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:
William Hoff, MD – Workshop Director
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John Gillard, PA-C
Ruth Kleinpell, RN, PhD, ACNP, CCRN
John Osborn, MSc
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

Basic Concepts in Health Economics

Or, the dismal science gets admitted
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*.
**Microeconomics 201**
- Elasticity: how much demand or supply changes in response to a change in one of its drivers

![Graph showing elasticity](image)
- Elastic - % change in demand **greater** than % change in price
- Inelastic - % change in demand **less** than % change in price

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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

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**The Health Care Market**
The Health Care Market

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)

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
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”

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

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
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

Health Insurance Coverage in the U.S., 2010

Total = 305.2 million

* 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.

Health Insurance Coverage of the Nonelderly Population, 2010

SOURCE: KCMU/Urban Institute analysis of 2011 ASEC Supplement to the CPS.
Distribution of Health Plan Enrollment for Covered Workers, by Plan Type, 1988-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Coverage</th>
<th>Family Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>40%</td>
<td>15%</td>
</tr>
<tr>
<td>1989</td>
<td>28%</td>
<td>20%</td>
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<td>1990</td>
<td>42%</td>
<td>17%</td>
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<tr>
<td>1991</td>
<td>37%</td>
<td>18%</td>
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<tr>
<td>1992</td>
<td>36%</td>
<td>18%</td>
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<tr>
<td>1993</td>
<td>34%</td>
<td>19%</td>
</tr>
<tr>
<td>1994</td>
<td>31%</td>
<td>18%</td>
</tr>
<tr>
<td>1995</td>
<td>30%</td>
<td>18%</td>
</tr>
<tr>
<td>1996</td>
<td>29%</td>
<td>18%</td>
</tr>
<tr>
<td>1997</td>
<td>28%</td>
<td>18%</td>
</tr>
<tr>
<td>1998</td>
<td>26%</td>
<td>17%</td>
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<tr>
<td>1999</td>
<td>24%</td>
<td>15%</td>
</tr>
<tr>
<td>2000</td>
<td>22%</td>
<td>14%</td>
</tr>
<tr>
<td>2001</td>
<td>20%</td>
<td>12%</td>
</tr>
<tr>
<td>2002</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>2003</td>
<td>16%</td>
<td>12%</td>
</tr>
<tr>
<td>2004</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>2005</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>2006</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>2007</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>2008</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>2009</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>2010</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>2011</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*Distribution is statistically different from the previous year shown (p<.05). No statistical tests were conducted for years prior to 1999. No statistical tests are conducted between 2005 and 2006 due to the addition of HDHP/SO as a new plan type in 2006.

Note: Information was not obtained for POS plans in 1988. A portion of the change in plan type enrollment for 2005 is likely attributable to incorporating more recent Census Bureau estimates of the number of state and local government workers and removing federal workers from the weights. See the Survey Design and Methods section of the 2005 Kaiser/HRET Survey of Employer-Sponsored Health Benefits for additional information.


Percentage of All Firms Offering Health Benefits, 1999-2011

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Offer</td>
<td>50%</td>
<td>55%</td>
<td>60%</td>
<td>65%</td>
<td>70%</td>
<td>75%</td>
<td>80%</td>
<td>85%</td>
<td>90%</td>
<td>95%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Estimate is statistically different from estimate for the previous year shown (p<.05).

Note: Estimates presented in this exhibit are based on the sample of firms that completed the entire survey and those that answered just one question about whether they offer health benefits. The percentage of firms offering health benefits is largely driven by small firms. The large increase in 2010 was primarily driven by a 12 percentage point increase in offering among firms with 3 to 9 workers. In 2011, 48% of firms with 3 to 9 employees offer health benefits, a level more consistent with levels from recent years other than 2010. The offer rate in 2011 is consistent with the long term trend, indicating that the high 2010 offer rate may be an aberration.


Average Annual Worker Premium Contributions and Total Premiums for Covered Workers, Single and Family Coverage, by Firm Size, 2011

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>Single Coverage</th>
<th>Family Coverage</th>
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<tbody>
<tr>
<td>Premium</td>
<td>$9,526</td>
<td>$15,596</td>
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<tr>
<td>Worker Contribution*</td>
<td>$15,115</td>
<td>$15,596</td>
</tr>
<tr>
<td>Premium</td>
<td>$21,755</td>
<td>$21,936</td>
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<tr>
<td>Worker Contribution*</td>
<td>$4,936</td>
<td>$4,755</td>
</tr>
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</table>

* Estimates are statistically different between All Small Firms and All Large Firms (p<.05).

**Average Annual Premiums for Single and Family Coverage, 1999-2011**

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Coverage</th>
<th>Family Coverage</th>
</tr>
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<tbody>
<tr>
<td>1999</td>
<td>$16,470*</td>
<td>$18,490*</td>
</tr>
<tr>
<td>2000</td>
<td>$17,000*</td>
<td>$19,000*</td>
</tr>
<tr>
<td>2001</td>
<td>$17,500*</td>
<td>$19,500*</td>
</tr>
<tr>
<td>2002</td>
<td>$18,000*</td>
<td>$20,000*</td>
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<tr>
<td>2003</td>
<td>$18,500*</td>
<td>$20,500*</td>
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<tr>
<td>2004</td>
<td>$19,000*</td>
<td>$21,000*</td>
</tr>
<tr>
<td>2005</td>
<td>$19,500*</td>
<td>$21,500*</td>
</tr>
<tr>
<td>2006</td>
<td>$20,000*</td>
<td>$22,000*</td>
</tr>
<tr>
<td>2007</td>
<td>$20,500*</td>
<td>$22,500*</td>
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<tr>
<td>2008</td>
<td>$21,000*</td>
<td>$23,000*</td>
</tr>
<tr>
<td>2009</td>
<td>$21,500*</td>
<td>$23,500*</td>
</tr>
<tr>
<td>2010</td>
<td>$22,000*</td>
<td>$24,000*</td>
</tr>
<tr>
<td>2011</td>
<td>$22,500</td>
<td>$24,500</td>
</tr>
</tbody>
</table>

* Estimate is statistically different from estimate for the previous year shown (p<.05).


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**Medicare Enrollment, 1966-2010**

- **Nonelderly Disabled (Under Age 65)**
- **Elderly (Age 65 and Older)**

Number in millions:

<table>
<thead>
<tr>
<th>Year</th>
<th>Nonelderly Disabled</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>19.1</td>
<td>20.5</td>
</tr>
<tr>
<td>1970</td>
<td>25.0</td>
<td>22.8</td>
</tr>
<tr>
<td>1975</td>
<td>31.1</td>
<td>28.5</td>
</tr>
<tr>
<td>1980</td>
<td>34.2</td>
<td>31.0</td>
</tr>
<tr>
<td>1985</td>
<td>37.6</td>
<td>34.1</td>
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<td>1990</td>
<td>39.4</td>
<td>33.2</td>
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<td>1995</td>
<td>42.0</td>
<td>33.4</td>
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<td>2000</td>
<td>43.3</td>
<td>33.5</td>
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<td>2005</td>
<td>44.0</td>
<td>33.6</td>
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<td>2006</td>
<td>45.4</td>
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<td>2007</td>
<td>46.1</td>
<td>33.8</td>
</tr>
<tr>
<td>2008</td>
<td>47.0</td>
<td>33.9</td>
</tr>
</tbody>
</table>

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**Medicare Beneficiaries as a Percent of State Populations, 2010**

National Average, 2010 = 15%

[Map showing the percentage of Medicare beneficiaries by state, ranging from 9% to 18%.]

Sources: Medicare beneficiaries as a percent of state populations as of May 1, 2010, based on decennial census; and 2010 Health Receipts.
The federal poverty level was $22,050 for a family of four in 2010. Data may not total 100% due to rounding.

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

**Characteristics of the Nonelderly Uninsured, 2010**

<table>
<thead>
<tr>
<th>Family Status</th>
<th>Family Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults with Dependent Children</td>
<td>400% FPL and Above</td>
</tr>
<tr>
<td>Children</td>
<td></td>
</tr>
<tr>
<td>Parents</td>
<td></td>
</tr>
<tr>
<td>Total = 49.1 million uninsured</td>
<td></td>
</tr>
</tbody>
</table>

**Family Work Status**

- No Workers: 24%
- 1 or More Full-Time Workers: 43%
- Part-Time Workers: 33%

**Practice Management 101**

**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
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

Professional Fees

- 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
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

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.

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
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

Hospital Billing

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)
Practice Management

- Medicare DRG Payments
  Base Payment * Relative Weight
  [+ DSH + IME]
  - 2011 Base Payment = $5164.11

<table>
<thead>
<tr>
<th>DRG</th>
<th>Title</th>
<th>Weight</th>
<th>Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>799</td>
<td>Splenectomy w MCC</td>
<td>4.9434</td>
<td>$25,528.26</td>
</tr>
<tr>
<td>800</td>
<td>Splenectomy w CC</td>
<td>2.5874</td>
<td>$13,361.62</td>
</tr>
<tr>
<td>801</td>
<td>Splenectomy wo CC</td>
<td>1.5586</td>
<td>$8,048.78</td>
</tr>
</tbody>
</table>


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

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, pO2 = 78 on non-rebreather, pH = 7.18, pCO2 = 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?
# Practice Management

## Principal Diagnosis
- Chills and Fever
- Sepsis

## Secondary Diagnosis
- Hemodilution
- Acute Respiratory Failure
- Aspiration Pneumonia
- Acute Renal Failure (or AKI)
- Respiratory Acidosis
- Metabolic Encephalopathy

### Medicare MS-DRG Table

<table>
<thead>
<tr>
<th>DRG Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>864</td>
<td>Fever w/o CCMCC</td>
</tr>
</tbody>
</table>

### APR-DRG Table

<table>
<thead>
<tr>
<th>APR-DRG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>720</td>
<td>Fever</td>
</tr>
</tbody>
</table>

### APR-DRG Severity Score
- 1 = Minor
- 3 = Moderate
- 4 = Severe

### APR-DRG Risk of Mortality
- 1 = Minor
- 3 = Moderate
- 4 = Severe

### 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!**
The Use of CT Scan in the Trauma Bay

Riad Cachecho, MD, MBA
Crozer Chester Medical Center

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

Computed Tomography Scan
• Converts 2 D images to 3 D images
• Cross sectional vs. Spiral (helical)
• Single slice vs. 168 slice
• Speed
• Resolution
The Risk of Radiation

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

* US Nuclear Regulatory Commission
** DJ Brenner et al: Estimated risk of radiation induced fatal cancer from pediatric CT, ARRS, 2000
**** TA Laack et al: Comparison of trauma mortality and estimated cancer mortality from CT during initial evaluation of thoracic trauma, 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/abdominal/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

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

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

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

ATLS/EAST Guidelines

Indications of Chest CT Scan

- Thoracic aortic injury
- Thoracic spinal injury
- Ruptured diaphragm
- Pulmonary contusion
- Rib fracture
Indications of Chest CT Scan

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

ATLS/EAST Guidelines

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

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
Pediatric Trauma

• Use clinical judgment
• Consider risk of traumatic mortality Vs. radiation exposure
• Consider observation
• Consider your resources
Chest, abdomen & pelvis
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

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

Compensated Shock
Early definitive control of the airway

Control active hemorrhage

Early correction of hypoperfusion of tissue
- Uncontrolled/Excessive fluid resuscitation is harmful
Goals of Trauma Care

- Ensure that tissues receive adequate oxygen
  - Oxygen Delivery (DO₂)
- Ensure that tissues are able to consume the oxygen they require to function
  - Oxygen Consumption (VO₂)

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

Components of Oxygen Delivery and Consumption

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

Pulmonary Gas Exchange
- Oxygen availability (FiO₂)
- Alveolar ventilation (RR and Vt)
- Diffusion across alveolar-capillary membrane
- Pulmonary perfusion
- Ventilation/Perfusion (V/Q)
  - Ratio of ventilation to perfusion
Oxygen Delivery (DO₂)

- \( \text{DO}_2 = \text{CO} \times \text{CaO}_2 \times 10 \)

- **Cardiac Output (L/min)**
  - \( \text{CO} = \text{Heart Rate (HR)} \times \text{Stroke Volume (SV)} \)
  - The major component of oxygen delivery

- **Oxygen Content of blood**
  - \( \text{PO}_2 \) (2%) – pressure that is exerted by oxygen when dissolved in plasma
  - \( \text{SO}_2 \) (98%) – amount of oxygen bound to hemoglobin
  - Greatest contributor to \( \text{CO}_2 \) is the hemoglobin level
  - \( \text{CaO}_2 = (1.38 \times \text{Hgb} \times \text{SaO}_2) + (0.0031 \times \text{PaO}_2) \)
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
**Oxygen Consumption (VO₂)**

- VO₂ = Arterial Oxygen Delivery - Venous Oxygen Delivery
- VO₂ = CO x Hgb x 1.38 x (SaO₂ - SvO₂)
- Oxygen consumption is the best index of tissue oxygen requirements available to the clinician

**Venous Oxygen Saturation**

- Sample of blood taken from the pulmonary artery (SvO₂)
  - Mixed venous oxygen saturation
- Sample of blood taken from the superior vena cava (ScvO₂)
- 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
**Threats to $\text{DO}_2/\text{VO}_2$ Balance**

- Inadequate Oxygen Delivery
  - Impaired pulmonary exchange
  - Inadequate oxygen carrying capacity
  - Insufficient cardiac output

- Increased Metabolic Requirements
  - Fever, pain, anxiety, shivering
  - SIRS

**Compensatory Mechanisms**

- Increase cardiac output

- Redistribution of blood flow
  - Shunting of blood from extremities, mesentery, kidneys, etc.

- Increase oxygen extraction by the tissues

**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
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

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

Lactate Level

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 O₂ at 37°C and PaCO₂ of 40 mmHg
- Good correlation between the base deficit and survival
  - LD₅₀ 11.8 mmol/L
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.

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 24h correlated with MODS

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

Lactate clearance

- Lactate clearance at 24h, 24-48h, and >48h.
Monitor 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

Levels of Assessment
- Physical Assessment
- Laboratory Assessment
- Non-invasive Monitoring
- Basic Invasive Monitoring
- Advanced Invasive Monitoring

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
Advanced Monitoring

- Echocardiogram
- Central Venous Oximetry (ScvO₂)
- Arterial Pressure-Based Cardiac Output
- Pulmonary Artery Catheter
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

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)
Continuous venous oximetry
- Determining the adequacy of oxygen delivery to meet demand
  - Pulmonary artery catheter
  - Fiber optic oximetry catheters
Swan–Ganz pulmonary artery catheter

- PAP
- RAP
- PAOP
- CCO
- RVEF
- RVEDV
- SvO2
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 ; www.AAPA.org

Online membership survey
N=3368
AANP Membership Survey: NP Specialty Areas

N=3368

Goolsby MJ. JAANP 2009;21:618-622

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

Primary Specialty

N=19,830

www.aapa.org
Most Common Practice Settings

<table>
<thead>
<tr>
<th>Practice Setting</th>
<th>Census</th>
<th>PA Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive/critical care unit of hospital</td>
<td>461</td>
<td>1,024</td>
</tr>
<tr>
<td>Inpatient unit of hospital (not ICU/CCU)</td>
<td>2,116</td>
<td>8,724</td>
</tr>
<tr>
<td>Outpatient unit of hospital</td>
<td>1,576</td>
<td>6,668</td>
</tr>
<tr>
<td>Hospital ER</td>
<td>2,012</td>
<td>8,587</td>
</tr>
<tr>
<td>Hospital OR</td>
<td>1,144</td>
<td>4,856</td>
</tr>
<tr>
<td>Other hospital unit</td>
<td>244</td>
<td>1,131</td>
</tr>
</tbody>
</table>

Physician Assistant and Nurse Practitioner Utilization in Academic Medical Centers

Marc Mootz, MS, PA-C,1 Cathleen Kresek, RN, MSN, MBA,1 Ruth Kinneppell, PhD, RN, FAAN, FCCM,1 and Barbara Todd, DNP, CRNP, FAANP1

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 (AMC).
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
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."


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

http://www.legacce.com/info/Leadership/LeadershipEntrepreneurial.html

Leadership Styles

http://www.nwlink.com/~donclark/leader/leadstl.html
Providing Leadership Opportunities

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

Rush University Medical Center
Purpose

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

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

**Day 1**

<table>
<thead>
<tr>
<th>Indications for use of an indwelling urinary catheter</th>
<th>Indications for discontinuation or change in catheter placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary tract obstruction</td>
<td>Incontinence without any of the appropriate indications</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Patient to undergo prolonged (&gt;3 hours) procedure</td>
<td>Frequent, but nonessential, determination of urinary output</td>
</tr>
<tr>
<td>Recently undergone surgical invasive procedure</td>
<td>Nausea concern about patient's discomfort</td>
</tr>
<tr>
<td>Epidural catheter in place</td>
<td>Diarrhea, without any of the appropriate indications</td>
</tr>
<tr>
<td>Frequent monitoring (&gt; every 2 hours) of urinary output required</td>
<td>Patient's preference</td>
</tr>
<tr>
<td>Deep wound/paralysis</td>
<td>Notes of concern about patient's discomfort</td>
</tr>
<tr>
<td>Stage III or IV skin ulcer</td>
<td></td>
</tr>
<tr>
<td>Surgical repair of dialysis alve</td>
<td></td>
</tr>
<tr>
<td>Urine retention due to terminal illness or severe impairment</td>
<td></td>
</tr>
</tbody>
</table>

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.
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
Differentiating Leadership and Management

<table>
<thead>
<tr>
<th>Leadership</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produces change and movement</td>
<td>Produces order and consistency</td>
</tr>
<tr>
<td>1. Establishes direction</td>
<td>1. Planning and budgeting</td>
</tr>
<tr>
<td>- Creates a vision</td>
<td>- Establishes agenda</td>
</tr>
<tr>
<td>- Clarifies the big picture</td>
<td>- Sets timetable</td>
</tr>
<tr>
<td>- Sets strategies</td>
<td>- Allocates resources</td>
</tr>
<tr>
<td>2. Aligns people</td>
<td>2. Organizing and staffing</td>
</tr>
<tr>
<td>- Communicates goals</td>
<td>- Provides directionality</td>
</tr>
<tr>
<td>- Seeks commitment</td>
<td>- Makes job placements</td>
</tr>
<tr>
<td>- Builds teams, coalitions and alliances</td>
<td>- Establishes rules and procedures</td>
</tr>
<tr>
<td>3. Motivates and inspires</td>
<td>3. Controlling and problem solving</td>
</tr>
<tr>
<td>- Energizes</td>
<td>- Develops contingency plans</td>
</tr>
<tr>
<td>- Empowers subordinates and colleagues</td>
<td>- Generates creative solutions</td>
</tr>
<tr>
<td>- Satisfies latent needs</td>
<td>- Takes corrective actions</td>
</tr>
</tbody>
</table>

Project Example: VAP Prevention Initiative

Rush University Medical Center

Focusing on Prevention of VAP: Increasing Awareness
Audits were conducted on Oral care practices.

Results of the audits reveal increased use of oral care.

24 hour Oral Kit at bedside
2nd quarter N=71
3rd quarter N=81

Audits were conducted on head of bed (HOB) Positioning.
Results of the audits reveal increased HOB positioning to recommended levels.

Rates of ventilator associated pneumonia (VAP) decreased.

Developing Leadership Skills in NPs and PAs

- Recognize accomplishments
- Provide feedback and mentoring
- Identify opportunities for additional leadership roles
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-don-t-fall-prey-to-them/

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
Ongoing Webinar Series: Critical Care Workforce

Forthcoming book "Integrating Nurse Practitioners and Physician Assistants in the ICU" February, 2012
"Practical Application of Performance Improvement"

Forrest B. Fernandez, MD, FACS
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Assistant Professor of Surgery
Hospital of the University of Pennsylvania
LTC, USA

Email: FernandezF@ReadingHospital.org

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

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
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

<table>
<thead>
<tr>
<th>War</th>
<th>Wounded</th>
<th>% Died of Wounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil War</td>
<td>315,200</td>
<td>14</td>
</tr>
<tr>
<td>WWII</td>
<td>153,000</td>
<td>8</td>
</tr>
<tr>
<td>WWII</td>
<td>599,724</td>
<td>4.5</td>
</tr>
<tr>
<td>Korean War</td>
<td>77,788</td>
<td>2.5</td>
</tr>
<tr>
<td>Vietnam War</td>
<td>96,000</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Surgical Mortality for Wounds Requiring Operative Intervention: US Army

<table>
<thead>
<tr>
<th>Conflict</th>
<th>Head</th>
<th>Thorax</th>
<th>Abdomen</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWI</td>
<td>40%</td>
<td>37%</td>
<td>67%</td>
</tr>
<tr>
<td>WWII</td>
<td>14%</td>
<td>10%</td>
<td>23%</td>
</tr>
<tr>
<td>Korean War</td>
<td>10%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>Vietnam War</td>
<td>10%</td>
<td>7%</td>
<td>9%</td>
</tr>
</tbody>
</table>
History of Modern Trauma Systems

1912: American Surgical Association, Committee on fractures
Committee on Fractures
Committee on Trauma
Hospital standardization Program (Trauma Registry)
1916 Board of Industrial Medicine in Traumatic Surgery
1966: First Trauma Centers
SFGH, Cook County Hospital
1969: R. A. Cowley: Statewide trauma system
1966: ACS (COI), 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.16
- Assessing Effectiveness of a Mature Trauma System: Association of Trauma Center Present with Lower Injury Mortality Rate
- Direct Transport to Tertiary Trauma Centers vs. Transfer from Lower Level Facilities: Impact on Mortality and Morbidity Among Patients with Major Trauma

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

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

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

National Trauma Statistics

37 million emergency department visits
2.6 million hospital admissions

Life Years Lost (2006, most recent available)
- Trauma injury accounts for 5% of all life years lost in the U.S.
- Cancer accounts for 16%
- Heart disease accounts for 14%
- PV accounts for 2.5%

Economic Burden (Finkelstein, 2006)
- Estimates a year, including both health care costs and lost productivity
- Deaths due to injury (2006, most recent available)
- 429,965

Ranking as cause of death
- 4th leading cause of death overall, across all age groups
- 11th leading cause of death in age group

What is Trauma PI?

- "Performance Improvement" (PI)
  - continuous evaluation of a trauma system
  - 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)

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

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
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

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)

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
Basic Concepts

Issue Identification

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

Performance Improvement Process

Monitoring - Recognition - Correction

- Loop Closure: Complete
- Individual counseling
- Education
- Policy review
- Peer review
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.

Registry

Secondary Trauma PI Review Criteria

- PTOS Population
  - Deaths
  - Transfers
  - ICU Admits
  - Age ≤ 14
  - LOS ≥ 48 hrs
- PTOS Occurrences
- PTOS Audit Filters

- Institution Specific Filters
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

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

THE READING HOSPITAL AND MEDICAL CENTER
Trauma Performance Improvement Levels of Review

Issue ID

- Prehospital
- Acute Care
- Resuscitation
- Post Discharge

PRIMARY REVIEW:
- Daily
- Concurrent review: Director, Trauma Surgeons, PI Coordinator, CRNP/PA, Program Manager
- Concurrent data entry in Collector and POPIMS: Trauma Registrar, PI Coordinators
- POPIMS Case Management Initiated – Trauma PI Coordinators

SECONDARY REVIEW:
- Daily and Weekly
- Potentially Preventable/Preventable Issues (and Non-Preventable with educational value)

TERTIARY REVIEW:
- Trauma Program Medical Director
- Trauma Program Manager
- Trauma PI Coordinators
- Team (TPMD, TPM, Data Coordinator, PI Coordinator, CRNP/PA, Trauma Surgeons, Specialties Staff, Hospital PI)

Morbidity & Mortality
- Trauma Peer Review Committee (Monthly)
- Specialty Specific Trauma PI Committee (Ortho/Neuro/ED)

Actions
- EDUCATION
- SESSION
- COUNSELING
- P & P, GUIDELINES
- PI TEAM
- PROJECT

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 Airway 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

Secondary Review

- Primary Review: Morning Report, Rounds
- External Email, Internal email, Quality line, Registry Data
- Secondary Review: TPMD, PIC, TPM, LEAD TS, LEAD AP
- Tertiary Review: TSPI, EDPI, Ortho PI, NS PI, Peer
- Consensus Opinion

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.*
Performance Improvement
Action Plan & Implementation

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

Performance Improvement
Loop Closure & Reevaluation

- Continuous Monitoring
- Trending of Data
- Focused Audits

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

Critical Definition: Disease-Related

- Any event or complication that is an expected sequela 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: Bleed 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
Chart Review 101

Trauma Performance Improvement File

- Contents of Trauma PI File
  - PCPIMS 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

AP Role in PI: TRHMC Experience

"An investment in knowledge always pays the best interest."
Benjamin Franklin
The Reading Hospital and Medical Center: Reading, PA

TRHMC Trauma and Emergency Surgical Service
- 5 Full Time Trauma Surgeons
- 4 Part-time Trauma Surgeons
- 1 ED Critical Care provider
- 8 Advanced Practitioners
- 4 Residents

Service Structure
- 4 Leaders
- 9 Providers
- 4 Triage Stations (TS)
- Red, Blue, SICU, Trauma Bay
- 2AP, 1AP, 1AP, 1 Res
AP Role in Service Structure

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

AP as Colleague: Key to Satisfaction

Lesson 3: “If a tree falls in the wilderness, did it really happen?”
PI and Trauma Center Maturation

"Never confuse motion with action."  
Benjamin Franklin

"Energy and persistence conquer all things."  
Benjamin Franklin

2008 PTSF Survey

- Trauma volume has grown significantly over the last year creating the need to re prioritize 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.

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)
Lesson 4: “The Power is in We!”

Tier 3 Activation Team: Initial Assessment

- ED Physician: ATLS Primary Survey
- RN, Medic
  - Cardiac Monitor
  - O2, IV
  - Hourly VS
  - Neuro Checks
- Ancillary Support: Portable CXR, Modified Trauma Panel
- CT Scan
- RN, Medic
- Transport patient on Monitor for continued Hourly VS & Neuro Checks

Unit Clerk: Registration, Order Entry

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

<table>
<thead>
<tr>
<th></th>
<th>Total Contacts</th>
<th>Alerts Trauma*</th>
<th>Responses Trauma*</th>
<th>Tier 3 Trauma*</th>
<th>Tier 3 ED†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>351</td>
<td>686</td>
<td>316</td>
<td>1753</td>
<td></td>
</tr>
<tr>
<td>Percent Admit</td>
<td>62%</td>
<td>45%</td>
<td>26%</td>
<td>24%</td>
<td></td>
</tr>
</tbody>
</table>

*Trauma Registry Data
†ED Source: Pulsecheck®

Mortality: All Contacts

PreT3: 3/1/2000-8/31/2008
PostT3: 3/1/2010-8/31/2010

<table>
<thead>
<tr>
<th>Era</th>
<th>n (patients)</th>
<th>Mortality % in Consults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre T3 (Consults All)</td>
<td>266</td>
<td>3.4%</td>
</tr>
<tr>
<td>Post T3 Consults All (Routine Consult +T3)</td>
<td>502</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Mortality for T3 patients same period=1.5%
T3 Trauma Activation: Impact on ED

<table>
<thead>
<tr>
<th>Tier</th>
<th>N</th>
<th>% all ED presenting patients</th>
<th>% Acute ED patients</th>
<th>% of Total Activations</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3467*</td>
<td>3%</td>
<td>10%</td>
<td>70%</td>
</tr>
</tbody>
</table>

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

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

- Trauma Activations
- ED T3 Activations
- 6212 per year!

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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