2013: Where we’re headed

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Challenges of rapid growth

- Staying focused on basic goals and objectives
- Managing growth
- Developing the program based on needs and priorities
- Supporting growing numbers of participants
- Providing the basics
  - Risk adjusted reports
  - Data quality improvement
  - Training
  - Best practices
What’s planned

• Additional data capture
• Evaluating the impact of different modeling approaches
• Complications
• Evaluating withdrawal of care, VTE
• Best practices
  • Massive transfusion
• Regional collaboratives
• State level TQIP
• Level III’s
Revisions for NTDS 2013

- Hemorrhage control
- Height and weight
- ICD-10 fields for
  - diagnosis
  - procedures
  - Ecodes
  - inclusion criteria
ICD-10

- Fields are available through transition period
- Will allow for more international participation
- We will collect mixed data for 2014 admission year
- Required for all injuries for 2015 admission year
Hemorrhage Control

• Additional data to be collected on patients transfused within 4 hours of ED/hospital arrival

• Goal is to understand practices and benefits of different transfusion strategies and timing of hemorrhage control
Better identification of bleeding patients

• Existing data captures only SBP at presentation
  • Impacted by pre-hospital care, timeliness of EMS

• Lowest SBP
  • Lowest sustained (>5 min) systolic blood pressure measured within the first hour of ED/hospital arrival.
  • Better identification of bleeding patients
Transfusion practices

• Capture transfusion of blood products within two time intervals: 4 hours and 24 hours of ED arrival
  • RBC’s
  • Plasma
  • Platelets
  • Cryoprecipitate
Angiography for hemorrhage control

- Angiography
  - First angiogram with or without embolization within first 48 hours of ED/Hospital Arrival.
  - Capture of date, time and whether embolization occurred
Surgery for Hemorrhage Control

Definition
Type of first operation (and timing) for hemorrhage control within the first 24 hours of ED/hospital arrival.

Options

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<td>2</td>
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<tr>
<td>3</td>
<td>Thoracotomy</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Extremity (peripheral vascular)</td>
<td>6</td>
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<tr>
<td>7</td>
<td>Mangled extremity/traumatic amputation</td>
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What has happened to the obesity epidemic?

- Only 2-4% of patients are identified as obese in TQIP ...either trauma patients are healthier and more fit than the average American, or this is not being well captured

- Goal - to estimate BMI
  - Capture
  - Height/weight (baseline) - family/self report/estimated
Data quality assessment

- Data validation visits have been successful, but are time intensive for ACS and hospital.
- Process will become more data driven:
  - Data from the validator used to identify centers with potential mapping and missing data issues.
  - Further analysis will identify centers with logical inconsistencies in patient data.
  - Filters to identify improbable scenarios.
- Provide reports to hospitals and work with them to address data quality issues.
- Site visits to selected centers and for those that need more focused attention.
Complications

• Modeling nearly completed
• NSQIP-like approach
• Focus on outcome of “Major complications” as a composite outcome
  • Equivalent to “Major morbidities” defined by NSQIP
Complications modeling

- Complication model includes all baseline patient characteristics
  - Age, gender, SBP, GCS, heart rate, mechanism, transfer status, comorbidities
  - Worst AIS in each body region
  - Complication rate ratio (CRR)
    - Each injury has a particular rate of associated major complications
    - Model incorporates the rate associated with the three worst injuries
Major complications

- Acute renal failure
- Acute respiratory distress syndrome (ARDS)
- Cardiac Arrest with CPR
- Decubitus ulcer
- Deep or organ space SSI
- Myocardial infarction
- Pneumonia
- Pulmonary Embolism
- Stroke / CVA
- CRBSI
- Unplanned return to the OR
- Unplanned return to the ICU
- Severe sepsis
How good is the model?

• Can the model discriminate between patients who do and don’t develop a complication?
  • Discrimination - excellent: 0.82-0.85

• Calibration
  • How well does the model perform for patients at low, medium, and high risk for complications?
Calibration graph
Complications

Competing risks

• Major challenges not faced by NSQIP
  • Patients who die early don’t have an opportunity to develop a complication
    • Centers with high early mortality rates will have lower rates of complications
    • Centers that have “great saves” will have higher rates of complications
Excluding early deaths
Combining deaths & complications
Complications vs Deaths

- What is early?
  - Deaths in ED, 24 hrs?, 48 hrs?
- Can we exclude patients with early deaths from complications model?
- Should we consider a death a "major complication" and combine them?
- Can we interpret the two outcomes in the appropriate context?
State-level TQIP

- Several states or ACS COT regions interested in forming regional collaboratives
- Region-level reports
  - Whole state/region compares its performance to all TQIP participants
  - Centers within a region compare their outcomes
TQIP for Level III’s and States

- Working with several states to...
  - Identify appropriate outcomes for smaller centers:
    - Time to transfer
    - Transport time
    - Discharge disposition
    - Mortality
    - LOS
Data linkage

- Exploring linkage with state NEMSIS data
- Allows us to incorporate pre-hospital information in risk adjustment models including time from injury
The Portability of Data - the NEMSis Standard.
Current data collection process

NTDB:
- Annual call for data March - May
- Collection of previous admission year
- Basis for all TQIP analyses

TQIP:
- Beginning this year we will use quarterly submissions for analysis
- Will be required to pass Validator
- Over 80% report that they can meet quarterly deadlines
- Obstacle for those who cannot: Staffing
New data collection model

- **Goals**
  - Collect more contemporary data
  - Reports available within months (rather than years) of patient care
  - Timely feedback on data quality
  - Better basis for external data validation
Features of new process

- Data collection will be available year-round
- Hospitals can upload data as they are ready - monthly, quarterly, etc.
- We will post deadlines associated with TQIP reports. For example: *All data received by April 1st will receive the August report*...
- We will report on the most recent 12 months of data received and validated from your hospital
- If you miss a report deadline, you can send for next report deadline
For example:

May 2013: TQIP Deadline for August Report
- 1\textsuperscript{st} quarter of the current year data is transmitted.
- TQIP creates a dataset of the most recent 12 months of data, including 1\textsuperscript{st} quarter of current year if available

June/July 2013: TQIP Analysis for August Report
- TQIP will aggregate and analyze most recent 12 months of data received from hospitals that met August report deadline

August/September 2013: TQIP Report Delivered
What we need to do...

• Revise some internal processes to meet new timelines
• Automate manual data checking and cleaning processes
• Provide descriptive data via an online, dynamic system
• Work with centers to identify challenges and develop the system accordingly
What you need to do...

• Keep your registry up-to-date in accordance with time frame required by ACS and/or your state
• Communicate with us about challenges
• Work with your TQIP team to ensure data quality in the registry
• Make efficient and effective use of your Validator reports
The transition

- Beginning in 2013 with quarterly submissions
- We will ensure that all deliverables are met through the transition
- More details to come - for now, check into the timeliness of your registry and contact us with your thoughts, etc. at tqip@facs.org
TQIP and MOC

• New guidelines for part IV practice assessment:
  • The activity must assess compliance with meaningful and measurable patient outcomes.
  • A comparative analysis of individual and group results must be provided.
  • Individual results must be provided to the surgeon at least yearly and preferably should be reported at least every 6 months.
  • The activity must include the ability for re-measurement and comparison after the diplomate has been able to implement a quality improvement activity based on an analysis of the results.
  • The parameters assessed should be important, scientifically acceptable, useable, relevant, clearly defined, and easy to collect.
  • Resources should be provided to enable initiation and completion of quality improvement activities based on the results.
  • The method for inclusion of procedures and outcomes should minimize selection bias.
Proposed MOC reports

- Reports will be based on the same analysis conducted for TQIP.
- Surgeons will receive reports on risk adjusted outcomes for patients in categories selected from TQIP analyses.
- The reports will also provide non risk adjusted information on complications and other outcomes, providing context for the surgeons’ results.
Report Logistics

American Board of Surgery

Maintenance of certification

Confirmation of surgeon participation

Surgeon/trauma center

NTDB data submission

Surgeon report

Committee on Trauma/NTDB
New analytic approaches

Chapter 23
Multilevel Modeling

David E. Clark and Lynne Moore

Introduction

Mortality is the most frequently modeled outcome in injury research. It is easy to recognize, relatively free from measurement error, and fundamentally interesting. Injury researchers in public health or clinical medicine have become familiar with logistic regression as a standard way to model a binary outcome like mortality (or alternatively survival). Many other outcomes encountered in injury research can also be considered binary, such as the occurrence of a serious complication or an extended length of stay in hospital.

Traditionally, mortality modeling has been based on single-level logistic regression models, which assume that individual observations are independent and have the same error variance. However, individual observations in epidemiologic or health services data often occur naturally within groups that have certain properties in common. If an observation is more likely to be correlated with observations in the same group than it is to be correlated with observations in other groups, then it may be more appropriate to devise a statistical model that does not assume that all observations share a single error variance.

In the field of injury prevention and control, “clustering” of this sort might arise, for example, when patient outcomes from different hospitals are compared, when occupational injuries are recorded for different industries, or when repeated episodes of violence are suffered by the same person. One categorization may even be nested within another, such as when traffic fatalities are grouped by county and counties are grouped by state. Models incorporating such a structure could be considered “hierarchical.” However, we might also be interested in multiple categorizations that
Hierarchical models

- Single level logistic models assume observations (patients) are independent
  - Even centers within the same region/state are not independent!
- If it’s more likely that events could be correlated, then multi-level modeling may be more appropriate
- When sample sizes are small and/or event rates low, the logistic model (the Observed/Expected ratio) that is assigned to hospitals may be too extreme
- Multi-level models allow for “shrinkage” to account for small sample sizes and/or low rates of occurrences
Best practices

Massive transfusion
TBI
...others derived from your centers’ experiences
Report content

Withdrawal of care
   Who? When? Do different practices account for mortality differences?

Pharmacologic prophylaxis
   What is being used? When is it started and does it matter?
Questions?