



# TRAUMA PERFORMANCE IMPROVEMENT

*Reference Manual*

*Performance Improvement Subcommittee  
of the American College of Surgeons  
Committee on Trauma*

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The purpose of this manual is to complement the offering by American College of Surgeons' Committee on Trauma entitled *Resources for Optimal Care of the Injured Patient* (known as the *GOLD BOOK*), published in 1999 and subsequent amendments to the gold book published in June 2000. This manual is designed to provide an online handbook of practical suggestions and examples of performance improvement applications for trauma. This document reflects a variety of definitions, models, and examples. The American College of Surgeons Committee on Trauma (ACS COT) does not endorse any specific model, definition, or example over another.

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## I. OVERVIEW

### A. What is in this manual?

This manual contains an informal but structured review of some important definitions that have emerged in the maturation of “qualitology,” followed by discussion of guidelines, protocols, and pathways. A review of personnel, hospital-wide integration, “JCAHO-speak,” patient safety and registries will lead to an assessment of outcome and process measures. Explanations of corrective action plans and loop closures will be followed by practical examples of PI in action.

### B. Performance Improvement

“Performance Improvement” (PI) is a term recommended by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) to describe the **continuous** evaluation of a trauma **system** and trauma providers through structured review of the **process** of care as well as the **outcome**. Several recent published reports (Nov 99, Mar 01) by the Institute of Medicine on **errors in medicine** and the national attention directed toward **patient safety** has given new energy to PI.

Before starting, it is useful to review some realities:

1. Nobody has an ideal trauma program.
2. Most programs struggle with PI.
3. No precise prescription for PI exists.
4. The trauma surgeon must lead.
5. The effort must be multidisciplinary.
6. The trauma PI programs can set the PI tone for the health care organization.
7. Adverse outcome does not always indicate bad care.
8. The focus should be on opportunities for improvement rather than on problems.
9. Most errors are related to system failure.
10. Timely collection and analysis of meaningful data are great challenges.
11. A solid trauma PI program provides leverage for obtaining needed resources.
12. Trauma PI is most effective when integrated with hospital-wide (system-wide) PI.
13. The trauma program should be familiar with JCAHO requirements for PI and current initiatives for patient safety as promoted by the Institute of Medicine.
14. PI will benefit from the advances in information technology.
15. Current interest exists in evidence-based guideline-derived PI.

### C. Trauma Center Verification

1. Several terms have emerged to describe a formal acknowledgment of meeting the standards of a trauma center. Verification, Accreditation, and Designation are variably used throughout the United States by state, county, and EMS agencies to denote successful compliance with standards required by a particular “certifying” agency. Most of these agencies use the ACSCOT publication (*Resources for Optimal Care of the Injured Patient*, and its amendments as published on the ACS web site at [www.facs.org](http://www.facs.org)) as a basic framework for required standards.
2. The **Verification Review Committee (VRC)**, a subcommittee of ACSCOT, was established in 1987 to assist in improving the care of injured patients through a system of on-site consultation and verification reviews. The verification of a trauma center identifies that the center has met all of the criteria offered by the Optimal Resources Document. As an extension of the executive committee of the ACSCOT, the VRC works closely with the executive committee to insure consistency and fairness in the review process.
3. The **VRC has expectations of a Performance Improvement Program (PIP)** for successful verification as a trauma center. The reviewers measure PIP **maturity, effectiveness** and identification of **loop closures** of **patient care** and **system** issues. Specific expectations include:
  - a. **A multidisciplinary peer review**
    - ⇒ Trauma Medical Director leads
    - ⇒ Trauma panel general surgeons (min attendance requirement of 50% for each of the **core** general surgeons. (Core group to be determined by the Trauma Medical Director)
    - ⇒ Representatives from (**required** minimum attendance of 50% for each)
      - Orthopedic Surgery
      - Neurosurgery
      - Emergency Medicine
      - Anesthesia
      - Trauma nursing
    - ⇒ Goals
      - Review selective deaths
      - Review complications
      - Discuss sentinel events
      - Review system issues of a peer review nature
    - ⇒ Objectives
      - Identify and resolve problems
      - Trigger new policies/protocols
      - Representatives act as conduits to their departments

**b. A multidisciplinary system review**

- ⇒ Trauma Medical Director
- ⇒ Trauma Nurse coordinator/program manager
- ⇒ Representatives from (**suggested** minimum attendance of 50% each)
  - General Surgery Trauma Panel
  - Subspecialists as listed above
  - OR, ED, Blood Bank, Radiology
  - Pre-hospital, Rehab, Social Service
  - Administration
  - Trauma Registry
  - Other
- ⇒ Purpose is to review and resolve any non-peer review system-related issues

**c. Documentation of the following:**

- ⇒ Minutes reflecting attendance and actions of multidisciplinary committees
- ⇒ Use of audit filters (ACS) or hospital-specific to monitor performance
- ⇒ Use of trauma registry to monitor performance
- ⇒ Classification of deaths and complications
  - Preventable
  - Potentially preventable
  - Non-preventable

**d. Demonstration of at least two or three examples of loop closures.**

- ⇒ Performance monitored (process and outcome) ◇ filters, registry, rounds, etc.
- ⇒ Problems/ issues identified
- ⇒ Analysis
- ⇒ Corrective action
- ⇒ Demonstration of resolution of problem/issues

## II. DEFINITIONS

### A. Complication

Any event that deviates from an anticipated uneventful recovery from illness or surgery (see pp. 74–76, *Resources for Optimal Care of the Injured Patient: 1999*).

*Comment: Hypothermia and coagulopathy on admission after major trauma are usually not complications, but admitting diagnoses. Hypothermia or coagulopathy after initial resuscitation may be complications.*

### B. Disease-related

An event or complication that is an expected sequelae of a disease, illness, or injury.

*Comment: For example, intra-abdominal abscess after damage control laparotomy, despite good surgical technique and appropriate antibiotics. Other examples frequently include issues related to:*

- ⇒ *Infectious events*—Urinary tract infection after prolonged, but necessary urethral catheter
- ⇒ *Pulmonary (noninfectious)*—Adult respiratory distress syndrome (ARDS) from injury despite best available treatment
- ⇒ *Organ failure (pulmonary, renal, liver)*—Renal failure despite preventative efforts
- ⇒ *Cardiovascular events*—Atrial fibrillation after appropriate fluid resuscitation
- ⇒ *Neurologic events*—Intracranial hemorrhage during appropriate therapy
- ⇒ *GI events*—Ileus after injury, or stress ulcer bleed despite appropriate prophylaxis
- ⇒ *Hematologic events*—Anemia after unavoidable blood loss in the field
- ⇒ *Dermatologic events*—Skin-sloughing over area of severe contusion; for example, in the elderly

### C. Morbidity

Any deviation from normal health that may be a result of a complication or may be preexisting (sometimes called a comorbidity)

*Comment: ARDS is usually a complication, whereas chronic obstructive pulmonary disease is a comorbidity. Distinction must be made for more accurate risk adjusting and outcome benchmarking.*

### D. Non-preventable

An event or complication that is a sequela of a procedure, disease, illness, or injury for which reasonable and appropriate preventable steps have been taken.

**Comment:** Examples include a gunshot wound to the head with a Glasgow Coma Scale (GCS) of 3 on arrival and subsequent death, posttraumatic pancreatitis, pneumonia, deep venous thrombosis (DVT), and so on, in patients who had appropriate preventative steps taken. Most deaths and morbidities fall into this category.

#### **E. Potentially Preventable**

An event or complication that is a sequela of a procedure, disease, illness, or injury that has the potential to be prevented or substantially ameliorated.

**Comment:** For example, iatrogenic pneumothorax or wound dehiscence, wherein alternate techniques or judgments may have prevented the complication with some certainty. Such a choice is always a difficult call and requires determination from experienced trauma surgeons or a panel of physicians. An example of a potentially preventable mortality may be an elderly trauma patient with a severe head injury who develops a fatal arrhythmia from electrolyte abnormality. The arrhythmia may have been preventable, but it is unlikely that the death was; therefore, the death is deemed “potentially preventable.” A patient suffering a preventable morbidity who subsequently expires after being declared DNR (do not resuscitate) by family or advanced directive may be determined to be a potentially preventable mortality. There is no precision in these determinations; these are clinical judgments based on the best available evidence.

#### **F. Preventable**

An event or complication that is an expected or unexpected sequela of a procedure, disease, illness, or injury that could have been prevented or substantially ameliorated.

**Comment:** For instance, a patient admitted with abdominal distention and shock who dies from a ruptured spleen two hours later while waiting for a surgeon. Death as a result of a missed epidural hematoma or esophageal intubation may be preventable. Preventable mortalities should be very unusual in a mature trauma system. A missed fracture resulting from failure to examine the patient may be a preventable morbidity.

#### **G. Provider-related**

An event or complication resulting from care given by prehospital personnel, technicians, nurses, or physicians that lead to delays or errors in technique, judgment, treatment, or communication

**Comment:** May be difficult to determine. Examples are:

- ⇒ Prehospital mis-triage, inappropriate airway, delay in treatment
- ⇒ Delay in team activation, disposition, surgery or diagnosis.

⇒ *Error in diagnosis, judgement, treatment or technique*

#### **H. Credentialed Provider**

A health care professional whose education, training, and performance have been evaluated through an explicit process by his or her appropriate peers.

*Comment: Typically refers to physicians who are credentialed to use granted privileges. Issues related to credentialed providers usually require peer review. Advanced practice nurses, physicians, and other allied or specified health professionals are credentialed in some institutions.*

#### **I. Non-credentialed Provider**

A health care professional who provides direct patient care according to his or her job description and performance standards, and whose performance may be assessed on a regular basis by a credentialed provider.

*Comment: Usually refers to nurses, technicians, and paramedics; any provider who is evaluated primarily through system review rather than peer review.*

#### **J. System-related**

An event or complication not specifically related to a provider or disease, such as operating room availability, blood availability, and diagnostic test availability.

*Comment: Used in the context of a system-related complication or morbidity rather than a provider-related or disease-related morbidity and usually detected by monitoring process measures. For example, a delay in surgeon response to a trauma resuscitation that is attributed to a systemwide pager dysfunction or an incorrect call schedule may be found to be system-related rather than disease- or provider-related. Such an event may be reviewed by the trauma program PI team, usually with a suggested action plan to prevent a recurrence.*

#### **K. Process**

Elements of care that relate primarily to the system or structure in which the care is delivered.

*Comment: See Section VI. Process Measures. Other examples include emergency department (ED) triage, blood transport to the ED or operating room (OR), patient transport to computed tomographic (CT) scan, equipment available where needed, and so on. Even if outcome has been positive, measuring the process can still be valuable to highlight why things went well and to look for opportunities to improve efficiency.*

#### **L. Outcome**

Results of the care given from the perspective of patient, provider,



and society.

**Comment:** See Section VII. Outcome Measures. Along with standard outcomes, parameters such as pain control, team morale, community support, or reduction in gunshot wounds are not routinely included, but are examples of outcomes that a trauma program may choose to measure and improve.

### **M. Evidence-based Medicine (EBM)**

A method of patient care, decision making, and teaching that integrates high-quality research evidence with pathophysiologic reasoning, experience, and patient preference.

**Comment:** *The discipline of EBM is derived from utilizing validated methodology to quantify the power of research for clinical decision making. The idea is to base clinical decisions on the best available evidence and to understand the power (or certainty) of that evidence. EBM also points out the somewhat uncomfortable fact that much of what trauma practitioners do is based on published evidence of limited certainty. This discipline is used to develop guidelines, pathways, and protocols that may be used as the basis for quality indicators (performance measures). For example, a missed or delayed odontoid fracture diagnosis may reflect failure to perform a CT scan in a patient with an inadequate standard odontoid view. This oversight is in noncompliance with an institutional protocol using the evidence-based cervical spine clearance guideline published by the Eastern Association for the Surgery of Trauma. Corrective action plans, such as education, reinforcement of the protocol, or a revised protocol, may be indicated. Evidence-based guidelines for institutional protocols or pathways can enhance the buy-in and compliance of the team.*

### **N. Credentials to Measure Competency**

The process of verifying appropriate licensure and training to provide care and perform procedures.

**Comment:** *JCAHO suggests at least four components for medical staff membership:*

- ⇒ **License**
- ⇒ **Training;** *eg., residency, fellowship*
- ⇒ **Ability to perform;** *usually refers to health status of provider*
- ⇒ **Current competency;** *traditionally, this refers to, board certification. However, the ACGME( Accreditation Council for Graduate Medical Education) and the ABMS( American Board of Medical Specialties) have both adopted and defined the following six general competencies:*
  - **Medical knowledge**
  - **Patient care**

- *Interpersonal and communication skills*
- *Professionalism*
- *Practice-based learning and improvement*
- *Systems-based practice*

⇒ Trauma-specific credentials can include:

- *Specific training in trauma/critical care*
- *CME credits in trauma/critical care*
- *Successful completion of the Advanced Trauma Life Support® (ATLS®) course*
- *Volume of trauma patients*
- *PI evaluation of trauma care*
- *Participation in conferences, committees*

*Additional credentialing criteria sometimes utilized, depending on the local environment (occasionally called “turf” factors), include:*

- *Specialty; for example, general surgery, thoracic surgery*
- *Community need*
- *Tradition*

*An alternate pathway to board certification has been defined by the ACS COT (see pp. 27–28, Resources for Optimal Care of the Injured Patient: 1999).*

## **O. Clinical Privileges**

Giving permission to provide care and perform procedures for which appropriate credentials exist.

***Comment:** Privileges are those usually accorded with credentials, but this process may vary considerably among institutions, depending on the practice model, aforementioned turf issues, and compromise. The trauma director may recommend privileges based on a surgeon’s credentials, but the granting of privileges is usually a function of the medical staff and board of directors (or its equivalent).*

## **P. Value**

A performance improvement equation designed to reflect both quality and cost, generally presented as the quality of the process plus the quality of the outcome, divided by the cost.

***Comment:** See page 71 of Resources for Optimal Care of the Injured Patient: 1999. Value can be increased by improving the quality of process or outcome, or by decreasing cost. However, a modest cost increase that significantly improves quality can also add value. This equation is useful for presenting initiatives to administrators, medical staff, board members, and regulating agencies and also helps to establish priorities.*

## **Q. Electronic Patient Record**

An electronic, digitized patient chart designed to replace the standard patient record or chart.

*Comment: This long-awaited development is beginning to emerge, appearing in phases such as access to lab data repositories, imaging studies, discharge summaries, dictated notes and consultations, and other available digitized data. Currently unavailable in most hospitals are digitized progress notes and current flow charts that include vital signs, intake and output, current medications, and nursing notes. Even as these later elements become routine, development of valid clinical decision support systems as part of the electronic patient record will be necessary to truly realize the benefits of evidence-based, guideline-derived performance improvement.*

*Such a breakthrough will allow concurrent data acquisition with rapid analysis and rapid (possibly instantaneous) corrective action. Although this tool is several years away from wide availability, it seems prudent to use more traditional PI methods with an eye toward a meaningful, user-friendly, time-neutral electronic patient record for performance improvement. Pursuit of this goal emphasizes the need to integrate trauma PI efforts into the hospital-wide program.*

## **R. Peer Review**

The process of performance review by others with similar credentials

*Comment: It is important to become familiar with state laws outlining the parameters of peer review. "Peer review" usually implies that the review process is protected from legal discovery as long as the information is not made public by any member involved. However, no guarantee of confidentiality applies, and any minutes or records should be written as if anyone may read them. Some have found that peer review is whatever a judge says it is. Many institutions refer only to physicians as peers, and they provide the usual forum for review of provider-related issues. JCAHO requires that each institution develop a definition of peer. Consultation with legal counsel can be helpful, but discretion in conference attendance and subsequent recording is advised.*

## **S. Informatics**

The science of analysis, management, and presentation of information

*Comment: The four cornerstones of medical informatics are (1) production of structures like standardized medical vocabularies and knowledge representations essential to the study of medical care in a meaningful, shareable way; (2) development of methods for accurate and practical data acquisition; (3) management of organizational change and cultural issues to permit optimal leverage*

*of information technology in the medical setting; and (4) development of optimal methods for integration of information from diverse sources. Health care systems usually include individuals who think of themselves as “informaticians.” The trauma director can work with these individuals to help the institution move forward and keep trauma PI in the forefront.*

#### **T. Repository**

An electronic storage site of data and information for subsequent retrievals.

***Comment:** Examples of repositories include registries and hospital information systems providing laboratory values, digital imaging such as PACS (picture archiving and communication system), digitalized records, PI data systems, and so on. Repositories are important for a trauma director to understand since many hospitals have PI data that can be utilized by the trauma PI program. In addition, by using informatics-guided technology for future planning, repositories are integral to the development of the electronic patient record.*

#### **U. Corrective Action Plan**

A structured effort to improve suboptimal performance identified through the PI monitoring process.

***Comment:** See Section VIII. A corrective action plan is basically a proposed solution to fix a problem or a process. Such plans may be case-specific or system-specific. Although some methods are used regularly for this task, many trauma programs have been creative (see Section XIII. Examples). Accreditation and verification bodies like JCAHO and the ACS COT are interested in seeing these plans during site surveys.*

#### **V. Closing the Loop**

Measuring the result of a corrective action plan

***Comment:** Closing the loop implies that the process or outcome has been measured after implementation of the corrective action plan, and improvement has been demonstrated. Because of the inherent flaws in attempting to show a difference without a statistically well-designed research study, it can be difficult to offer convincing proof that performance has improved. Sample sizes (both too small and too large) and the cost of such studies can be prohibitive. Trauma PI programs should avoid (with few exceptions) the temptation to convert a PI initiative into a research study. Site surveyors look for loop closures and are usually satisfied by demonstrated attempts to close the loop through continuous PI, recognizing that some loops may never be totally closed. The word “loop” refers to a cycle of monitoring, finding,*

*fixing, and monitoring again. Five cycle models are described in Section V. JCAHO/Hospital-wide Integration.*

**W. Opportunity for Improvement (OI)**

A problem or performance failure.

***Comment:** OI has become a popular term to describe a problem or performance failure in a kinder, gentler fashion. As an institutional or system leader, the trauma program director will be expected to look for OIs both inside and outside the trauma program. Such opportunities for improvement can be clinical, fiscal, administrative, and so on.*

### **III. PERSONNEL**

#### **A. In General**

A variety of personnel are involved in trauma performance improvement. In most institutions, trauma PI is not a stand-alone function, but is integrated into other activities—for example, hospital-wide PI, care management, guideline development. The following functions are frequently shared by different personnel and are provided as starting points.

#### **B. Trauma Director**

Responsible for the leadership of a trauma PI program. Frequently delegates trauma PI responsibilities to other team members, but retains ultimate accountability, which should be reflected in job description. Directs the peer review process and oversees the multidisciplinary review process. Actively participates in the hospitalwide PI program.

#### **C. Trauma Nurse Coordinator/Program Manager**

Traditionally has held a “coordinator” role for the clinical, administrative, and quality review functions, but has evolved into a trauma program manager with varying administrative and clinical duties. Usually heavily involved in the trauma PI program. Shares responsibility with trauma director for collecting and presenting data to the various trauma PI committee structures. May delegate much of the PI function to others in high-volume centers.

#### **D. Trauma Registrar**

Has traditionally been responsible for abstracting and entering data into a registry. Personnel from medical records, trauma coordinators, and PI coordinators (usually nurses) may all be participating in this effort. This position may be integrated into other functions in some institutions.

#### **E. Specified Health Professionals**

Advanced practice nurses (APNs) and physician assistants (PAs) can participate in data collection and provide oversight in guideline, pathway, and protocol implementation.

#### **F. PI Coordinators**

Most hospitals have nursing personnel dedicated to hospitalwide PI. The trauma program may have dedicated or shared personnel, depending on volume and resources. In many instances, these coordinators have assumed some responsibilities for quality review previously performed by the trauma nurse coordinator and registrar.

### **G. Clinical Nurse Specialists, Case Managers, Nurse Managers, and so on**

A variety of nursing efforts are very useful for participation in PI and implementation of evidence-based guidelines. With reduction in resources, these personnel will likely assume greater roles in PI and guideline management.

### **H. Bedside Nurse**

The bedside nurses, those from the emergency department to rehab and outpatient follow-up, will become the most valuable personnel in trauma PI. These personnel require a job description evolution to include performance assessment and guideline tools. Many are currently overwhelmed with patient care duties and therefore perceive PI and guideline implementation as distractions. Only when a user-friendly, time-neutral bedside information system is available, will the true value of the bedside nurse in PI be realized.

### **I. House Staff**

Where available, house staff can have an enormous impact on PI. They must understand the purpose and function of PI, participate in the multidisciplinary review, and provide continuous input into guideline implementation. The educational curriculum of the house staff must be focused around PI principles and evidence-based medicine.

### **J. Attending Staff**

The attending surgeon and consultant staff must recognize a PI program's value before meaningful participation will occur. At minimum, participation in the multidisciplinary review process is useful. With the advances of useful clinical decision support systems, active participation in PI, and evidence-based guideline, implementation will be forthcoming.

### **K. Emergency Medical Service (EMS) Liaison**

Representatives from regional or local EMS systems frequently have access to databases that may be helpful to system PI issues, such as prehospital care and triage.

## **IV. DATA COLLECTION**

### **A. Quality**

Efficient data collection for subsequent PI use is one of the greatest challenges for a trauma program or system. It is important that the data collected is:

1. Easily obtainable
2. Clinically relevant
3. Clearly defined
4. Limited in scope

An attempt at a periodic comprehensive review of the trauma program/system is very resource consumptive and may be counterproductive.

### **B. Source**

Several sources provide information useful for PI efforts. Frequently, the data is extracted from many previous entries in the form of:

1. Registries
2. Hospital information systems
3. Rounds
4. Conferences
5. Minutes
6. Patient charts
7. PI tracking forms
8. E-mails
9. Risk management reports
10. Patient relations inquiries
11. Personal observations
12. Hallway conversations
13. Other sources
14. Videotaping\*

(\*Videotaping of trauma resuscitation for education and quality review has been practiced by many trauma centers over the past 15yrs. This practice came under recent review as reflected by a JCAHO memorandum suggesting that consent must be obtained prior to taping. Subsequently it has been recognized that this is impractical in most settings of trauma resuscitation and an institutional policy on videotaping dealing with confidentiality and subsequent tape destruction is used by many trauma centers to support this practice. This should be reviewed by hospital legal services. )

### **C. Selection**

Multiple data sources can lead to a blizzard of data, challenging time and energy of trauma personnel. Ultimately, with the advent of sophisticated hospital information systems that are sure to emerge, much of the data will be entered only once. In the meantime, carefully selected data sources can be used to develop a profile of the performance of the trauma program. Each institution must determine



the sources that are most readily available and thereby construct a program that promotes a culture of quality improvement

It is important to remember that we cannot monitor and fix every problem in the trauma program. In fact, a comprehensive review of the program may be too ambitious without the aid of sophisticated information systems. Usually, a more focused approach prioritized using the quality of data element described above. As mentioned previously, *no precise prescription for this effort exists*. Trauma personnel must be creative in using their resources to improve care by integrating efforts with hospital-wide PI programs.

#### **D. Vintage**

Frequently, a distinction is made between *concurrent* data acquisition and *retrospective* data abstraction. The former implies that data is recorded in real time as care is provided (for example, immediate or near-immediate recording of the events of care). The latter implies abstraction from charts, conferences, or registry reports often analyzed days, weeks, months, or even years after care. The implication is that the concurrent data is more accurate and therefore more useful. However, the labor-intensive nature of concurrent data acquisition may limit the value and completeness of the information. Nonetheless, the advent of time-neutral, patient/bedside information systems supported by evidence-based decision support systems has the potential of realizing the multiple benefits of meaningful concurrent data retrieval with instantaneous PI analysis.

Data entry at the patient's bedside or care area using a portable notebook computer or a personal digital assistant (PDA; for example, PalmPilot™) is under trial in several trauma centers. Entry into any networked desktop workstation (Intranet or Internet) is also emerging (including wireless), but obstacles like access and confidentiality must be overcome.

## V. JCAHO/HOSPITALWIDE INTEGRATION

### A. Introduction and Overview

Most U.S. hospitals seek accreditation by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), since lack of accreditation can jeopardize reimbursement and residency programs. Over the past 30 years, JCAHO's efforts have evolved from performing retrospective audits of physician performance to pursuing an organized approach of continuously monitoring the process and outcome of care. It may be extremely useful for the trauma program director to understand the hospital's PI program relative to JCAHO. Structuring the trauma PI program to integrate, facilitate, and collaborate with the hospital-wide program can gain favor within the institution as well as provide resources for the trauma program.

At first glance, those unfamiliar with JCAHO PI standards will find the terminology somewhat foreign to traditional trauma PI efforts. In many hospitals with mature trauma programs, the trauma PI is more productive and organized than the hospital-wide program. However, on closer review, the JCAHO PI standards can lend themselves well to the trauma program and, when properly structured, have the potential to eliminate a duplication of effort. In addition, consideration is currently being given to having the American College of Surgeons (or its equivalent) verify trauma programs, eliminating the need for the JCAHO review portion of a trauma program.

### B. 2001 JCAHO Standards on “Improving Organizational Performance”

⇒ The JCAHO standards describe the dimensions of performance in two categories:

#### a. *Doing the right things*

- **Efficacy** of the procedure or treatment in relation to the patient's condition
- **Appropriateness** of a specific test, procedure, or service to meet the patient's needs

#### b. *Doing the right things well*

- **Availability** of a needed test, procedure, treatment, or service to the patient who needs it
- **Timeliness** with which a needed test, procedure, treatment, or service is provided to the patient
- **Effectiveness** with which tests, procedures, treatments, and services are provided
- **Continuity** of the services provided to the patient with respect to other services, practitioners, and providers and over time
- **Safety** of the patient and others to whom the services are provided

- **Efficiency** with which care and services are provided
- **Respect and caring** with which care and services are provided

⇒ From these dimensions, performance measures/indicators are selected to monitor processes and outcomes of important functions. Specific details of this effort are outlined in the *Comprehensive Accreditation Manual for Hospitals (CAMH)* published in August 2001. This manual should be familiar to trauma PI personnel.

### C. ORYX

A JCAHO program requiring accredited hospitals to capture and report on clinical performance indicators (for example, surgical complication rates) using one or more of 300 JCAHO-approved clinical performance management systems. ORYX's next evolution will be noted as *core measures* and is anticipated to include surgical procedures and complications.

### D. Performance Improvement Models

⇒ 10-Step Process, Developed by JCAHO in the mid-1980s

- Step 1. Assign responsibility
- Step 2. Delineate scope of care and service
- Step 3. Identify important aspects of care service
- Step 4. Identify indicators
- Step 5. Establish a means to trigger evaluations
- Step 6. Collect and organize data
- Step 7. Initiate evaluation
- Step 8. Take actions to improve care and service
- Step 9. Assess the effectiveness of the actions and ensure that improvement is maintained
- Step 10. Communicate results to relevant individuals and group.

⇒ PDCA Cycle, Developed by Walter A. Shewhart in the 1920s

**Plan:** Study a process by collecting data and evaluating results

**Do:** Carry out plan on a small scale/pilot

**Check:** Check results of the change (some now use "S" for study)

**Act:** Implement the change or abandon plan and go through the cycle again

⇒ FOCUS-PDCA, Hospital Corporation of America

**Find** a process to improve

**Organize** a team that knows the process

**Clarify** current knowledge

**Understand** variation

**Select** a potential process improvement

### **Plan - Do - Check - Act**

⇒ FADE, Developed by Organizational Dynamics, Inc

**Focus:** Narrow a list of problems to one

**Analyze:** Collect data and determine influential factors

**Develop:** Formulate a plan to solve the problem

**Execute:** Gain an organizational commitment, put plan into action, and monitor effect

⇒ **IMPROVE, Developed by Ernst & Young**

Identify and define the problem

Measure the impact on customers

Prioritize possible causes

Research and analyze root causes

Outline alternative solutions

Validate that solutions will work

Execute solutions and standardize

⇒ **ROOT CAUSE ANALYSIS, Developed by JCAHO**

A process for reviewing a sentinel event, which is any unexpected occurrence involving death or serious physical or psychologic injury, or the risk thereof. Serious injuries specifically include a loss of limb or function. The phrase “or the risk thereof” includes any process variation for which a recurrence would carry a significant chance of serious adverse outcome. These events are subject to JCAHO review on either a voluntary or discovery basis. A root cause analysis and action plan must be submitted within 45 calendar days of the event or of becoming aware of the event. Criteria for sentinel events are:

The event has resulted in an unanticipated death or major permanent loss of function not related to the natural course of the patient’s illness or underlying condition, or

The event is either:

1. Suicide in a setting where the patient receives around the-clock care
2. Infant abduction or discharge to the wrong family
3. Rape
4. Hemolytic transfusion reaction
5. Surgery on wrong patient or wrong body part

## **VI. PROCESS MEASURES**

### **A. Compliance with Guidelines, Protocols, and Pathways**

*Comment: Guidelines, protocols, and pathways, particularly when evidence-based, can provide parameters to measure performance. In other words, do you do what you say you do? Section IX. Guidelines, Pathways, Protocols, discusses these parameters and provides a list of current trauma-related guidelines.*

### **B. Appropriateness of Prehospital and ED Triage**

*Comment: Some trauma programs have a tiered trauma response, and measuring its effectiveness can be useful (for example, determining what percentage of upgrades were necessary after admission, or what percentage of over triage occurred). Since there are no evidence-based national guidelines, each institution can set its own parameters of acceptability.*

### **C. Delay in Assessment, Diagnosis, Treatment, or Consultation**

*Comment: These are standard provider-related quality indicators, requiring subjective determination, usually by peer review.*

### **D. Error in Judgment, Communication, Technique, or Treatment**

*Comment: These are also standard provider-related quality indicators, requiring subjective determination, usually by peer review.*

### **E. Appropriateness and Legibility of Documentation**

*Comment: Several recent studies have suggested that many medical records are either illegible or irrelevant, resulting in poor patient care. Asking physicians to improve their handwriting has never been productive, but providing dictation with rapid transcription, pursuing an electronic record, and facilitating chart documentation through templates and ready availability can be helpful as a PI effort.*

### **F. Timeliness and Availability of X-ray Reports**

*Comment: For example, an institution may determine that all trauma resuscitation films are reviewed by an attending radiologist within 12 hours and that abnormal findings are called to the attention of a trauma team member.*

### **G. Timely Participation of Subspecialists**

*Comment: In some institutions, timely participation of neurosurgeons, orthopaedic surgeons, thoracic surgeons, and so on, can vary tremendously. Incorporating institution-specific guidelines with subsequent measurement of compliance can be a powerful tool in improving care. Problems are usually unrelated to the behavior of the subspecialists and are more frequently caused by logistic and communication barriers. Correcting these problems through enhanced institutional resources can be facilitated by incorporating these parameters into the institution-wide PI program.*

## **H. Availability of Operating Room—Acute and Subacute**

*Comment: The resources document recommends that an operating room be immediately available for the trauma patient, a factor that can be easily measured. An additional quality indicator that is more difficult to measure is availability of the operating room for follow-up procedures, like orthopaedic fixation, wound debridement, delayed closures, or facial reconstruction. The ability of specialists to work collaboratively to avoid unnecessary OR trips is also a quality measure.*

## **I. Timeliness of Rehabilitation**

*Comment: Rehab planning should begin soon after admission for most trauma patients. Institutional guidelines can be set through protocols and pathways. The effectiveness of these tools can be measured as quality indicators.*

## **J. Professional Behavior--Code of Conduct**

*Comment: The behavior of the physicians involved in trauma care can set the tone for the entire PI effort. Some medical staffs or trauma programs have included a code of conduct in their bylaws, rules, or policies. A sample code of conduct follows:*

1. Display courtesy and professionalism in all interactions with patients, employees, and peers.
2. Avoid disruptive behavior, offensive or demeaning language, and verbal abuse in all interactions with patients, hospital employees, and peers.
3. Employ discretion and observe the rules of confidentiality in discussing sensitive or potentially controversial issues.
4. Request assistance/consultation when necessary to advance a patient's health and well being.
5. Provide assistance/consultation when requested to a staff member without regard to any factor that may provide a basis for discrimination.
6. Display professionalism in personal appearance while acting in a professional capacity.
7. Maintain effective communication with patients and their families, hospital staff, and peers.
8. Maintain an environment that promotes the dignity of those who seek our care.

## **K. Availability of Family Services**

*Comment: Are personnel assigned to meet the family of the arriving trauma patient? How punctual are they, and how well do they inform and/or comfort the family before the trauma surgeon can speak with them? This varies significantly among hospitals and may be useful to monitor as a measure of the program's quality. This initial encounter can be very important to the rapport that is developed with the trauma team. Is there a process to inform the ICU patient's family, and how*

*effective is it? Periodic surveys of patients' families can be useful.*

#### **L. Insurance Carrier Denials**

*Comment: The percentage of insurance carrier denials can be a measure of the effectiveness of care documentation. This information is usually available in most hospitals and can be monitored as a gross measure of quality. For the most part, denials are unjustified, but the fiscal survival of the trauma program may depend on the ability to obviate the denials through PI measures, such as improved documentation, timely testing and procedures, and so on. This is a potentially fruitful area, offering trauma programs the chance to lead the way for other services in the hospital.*

#### **M. Consistency of Outpatient Follow-up**

*Comment: The model of trauma patient follow-up after discharge varies from none, to clinic visits, to private office appointments. Attempts to measure timeliness and effectiveness can be useful to gain some perspective on quality of care. Many patients are “lost to follow” or discharged to rehab, never to be heard from again. A measure of a trauma program's quality would be to sample discharged patients in all categories to see if they had timely follow-up by appropriate specialists, and if a coordinated effort was made to return overall care to the primary care physician where appropriate. Results of such a sample may lead to opportunities for improvement through an action plan that assigns an outpatient coordinator to shepherd patients through their recovery by facilitating communications, via fax, e-mail, and so on.*

## VII. OUTCOME MEASURES

### A. Mortality

*Comment: No mortality prediction system is without fault; nevertheless, a standardized barometer of comparison is worthwhile. “Z-scores,” as calculated in the Major Trauma Outcomes Study (MTOS) are often used to give an idea of predicted number of deaths as related to Injury Severity Score (ISS), age, and mode of injury. This methodology, known as Trauma and Injury Severity Score (TRISS), is evolving into alternative models, including A Severity Characterization of Trauma (ASCOT), International Classification of Disease, Ninth Revision-based Injury Severity Score (ICISS), and New Injury Severity Score (NISS), and Neural Networks. National trauma registries, such as the National Trauma Data Bank (NTDB), can potentially complement and improve upon existing methodologies and provide a constantly updated method of benchmarking mortality results. Trauma system mortality should also consider prehospital care and prevention activities, for example, seat belt and helmet usage.*

### B. Morbidity

*Comment: Large data repositories of trauma patients (for example, NTDB) and tight definitions of morbidities must be used to obtain comparisons of similar problems. For example, if nosocomial pneumonia (NP) is diagnosed at one institution as “fever and chest X-ray changes,” and another institution uses Centers for Disease Control and Prevention criteria, NP rates will vary, and comparisons will be invalid. Agreeing upon morbidity definitions is an important and difficult process, but it is the necessary first step in obtaining meaningful information.*

### C. Length of Stay (LOS)

*Comment: Inpatient LOS must recognize different levels of intensity, such as intensive care unit (ICU), step down, floor, and so on, that are not uniform between institutions. Also, reduced hospital LOS must be measured by its effect on the patient’s family, visiting nurses, physicians’ offices, and unanticipated hospital readmission. Few systems have the sophistication to measure these effects accurately. Therefore, hospital LOS is, at best, a gross parameter of quality or outcome.*

### D. Cost

*Comment: In the past, trauma centers have used charges as a surrogate for cost. Such an arrangement has led to many flawed conclusions and is clearly unsuitable in today’s health care environment. The determination of true cost is challenging, since most hospital data systems were developed to track operational and capital expenditures rather than clinical care. To overcome this dilemma, the development of techniques generally termed “cost accounting” has*



*emerged. These techniques require many assumptions that need to be clearly understood by clinicians. These assumptions factor in personnel time, resource utilization, supplies, overhead, and so on, by developing equations of proportionality based on expenditures.*

## **E. Quality of Life**

***Comment:*** *Quality of life as an outcome parameter has been recognized by researchers for several decades, and a number of measurement tools have been developed. Many of these are designed to measure the patient/family's perception as well as the providers' perception of outcome.*

- ⇒ *American Spinal Injury Association (ASIA) Score*
- ⇒ *Ashworth Scale*
- ⇒ *Barthel Index*
- ⇒ *Beck Depression Index*
- ⇒ *Craig Handicap Assessment and Reporting Technique (CHART)*
- ⇒ *Disability Rating Scale (DRS)*
- ⇒ *Frankel Score*
- ⇒ *Functional Capacity Index (FCI)*
- ⇒ *Functional Independence Measure (FIM)*
- ⇒ *Glasgow Outcome Scale (GOS)*
- ⇒ *Head Injury Symptom Checklist*
- ⇒ *Health Assessment Questionnaire (HAQ)*
- ⇒ *Impact on Family Scale*
- ⇒ *Index of ADL*
- ⇒ *Injury Impairment Scale (IIS)*
- ⇒ *Katz Adjustment Scale*
- ⇒ *Medical Rehabilitation Follow Along (MRFA) Minnesota*
- ⇒ *Multiphasic Personality Inventory (MMPI)*
- ⇒ *Musculoskeletal Functional Assessment (MFA)*
- ⇒ *Nottingham Health Profile*
- ⇒ *Patient Evaluation and Conference System (PDCS)*
- ⇒ *Pediatric Evaluation of Disability Inventory (PEDI)*
- ⇒ *Quality of Well Being Scale*
- ⇒ *Rancho Scale of Cognitive Functioning*
- ⇒ *Rehabilitation Outcome Questionnaire*
- ⇒ *SF-36 Survey*
- ⇒ *Sickness Impact Profile (SIP)*
- ⇒ *Supervision Rating Scale (SRS)*
- ⇒ *Trauma Motor Index (TMI)*
- ⇒ *UCLA Activity Index*

## **F. Patient Satisfaction**

*Comment: Many commercially available survey tools are religiously utilized by hospital and system administrators as tools to measure patient satisfaction as an outcome parameter. Goals are frequently set to meet target scores, suggesting either improvement or decline in outcome.*

1. Press Ganey  
404 Columbia Place  
South Bend, IN 46601
2. Picker Institute  
Suite 100  
1295 Boylston Street  
Boston, MA 02215
3. Solution Point  
Suite 440  
1501 LBJ Freeway  
Dallas, TX 75234
4. National Research Corporation (NRC)  
1003 O Street  
Lincoln, NB 68508
5. Partners in Quality (Parkside Associates INC)  
Suite 204  
205 West Touhy Avenue  
Park Ridge, IL 60068-4282

## **VIII. CORRECTIVE ACTION PLAN**

### **A. Guideline, Protocol, or Pathway Development**

*Comment:* For example, if the failed extubation rate in the ICU is 15 percent of patients extubated (the literature suggests 7 to 10 percent), part of the corrective action plan could be to initiate a protocol for weaning and extubation derived from evidence-based guidelines from the Society of Critical Care Medicine.

### **B. Education**

*Comment:* For example, rounds, conferences, journal clubs, focused reading, case presentations, newsletters, posters, and videos.

### **C. Enhanced Resources, Facilities, or Communication**

*Comment:* For example, delays in operating room availability on nights and weekends may be reduced by providing cell phones for the OR charge nurse and the anesthesiologist who may be in a room with another patient.

### **D. Process Improvement Team Implementation**

*Comment:* When opportunities for improvement are identified, a process improvement team may be appointed by the trauma PI committee to study the issues and provide recommendations.

### **E. Counseling**

*Comment:* Physician counseling by the trauma director or section chief or nurse counseling by nursing management may be indicated for behavior problems. Such counseling can be very difficult and may have limited effectiveness, but it is sometimes necessary. It is important to keep in mind that most problems and complications are systemogenic and not behavior related.

### **F. Peer Review Presentations**

*Comment:* For example, personnel involved in a case with suboptimal outcome may be asked to present the case in a peer review environment, for example, trauma or surgical M&M (morbidity and mortality). The atmosphere should not be punitive but educational. Leadership from the moderator (usually the trauma director) is required to insure a nonaccusatory environment.

### **G. Change in Privilege or Credentials**

*Comment:* Such a change is an unusual corrective action plan and would require implementation at the department and medical staff level when other corrective action plans have failed. Use of such a plan points out the need for integration of the trauma PI with the hospitalwide PI.

## **H. External Review**

***Comment:** External reviews, such as JCAHO, ACS COT site surveys, or consultations, may be helpful. Consultation from outside clinical, fiscal, or administrative experts may also be useful. Vendor consultations may be considered.*

## **IX. GUIDELINES, PATHWAYS, PROTOCOLS**

### **A. Guidelines**

The Agency for Health Research and Quality (AHRQ) definition of guidelines as systematically developed statements designed to assist in clinical decision making has been expanded to include evidence-based guidelines, which are outlines of generally accepted management approaches based on the best available evidence. These guidelines may be specific to a disease, problem, or process, but they are general in nature and include a series of recommendations rated by the power of the evidence. These documents are aimed at the appropriateness of care and are best derived through national organizations and societies.

### **B. Pathways and Protocols**

Pathways and protocols are bedside/patientside tools for the implementation of the nationally derived management guidelines. Pathways are designed to provide an overview of the entire care process and are primarily calendars of expected events designed to improve efficiency. They are usually specific to a diagnostic-related group (DRG), disease, or a procedure and are meant to provide a checklist for elements of care. Pathways have been used successfully for many entities, including coronary artery bypass surgery, knee replacement, hip replacement, and procedures relating to general surgery and trauma. Clinical management protocols derived from evidence-based national guidelines are institution-specific algorithms that can be used as bedside instruments to affect care. The ideal format for graphic display of these protocols has not yet been determined. Most experience to date has been with an annotated algorithm format following predetermined conventions of style. Pathways and protocols may be applied synergistically.

### **C. Function**

The development, implementation, and analysis of these tools require institution-specific flexibility, strategy for user buy-in, focused education, and integration into an information system to allow a user-friendly, time-neutral decision support system.

### **D. Evidence-based Guidelines**

Following is a sample list of evidence-based trauma-related guidelines from which institution-specific pathways and protocols can be developed (see [www.east.org](http://www.east.org), [www.sccm.org](http://www.sccm.org)):

1. Screening of blunt cardiac injury
2. Identifying cervical spine injuries after trauma
3. Penetrating intraperitoneal colon injuries
4. Venous thromboembolism in trauma patients
5. Prophylactic antibiotic use in penetrating abdominal trauma

6. Open fractures or tube thoracostomy for traumatic hemopneumothorax
7. Diagnosis and management of blunt aortic injury
8. Management of penetrating trauma to the lower extremity
9. Nonoperative management of blunt injury to the liver and spleen
10. Violence prevention programs
11. Optimal timing of long bone fracture stabilization in polytrauma patients
12. Ventilator management of patients with respiratory failure
13. Evaluation of blunt abdominal trauma
14. Nutritional support of the trauma patient
15. Management of mild traumatic brain injury
16. Severe closed head injury
17. Agitation/sedation
18. Alcohol withdraw prophylaxis
19. Stress ulcer prophylaxis
20. Infection control of invasive lines
21. Weaning and extubation
22. Albumin transfusion
23. Pain management
24. Hyperglycemia
25. Nosocomial pneumonia
26. ED Thornectomy

## **X. MULTIDISCIPLINARY REVIEW**

### **A. Overview**

The goals of multidisciplinary review are to (1) assess the performance of the trauma program, (2) provide education, and (3) offer peer review. These three activities can be accomplished in a variety of formats, depending on the volume of trauma patients. Review data can come from either a concurrent care evaluation or a structured review process (see Section IV. Data Collection). The concurrent care evaluation can use an occurrence tracking form (see page 72, resources document), whereby concerns may be raised by a variety of sources, including trauma nurse coordinators, nurse managers, case managers, hospital-wide PI coordinators, pathway and protocol coordinators, patient relations personnel, risk management, and most important, daily rounds. Structured periodic reviews include focused audits and structured reports from the registries or hospital-wide PI database. Minutes from the multidisciplinary review and educational processes are another valuable format for data collection.

### **B. Trauma Program Performance Committee**

This function is accomplished by a multidisciplinary committee that ideally should include representatives from all phases of care provided to the injured patient, including physicians, prehospital personnel, nurses, technicians, administrators, and other ancillary personnel. This committee should meet periodically, depending on patient volume, to review system-related performance issues. Minutes should reflect the review including, when appropriate, the analysis and proposed corrective action.

### **C. Education**

A periodic trauma case review or didactic conference is useful for providing corrective action or disseminating evidence-based guidelines. This conference usually occurs weekly in high-volume trauma centers, but may be incorporated monthly into existing departmental conferences in low-volume centers. When an educational conference is based in a medical staff or departmental conference, every effort should be made to include representatives from appropriate disciplines, such as emergency medicine, anesthesiology, trauma surgery, orthopaedics, and neurosurgery. The importance of taking advantage of existing educational conferences cannot be overemphasized. These uniquely scheduled events are part of many trauma teams' expected activities and are a rich source for information exchange. Ad hoc committees for the developing guidelines are necessary but cumbersome because of competing schedules of trauma team members. Therefore, education meetings should be focused on topics for evidence-based guidelines, when possible, to enhance the PI initiatives.

#### **D. Trauma Peer Review Committee**

This peer review process can be in a committee or conference (eg. M&M) format and includes a multidisciplinary physician review of provider performance. Non-physicians may participate at the discretion of the trauma director and according to hospital-wide policies and state peer review laws. The multidisciplinary physician group should include trauma surgeons and representatives from emergency medicine, anesthesiology, neurosurgery, and orthopaedics. No absolute prescription for the makeup and format of this activity, which will be dependent on patient volume and practice model, exists. The specialists in low-volume trauma centers may be invited selectively for discussion of issues directly relating to their care.



## **XI. USE OF TRAUMA REGISTRY**

### **A. Commercial Trauma Registries**

A variety of commercial trauma registries are currently available which may be hospital-specific or part of a regionwide or statewide system. Note that all have a PI (sometimes called “quality indicators”) section. Both standard reports and designed reports can be generated. The following information may be available:

1. Volume indicators and trends
2. Cost/charge indicators and trends
3. Mortality (may be risk-adjusted, that is, TRISS, ASCOT, and so on)
4. Complications—total number or rate
5. Calculated standard quality indicators
6. Abstracted standard quality indicators
7. Designed quality indicators
8. Other uses of trauma registries:
  - d. Injury characteristics
  - e. Prevention strategies
  - f. Legislation
  - g. Report cards
  - h. Managed care contracts

### **B. Quality Indicators**

Each quality indicator is a statement of an ideal expectation. For example, “Open fractures taken to the OR > 8 hr after admission.” All cases would be identified from the registry over a period of time (for example, over six months). The expectation is that ideal treatment of open fractures is operative debridement and possible fixation within 8 hours. However, many valid reasons exist as to why this option may not have been appropriate or possible, which can only be determined by chart/case review. This review may proceed through a variety of pathways(examples):

1. Several cases were found to be delayed beyond 8 hours because a surgeon, operating room, or piece of equipment was unavailable—or the trauma team/orthopaedic surgeon did not recognize the injury. This conclusion would then lead to a corrective action plan (counseling the surgeon, an educational session for the trauma team on open fracture management, making more resources available for opening an operating room in a more timely fashion). After the corrective action plan is completed, this indicator should be monitored for the next six months to see if the problem has been resolved (closing the loop).
2. Several cases were delayed beyond 8 hours, but these delays were found appropriate because of the injury grade or other competing needs of the patient. No further action needed.

3. The trauma PI program has monitored this indicator for compliance of “fallout” and has found no opportunities for improvement. A threshold of fallouts is then developed, which must be exceeded before chart review is enacted: a variety of denominators can be used; for example, total number, percentage of open fractures, percentage of all fractures, percentage of all trauma patients admitted to trauma service, percentage of all trauma admissions. Alternatives may be to trend, to review periodically (such as via a focused audit), or to delete it from the registry.
4. The trauma PI program may decide that this empirically derived indicator is not evidence-based and should not be used as a parameter of quality.

### C. Critique

Some trauma programs have found that existing quality indicators contained in registries are useful, but others have found them to be labor intensive and are seeking alternatives. Ultimately, evidence-based, guideline-derived indicators available on a sophisticated time-neutral information basis like a decision support system, will replace the registry-based indicators. In the meantime, optimal use of registry indicators will be institution-specific and vary greatly with the maturity and volume of the trauma center.

Example of standard quality indicators include:

- ⇒ Missing EMS Report
- ⇒ Glasgow Coma Scale <14, no head CT
- ⇒ Glasgow Coma Scale <8, no endotracheal tube or surgical airway
- ⇒ Nonoperative treatment of gunshot wound to the abdomen
- ⇒ No laparotomy <1 hour, abdominal injuries, and systolic blood pressure <90
- ⇒ Laparotomy after 4 hours
- ⇒ Craniotomy after 4 hours, with epidural or subdural hematoma, excluding intracranial pressure monitoring
- ⇒ Initial treatment >8 hours of open tibia fracture, excluding low-velocity gunshot wound
- ⇒ Abdominal, thoracic, vascular, or cranial surgery after 24 hours
- ⇒ Admit by nonsurgeon
- ⇒ Nonfixation of femoral diaphyseal fracture in adult
- ⇒ Trauma death
- ⇒ Ambulance scene time >20 minutes
- ⇒ Absent hourly charting
- ⇒ Transfer after 6 hours in the initial hospital
- ⇒ Reintubation within 48 hours of extubation

## **XII. ADDITIONAL PI RESOURCES**

### **A. National Trauma Data Bank (NTDB)**

The NTDB is designed to provide national and regional benchmarking for use in trauma center and trauma system PI. In addition, research from the data bank will provide some useful Class III evidence-based medicine where little or none exists today. Although not totally population based, the incidence and prevalence of trauma-related disease and complication can be more accurately estimated. As this evidence accrues, guidelines will emerge to provide standards and options against which to measure performance..

### **B. Agency for Healthcare Research and Quality (AHRQ)**

The AHRQ is a governmental agency that has created 12 evidence based centers throughout the United States commissioned to study evidence based guidelines on a variety of topics, including trauma. The agency has also identified clear opportunities for safety improvement relating to topics such as central catheters, enteral nutrition, antibiotic prophylaxis, venous thromboembolism prophylaxis and informed consent. They have also prioritized research issues such as handwashing compliance, analgesia, computerized order entry with clinical decision support, nurse staffing for reduced morbidity and prevention of urinary tract infections. These are excellent resources for developing corrective action plans as part of a performance improvement program.

### **C. NAHQ (National Association of Healthcare Quality)**

NAHQ is a 7,000+-member organization with a goal of promoting continuous quality improvement of health care by providing educational and development opportunities for professionals at all levels and within all settings. Multiple resources are available on their web page at [www.nahq.org](http://www.nahq.org).

### **D. American College of Surgeons Office of Evidence-Based Surgery**

This recently established resource is designed to process and analyze data leading to best practices and potentially to clinical trials in many areas including trauma. This can provide benchmarks and evidence based guidelines for trauma PI.

### **XIII. EXAMPLES**

#### **A. Trauma Mortality Reviews**

1. 80 mortalities occurred in 1998
2. 50 were reviewed by the trauma director or his/her designee and found to be non-preventable (TRISS was not used; judgment of trauma director)
3. 30 deaths were selected for presentation at the monthly trauma M&M conference based on:
  - a. Concerns noted on preliminary review
  - b. Interesting or unusual case
  - c. Request for presentation by a physician
4. 20 were determined to be disease-related and non-preventable
5. 8 were determined to be potentially preventable  
Causes (one or more for each mortality)
  - a. Missed or delayed diagnosis, 3
  - b. Delay or error in treatment, 5
  - c. Communication failure, 4
  - d. Error in judgment, 5
  - e. Delay in consultation, 1
  - f. Inadequate resources, 3
  - g. Protocol inappropriately violated, 1
6. 2 were determined to be preventable  
Causes
  - a. Delay in diagnosis, 2
  - b. Delay in treatment, 2
  - c. Communication failure, 1
7. Analysis of the potentially preventable and preventable deaths revealed:
  - a. Credentialed provider-related, 6
  - b. Noncredentialed provider-related, 3
  - c. System-related, 5
  - d. Could not be determined, 1
8. Corrective action plans initiated
  - a. Education—5 topic-focused reviews at trauma conference
  - b. Counseling of providers
  - c. Meet with neurosurgical chief to discuss response guidelines
  - d. A protocol for DVT prophylaxis using an evidence-based guideline was initiated
  - e. Recommendations were taken to the trauma system PI committee
    - ⇒ PI task force to improve the paging system
    - ⇒ Improve blood bank technician availability on weekends
    - ⇒ Ask operating room committee to develop policy allowing for the appropriate resources to make OR available for planned take-back of the open abdomen or multiple fractures in a more timely fashion

9. Follow-up
  - a. The trauma PI recommendations were taken to the hospital-wide PI committee.
  - b. This activity was done on a quarterly basis or more frequently if needed.
  - c. Timelines were set for resolution.
  - d. Hospital-wide PI committee recommended resources (fiscal and personnel) for paging system and blood bank. Hospital-wide PI committee recommended that OR committee develop a trauma priority block. The PI committee did not recommend personnel or other resources.
  - e. The trauma potentially/preventable mortality rate is continuously trended.
10. Analysis:
  - a. This is one trauma center's approach to one aspect of trauma PI. Although presented in an annual report format, the issues are dealt with as they occur. However, bringing cumulative data to the hospitalwide committee can be a powerful tool to generate needed resources. TRISS (ASCOT) analysis was not used in this particular example, but is used by many as a screening tool to decide which cases should be reviewed. For example, the trauma director can review only the unexpected mortalities as defined by TRISS. Volume, experience, and available resources are factors in determining the utility of TRISS for mortality analysis.
  - b. Case selection and abstract can be greatly facilitated by a trauma registry, limiting reviews with minimal value and allowing time for focus on improvement opportunities.
  - c. The determinants of performance as outlined by JCAHO (see section ) can be used to structure a report.

## **B. Clinical Example**

1. Clinical problem/adverse outcome: acute respiratory failure in CT, delayed intubation (no significant adverse sequelae)
2. WHY?
  - a. Clinical process failure: Delayed response by anesthesia
  - b. Organizational process failure: Anesthesia not connected to TTA pagers, no anesthesia policy regarding TTA response.
  - c. Organizational process failure: No ICU nurse available to monitor patient in CT
  - d. Resource deficit: Insufficient staffing availability
  - e. Clinical process failure: Inadequate patient monitoring in CT, inadequate monitoring equipment

3. Action plan
  - a. Anesthesia TTA pagers
  - b. Anesthesia policy for response to major TTA
  - c. ICU float RN to be made available 24 hr/day
  - d. Capital budget request for CT monitors
  - e. Policy for mandatory monitoring in CT by ICU RN
4. Follow-up/surveillance
  - a. Anesthesia response to TTA
  - b. Incidence of delayed intubation
  - c. Compliance with float policy (target 100 percent)
  - d. Procurement of installed monitoring equipment in CT
  - e. Surveillance period: one year
  - f. Surveillance reporting: Trauma quality assurance committee; critical care committee

**C. Tracking Forms** (see Figure 1 on page 45)

#### **XIV. SUMMARY**

This how-to manual on trauma PI will always be a work in progress. It is designed to provide the best available definitions of the elements and tools of PI. Integration of trauma PI into hospitalwide and systemwide PI, which includes understanding and using PI tools and philosophy of JCAHO, is emphasized. Measures of process and outcome as well as corrective action plans are offered. Three forms of multidisciplinary review are outlined: peer review, system review, and education. The utility of local and national trauma registries is stressed. The emergence of evidence-based, guideline-derived trauma PI as a supplement to or eventual replacement of empirically derived audit filters is introduced. Several examples of tracking forms and specific PI scenarios are provided.

The American College of Surgeons Committee on Trauma views this manual not only as an offering, but as an invitation to all involved in trauma care to contribute ideas and share experiences through e-mail ([cwilliams@facs.org](mailto:cwilliams@facs.org)), fax (312/202-5005), or letter to the ACS Committee on Trauma, 633 N. Saint Clair St., Chicago, IL 60611-3211. These ideas will be reflected in the periodic updates of this manual appearing on the College's Web site at [http://www.facs.org/about\\_college/acsdept/trauma\\_dept/traumgrd.html](http://www.facs.org/about_college/acsdept/trauma_dept/traumgrd.html).

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## Links

- [www.AHRO.gov](http://www.AHRO.gov) Agency for Health Research and Quality
- [www.guideline.gov](http://www.guideline.gov) National Guideline Clearinghouse
- [www.jcaho.org](http://www.jcaho.org) Joint Commission on Accreditation of Healthcare Organizations
- [www.nahq.org](http://www.nahq.org) National Association of Healthcare Quality
- [www.aahp.org](http://www.aahp.org) American Association of Health Plans
- [www.noah.cuny.edu:8080/ebhc/ebhc.html](http://www.noah.cuny.edu:8080/ebhc/ebhc.html)  
New York Online Access to Health (EB M)
- [www.clinicalevidence.org](http://www.clinicalevidence.org)  
Clinical Evidence (British Medical Journal)
- [www.ovid.org](http://www.ovid.org) Evidence-Based Medicine Reviews
- [www.leapfroggroup.org](http://www.leapfroggroup.org)  
The LeapFrog Group

FIGURE 1

PERFORMANCE IMPROVEMENT TRACKING FORM (EXAMPLE)

Demographics	Source of information (O)	Location of issue (O)
Date of report _____	<input type="checkbox"/> Trauma nurse coordinator	<input type="checkbox"/> Prehospital
Medical record # _____	<input type="checkbox"/> Nurse management	<input type="checkbox"/> Resuscitation
Trauma registry # _____	<input type="checkbox"/> Case manager	<input type="checkbox"/> Imaging
Attending # _____	<input type="checkbox"/> PI coordinator	<input type="checkbox"/> Lab
Floor _____	<input type="checkbox"/> Patient relations	<input type="checkbox"/> OR
	<input type="checkbox"/> Risk management	<input type="checkbox"/> PACU
	<input type="checkbox"/> Rounds	<input type="checkbox"/> ICU
	<input type="checkbox"/> Conference	<input type="checkbox"/> Floor
	<input type="checkbox"/> Registry	<input type="checkbox"/> Rehab
	<input type="checkbox"/> Other _____	<input type="checkbox"/> Other _____

Complication, occurrence, problem, or complaint:

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Reported to \_\_\_\_\_ Reviewed by \_\_\_\_\_

**Determination:**

- system-related
- disease-related
- provider related
- cannot be determined

**Preventability:**

- nonpreventable
- potentially preventable
- preventable
- cannot be determined

**Corrective Action(s)**

- unnecessary
- trend
- education
- guideline/protocol
- counseling
- peer review presentation
- resource enhancement
- process improvement team
- privilege/credentialing action
- other \_\_\_\_\_

Comments:

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Signature \_\_\_\_\_ Date \_\_\_\_\_

**FIGURE 2-A**

**Department of Surgery Occurrence Report**

**WHO:** Unit # \_\_\_\_\_ Name: \_\_\_\_\_

**WHOSE:** Resident: \_\_\_\_\_ Attending of Record: \_\_\_\_\_

Operation related? (Y/N) \_\_\_\_\_

Procedure: \_\_\_\_\_

**WHAT:** Occur Code: \_\_\_\_\_ happened on (Date) \_\_\_\_\_ resulting from these codes: \_\_\_\_\_

*(See table below for codes)*

Details: (Write legibly or print)
Attending Signature _____ <b>Death Analysis:</b> ES US UM UD <i>Use other side if necessary</i> <span style="float: right;"><i>(See table below)</i></span>

Reported at conference held on (Date) \_\_\_\_\_, moderated by: \_\_\_\_\_

It was NOTED or DISCUSSED and these codes assigned by consensus:

(circle one)	<b>CAUSE:</b>	N	T	D	C <sup>1</sup>	<i>(See table below)</i>
	<b>EFFECT:</b>	I	II	III	IV	
	<b>ACTION:</b>	N	Chr	OUT		

Comments: \_\_\_\_\_

Moderator Signature: \_\_\_\_\_

If referred OUT, to whom? \_\_\_\_\_

**FIGURE 2-B**

**Occurrence Codes**

- Code Definition**
- 1 **Readmission within 3 months.** Any readmission to hospital for problem directly related to operative procedure or original admission.
  - 2 **Admission post ambulatory surgery.** Procedure performed as outpatient case that requires overnight admission/observation for any reason.
  - 3 **Unplanned Procedure.** Any procedure performed concurrently or subsequently during same hospitalization that was not initially anticipated as necessary part of the patient’s care.
  - 4 **Unplanned Intensive Care.** Admission to any ICU for management of problems related to procedure or surgical disease.
  - 5 **Removal of Damage to any body part or organ system.** Unplanned loss of organ or organ part.
  - 6 **Retained Foreign Body.** Any material unintentionally left in surgical site.
  - 7 **Infection NOS.** Any culture documented infection at site other than below
    - 7a **Wound** infection
    - 7b **Device** infection (line, bladder, drain, etc.)
    - 7c Peritonitis or **abdominal** abscess
    - 7d **Pneumonia** (Fever, Leukocytosis, Infiltrate, and Positive culture)
  - 8 **Organ Failure or Damage.** Unexpected organ system insufficiency or failure.
  - 9 **Neurologic Injury.** Unexpected neural paresis, paralysis or disruption
  - 10 **Deep Venous Thrombosis.** Doppler or clinical evidence of venous thrombosis
  - 11 **Pulmonary Embolism** Documented by Angiography or V/Q scan
  - 12 **Acute Myocardial Infarction.** Documented new or advanced infarction within 48 hours of surgery
  - 13 **Cardiopulmonary Arrest.** Cessation of spontaneous cardiopulmonary function requiring intubation, ventilation, chest compression or ACLS resuscitation drugs.
  - 14 **Death**
  - 15 **Bleeding intra-operatively or post operatively.** Any hemorrhage excessive enough to require unplanned transfusion.
  - 16 **Adverse/Unsuccessful Operative Result.** Purpose for procedure not achieved. Unexpected postoperative event causing morbidity.
  - 17 **Delay in Diagnosis or Treatment.** Self evident
  - 18 **Inappropriate or Incorrect Diagnosis or Therapy.** Self evident
  - 19 **Case Delay or Cancellation.** Progress of scheduled case from admission to procedure completion interrupted for inordinate period.
  - 99 Other

<u>Cause Codes</u>	
N	Nature of Disease
D	Diagnostic Problem
T	Technical Problem
C	Clinical Judgement

<u>Death Analysis</u>	
ES	Expected outcome, unrelated to practitioner
US	Unexpected outcome, within standard of care
UM	Unexpected outcome, marginal skill/care
UD	Unexpected outcome, deviation from standard

<b>EFFECT</b>	
<b>Occurrence grade</b>	
Grade I	Alteration from ideal post-op course, or Non life-threatening, or No lasting disability, or Requires only bedside care, or Does not extend hospital stay
Grade II	Potentially life threatening, or No residual disability, or Requires invasive procedure.
Grade III	Residual disability, or Organ loss, or Persistent threat to life.
Grade IV	Death

**FIGURE 3****Trauma Center: QUALITY ASSURANCE EVENT REPORT FORM**

This form is used to report QA events, which may be errors, problems, deaths, or patient complications. This information is for confidential peer review q/a information is protected under section 1156/1157 of the California Evidence Code.

REV. 7/9/99

<b>TRAUMA Q/A REVIEW PROCESS</b>	
9 Trauma Nursing Coordinator	9 Trauma Quality Assurance Committee
9 Trauma Director	9 Hospital Quality Assurance/Risk Management
9 Trauma/Surg: Departmental	9 EMS agency
9 <b>DEATH</b> (mandatory review by TD, TQAC)	9 Subspecialty review(s):

<b>Patient:</b>		admitting service:	
Hospital #:	Adm. Date:	Event date:	time:

*Narrative summary of hospital course & Q/A events:*

EVENT CODES (circle all that apply to this event):

Code	Error or Problem	Services(s) Involved	Impact (0-5)	Justified (Y,N,I)	Action Plan
B	<b>Delayed dx.</b> (dx. made prior to DC or transfer)				
C	<b>Missed inj/dx.</b> (dx. made after D/C or transfer)				
D	<b>Delay in dispo.</b> (from E.D., radiology, scene, etc.)				
E	<b>Delay to the O.R.</b> (Delay in oper. rx. once dx. made)				

Code	Error or Problem	Services(s) Involved	Impact (0-5)	Justified (Y,N,I)	Action Plan
F	Delay in rx. (delay in non-op rx once dx. made)				
G	Technical or procedural error				
H	Judgement error in patient management				
I	Unplanned return to O.R.				
J	Equipment failure or delay or unavailability				
K	Drug/blood/fluid delay or unavailability				
L	Personnel unavailable or delayed				
M	Inadequate patient monitoring				
N	Inadequate documentation				
O	Other error type identified (describe)				
P	Inadequate notification of pt. status or need				
Q	Delayed/failed trauma team activation				
R	Failure to follow established policy				
X	No error identified				

Death Review: (Check if applicable)			
	<p><b>Non-Preventable:</b> Requires that:</p> <ol style="list-style-type: none"> <li>To a reasonable degree of medical certainty, outcome would have been the same regardless of any errors made. <b>OR</b></li> <li>No substantive error were made and identified</li> </ol>		<p><b>Probably Preventable:</b> Requires that:</p> <ol style="list-style-type: none"> <li>Substantive errors made and identified.</li> <li>Errors were “prospective” errors.</li> <li>Death did not meet criteria for preventable.</li> <li>More likely than not, death would NOT have occurred had the identified errors been avoided.</li> </ol>
	<p><b>Possibly Preventable:</b> Requires that:</p> <ol style="list-style-type: none"> <li>Substantive errors made and identified.</li> <li>Errors were “prospective” or “retrospective” errors.</li> <li>Death did not meet criteria for non-preventable.</li> <li>More likely than not, outcome would have been the same regardless of the errors made.</li> </ol>		<p><b>Preventable:</b> Requires that:</p> <ol style="list-style-type: none"> <li>Substantive errors made and identified.</li> <li>Errors were “prospective” errors.</li> <li>To a reasonable degree of medical certainty, death would NOT have occurred had the identified errors been avoided.</li> </ol>
Autopsy Review Completed on (date):			

List errors/problems linked to adverse outcomes (death or complications)	
Error Codes(s)	Adverse Outcome

*Comments:*

**Codes Used for the TQA Event Form:**

**Service Attribution for Error or Problem:** circle all that may apply to this event

Code	Services	Code	Services	Code	Services	Code	Services
A	Trauma Service	G	Urology	L	Respiratory Care	S	CPD (central supply)
B	Emergency Department	H	ENT/Max./face	M	Radiology, Tech	T	MICN
C	Radiology	I	Plastics	N	E.D. Nursing	U	Paramedics
D	Anesthesiology	J	Critical Care	P	Critical Care Nursing	V	Other (specify)
E	Neurosurgery	K	Pediatrics	Q	Ward Nursing	X	Indeterminate
F	Orthopedics			R	OR/PAR		

**Judgement of Errors Associated with this Event**

A	Justifiable, unavoidable, or consistent with reasonable and prudent practice given the situation or clinical data available.	C	Indeterminate, controversial, cannot be resolved
B	Not justifiable; avoidable; not consistent with standards of practice or service at a Level I Trauma Center	D	No errors identified for this event.

**Action Plan Codes for this Event** (circle all that may apply)

Code	Error	Code	Error
A	None required (explain in comments)	F	Modification of dept. training/educational program
B	Tabulation and tracking of problem for further reporting	G	Individual counseling and discussion
C	Institution of formal Q/A audit	O	Other (describe in common)



D	Formulation of new policy or procedure	P	Action pending review
E	Educational offering (describe in comments)		

**Judgement of Impact of this Event on Patient Outcome**

0	<b>No impact</b> on patient outcome	3	<b>Major Impact:</b> Prolonged hospital course, major discomfort. No permanent disability or long-term risk. (e.g., un-planned, uncomplicated return to OR)
1	<b>Minimal impact:</b> transient discomfort, small risk exposure. No prolonged recovery.	4	<b>Major Impact:</b> Prolonged hospital course, recovery or disability. Limited permanent disability (e.g., compartment syndrome with muscle loss)
2	<b>Moderate impact:</b> significant discomfort, risk exposure with limited prolongation of recover (e.g., chest tube for iatrogenic pneumothx.)	5	<b>Severe Impact:</b> Death or major permanent disability (major neurologic injury, amputation)
X	Impact cannot be accurately determined.		

**NOTES**

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