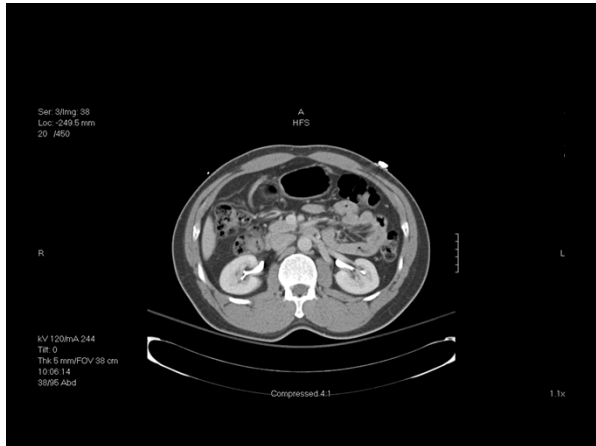
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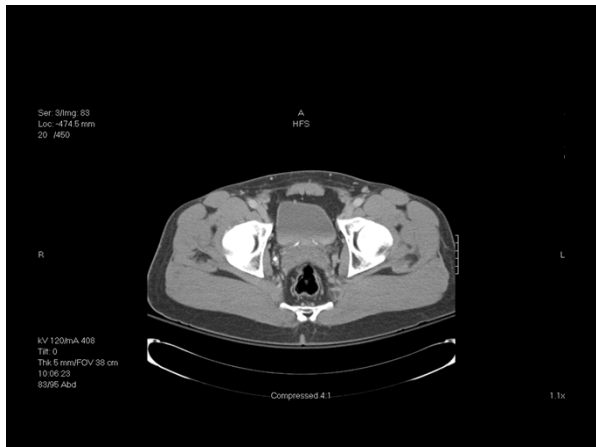
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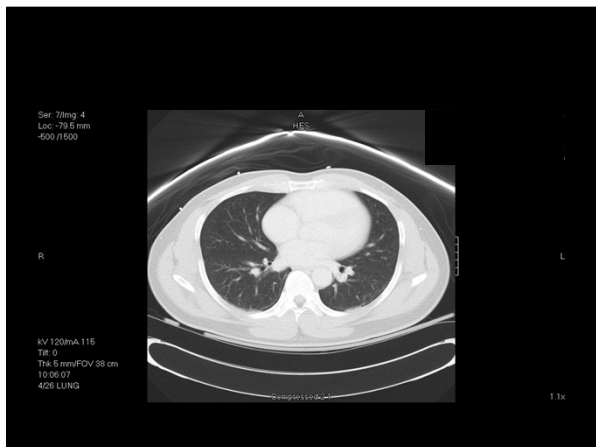
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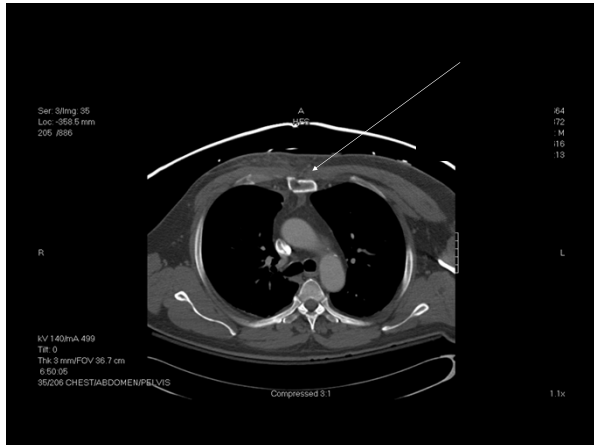
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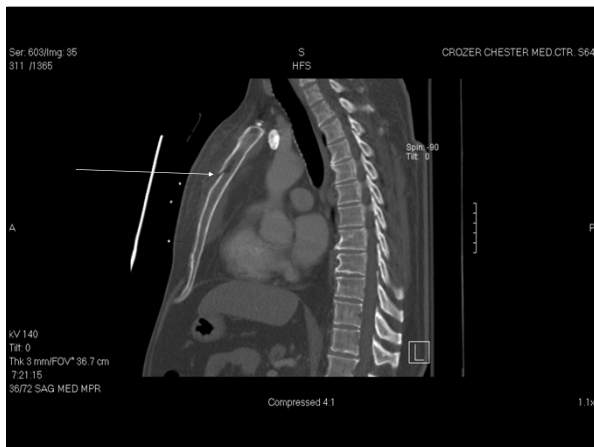
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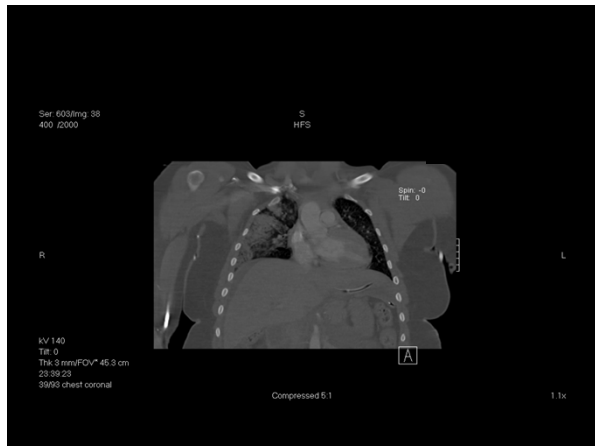
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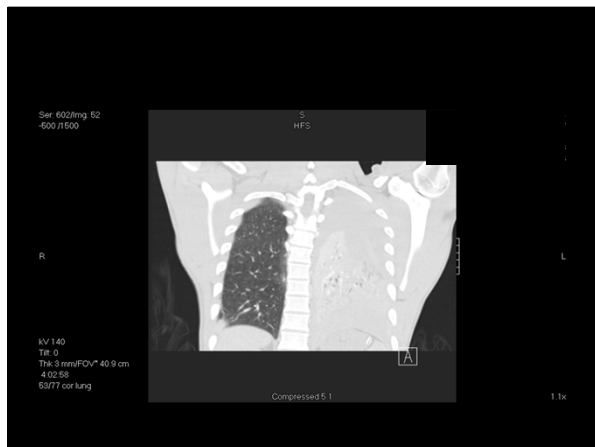
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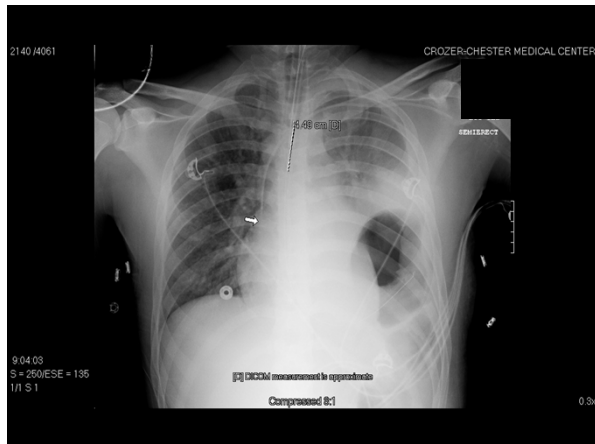
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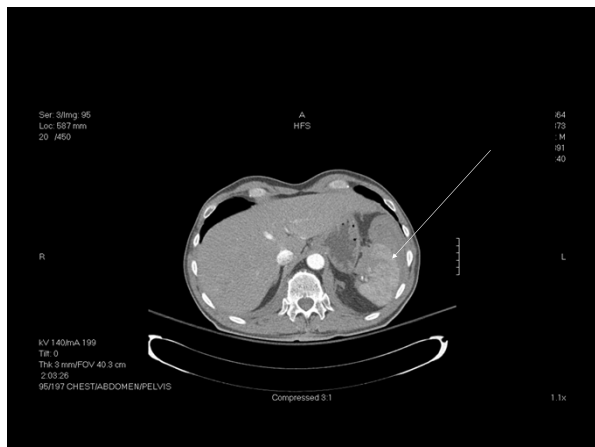
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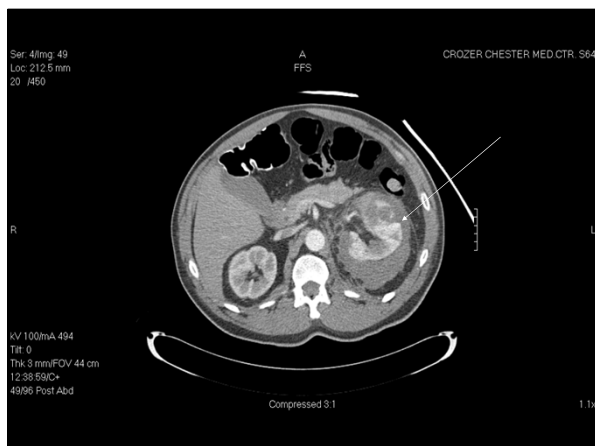
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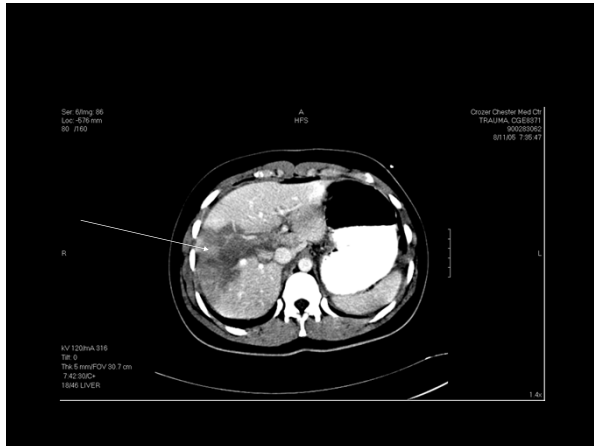
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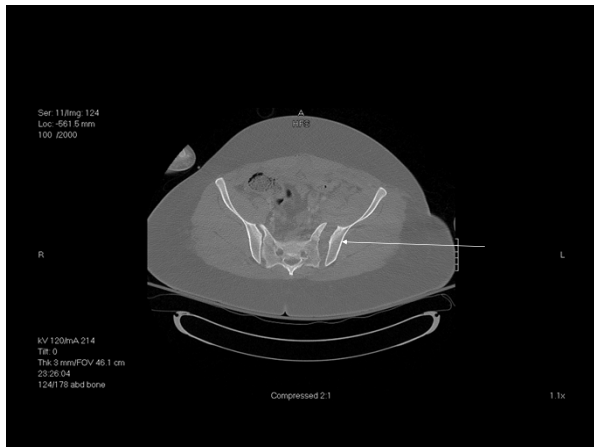
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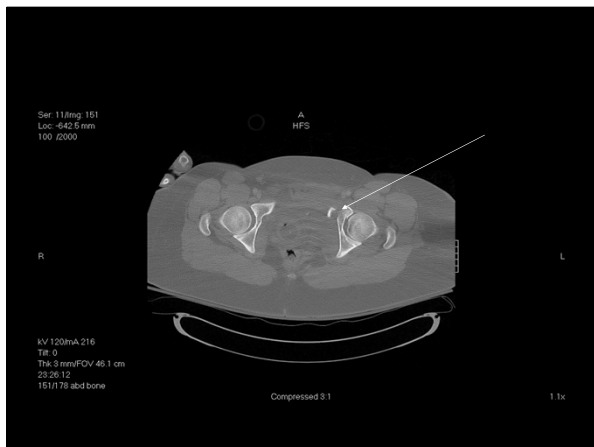
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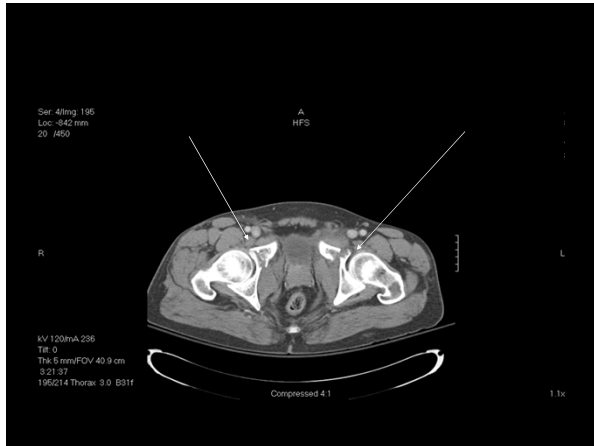
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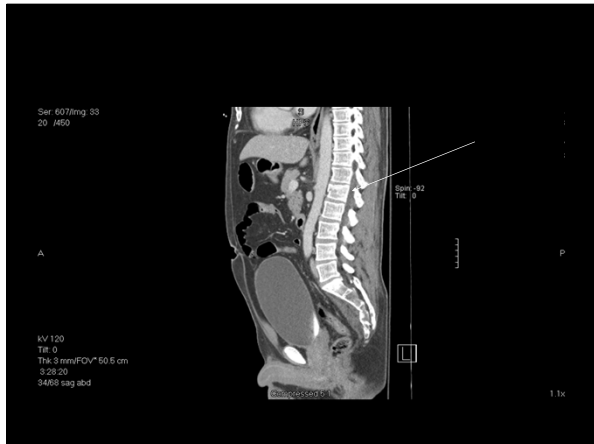
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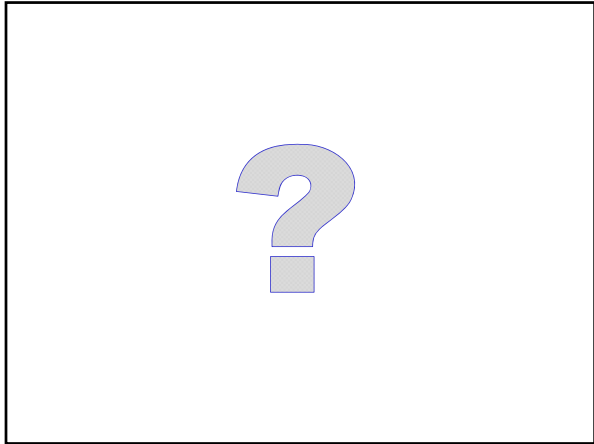
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## Objectives

- ❑ Review basic hemodynamic principles
- ❑ Discuss invasive and non-invasive modalities of hemodynamic monitoring
- ❑ Review most appropriate contemporary approach to hemodynamic monitoring including indications
- ❑ Understand the role of hemodynamic monitoring in the resuscitation of injured patient
- ❑ Identify endpoints of resuscitation

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## Shock

- ❑ Inadequate tissue oxygenation to meet tissue oxygen requirements
- ❑ Condition of the inadequate delivery of oxygen and nutrients necessary for normal tissue and cellular function
- ❑ State of inadequate tissue perfusion in which delivery of oxygen to tissues and cells is insufficient to maintain normal aerobic metabolism

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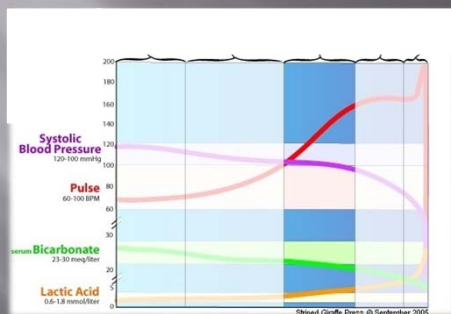
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## Compensated Shock



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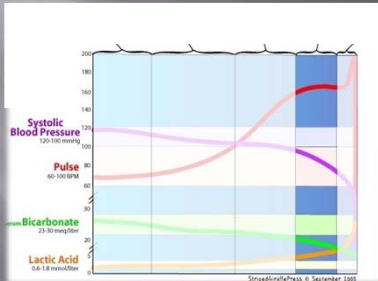
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## Decompensated Shock Reversible




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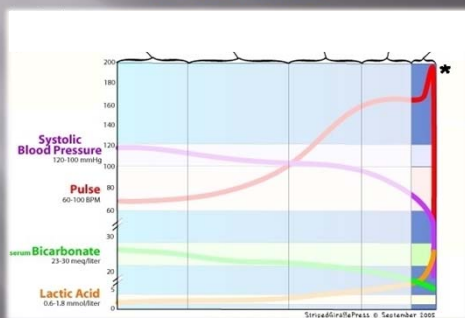
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## Decompensated Shock Irreversible




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## Management of Shock

- ❑ Early definitive control of the airway
- ❑ Control active hemorrhage
- ❑ Early correction of hypoperfusion of tissue
  - Uncontrolled/Excessive fluid resuscitation is harmful

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## Goals of Trauma Care

- ❑ Ensure that tissues receive adequate oxygen
  - Oxygen Delivery ( $DO_2$ )
- ❑ Ensure that tissues are able to consume the oxygen they require to function
  - Oxygen Consumption ( $VO_2$ )

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## Oxygen Debt

- ❑ Deficit in tissue oxygenation over time that occurs with shock
- ❑ Oxygen Consumption > Oxygen Delivery
- ❑ Magnitude correlates with the severity and duration of hypoperfusion
  - Marker of mortality is inability to repay the oxygen debt
- ❑ The magnitude of oxygen debt, its rate of accumulation, and time required to correct may all correlate with survival

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## Components of Oxygen Delivery and Consumption

- ❑ Pulmonary gas exchange
  - Ventilation
- ❑ Oxygen delivery
  - Circulation
- ❑ Oxygen consumption
  - Metabolism

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## Oxygen Delivery System

- ❑ Oxygen delivered to alveoli
  - Ventilation
- ❑ Diffusion of oxygen across the alveolar-capillary membrane
- ❑ Oxygen binds with hemoglobin
- ❑ Oxygenated blood delivered to systemic circulation via the heart
  - Cardiac Output

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## Pulmonary Gas Exchange

- ❑ Oxygen availability ( $\text{FiO}_2$ )
- ❑ Alveolar ventilation (RR and  $V_t$ )
- ❑ Diffusion across alveolar-capillary membrane
- ❑ Pulmonary perfusion
- ❑ Ventilation/Perfusion ( $V/Q$ )
  - Ratio of ventilation to perfusion

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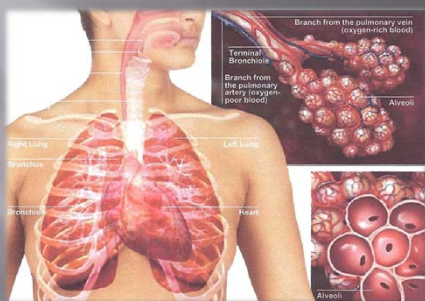
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## Oxygen Delivery ( $DO_2$ )

- $DO_2 = CO \times CaO_2 \times 10$
- Cardiac Output (L./min)
  - $CO = \text{Heart Rate (HR)} \times \text{Stroke Volume (SV)}$
  - The major component of oxygen delivery
- Oxygen Content of blood
  - $PO_2$  (2%) - pressure that is exerted by oxygen when dissolved in plasma
  - $SO_2$  (98%) - amount of oxygen bound to hemoglobin
  - Greatest contributor to  $CO_2$  is the hemoglobin level
  - $CaO_2 = (1.38 \times \text{Hgb} \times SaO_2) + (0.0031 \times PaO_2)$

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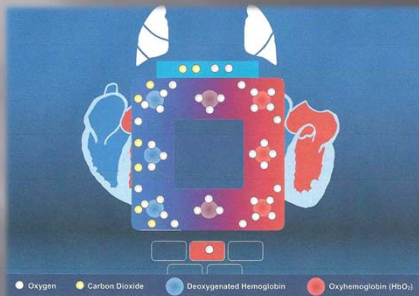
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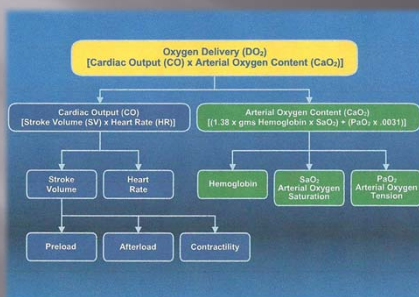
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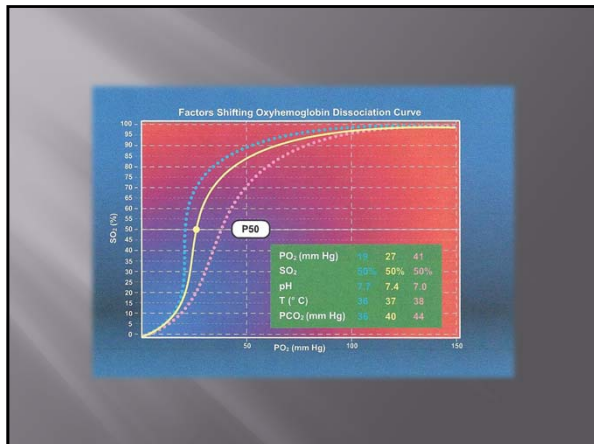
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## Oxygen Demand

- ❑ Amount of oxygen required to meet the body's metabolic requirement
- ❑ For homeostasis oxygen delivery must equal oxygen demand
- ❑ Oxygen delivery in a normal patient is approximately four times the oxygen consumed
- ❑ If oxygen demand is not met, the patient will revert to anaerobic metabolism
  - Develop an oxygen debt

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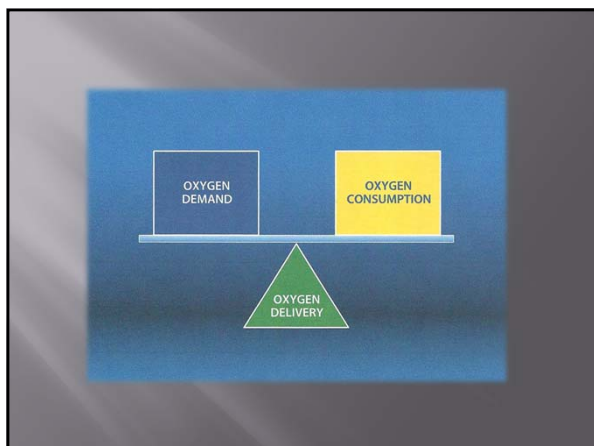
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## Oxygen Consumption ( $\text{VO}_2$ )

- ▣  $\text{VO}_2 = \text{Arterial Oxygen Delivery} - \text{Venous Oxygen Delivery}$
- ▣  $\text{VO}_2 = \text{CO} \times \text{Hgb} \times 1.38 \times (\text{SaO}_2 - \text{SvO}_2)$
- ▣ Oxygen consumption is the best index of tissue oxygen requirements available to the clinician

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## Venous Oxygen Saturation

- ▣ Sample of blood taken from the pulmonary artery ( $\text{SvO}_2$ )
  - Mixed venous oxygen saturation
- ▣ Sample of blood taken from the superior vena cava ( $\text{ScvO}_2$ )
- ▣ Venous Oximetry represents the balance of oxygen delivery and consumption
  - Difference between oxygen delivery and consumption
- ▣ Normal resting individual consumes 25% of the available oxygen content

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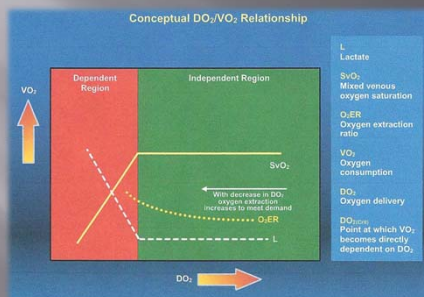
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## Threats to $DO_2/VO_2$ Balance

- ❑ Inadequate Oxygen Delivery
  - Impaired pulmonary exchange
  - Inadequate oxygen carrying capacity
  - Insufficient cardiac output
- ❑ Increased Metabolic Requirements
  - Fever, pain, anxiety, shivering
  - SIRS

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## Compensatory Mechanisms

- ❑ Increase cardiac output
- ❑ Redistribution of blood flow
  - Shunting of blood from extremities, mesentery, kidneys, etc.
- ❑ Increase oxygen extraction by the tissues

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## Endpoints of Resuscitation

- ❑ Depth and duration of shock leads to cumulative oxygen debt
- ❑ Resuscitation is complete when oxygen debt repaid
  - Tissue acidosis eliminated
  - Normal aerobic metabolism restored
- ❑ Restoration from hemorrhagic shock is impossible without hemostasis
- ❑ Use of endpoints to allow early detection and reversal of compensated shock

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## Traditional Markers

- Blood pressure
  - Heart Rate
  - Urine Output
- ❑ Standard hemodynamic parameters do not adequately quantify the degree of physiologic derangement in trauma patients
- Base deficit
  - Lactate level

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- ❑ Base Deficit
  - ❑ Stratify need for ongoing fluid resuscitation
  - ❑ Stratify risk of MODS and death
- ❑ Lactate Level
  - ❑ Time to normalization is predictive of survival
  - ❑ Persistent worsening of parameters indicative of ongoing hemorrhage or abdominal compartment syndrome

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## Arterial Base Deficit

- ❑ Amount of base in millimoles that is required to titrate 1L of whole blood to a pH of 7.40
  - Saturated with O<sub>2</sub> at 37° C and PaCO<sub>2</sub> of 40 mmHg
- ❑ Good correlation between the base deficit and survival
  - LD<sub>50</sub> 11.8 mmol/L

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## Serum Lactate

- ❑ Serum lactate is an indirect measure of oxygen debt and therefore approximation of the magnitude of shock
- ❑ Initial lactate levels and response of lactate level to an intervention is a predictive value
  - Vincent, et al
- ❑ Time needed to normalize serum lactate levels is an important prognostic factor for survival
  - Abramson, et al

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## Lactate Clearance...

- ❑ 76 patients
  - 0 % mortality with normal lactate in 24 hrs
  - 25% mortality with normal lactate 24-48 hrs
  - 86% mortality with normal lactate > 48 hrs
- ❑ Lactate level at end 24<sup>0</sup> correlated with MODS

Abrumson et al. J Trauma, 1993; 35: 584-589

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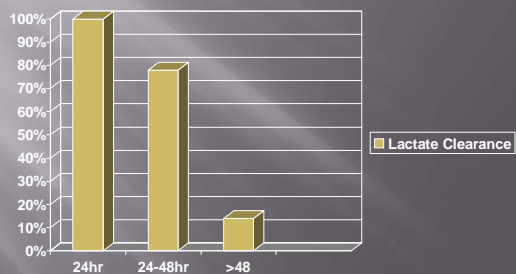
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## Lactate clearance



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## Monitoring and Assessment

- ▣ Assess the components of oxygen delivery and consumption
- ▣ Ensure metabolic needs of the patient are being met
- ▣ Level of assessment based on clinicians' preferences, technologies available, and the severity of illness of the patient

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## Levels of Assessment

- ▣ Physical Assessment
- ▣ Laboratory Assessment
- ▣ Non-invasive Monitoring
- ▣ Basic Invasive Monitoring
- ▣ Advanced Invasive Monitoring

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## Traditional Monitoring

- ▣ Physical Exam
- ▣ Blood pressure (NIBP)
- ▣ Heart rate
- ▣ Urine Output
- ▣ Central Venous Pressure (CVP)
- ▣ EKG
- ▣ Hemoglobin
- ▣ Serum Lactate
- ▣ Arterial Base Deficit
- ▣ Pulse oximetry (SpO2)
- ▣ End tidal CO2

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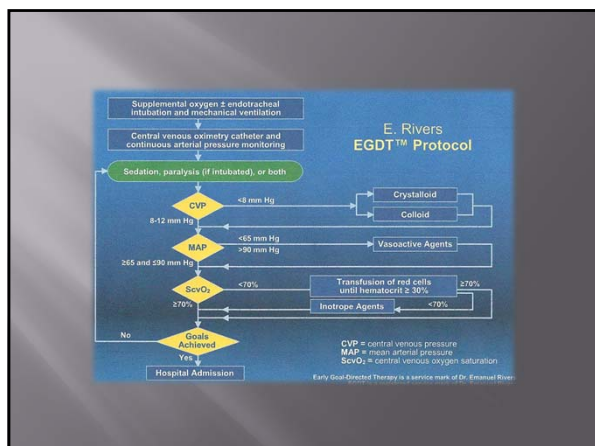
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## Advanced Monitoring

- ☐ Echocardiogram
- ☐ Central Venous Oximetry (ScvO<sub>2</sub>)
- ☐ Arterial Pressure-Based Cardiac Output
- ☐ Pulmonary Artery Catheter

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## Echocardiogram

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## Arterial Pressure-Based Cardiac Output Algorithm

- ▣ Uses patient's arterial waveform to continuously measure cardiac output
  - Measures the variations of the arterial pressure
    - Proportional to stroke volume
  - Cardiac output determined by pulse rate and calculated stroke volume
- ▣ Patient-specific vascular compliance is determined

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## Stroke Volume Variation

- ▣ Arterial pulse pressure falls during inspiration and rises during expiration due to changes in intra-thoracic pressure secondary to negative pressure ventilation
  - Spontaneously breathing
  - Pulsus paradoxus
- ▣ With controlled mechanical ventilation, arterial pressure rises during inspiration and falls during expiration secondary to positive pressure ventilation
  - Paradoxical Pulsus
  - Pulse Pressure Variation
    - Stroke Volume Variation (SVV)

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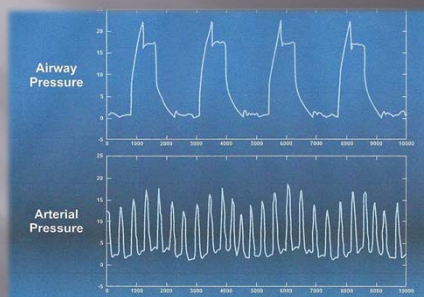
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## Minimally Invasive Venous Oximetry

- Continuous venous oximetry
  - Determining the adequacy of oxygen delivery to meet demand
    - Pulmonary artery catheter
    - Fiber optic oximetry catheters

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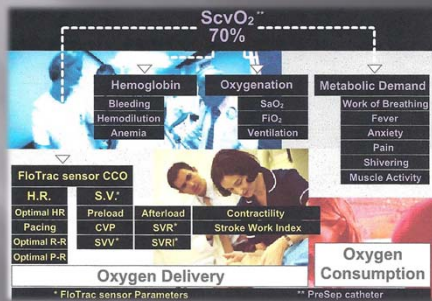
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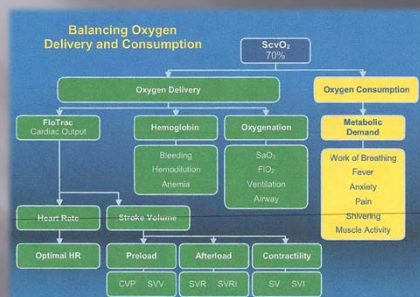
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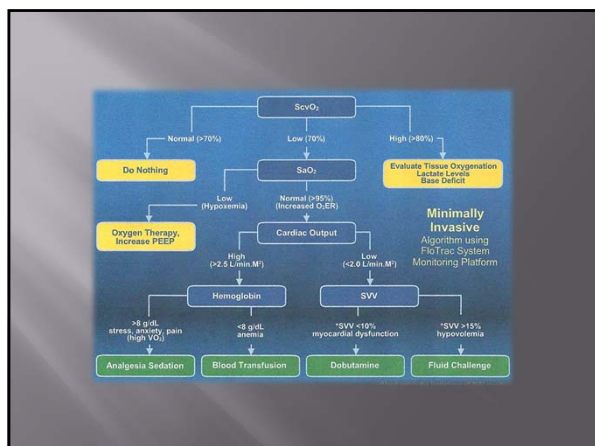
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## Swan-Ganz pulmonary artery catheter

- ▣ PAP
- ▣ RAP
- ▣ PAOP
- ▣ CCO
- ▣ RVEF
- ▣ RVEDV
- ▣ SvO2

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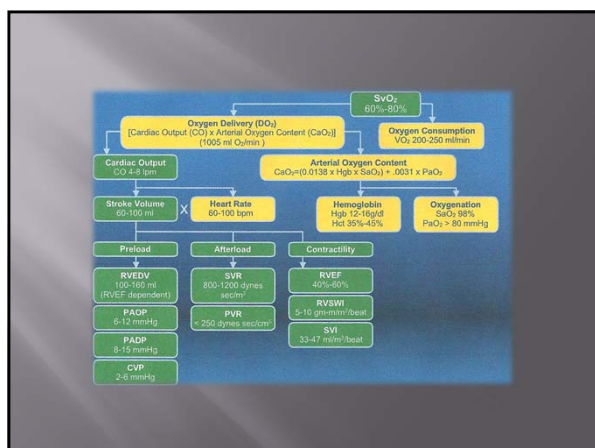
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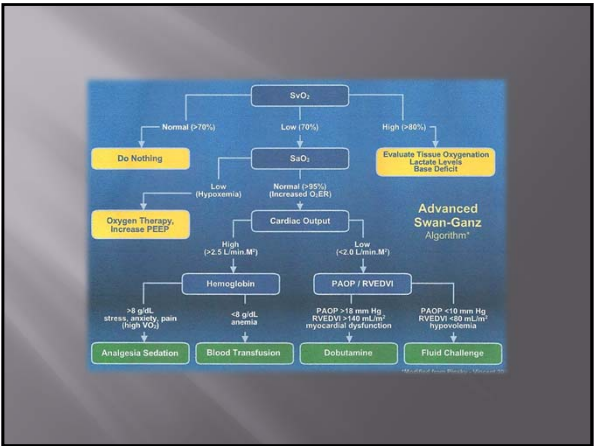
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Thank You



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## Leadership Development for Advanced Practitioners

Ruth Kleinpell PhD RN FCCM  
Rush University Medical Center  
Chicago Illinois USA

### NPs & PAs

- ▶ Nurse Practitioners
  - 140,000 in US
  - Close to 9,000 new NPs are prepared each year at over 325 colleges and universities
  - >2800 working in ICU settings
- ▶ Physician Assistants
  - 83,466 in US
  - Approximately 6,000 new PAs graduate each year from the 156 programs
  - >1,800 working in ICU settings



[www.aanp.org](http://www.aanp.org) ; [www.aapa.org](http://www.aapa.org)



AANP NEWS

#### American Academy of Nurse Practitioners Membership Survey

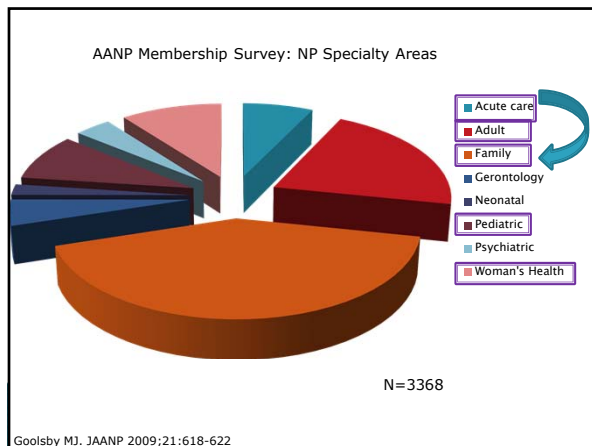
Mary Jo Goolsby, EdD, MSN, NP-C, CAE, FAANP

Research & Education, American Academy of Nurse Practitioners

Journal of the  
*American Academy of Nurse Practitioners*

Online membership survey  
N=3368

*Journal of the American Academy of Nurse Practitioners 21 (2009) 618-622*




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**American Academy of  
PHYSICIAN ASSISTANTS**

83,466 PAs practicing in the US  
N=19,830 respondents to survey

Physician Assistant Census Report:  
Results from the 2010 AAPA Census

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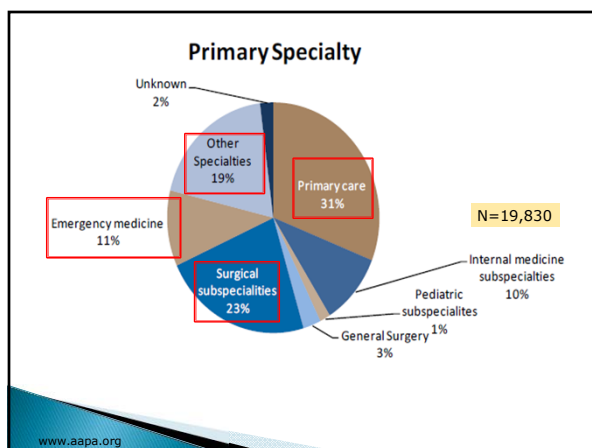
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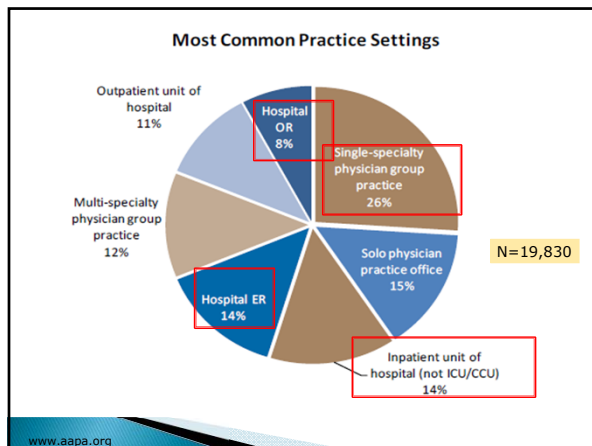
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Practice Setting	Census	PA Population
Intensive/critical care unit of hospital	451	1,824
Inpatient unit of hospital (not ICU/CCU)	2,116	8,724
Outpatient unit of hospital	1,576	6,668
Hospital ER	2,012	8,587
Hospital OR	1,144	4,856
Other hospital unit	244	1,131



www.aapa.org

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Article

## Physician Assistant and Nurse Practitioner Utilization in Academic Medical Centers

Marc Moote, MS, PA-C,<sup>1</sup> Cathleen Krsek, RN, MSN, MBA,<sup>2</sup> Ruth Kleinpell, PhD, RN, FAAN, FCCM,<sup>3</sup> and Barbara Todd, DNP, CRNP, FAANP<sup>4</sup>

**Abstract**

The purpose of this study was to collect information on the utilization of physician assistants (PAs) and nurse practitioners (NPs) in academic health centers. Data were gathered from a national sample of University HealthSystem Consortium member academic medical centers (AMCs).<sup>1</sup>

N=25 organizations

American Journal of Medical Quality  
1-9  
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DOI: 10.1177/1043986211402984  
<http://ajmq.sagepub.com>  
SAGE

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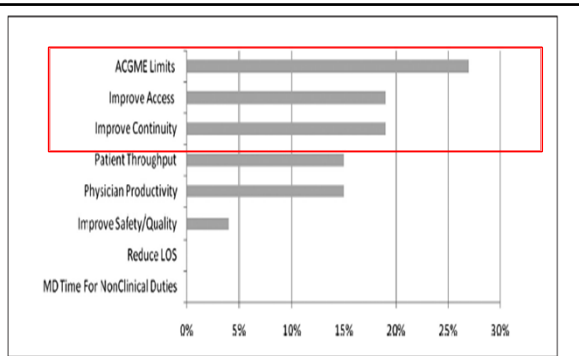
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**Figure 2.** Primary reason for employing PAs and NPs  
 Abbreviations: PA, physician assistant; NP, nurse practitioner; ACGME, Accreditation Council for Graduate Medical Education; LOS, length of stay.  
 Moote M. et al. Am J Med Quality 2011;1-9

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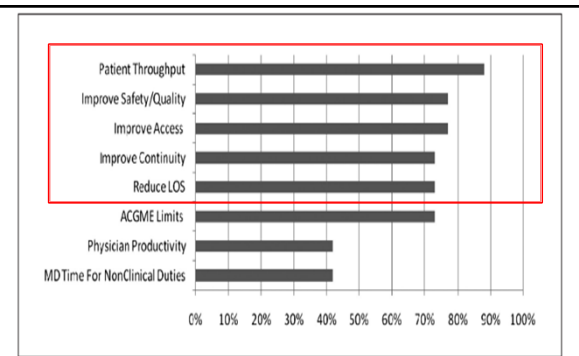
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**Figure 3.** Secondary reasons for employing PAs and NPs  
 Abbreviations: PA, physician assistant; NP, nurse practitioner; ACGME, Accreditation Council for Graduate Medical Education; LOS, length of stay.  
 Moote M. et al. Am J Med Quality 2011;1-9

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## Promoting Leadership

- ▶ Review unit based performance metrics
- ▶ Identify NPs and PAs with an interest in developing leadership skills
- ▶ Evaluate opportunities for leadership
  - QI initiatives
  - Research
  - Committee work




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## Developing Leadership Skills

- ▶ **Leadership** has been described as the "process of **social influence** in which one person can enlist the aid and **support** of others in the accomplishment of a common **task**"
- ▶ Leadership is "organizing a group of people to achieve a common goal"

Bass, B.M. & Bass, R. (2008). The Bass handbook of leadership: Theory, research, and managerial applications (4th ed.). New York: Free Press.

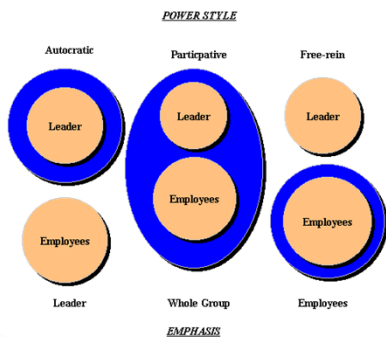
## Leadership Characteristics

- ▶ Effective Communication Skills
- ▶ Competent
- ▶ Goal orientation
- ▶ Strong internal motivation
- ▶ Self-esteem
- ▶ Proactive rather than reactive
- ▶ Honest

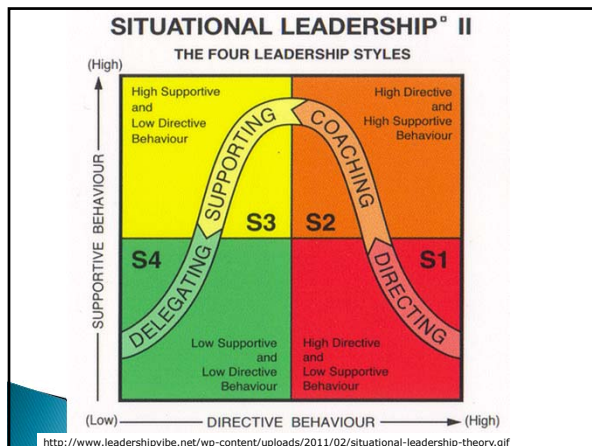
compassion formative character hope  
persevere competent flexible clarity  
imaginative courage effective patience  
**leadership**  
faithful empathetic innovative curious  
competitive diverse humility social  
sacrifice ethical global vision discerning

<http://www.legacee.com/Info/Leadership/LeadershipEntrepreneurial.html>

## Leadership Styles



<http://www.rwlink.com/~donclark/leader/leadstl.html> (U.S. Army Handbook, 1973):




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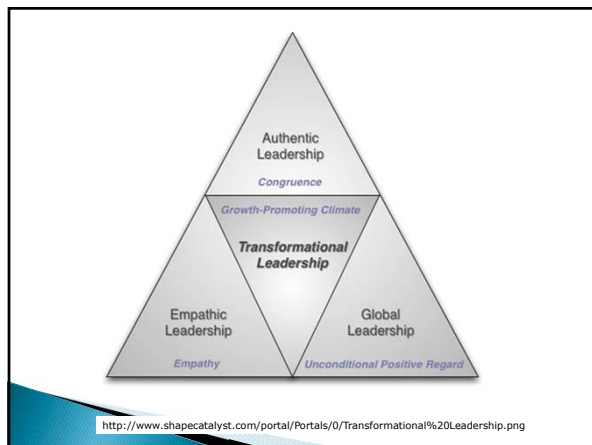
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## Providing Leadership Opportunities

- Project leadership
- Committee work
- Staffing/scheduling
- Oversight of credentialing/privileging applications
- Development of formal orientation program for NPs and PAs




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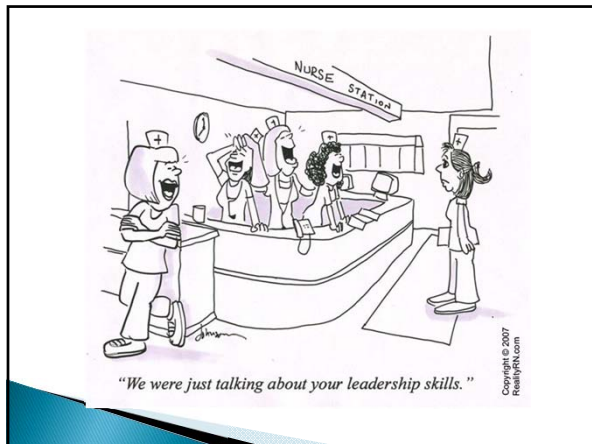
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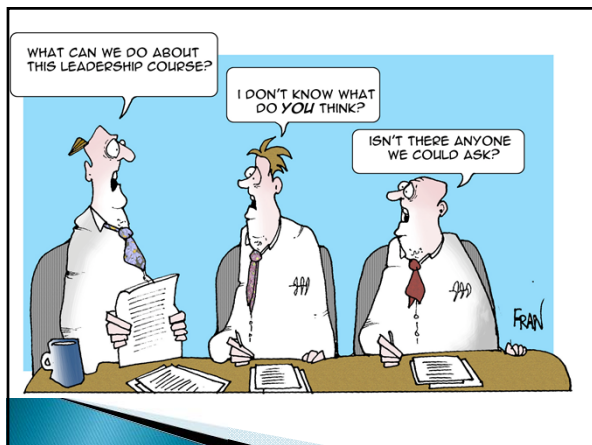
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RUSH UNIVERSITY  
MEDICAL CENTER

Project Example: UTI  
Prevention Initiative

Rush University Medical  
Center



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American Journal of

Critical Care

*Evidence-based interdisciplinary knowledge for high acuity and critical care*

### Reducing Use of Indwelling Urinary Catheters and Associated Urinary Tract Infections

Ellen H. Elpern, Kathryn Killeen, Alice Ketchum, Amanda Wiley, Gourang Patel and Omar Lateef

Am J Crit Care. 2009;18: 535-541. doi: 10.4037/ajcc2009938  
 © 2009 American Association of Critical-Care Nurses  
 Published online <http://www.ajcconline.org>

**Purpose**

- To implement and evaluate the efficacy of a multidisciplinary initiative to reduce CAUTIs in a Medical ICU by decreasing urinary catheter device use

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## Targeting Catheter Associated UTI

► **Method**

- During a 6 month period, pts with indwelling urinary catheters were evaluated daily using criteria for appropriate catheter continuance



Elpern et al. Am J Crit Care 2009

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**Table 1**  
**Indications for use of an indwelling urinary catheter**

Appropriate Indications	Inappropriate Indications
Urinary tract obstruction	Incontinence without any of the appropriate indications
Urinary retention	Diuresis
Patient to undergo prolonged (>2 hours) procedure	Frequent, but nonessential, determination of urinary output
Recently underwent surgical/invasive procedure	Nurse's concern about patient's discomfort
Epidural catheter in place	Diarrhea, without any of the appropriate indications
Frequent monitoring (every 1-2 hours) of urinary output required	Patient's preference
Deep sedation/paralysis	
Stage III or IV skin ulcers	
Surgical repair of decubitus ulcer	
Movement intolerance due to terminal illness or severe impairment	

During 6 month period, reinforced assessment of appropriate use of urinary catheters and monitored catheter device days and rates of CA-UTI's compared to prior 11 month timeline

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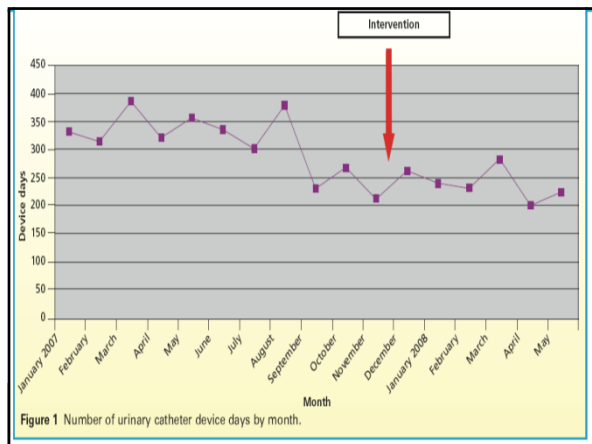
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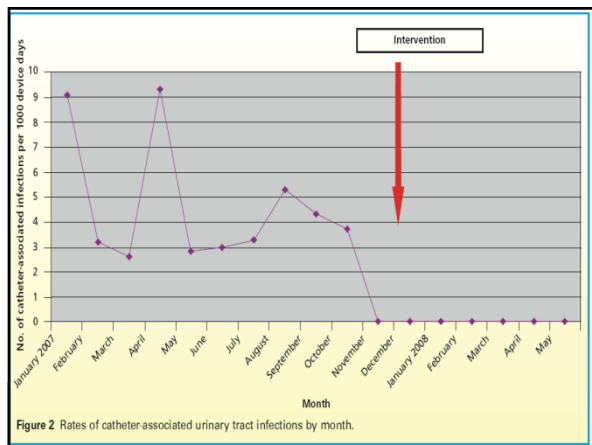
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## Strategies



- ▶ Enlist NPs and PAs to serve on committees including the Credentialing and Privileging Committee
- ▶ As NP and PA roles develop, consider designating a "lead" NP or PA
- ▶ Promote the development of formal orientation programs for NPs and PAs
- ▶ Identify other career advancement opportunities – formal leadership seminars, training

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## Differentiating Leadership and Management

Leadership Produces change and movement	Management Produces order and consistency
<ol style="list-style-type: none"> <li>Establishes direction <ul style="list-style-type: none"> <li>Creates a vision</li> <li>Clarifies the big picture</li> <li>Sets strategies</li> </ul> </li> <li>Aligns people <ul style="list-style-type: none"> <li>Communicates goals</li> <li>Seeks commitment</li> <li>Builds teams, coalitions and alliances</li> </ul> </li> <li>Motivates and inspires <ul style="list-style-type: none"> <li>Energizes</li> <li>Empowers subordinates &amp; colleagues</li> <li>Satisfies unmet needs</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>Planning and budgeting <ul style="list-style-type: none"> <li>Establishes agendas</li> <li>Sets timetable</li> <li>Allocates resources</li> </ul> </li> <li>Organizing and staffing <ul style="list-style-type: none"> <li>Provide structure</li> <li>Make job placements</li> <li>Establish rules and procedures</li> </ul> </li> <li>Controlling and problem solving <ul style="list-style-type: none"> <li>Develop incentives</li> <li>Generate creative solutions</li> <li>Take corrective action</li> </ul> </li> </ol>

<http://neltontouchconsulting.files.wordpress.com/2011/02/leadership-versus-management.png>

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**PROJECT MEDICAL CENTER**

## Project Example: VAP Prevention Initiative

### Rush University Medical Center

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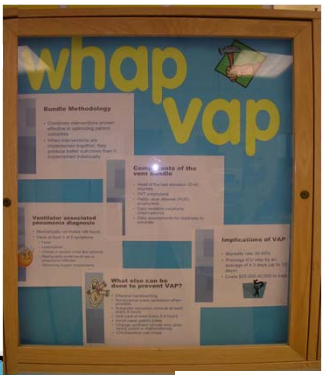
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## Focusing on Prevention of VAP: Increasing Awareness




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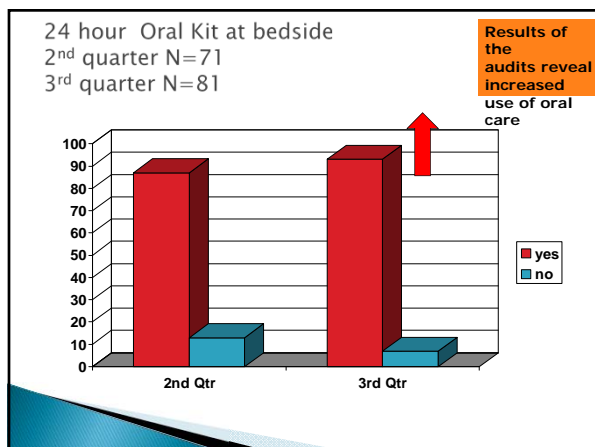
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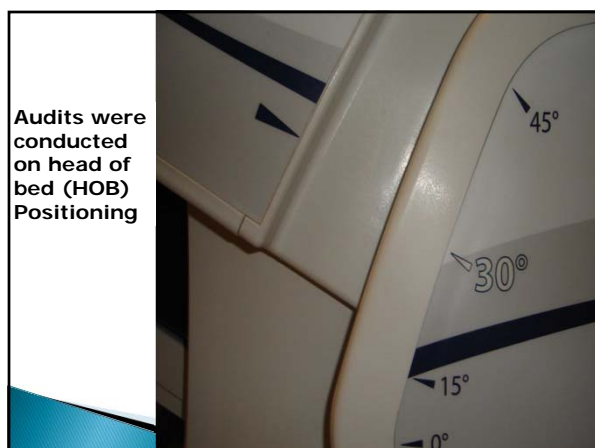
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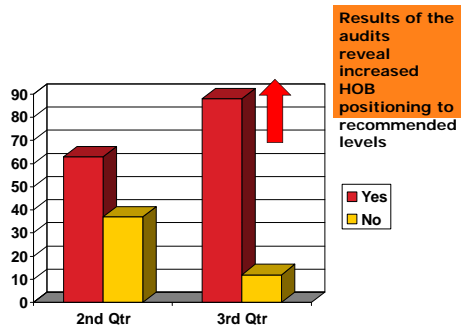
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### HOB Actually Up 30 Degrees



Results of the audits reveal increased HOB positioning to recommended levels

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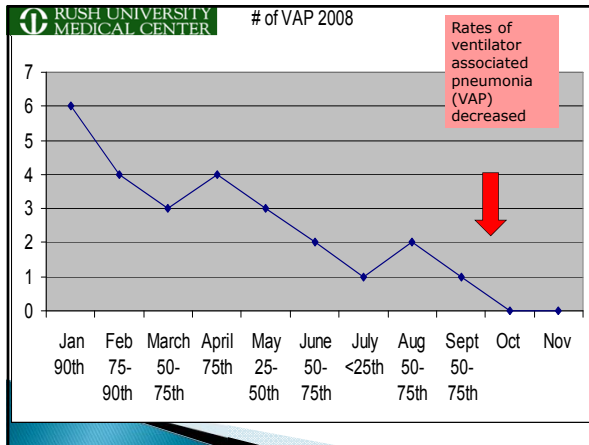
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Rates of ventilator associated pneumonia (VAP) decreased

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### Developing Leadership Skills in NPs and PAs

- Recognize accomplishments
- Provide feedback and mentoring
- Identify opportunities for additional leadership roles




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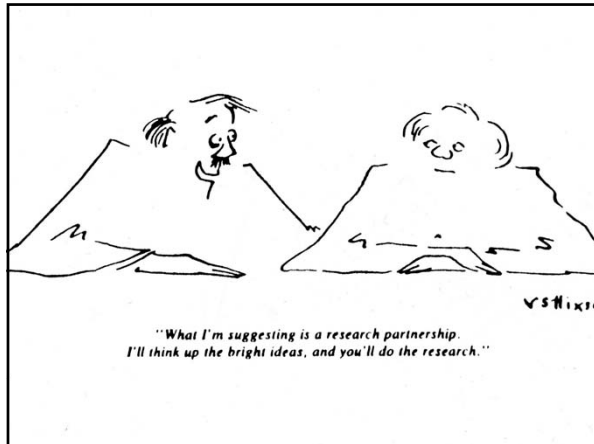
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### Common Leadership Pitfalls

- ▶ Vacillating
- ▶ Complaining
- ▶ Micromanaging
- ▶ Becoming overcommitted
- ▶ Being impatient with outcomes
- ▶ Burnout



<http://www.wickedstart.com/blog/startupsmart/2011/09/16/3-leadership-pitfalls%E2%80%A6don%E2%80%99t-fall-prey-to-them/>

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### Summary

- ▶ NPs and PAs are increasingly being used to meet the workforce needs in the ICU
- ▶ A number of strategies can be used to develop leadership among NP and PA team leaders to impact outcomes of care in the ICU




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## Resources



Ongoing Webinar Series: Critical Care Workforce

Forthcoming book "Integrating Nurse Practitioners and Physician Assistants in the ICU"  
February, 2012



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## "Practical Application of Performance Improvement"

"The Constitution only gives people the right to pursue happiness. You have to catch it yourself."

*Benjamin Franklin*

Forrest B. Fernandez, MD, FACS  
 TRHMC Trauma Program Medical Director  
 The Reading Hospital and Medical Center  
 Assistant Professor of Surgery  
 Hospital of the University of Pennsylvania  
 LTC, USAF

*Email: FernandezF@ReadingHospital.org*



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## Disclosures

- I am from Pennsylvania (PTSF)
- Most of what I have learned in Trauma, I learned by making mistakes.



"Being ignorant is not so much a shame, as being unwilling to learn"

*Benjamin Franklin*

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## Objectives:

- PI: Perspective
  - What is it?/Why bother?
  - Evolution of Trauma Systems and PI
- Basics Concepts of PI:
  - Industry Standard
  - Chart Review 101
- AP Role in PI
  - The TRHMC Experience
- Impact of PI on Maturation of a Trauma Center



"To Follow by faith alone is to follow blindly."

*Benjamin Franklin*

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## Evolution of Trauma Systems

- Dominique Larrey  
Napoleon's surgeon
- "Flying ambulance"
- Rapid recovery of wounded
- Bring hospital as close as possible to front lines
- Operate during "wound shock"



## Trauma Systems: The American War Experience

War	Wounded	% Died of Wounds
Civil War	318,200	14
WWI	153,000	8
WWII	599,724	4.5
Korean War	77,788	2.5
Vietnam War	96,000	3.6

## Surgical Mortality for Wounds Requiring Operative Intervention: US Army

Conflict	Head	Thorax	Abdomen
WWI	40%	37%	67%
WWII	14%	10%	23%
Korean War	10%	8%	9%
Vietnam War	10%	7%	9%



## History of Modern Trauma Systems

1912: American Surgical Association, Committee on fractures

1922: ACS founded:

- Committee on Fractures
- Committee on Trauma
- Hospital standardization Program (Trauma Registry)

1926 Board of Industrial Medicine in Traumatic Surgery

1966: First Trauma Centers

- SFGH, Cook County Hospital

1969 R.A. Cowley: Statewide trauma system

1976 : ACS COT, Optimal Criteria for Care of Injured Patient

1980's to Present:

- Verification Review Committee (VRC)
- ATLS
- National Trauma Data Bank

## Are Trauma Systems Effective?

- Effectiveness of State Trauma Systems in Reducing Injury-Related Mortality: a National Evaluation  
Nathens et al, JTrauma 2000, Vol 48, Issue 1, p. 25.
- Assessing Effectiveness of a Mature Trauma System: Association of Trauma Center Present with Lower Injury Mortality Rate  
Pape, L et al, JTrauma 2006, Vol 61, Issue 2, pp. 261-267.
- Direct Transport to Tertiary Trauma Centers vs. Transfer from Lower Level Facilities: Impact on Mortality and Morbidity Among Patients with Major Trauma  
Sampalis, JS et al, JTrauma 1997, Vol 43, Issue 2, pp. 288-296.
- State System
  - Pennsylvania Trauma Systems Foundation
    - Began accrediting trauma centers in 1986
    - "20 Years - 400,000 Lives"

## Institute of Medicine, Errors in Medicine

- 1999 To Err is Human  
44,000-98,000 preventable deaths/yr
- Associated cost \$17-29 billion
- Among the leading cause of death in the US

Institute of Medicine. 1999. To Err is Human: Building a Safer Health Care System. Washington, DC: National Academy Press

## IOM Recommendations

1. Fragmentation and decentralization of care
2. Accreditation: insufficient attention to preventing errors
3. System impedes systematic efforts to uncover and learn from errors
4. Little third party incentive to improve safety and quality

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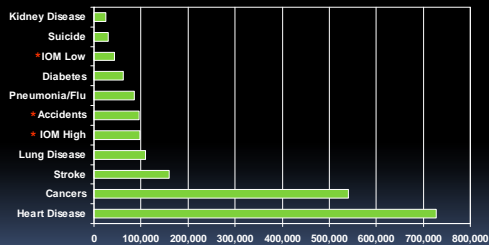
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## Annual Deaths Associated with Medical Errors Compared to Leading Causes of Death in the US: 1997



Leatherman, S. et al. 2002. Quality of Health Care in the United States: A Chartbook. New York, NY: The Commonwealth Fund.

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## National Trauma Statistics

**37 million** emergency department visits

**2.6 million** hospital admissions

### Life Years Lost\* (2006, most recent available)

Trauma injury accounts for 31% of all life years lost in the U.S.

Cancer accounts for 16%

Heart disease accounts for 12%

HIV accounts for 2.0%

### Economic Burden (Finkelstein, 2006)

\$406 billion a year, including both health care costs and lost productivity

### Deaths due to injury (2006, most recent available)

179,065

### Ranking as cause of death

#1 for age group 1-44, or 47% of all deaths in this age range

#5 as leading cause of death overall, across all age groups

Finkelstein, E.A., Corso, P.S., & Miller, T.R. The Incidence and Economic Burden of Injuries in the United States. Oxford University Press, 2006.

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## What is Trauma PI?

- "Performance Improvement" (PI)
  - the **continuous** evaluation of a trauma **system** and trauma providers through structured review
    - **process** of care
    - **outcome**
  - Review of *errors/opportunities for improvement*
    - Increase awareness
    - Process change
    - Prevention of future like events

Joint Commission on Accreditation of Healthcare Organizations (JCAHO)

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## Crew Resource Management in Healthcare



- 1979: Introduced to aviation during a NASA workshop
- improve air safety and reduce fatal accidents attributable to human error
  - primary cause of aviation accidents
    - human error
      - failures of interpersonal communication
      - Leadership
      - decision making in the cockpit.
  - cognitive and interpersonal skills needed to effectively manage a team-based, high-risk activity

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## Crew Resource Management in Trauma Bay

- Standardized Communication in Healthcare
- Team Briefings and Debriefings in the OR
- Situational Awareness in Healthcare
- Decision Making
- Leadership in Healthcare Strategies
- Conflict Resolution in Healthcare
- Effective Teamwork in Healthcare
- Critical Language in Healthcare
- Threat and Error Management



York Hospital  
TPMD: Keith Clancy, MD

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## CRM in the Trauma Bay

- Task prioritization
- Shared Mental Model and Situational Awareness
- Assignment of work
- Team communication: Before and After
- Mobilization of resources
- Performance monitoring: Data and Team
- Command: communication, coordination and feedback
- Willingness to Challenge
- Conflict resolution skills
- Video Surveillance

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## VRC Expectations of PI

- PIP maturity
- Effectiveness
- Loop Closure in Patient Care
- Expectations
  - Multidisciplinary System Review
  - Documentation of use of Audit Filters
  - Use of Trauma Registry to monitor PI
  - Classification of Deaths and Complications (preventability)



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## PI Realities

Nobody has an ideal trauma program  
Most programs struggle with PI  
No precise prescription for PI exists  
Trauma provider involvement critical  
Multidisciplinary involvement is critical  
Adverse outcome does not always indicate bad care  
Focus on opportunities for improvement rather than on problems  
Most errors are related to system failure  
Concurrency is critical  
Data Driven

- Evidence based
- Registry

Effective PI program provides leverage for obtaining resources  
PI will benefit from the advances in information technology



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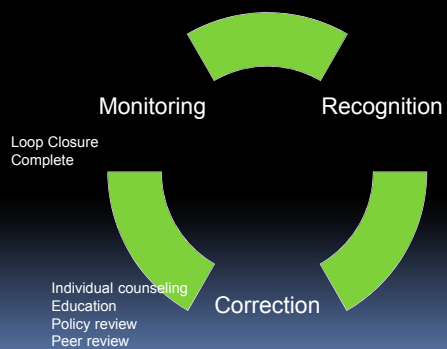
## Basic Concepts

## Issue Identification

- Guideposts
  - ATLS
  - Green Book
  - Industry Standards
  - Evidenced based Care
- Registry Data



## Performance Improvement Process



## PI: Primary Review (Issue Identification)

### ▪ Concurrent Issue ID

- AM Report (multidisciplinary team review)
- Daily trauma service census list
- Daily ICU and Floor Rounds
- Trauma registry abstraction
- Communication with Trauma Staff and Trauma Registry
- PI Hotline



*Concurrent data entry of issues and relevant discussions is entered into POPIMS real time.*

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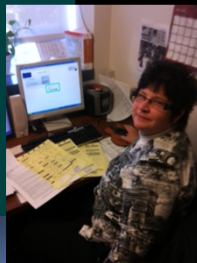
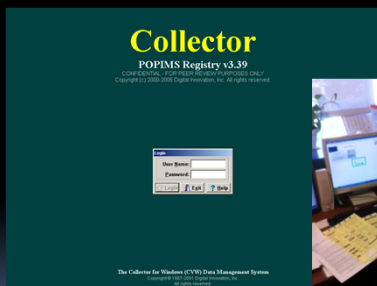
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## Registry



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## Secondary Trauma PI Review Criteria

- PTOS Population
  - Deaths
  - Transfers
  - ICU Admits
  - Age  $\leq 14$
  - LOS  $\geq 48$  hrs
- PTOS Occurrences
- PTOS Audit Filters
- Institution Specific Filters

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## Lesson 1: "Resist the urge to make sweeping policy changes based on one case?"



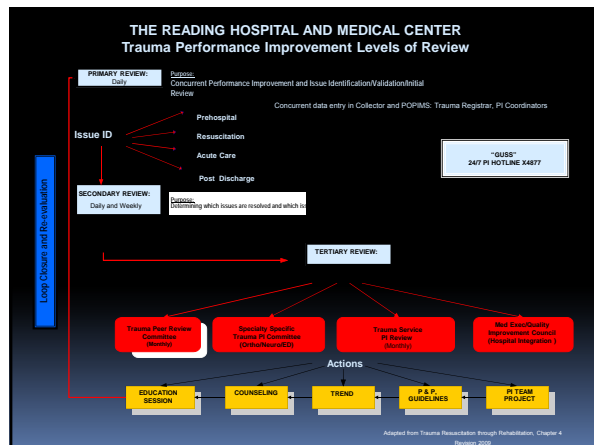
### ▪ Triage of Trauma Activations

- Physiologic
  - Vital Signs including GCS
- Anatomic
  - Injuries noted
- Mechanism
  - Specifics of events
- Co-Morbid Factors
  - Extremes of Age, **Pregnancy**, Medical Illnesses



Trauma Team Activation

*A better solution to ensure a better process intrinsic to ED would have avoided encumbering vital resources needed by sicker patient populations.*



## Performance Improvement Program Case Review Example

- Case Summary:
  - J.S. a 74yoM bicyclist who crashed into mailbox
  - Injuries: L flail chest with pneumothorax
  - Pt discussed at AM Report - multiple unsuccessful attempts made at intubation followed by immediate cricothyroidotomy
- Issue Identification:
  - Primary review: An issue surrounding the intubation was identified.
  - Secondary review: Case discussed at Weekly PI with regard to delay in definitive airway control due to location of difficult airway cart. Cart was a distance away from the trauma bay.
  - Tertiary Review: Case reviewed during our Trauma Peer Review forum the month following the incident.

## Performance Improvement Program : Case Review

- Action Plan:
  - Movement of Difficult Air way cart in closer proximity to Trauma Bay
  - Anesthesia would modify the contents of the cart
  - Counseling specific provider with regards to need earlier surgical airway
- Outcome:
  - Cart was moved and sign placed above cart
  - All personnel notified of new location
  - Education discussion during Peer Review regarding difficult airway management



■ Evaluation:  
- No further issues identified

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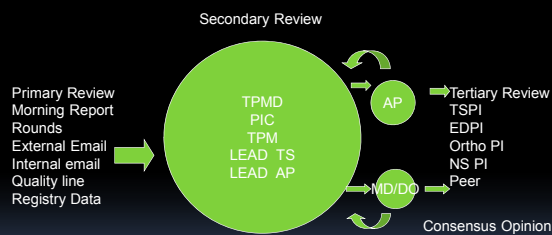
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## Secondary Review




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## Performance Improvement Tertiary Review

- Trauma Surgeon PI Meeting (Trauma clinicians)
- Subspecialty PI Meetings
  - Ortho PI (Trauma and Ortho Clinicians)
  - Neurosurgery PI
  - Emergency Department PI
- Multidisciplinary (all specialties)
  - Peer Review

*Data entry of issues and relevant discussions is entered into POPIMS real time.*

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## Performance Improvement Action Plan & Implementation

- Physician & Staff Counseling
- Policy Development or Revision
- Change in Practice
- Refer for Focused Provider Review
- Educational Session

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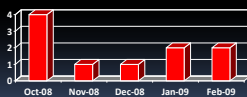
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## Performance Improvement Loop Closure & Reevaluation

- Continuous Monitoring
- Trending of Data
- Focused Audits

Missed Injuries / Delays in Diagnosis



Data is being trended to monitor patient outcomes to assure  
loop closure.

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## Critical Definition: Disease-Related

- Any event or complication that is an expected sequellae of a disease, illness, or injury
  - **Infectious events:** UTI after prolonged but necessary urethral catheter
  - **Pulmonary:** Adult respiratory distress syndrome (ARDS) from injury despite best available treatment
  - **Organ failure:** Renal failure despite preventative efforts
  - **GI:** Ileus after injury, or stress ulcer bleed despite appropriate prophylaxis
  - **Hematologic:** Anemia after unavoidable blood loss in the field
  - **Dermatologic:** Skin-sloughing over area of severe contusion; for example, in the elderly

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## Chart Review 101

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## Trauma Performance Improvement File

- Contents of Trauma PI File
  - POPIMS Case Review Summary
  - Trauma Surgeon Evaluation Form
  - Trauma Flow Sheet
  - Standard Chart Review Form
  - Focused Provider Review Form (ATLS/ MD chart review)
  - Neurosurgery Review Form
  - Correspondence
  - Supporting Documents



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## AP Role in PI: TRHMC Experience



"An investment in knowledge always pays the best interest."  
*Benjamin Franklin*

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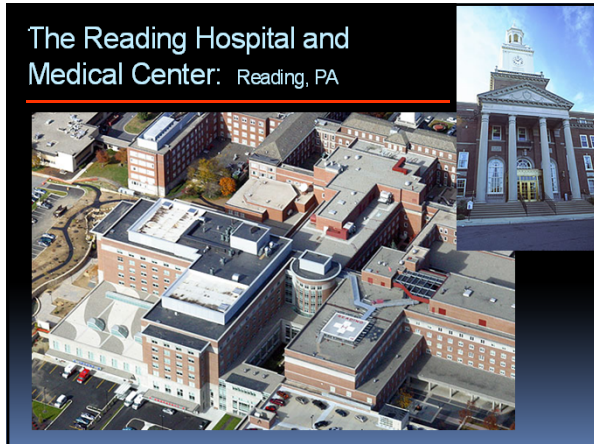
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## The Reading Hospital and Medical Center: Reading, PA




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## TRHMC Trauma and Emergency Surgical Service

- 5 Full Time Trauma Surgeon's
- 4 Part-time Trauma Surgeons
- 1 ED Critical Care provider
- 8 Advanced Practitioners
- 4 Residents

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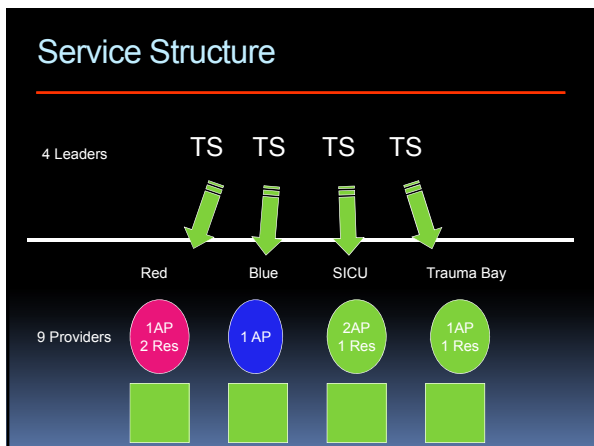
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## Service Structure




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## AP Role in Service Structure

- Floor Care
- Resuscitation Team Leader
- First Assistant in OR
- SICU patient management
- Consultation ED and Inpatient

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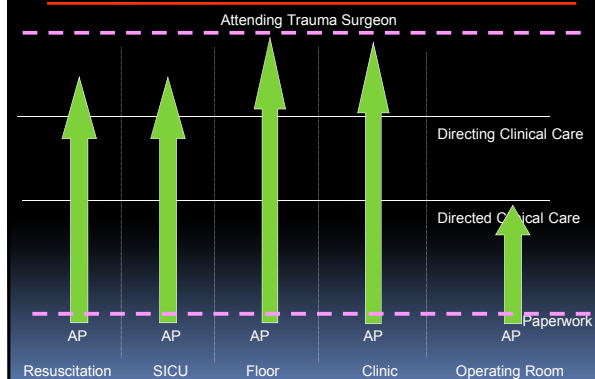
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## AP as Colleague: Key to Satisfaction




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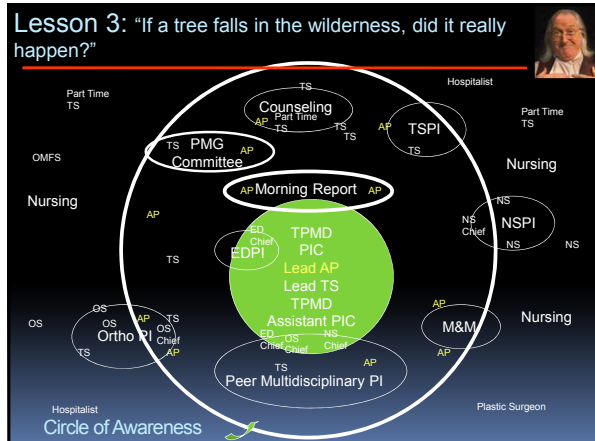
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## PI and Trauma Center Maturation



"Never confuse motion with action"  
*Benjamin Franklin*

"Energy and persistence conquer all things."  
*Benjamin Franklin*

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## 2008 PTSF Survey

- Trauma volume has grown significantly over the last year creating the need to reprioritize efforts relating to PI.
- Our outcomes reflect consistent improvement in identifying and addressing issues in a concurrent manner.
- PI documentation is more consistent and evident through better use of the POPIMS database.
- We now have the ability to trend data including provider specific issues
- Loop closure has been realized on some issues while many are in progress due to action plan implementation occurring only a short while ago.

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## Integration w/ Hospital PI

- Transforming ICU (TICU)
  - VAP
- Nursing Core Group
  - Brain Death
  - Pain / skin integrity
- Nursing CQI Committee
  - Transition from ICU
- DVT Initiative (hospital)
- UTI Initiative (hospital)



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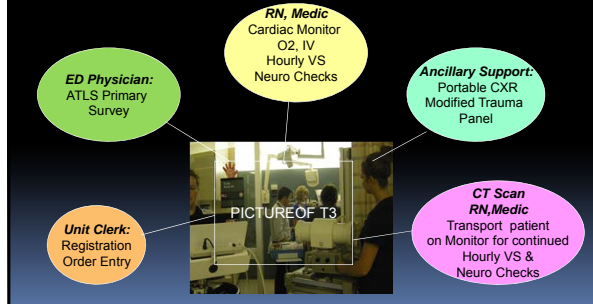
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## Lesson 4: "The Power is in We!"



### Tier 3 Activation Team: Initial Assessment




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### Triage Level and Admission Rate: All Contacts (3/1/10-8/31/10)

	Alerts Trauma*	Responses Trauma*	Tier 3 Trauma*	Tier 3 ED†
Total Contacts	351	686	316	1753
Percent Admit	62%	45%	76%	24%

\*Trauma Registry Data  
†ED Source: Pulsecheck®

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### Mortality: All Contacts PreT3: 3/1/2008-8/31/2008 PostT3: 3/1/2010-8/31/2010

Era	n (patients)	Mortality % In Consults
Pre T3 (Consults All)	266	3.4%
Post T3 Consults All (Routine Consult + T3)	502	1.4%
		p-value=0.038

Mortality for T3 patients same period=1.5%

TRHMC Trauma Registry Data

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### T3 Trauma Activation: Impact on ED

	N	% all ED presenting patients	% Acute ED patients	% of Total Activations
Tier 3	3467* (9.5/day)	3%	10%	70%

\*Annualized estimate (3/1/10-8/31/10)

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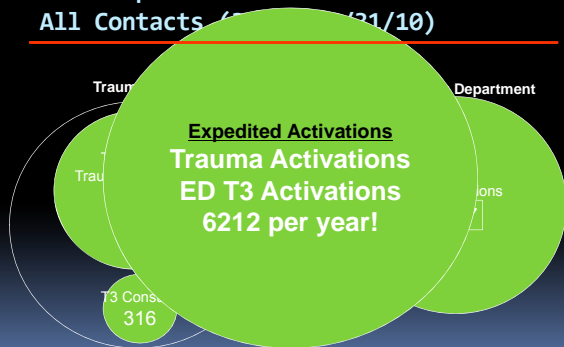
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### Resources for the High/Moderate Risk Populations: All Contacts (3/1/10-8/31/10)




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### Summary

- PI is critical to maturation of a Trauma Center
- AP's can and should play a critical role in PI process from issue identification, analysis and institution of change
- Current trends of increasing practice armament of AP's and maturation of Acute Care Surgery with application of the PI process will only serve to increase the critical importance of AP's in the PI process



"When you're finished changing,  
you're finished."  
*Benjamin Franklin*

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