BELLEVUE HOSPITAL CENTER
TRAUMA PROGRAM

Trauma Performance Improvement
and
Patient Safety (PIPS) Plan

(Revised October 25, 2015)

A smart man makes a mistake, learns from it, and never makes that mistake again. But a wise man finds a smart man and learns from him how to avoid the mistake altogether.

Roy H. Williams

TRAUMA PROGRAM
Trauma Performance Improvement Plan

Table of Contents

I. Philosophy of the Trauma Program

The Trauma Program is dedicated to providing specialized effective care to all injured patients brought to Bellevue Hospital Center.

II. Mission and Vision of the Trauma Performance Improvement (PI) Program

Consistent with the mission and vision set forth by Bellevue Hospital Center, the Trauma Program is committed to providing comprehensive health services of the highest quality to individuals who sustain injury in New York City, regardless of ability to pay, in a compassionate and respectful manner. The PI Program is designed to support clinical excellence; develop, measure, and assess the effectiveness of continuous PI initiatives; and to provide a framework that supports the Corporate goal of becoming one of the safest hospitals in the nation. The PI plan forms the basis for a dynamic multidisciplinary program structured to maximize collaborative efforts, facilitated by data analysis and resolution of issues through the peer review process at all levels of trauma care delivery.

III. Authority/Scope

The Trauma PI Program is under the direction of the Trauma Medical Director, who reports to the New York University School of Medicine Department of Surgery Chief of Surgery for Bellevue Hospital Center, who is responsible for overseeing Departmental-wide safety and PI programs and provides clinical and administrative direction for clinical services and PI functions.

The Trauma Program has the authority to monitor all events that occur during a trauma-related episode of care when the trauma patient is admitted to the hospital. The Trauma Program reports all PI activity to the Department of Surgery Quality Assurance (QA) Committee and to the Hospital-wide PI Committee. The Trauma Program is also represented at the Hospital wide peer review committee

IV. Credentialing and Privileges

Physicians taking trauma call will be credentialed per Medical Staff policy. In addition, surgeons and surgical subspecialists taking trauma call will meet additional criteria as specified by the Trauma Program and the Trauma Medical Director to include:

- Advanced Trauma Life Support [ATLS] certification (mandatory for EM [at least once] and trauma attendings)
- An average of 16 hours annually or 48 hours in three years of verifiable external trauma-related Continuing Medical Education **or** participation in the Trauma Program's Internal Education Program as appropriate
- At least 50% attendance at Trauma Peer Review Committee for specific physician liaison
- Compliance with the Trauma Program Guidelines
- TMD has authority to recommend changes to the trauma panel based on performance review. Review includes evaluation of the practitioners' continuing education (CE), complications, mortality rates, and participation in evidence-based guidelines, pathways, and protocols

V. Trauma Patient Population Criteria for Registry Inclusion

The trauma patient is defined as a patient who sustains a traumatic injury and meets the following criteria:

a. Includes at least one code within the range of the following ICD 10-CM diagnostic codes: 800.0-959.9
b. Excludes all diagnostic codes within the following ITQIP ranges:
   - 905-909.9 (late effects of injury)
   - 910-924.9 (superficial injuries)
   - 930-939.9 (foreign bodies)
c. NTDS definitions
d. And must include one of the following criteria:
   - Hospital admission
   - Inter-hospital transfer
   - Death resulting from the traumatic injury (independent of hospital admission or hospital transfer status)

VI. Data Collection and Analysis

Information for the Trauma PI process is collected concurrently and retrospectively. It comes from various sources to include, but not limited to:

- Daily morning report (held every day, e.g. 365 days per year including all holidays): cases discussed including complications, monitoring of compliance with clinical guidelines, etc.
- Daily rounds with the trauma team
- Daily admission log
- Trauma registry
- Weekly trauma morbidity and mortality (M&M) conference
- Referrals from staff and departments involved in care of the injured patient
- Mapping of data from Finance
- Case review at Pediatric PI
- Review of Transfer Logs
- Trauma registry validation occurs on a monthly basis through internal data check, NTBD/TQIP validation and inter-rater reliability by review of trauma data abstracts and reports

VII. Process for Monitoring Compliance

1. ***Standards of Quality Care:***
   All trauma patients that meet the criteria for inclusion into the trauma registry are monitored for compliance with or adherence to the standards of quality trauma care as established by the American College of Surgeons Committee on Trauma "Resources for Optimal Care of the Injured Patient 2014" book.

2. ***Death Reviews:***
   All trauma patient deaths are reviewed as they relate to trauma care and trauma system issues.

3. ***Indicators:***
   Indicators defined by the Trauma Program are monitored including:

i. **Complications:**
Complications that occur in the injured patient are tracked, trended and entered into the Trauma Registry. The Trauma Peer Review Committee (TPRC) will review complications from injury or treatment that temporarily or permanently affect patient outcome. The committee makes appropriate referrals (*i.e.* other clinical departments, nursing, etc.) and recommendations and monitors all complications for trend analysis.

ii. **Systems Issues:**
Identified systems issues are reviewed in the Trauma Peer Review Committee and/or Trauma Program Operational Process Performance Committee.

VIII. Review Process

The process of care will be monitored by utilizing the indicators defined by the Trauma Program, regional and state trauma systems, and the Trauma Peer Review Committee. Quality and system issues identified will be reviewed for determination of further action. See flow diagrams on pages 8 and 9 of this plan.

Levels of Review:

1st Level Review (Weekly Trauma M&M) (Concurrent/retrospective event identification)
Attendees include: TMD, TPM, trauma PI coordinator, trauma attendings, trauma house staff, trauma PAs, medical students.
Provider or systems issues are identified by any and all members of the team in advance of the meeting. A level 1 (resident) write-up is completed by the chief resident who presents the case in an organized and systematic fashion. Clinical care is reviewed and provider or systems issues are further discussed and identified. Any questions that arise will be answered by a review of the medical record in a timely fashion or by sending queries to the relevant services for review and comments. A formal Level 1 attending write-up is then completed. Certain cases may be closed, although the care may require 2nd or 3rd level review depending on level of harm, complexity, and multidisciplinary aspect.

2nd Level Review (Trauma Medical Director - TMD)
Attendees include: TMD and TPM/ trauma PI coordinator as necessary.
Issues in clinical care, provider, or systems issues are evident that require the Trauma Medical Director's expertise and judgment. The Level 1 write-ups and all query responses are reviewed. Further investigation may be initiated and/or action implemented without formal referral through the Trauma Peer Review Committee. Certain cases may be closed by TMD, although the care may require 3rd level review depending on level of harm, complexity, and multidisciplinary aspect. All deaths and level of harm representing moderate permanent harm, severe temporary harm, or severe permanent harm **must** be reviewed at Trauma Peer Review Committee.

3rd Level Review (Trauma Peer Review Committee - TPRC)
Attendees include: TMD, TPM, trauma PI coordinator, trauma attendings, sub-specialty liaisons, trauma nursing, trauma registrars, and invited guests.
All deaths and level of harm representing moderate permanent harm, severe temporary harm, or severe permanent harm are reviewed by this committee. Important issues related to the

case as well as any query responses collected are reviewed and discussed. Determination of judgment for mortalities and final determination of judgment for level of harm will be made by the committee using the criteria described in section IX. Determination of any necessary corrective action(s) will be made as described in section XV. In certain circumstances where a complex action plan is implemented (especially on systems PI issues), a discrete loop closure form will be completed by the TMD to assure tracking and documentation of loop closure.

The **Trauma Peer Review Committee - TPRC** is responsible for the overall evaluation of trauma care by individual specialties providing trauma care. Mortality data, adverse events and problem trends, and selected cases involving multiple specialties undergo multidisciplinary trauma peer review. This committee is under the leadership of the Trauma Medical Director and includes the involvement of the trauma surgeons call panel and liaisons from Emergency Medicine, orthopedics, neurosurgery, anesthesia, critical care and radiology. This meeting is held monthly and liaison members of the committee must attend at least 50% of all TPRC meetings.

Operational Review (Trauma Program Operational Performance Process - TPOPPC)
The Trauma Program Operational Performance Process is responsible for examining trauma-related hospital operations and includes representatives from all phases of care provided to injured patients. This committee meets on a monthly basis and liaison members must attend at least 50% of all TPOPPC meetings.

Sup-specialty PIPS process (e.g. EM, NS, ortho, critical care, anesthesia, radiology, trauma nursing)

- Sub-specialties review specialty-specific PI issues. The disciplines review their own data including trauma-related systems issues. They report their findings at Trauma Peer Review Committee on a quarterly basis.

Pediatrics PI Committee
Attendees include: TMD, TPM, trauma PI coordinator, PICU attending, Peds-EM attending, Pediatric Surgery attending, and trauma attendings.

- This committee systematically reviews all injured pediatric (under 15 years of age) admissions. Review forms for each injured child admission are completed in advance of the meeting by a pediatric surgery attending. Any relevant PI issues which are identified are discussed and reviewed. Certain cases may be referred for a Level 2 or 3 review (TPRC) depending on level of harm, complexity, and multidisciplinary aspect.

Pre-hospital PI Committee
Attendees include: TMD, TPM, trauma PI coordinator, EM attending, trauma attendings, Manhattan FDNY-EMS medical director, EMS staff (as needed)

- This committee systematically reviews any pre-hospital PI issues identified on injured patients. Any relevant PI issues which are identified are discussed and reviewed. Certain cases may be referred for a Level 2 or 3 review (TPRC) depending on level of harm, complexity, and multidisciplinary aspect.

IX. Determination of Judgments (Query Process)

For all mortalities, the Trauma Peer Review Committee will render judgment based on the following categories:

1. Unanticipated mortality with opportunity for improvement
2. Anticipated mortality with opportunity for improvement
3. Mortality without opportunity for improvement

Additionally, level of harm will be determined for complications and deaths based on the following categories:

Level of Harm:
☐ 0 – No harm, no detectable harm
☐ 1 – Potential for harm
☐ 2 – Mild temporary harm
☐ 3 – Mild permanent harm
☐ 4 – Moderate temporary harm
☐ 5- Moderate permanent harm
☐ 6- Severe temporary harm
☐ 7 – Severe permanent harm
☐ 8– Death

X. Documentation of Analysis and Evaluation

Trauma performance improvement issues will be documented on Level 1 (resident and attending), Level 2, and/or Level 3 PI case review forms (see appendix). These forms track all aspects of the case review process including the summary of clinical care, identified issues, recommendations, judgment, corrective actions, and loop closure. In certain circumstances where a complex action plan is implemented (especially on systems PI issues), a discrete loop closure form will be completed by the TMD to assure tracking and documentation of loop closure. All of this documentation will be summarized in the monthly Trauma Peer Review Committee meeting minutes.

XI. Referral Process for Investigation or Review (Query Process)

The cases determined to require further assessment and comment by other disciplines will be referred by query letters to the appropriate liaison or department (via appointed liaison) for review and response. The TMD and/or Trauma Peer Review Committee will then review the response of the query for follow-up action planning.

XII. Trauma Peer Review Committee Structure

The Trauma Peer Review Committee will function as follows:

1. It is a multidisciplinary peer review committee functioning under the auspices of the Department of Surgery QA Committee, Hospital Peer Review Committee Medical Board and Clinical Service Line - CSL.

2. The charge of the committee is to evaluate the care of the trauma patient from a clinical and systems perspective and to perform interdisciplinary implementation of improvement strategies. It is responsible for establishing objective criteria for identifying issues for review and determining compliance with standard of care. The committee will systematically monitor/analyze data and strive to improve patient outcomes through identified opportunities.

3. Recommendations and action plans with associated re-evaluation will be made when areas needing improvement are determined. Attendees include TMD, TPM, trauma PI coordinator, trauma attendings, sub-specialty liaisons, trauma nursing, trauma registrars, and invited guests ad hoc. The Trauma Peer Review Committee provides the minutes to the Hospital PR Committee and Medical Board.

XIII. Operational Staff Responsibility for the Trauma Peer Review Committee

The Trauma Medical Director, Trauma Program Manager, and Trauma PI Coordinator maintain the Trauma PI process.

XIV. Trauma Peer Review Committee Membership

The Trauma Peer Review Committee will be composed of the Trauma Medical Director, the Trauma Surgeons, Subspecialty liaisons (Orthopedic Surgery, Neurosurgery, Emergency Medicine, Critical Care, Anesthesia, Pediatrics (PICU and Peds-EM), Radiology), Trauma Program Manager, Trauma PI Coordinator, Trauma Registrars, Trauma Physician Assistants, and nursing leadership. Invited guests will attend ad hoc. Each liaison member of the committee and all trauma surgeons must attend at least 50% of the time, and this attendance may not be met by having multiple different providers from the specialty in attendance.

XV. Corrective Action Planning

The Trauma Medical Director oversees all corrective action planning and implementation. The goal is to achieve loop closure that will optimize outcomes. An evaluation and re-evaluation process will be a part of the plan. Examples of potential corrective action categories are:

- Counseling
- Targeted Education
- Guideline/Protocol or pathway development or revision
- Privilege/Credentialing action – change in provider privileges
- Additional and/or enhanced resources
- Trend and monitor
- PIPS Team Project

XVI. Confidentiality Protection

All performance improvement activities and related documents will be considered confidential and protected as specified in New York State, Bellevue Hospital Center policies, and the Health Insurance Portability and Accountability Act (HIPAA). All documents will include the following footer *"The information contained herein is privileged and intended solely for quality assurance*

purposes. It is confidential and protected by Public Health Law 2805-j, k and l and Education Law 6527."

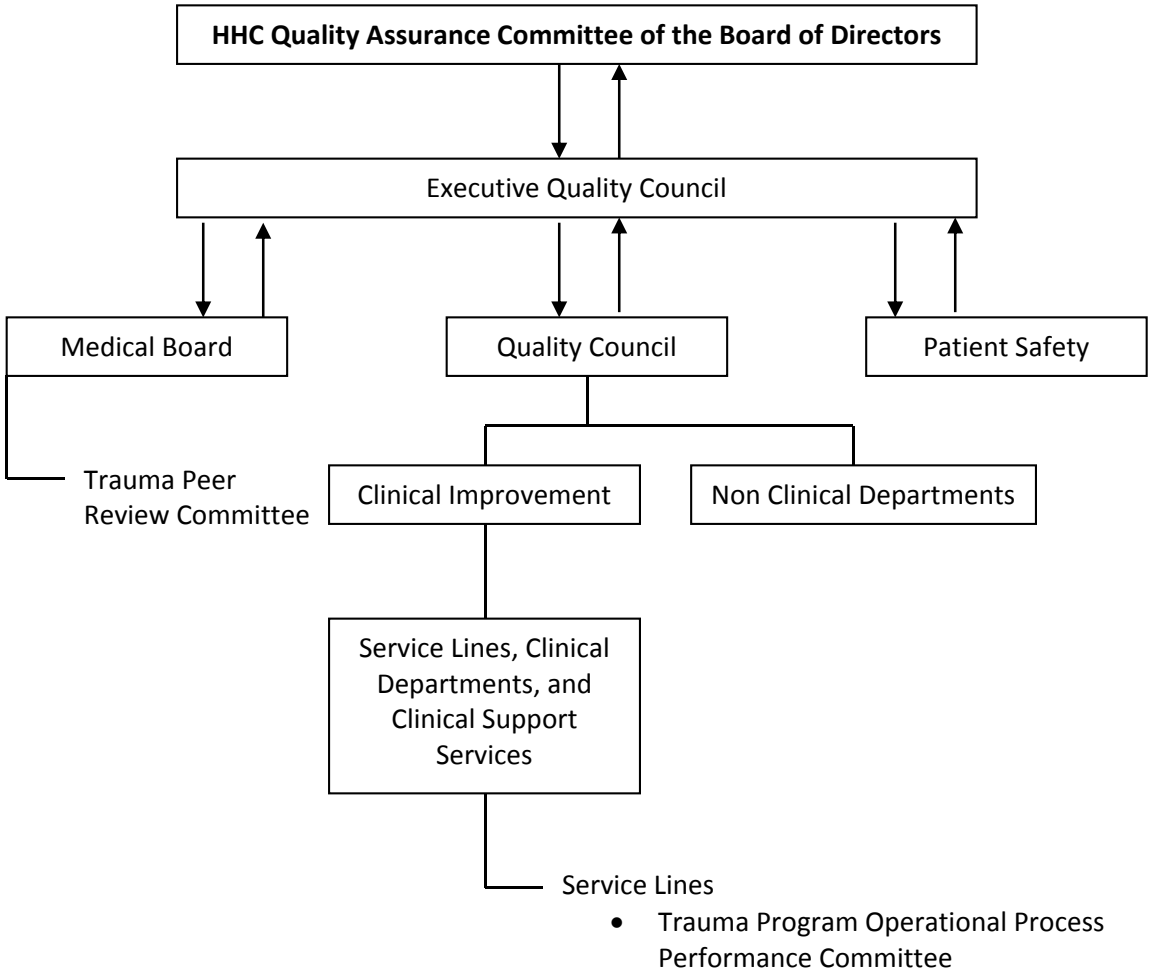
XVII. Loop Closure and Re-evaluation

Any identified issues will be subject to Level 1, 2, and/or 3 reviews as described previously, which will result in formation of an action plan. A PI issue with a comprehensive corrective action will not be considered closed until the re-evaluation process demonstrates a measure of performance or change at an acceptable level. "Acceptable level" may be determined by frequency tracking, benchmarking, and variance analysis as determined by the Trauma Medical Director and/or the Trauma Peer Review Committee. In certain circumstances where a complex action plan is implemented, a discrete loop closure form will be completed by the TMD to assure tracking and documentation of loop closure. Through clear documentation, identified opportunities for improvement will lead to specific interventions such that similar adverse events are less likely to occur. The effectiveness of these interventions should be continuously reevaluated to determine if these revisions improved the process or outcomes in care.

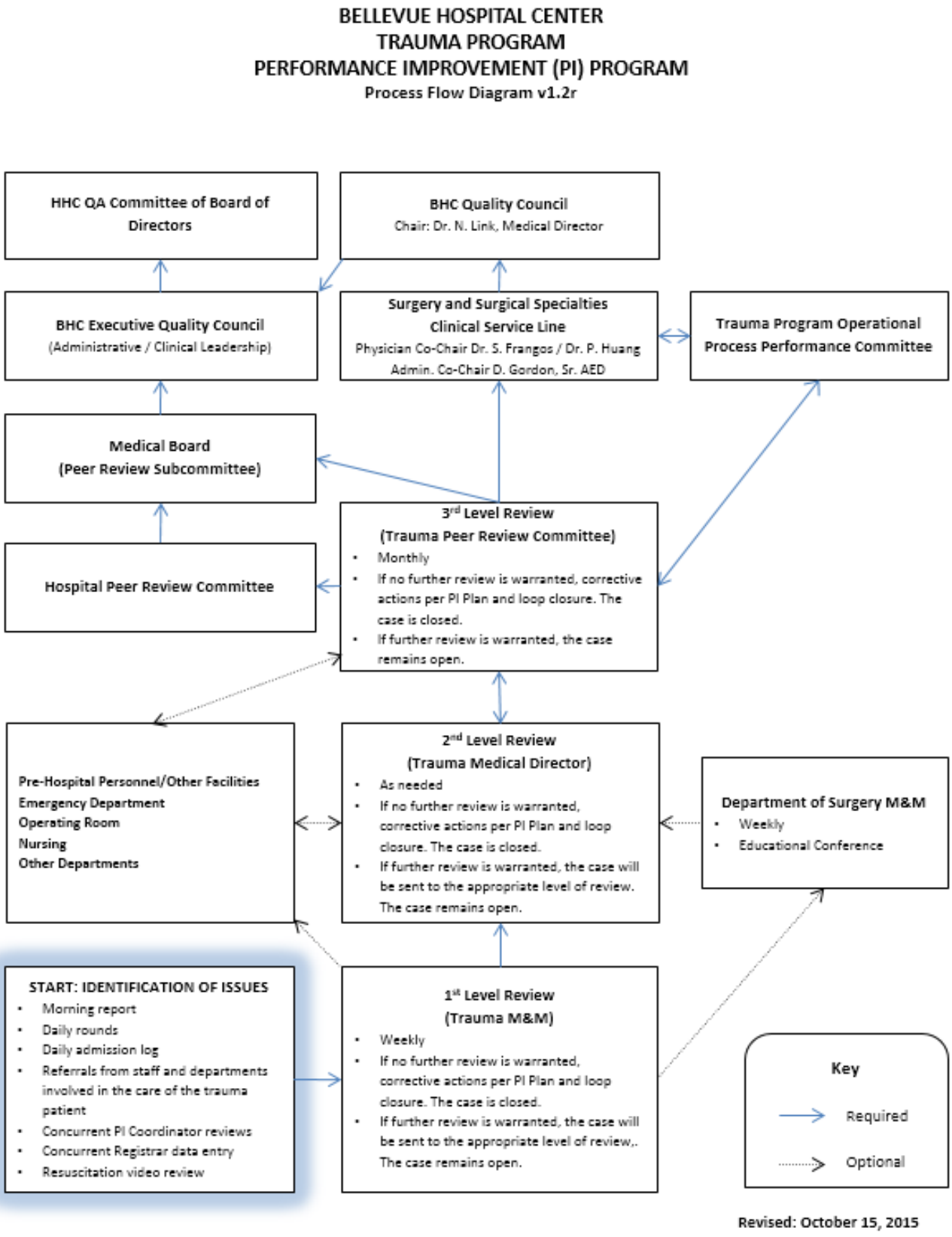
XVIII. Integration into the Hospital Performance Improvement Process

The Trauma PI program undertakes a multidisciplinary and multi-departmental approach to reviewing the quality of patient care across all departments and services. It is integrated with and collaborates with the Bellevue Hospital Center PI Committee via through Surgery QA Committee.

XIX. New York City Health & Hospitals Corporation (HHC) PI Structure



XX. Trauma Performance Improvement Program Review Process



XXI. Trauma Performance Improvement Program Calendar (2015)

Indicator Calendar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Core Indicators												
Trauma admission volume/demographics	x	x	x	x	x	x	x	x	x	x	x	x
Arrival times (TS) at Lv1 TTA	x	x	x	x	x	x	x	x	x	x	x	x
Arrival times (TS) at Lv2 TTA				x	x	x	x	x	x	x	x	x
Trauma Mortalities	x	x	x	x	x	x	x	x	x	x	x	x
TTA Breakdown	x	x	x	x	x	x	x	x	x	x	x	x
Non-surgical admissions	x	x	x	x	x	x	x	x	x	x	x	x
Complications	x	x	x	x	x	x	x	x	x	x	x	x
Trauma diversion hours	x	x	x	x	x	x	x	x	x	x	x	x
NeuroTrauma patients diverted or transferred	x	x	x	x	x	x	x	x	x	x	x	x
TPRC Mortality Judgments	x	x	x	x	x	x	x	x	x	x	x	x
TPRC Attendance	x	x	x	x	x	x	x	x	x	x	x	x
Overtriage/Undertriage	x	x	x	x	x	x	x	x	x	x	x	x
Transfers In/Out	x	x	x	x	x	x	x	x	x	x	x	x
Pediatric Patients <15yrs	x	x	x	x	x	x	x	x	x	x	x	x
Geriatric Patients >65yrs					x			x			x	
Trauma Registry Completion	x	x	x	x	x	x	x	x	x	x	x	x
Organ Donation Rate	x	x	x	x	x	x	x	x	x	x	x	x
Autopsy Rate	x	x	x	x	x	x	x	x	x	x	x	x
Indicators Identified as part of PIPS Review												
Tertiary Survey Completion				x				x				
Rate of Missing PCRs							x					
EW LOS for trauma patients requiring critical care								x	x			
IR Response Times			x					x			x	
PACU LOS for trauma patients									x			
Subspecialty Indicators												
Orthopedic Surgery:												
Time to treatment of open fractures (I&D)				x			x					
Time to antibiotic admin for open fractures				x			x		x			
Time to treatment of long bone fractures								x				
Response to time critical injuries				x	x	x	x	x	x	x	x	x
Neurosurgery:												
Craniotomy >4hrs from ED arrival				x			x		x			
Timeliness of ICP monitor placement							x		x			
Management of ICP							x		x			
Response to time critical injuries				x	x	x	x	x	x	x	x	x

Potential Indicators are prioritized based on issues identified through the PIPS process.

Indicator Calendar ***(continued)***	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Emergency Medicine:												
GCS <8 and no ETT	x	x	x	x	x	x	x	x	x	x	x	x
EM presence in trauma slot documented				x	x	x	x	x	x	x	x	x
Airway Management												
Critical Care:												
SICU LOS		x			x				x			
VAE		x			x							
CLABSI		x			x							
CAUTI		x			x							
C.difficile		x			x							
Self-extubations/tube dislodgements					x				x			
Anesthesia:												
Delay in OR availability						x			x			x
OR txfer to PACU v. SICU in acute trauma						x			x			x
Anesthesia delay to OR						x			x			x
Response to airway emergency						x			x			x
Intraoperative airway difficulty, hypoxia, hypothermia						x			x			x
Radiology:												
Changes in radiographic interpretations / Misreads				x				x				
EW Nursing:												
Trauma flowsheet vitals documented	x									x		
RN to CT with patient												
Guideline/Protocol Tracking												
MTP		x					x					
BCVI		x										
Open Fracture				x								
Long Bone Fracture								x				
TBI												
Trauma Airway									x			
Trauma Sedation									x			
TTA by Nursing								x				
TBI – Hyponatremia												
Intra-hospital system for patients injured in BHC												

Potential Indicators are prioritized based on issues identified through the PIPS process.

XXII. ACS Clinically Pertinent Indicators

- GCS < 14, no head CT scan
- GCS < 8, no endotracheal tube
- Non-operative treatment of GSW to abdomen
- Laparotomy not performed within 1 hour of ED arrival with clinical shock
- Patients with EDH or SDH receiving craniotomy more than 4 hours after arrival at ED, excluding those performed for ICP monitoring.
- Interval of more than 8 hours between arrival and initial treatment of blunt compound tibia fracture (or open tib/fib fracture)
- Admission by a non-surgeon
- Absence of hourly vital signs (BP, HR, RR)
- Ambulance scene time > 20 minutes
- Absence of ambulance report on the trauma record for patients transported by EMS
- Cardiac arrest/Respiratory arrest
- Decubitus ulcer
- Delayed diagnosis/missed injury (any injury related to the initial traumatic event diagnosed more than 24 hours after admission)
- DVT
- Initial OR performed >24 hrs from ED arrival
- Missed diagnosis
- Nursing documentation of temperature in ED
- Operating room available when requested
- Over- and under-triage in ED
- Patient seen on ED and discharged home and who re-presents to ED within 72 hours of initial ED visit AND is admitted to trauma service
- Patient transferred to SICU after first being admitted to another unit.
- Pulmonary embolus
- Pneumonia
- Readmission to SICU within 48 hours of discharge from SICU
- Re-intubation required within 24 hours of extubation
- Time to emergent angiography
- Transfers out > 2 hours between patient arrival, decision to transfer and patient departure
- Trauma deaths
- Trauma diversions
- Trauma patient requiring a laparotomy which is ***not*** performed within 4 hours of ED arrival
- Unplanned operation following non-operative management
- Unplanned readmissions of a patient previously an inpatient on the trauma service, discharged, and readmitted as an inpatient within 7 days of initial discharge
- Unplanned return to surgery

Process and outcome measures are documented below. Each is reviewed and updated at least annually. These measures are subjected to routine multidisciplinary trauma peer review and variances identified and further analyzed for causative factors and opportunities for improvement.

XXIII. Evidence-Based Clinical Guideline Tracking:

The Trauma PIPS Program strives to ensure compliance with evidence-based clinical guidelines in order to minimize variation in care as well as evaluate for opportunities for improvement in the care of the injured patient. The PIPS program accomplishes this in two ways:

A. **Focused Guideline Tracking:** If specific cases are identified through the M&M process or otherwise referred to the trauma program that indicate non-compliance with established guidelines or a possible opportunity to further refine guidelines toward best practice, this guideline is chosen for focused tracking. Tracking of compliance with the guideline and its effect on outcomes may occur through retrospective registry evaluation in combination with concurrent real-time tracking during morning conference, rounds, and/or M&M conference. The time frame chosen for tracking will correspond with the clinical frequency with which the given guideline typically comes into use (i.e. a high-frequency guideline such as DVT prophylaxis may be tracked over a shorter time frame than a low-frequency guideline such as MTP in order to yield an appropriate tracking sample).

B. **Ongoing Guideline Tracking**: In addition, there will be regularly scheduled tracking of clinical guidelines established by the Trauma Program in order to ensure compliance and evaluate ongoing appropriateness. As with the Focused Guideline Tracking process, tracking of compliance with a given guideline and its effect on outcomes may occur through retrospective registry evaluation in combination with concurrent real-time tracking during morning conference, rounds, and/or M&M conference. Similarly, the time frame chosen for tracking will correspond with the clinical frequency with which the given guideline typically comes into use.

(ex: BCVI, MTP, open fx, neurotrauma)

XXIV. PIPS core measures for all trauma patients

1. **Mortality Review:**
   A. Trauma-related mortality rates.
      - Total
      - Pediatric (under 15 years of age)
      - Geriatric (older than 64 years)

      Trauma encounters will categorized as:
      - DOA (pronounced dead on arrival with no additional resuscitation efforts initiated in the emergency department)
      - DIED (died in the emergency department despite resuscitation efforts)
      - In-hospital (including operating room)

   B. Mortality rates by Injury Severity Scale (ISS) subgroups (ISS of 0-9, 10-15, 16-24, greater than 25) for total number of admissions, total number admitted to trauma service, number of mortalities, and percentage mortality.
      - Additionally stratify for Pediatric (under 15 years of age)

2. **Response times to the emergency department**

   A. **Trauma surgeon on-call response for the highest level of activation (Level 1 activations)** is continuously monitored and variances documented and reviewed for reason for delay, opportunities for improvement, and corrective actions. (The minimum threshold is within 15 minutes of patient arrival for Level I trauma centers).

   B. **Trauma surgeon response time to Level 2 activations** (within 30 min) is determined and monitored.

   C. **Trauma surgeon time for backup call response** is determined and monitored.

   D. **Response parameters for consultants addressing time-critical injuries are determined and monitored.**
      - Orthopedics (within 30 min)
      - Neurosurgery (within 30 min)
      - Interventional Radiology (within 30 min)

3. **Trauma team activation criteria are defined and reviewed annually**

4. **Trauma Team Activation Summary:** All TTAs are categorized by the level of response (Level 1, Level 2, Level 3, or direct admit) and quantified by number of activations and percentage of total activations.

5. **Overtriage/Undertriage rates**
   - For all trauma patients
   - For pediatric trauma patients (under 15 years of age)

6. **Organ donation**
   - Organ donation rate
   - Missed opportunity for referral

7. **Trauma registry record completion within two months**

8. **Multidisciplinary trauma peer review committee attendance**

9. **Trauma center volume and admissions numbers to trauma, ortho, neurosurg, other surgical (subspecialty), burn)**
   A. **Trauma patient admissions (NTDS definition) to a nonsurgical service**
   B. **Admission volume requirements**
      - Total trauma admissions
      - Trauma admissions with an ISS higher than 15
      - Trauma admissions by service
   C. **Burn patients**
      - Number of burn patients admitted
      - Number of burn patients transferred in
      - Number of burn patients transferred out

10. **Geriatric trauma (older than 65 years)**
    - Number admitted with MOI = fall from standing height
    - Number of isolated hip fractures included in registry data
    - Special considerations for geriatric patient (team composition/approach)
    - Anticoagulation reversal
    - Comfort/palliative care

11. **Trauma center payor mix**

12. **Acute transfers out**
    All trauma patients who are diverted or transferred during the acute phase of hospitalization to another trauma center, acute care hospital, or specialty hospital (for example, a burn center, replantation center, or pediatric trauma center) or when specialty personnel are unavailable are subjected to individual case review to determine the rationale for transfer, appropriateness of care, and opportunities for improvement. Effort for follow-up from the accepting center will be made.

    A. **Diversion:**
       - Total number of instances of trauma diversion
       - Total time (hours and minutes) on diversion per year
       - Diversion log including reason for each diversion

    B. **Transfers in**:
       - Feedback provision to transferring facility

    C. **Transfers out:**
       - Feedback provision from receiving facility

13. **Hospital acquired adverse events and complications** (including ventilator-associated events, surgical site infection, venous thromboembolism events, decubitus ulcer rate, etc.) (Refer to section XXII below for complication definitions).

14. Other Outcome Measures

Mortality Rates	Measures
Adjusted trauma center mortality rate	Trauma-related deaths (excluding DOA*) ÷ total trauma admissions
Adjusted trauma service mortality rate	Trauma service mortalities (excluding DOA*) ÷ trauma service admissions
ED trauma mortality rate	ED trauma-related mortalities ÷ total trauma-related mortalities
Autopsy rate	Number of autopsies ÷ number of trauma mortalities
Mortality with opportunities for improvement	Provides a gross measure of individual or system errors that were evident in individual and aggregate cases.
Mortality without opportunities for improvement.	Provides a gross measure of in which no individual or system errors identified in individual or aggregate cases.
Morbidity/Complications	**Measures**
Trauma center complication rate	Number of complications ÷ number of trauma admissions
Trauma service complication rate	Number of complications ÷ number of trauma service admissions
Specific complication rate	Number of specific complications ÷ number of trauma admissions
LOS	**Measures**
Total EMS time	EMS hospital arrival time − dispatch time
Total EMS scene time	EMS hospital arrival time − scene arrival time
Hospital LOS	Hospital discharge date and time − hospital arrival date and time
EW LOS	EW disposition or discharge time − EW arrival time
ED LOS	ED disposition or discharge time – ED arrival time

15. Trauma program staff engagement in regional and state leadership positions.

- Trauma medical director
- Trauma program manager
- Trauma registrar
- Injury prevention coordinator
- Performance improvement coordinator

16. Percentage of follow-back reports to referring facilities and EMS agencies.

The trauma program will, in a timely, fashion, report back to referring facilities an acknowledgement and brief update on trauma patients transferred into Bellevue Hospital Center. All patients transferred in will be reviewed for opportunities for improvement. Opportunities for improvement involving the referring facility will be communicated back to the referring facility as appropriate in a timely fashion.

17. Engagement and participation of outside agencies (EMS, first response, injury prevention, disaster) and facilities (transferring and ancillary) in multidisciplinary peer review.

18. Documented participation in trauma system advocacy through public information, media events, and eliciting government (city, county, and state) support.

19. EMS variables

- Missing pre-hospital patient care reports
- Delayed pre-hospital patient care reports

20. EM

Trauma center diversion-bypass hours are routinely monitored, documented, and reported, including the reason for initiating the diversion policy.

- Missed intubation
- Extubation within 24 hrs of RSI (excluding OR procedures) GCS < 8 with no endotracheal tube
- Absence of delays in airway control

Trauma nursing in the slot

- Initial vitals signs every 5 minutes times 3
- Temperature documentation

Peds-EM

- Missed intubation
- Resuscitation volume problems
- Vascular access problems

21. Anesthesia

- Availability of anesthesia service for Level 1
- Operating room delays involving trauma patients because of lack of anesthesia support services
- Delay in operating room availability
- Availability of OR personnel
- PACU: equipment availability including pulse oximetry, end tidal CO2, aline pressure monitoring, PA catheterization, patient rewarming, and ICP monitoring

22. Radiology

- Rate of change in interpretation of radiologic studies (between prelim and final reports) are categorized
- All missed injuries
- Response times of interventional radiology team (30 minutes)
- Efficient resource use

Efforts will be made to track additional PI variables:

- Diagnostic accuracy of imaging compared with outcomes
- Timeliness of preliminary and final reports
- Agreement of preliminary and final reports
- Appropriate use of imaging using American College of Radiology appropriateness criteria
- Quality assurance of interventional procedures
- Timeliness of obtaining studies and procedures for critically ill patients
- Adequacy of clinical information provided on radiology requisitions
- Timely availability of radiology technical staff
- Adherence to appropriate imaging protocols
- Proper care and monitoring of trauma patients

- **Critical Care**
  - Documentation that timely and appropriate care and coverage is provided
  - Monitoring of timely response of credentialed providers to the ICU
  - Transfers to a higher level of care within the institution (e.g. floor to SICU)
  - ICU LOS (Total number of days in any ICU)
  - Ventilator days (total number of days on mechanical ventilation)

- **Orthopedics**
  - Time to open reduction, internal fixation for femur fractures
  - Time to washout for all open fractures
  - Appropriateness and timing of intravenous antibiotics for all open fractures

Protocols for the care of patients with severe musculoskeletal injuries, particularly patients requiring multiple specialty care. Examples: open fractures, patients with fractures with neurologic and vascular injury, and multisystem trauma patients with unstable pelvic ring and/or long bone fractures.

- **Neurosurgery**
  - Number of instances of neurotrauma diversion
  - Monitoring of the efficacy of the neurotrauma diversion plan
  - Monitoring of the efficacy of the 'formal published' neurosurgery contingency plan
  - Timeliness of placement of ICP monitors
  - Appropriateness of management of increased ICP
  - Timeliness of operative intervention
  - Compliance neurotrauma guidelines
  - Patients with EDH or SDH receiving craniotomy more than 4 hours after arrival at ED

  <u>Vertebral column injuries:</u>
  - Number with vertebral column injuries admitted
  - Number with neurologic deficits attributed to spinal cord injury
  - Number with vertebral column and/or spinal cord injury transferred in
  - Number with vertebral column and/or spinal cord injury transferred out

- **Pediatrics (14 years or younger) trauma care**
  As a trauma center which admits fewer than 100 pediatric trauma patients, timeliness and appropriateness of care are reviewed for each case.

  Trauma care–related core measures for monitoring:
  - Management of solid organ injury
  - Outcomes in head injury
  - Resuscitation approach in children (fluids)
  - Deep vein thrombosis prophylaxis
  - Child maltreatment assessment
  - Use of invasive monitoring
  - Radiation exposure
  - Pain management
  - Involvement of pediatricians/pediatric specialists
  - Evaluating pediatric transfers into Bellevue
  - Unplanned extubation
  - Extubation within 24h of RSI (excluding OR procedures)
  - Resuscitation volume problems

- Unplanned hypothermia

- **Blood Bank**
  - Turnaround time for massive transfusion protocol (MTP) use/times
  - Turnaround time for use of goal-directed component therapy

XXV. Trauma Performance Improvement Program Definitions (as extrapolated from the American College of Surgeons National Trauma Data Bank® 2015)

Acute Kidney Injury: Acute kidney injury, AKI (stage 3), is an abrupt (within 48 hours) reduction of kidney function defined as:

Increase in serum creatinine (SCr) of more than or equal to 3x baseline
or;
Increase in SCr to ≥ 4mg/dl (≥ 353.3µmol/l)
or;
Patients >18 years with a decrease in $_{e}$ GFR to < 35 ml/min per 1.73 m^2
or;
Reduction in urine output of < 0.3 ml/kg/hr for ≥ 24 hrs.
or;
Anuria for ≥ 12 hrs.
or;
Requiring renal replacement therapy (e.g. continuous renal replacement therapy (CRRT) or periodic peritoneal dialysis, hemodialysis, hemofiltration, or hemodiafiltration).

NOTE: If the patient or family refuses treatment (e.g., dialysis,) the condition is still considered to be present if a combination of oliguria and creatinine are present.

EXCLUDE patients with renal failure that were requiring chronic renal replacement therapy such as periodic peritoneal dialysis, hemodialysis, hemofiltration, or hemodiafiltration prior to injury.

Adult respiratory distress syndrome (ARDS):

Timing:	Within 1 week of known clinical insult or new or worsening respiratory symptoms.
Chest imaging:	Within 1 week of known clinical insult or new or worsening respiratory symptoms.
Origin of edema:	Respiratory failure not fully explained by cardiac failure of fluid overload. Need objective assessment (e.g., echocardiography) to exclude hybrostatic edema if no risk factor present
Oxygenation: (at a minimum)	200<Pa02/Fi02 ≤ 300 With PEEP or CPAP ≥ 5 cmH20c

Cardiac arrest with CPR: Cardiac arrest is the sudden cessation of cardiac activity after hospital arrival. The patient becomes unresponsive with no normal breathing and no signs of circulation. If corrective measures are not taken rapidly, this condition progresses to sudden death.

INCLUDE patients who have had an episode of cardiac arrest evaluated by hospital personnel and either:

Received compressions or defibrillation or cardioversion or cardiac pacing to restore circulation.
OR
Were pulseless but did not receive defibrillation attempts or CPR by hospital personnel.

Catheter-Related Blood Stream Infection: An organism cultured from the bloodstream that is not related to an infection at another site but is attributed to a central venous catheter. Patients must have evidence of infection including at least one of the following:

- *Criterion #1:* Patient has a recognized pathogen cultured from one or more blood cultures and organism cultured from blood is not related to an infection at another site.

OR:

- *Criterion #2:* Patient has at least one of the following signs or symptoms:
  - Fever ≥ 38^{o} C
  - Chills
  - WBC > 10,000 or < 3,000 per cubic millimeter
  - Hypotension (SBP<90) or >25% drop in systolic blood pressure
  - Signs and symptoms and positive laboratory results are not related to an infection at another site AND common skin contaminant (i.e., diphtheroids [Corynebacterium spp.], Baccillus [not B. anthracis] spp., Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis,] viridans group streptococcik, Aerococcus spp., Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.

OR:

- *Criterion #3:* Patient <1 year of age has at least one of the following signs or symptoms:
  - Fever > 38^{o} C
  - Hypothermia < 36^{o} C
  - Apnea, or bradycardia
  - Signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (i.e., diptheroids [Corynebacterium sup.] Bacillus [not B. anthracis] spp., Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.

Erythema at the entry site of the central line or positive cultures on the tip of the line in the absence of positive blood cultures is not considered a CRBSI.

Decubitus ulcer: Any partial or full thickness loss of dermis resulting from pressure exerted by the patient's weight against a surface. Deeper tissues may or may not be involved. Equivalent to NPUAP Stages II – IV and NPUAP "unstageable" ulcers. EXCLUDES intact skin with non-blanching redness (NPUAP Stage I,) which is considered reversible tissue injury.

Deep surgical site infection: A deep incisional SSI must meet one of the following criteria:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operative procedure and involves deep soft tissues (e.g., fascial and muscle layers) of the incision; AND patient has at least one of the following:

- Purulent drainage from the deep incision but not from the organ/space component of the surgical site of the following:
- A deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture-positive or not cultured when the patient has at least one of the following signs or symptoms: fever (>38C,) or localized pain or tenderness. A culture negative finding does not meet this criterion.
- An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.

- Diagnosis of a deep incisional SSI by a surgeon or attending physician.

NOTE: There are two specific types of deep incisional SSIs:

- Deep Incisional Primary (DIP): a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)
- Deep Incisional Secondary (DIS): a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB.)

REPORTING INSTRUCTION: Classify infection that involves both superficial and deep incision sites as deep incisional SSI.

Deep Vein Thrombosis (DVT): The formation, development, or existence of a blood clot or thrombus within the vascular system, which may be coupled with inflammation. This diagnosis may be confirmed by a venogram, ultrasound, or CT. The patient must be treated with anticoagulation therapy and/or placement of a vena cava filter or clipping of the vena cava.

Drug or alcohol withdrawal syndrome: A set of symptoms that may occur when a person who has been habitually drinking too much alcohol or habitually using certain drugs (e.g., narcotics, benzodiazepine) experiences physical symptoms upon suddenly stopping consumption. Symptoms may include: activation syndrome (i.e., tremulousness, agitation, rapid heartbeat and high blood pressure,) seizures, hallucinations or delirium tremens.

Extremity compartment syndrome: A condition not present at admission in which there is documentation of tense muscular compartments of an extremity through clinical assessment or direct measurement of intracompartmental pressure requiring fasciotomy. Compartment syndromes usually involve the leg but can also occur in the forearm, arm, thigh, and shoulder. Record as a complication if it is originally missed, leading to late recognition, a need for late intervention, and has threatened limb viability.

Graft/prosthesis/flap failure: Mechanical failure of an extracardiac vascular graft or prosthesis including myocutaneous flaps and skin grafts requiring return to the operating room or a balloon angioplasty.

Myocardial infarction: A new acute myocardial infarction occurring during hospitalization (within 30 days of injury.)

Organ/space surgical site infection: An infection that occurs within 30 days after an operation and infection involves any part of the anatomy (e.g., organs or spaces) other than the incision, which was opened or manipulated during a procedure; and at least one of the following, including:

- Purulent drainage from a drain that is placed through a stab wound or puncture into the organ/space.
- Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.
- An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
- Diagnosis of an organ/space SSI by a surgeon or attending physician.

Osteomyelitis: Defined as meeting at least one of the following criteria:

- Organisms cultured from bone.
- Evidence of osteomyelitis on direct examination of the bone during a surgical operation or histopathologic examination.
- At least two of the following signs or symptoms with no other recognized cause:
  - Fever (38^{o} C)
  - Localized swelling at suspected site of bone infection
  - Tenderness at suspected site of bone infection
  - Heat at suspected site of bone infection
  - Drainage at suspected site of bone infection

  AND at least one of the following:

  - Organisms cultured from blood positive blood antigen test (e.g., H. influenza, S. pneumonia)
  - Radiographic evidence of infection, e.g., abnormal findings on x-ray, CT scan, magnetic resonance imaging (MRI,) radiolabel scan (gallium, technetium, etc.)

Pneumonia: Patients with evidence of pneumonia that develops during the hospitalization and meets at least one of the following two criteria:

- *Criterion #1:* Rales or dullness to percussion on physical examination of chest
  AND any of the following:
  - New onset of purulent sputum or change in character of sputum.
  - Organism isolated from blood culture.
  - Isolation of pathogen from specimen obtained by transtracheal aspirate, bronchial brushing, or biopsy.
- *Criterion #2:* Chest radiographic examination shows new or progressive infiltrate, consolidation, cavitation, or pleural effusion AND any of the following:
  - New onset of purulent sputum or change in character of sputum.
  - Organism isolated from the blood.
  - Isolation of pathogen from specimen obtained by transtracheal aspirate, bronchial brushing, or biopsy
  - Isolation of virus or detection of viral antigen in respiratory secretions
  - Diagnostic single antibody titer (IgM) or fourfold increase in paired serum samples (IgG) for pathogen
  - Histopathologic evidence of pneumonia

Pulmonary embolism: A lodging of a blood clot in a pulmonary artery with subsequent obstruction of blood supply to the lung parenchyma. The blood clots usually originate from the deep leg veins or the pelvic venous system. Consider the condition present if the patient has a V-Q scan interpreted as high probability of pulmonary embolism or a positive pulmonary arteriogram or positive CT angiogram.

Severe sepsis: Sepsis and/or Severe Sepsis defined as an obvious source of infection with bacteremia and two or more of the following:

- Temp >38^{o} C or <36^{o} C
- WBC count >12,000/mm^{3}, or > 20%immature (source of infection)
- Hypotension – (Severe Sepsis)
- Evidence of hypo perfusion: (Severe Sepsis)
- Anion gap or lactic acidosis or Oliguria, or Altered mental status.

Stroke/CVA: A focal or global neurological deficit of rapid onset and NOT present on admission. The patient must have at least one of the following symptoms:

- Change in level of consciousness
- Hemiplegia
- Hemiparesis
- Numbness or sensory loss affecting on side of the body
- Dysphasia or aphasia
- Hemianopia
- Amaurosis fugax
- Other neurological signs or symptoms consistent with stroke

AND:

- Duration of neurological deficit ≥ 24 h

OR:

- Duration of deficit <24 h, if neuroimaging (MR, CT, or cerebral angiography) documents a new hemorrhage or infact consistent with stroke, or therapeutic intervention(s) were performed for stroke, or the neurological deficit results in death

AND:

- No other readily identifiable non-stroke cause, e.g., progression of existing traumatic brain injury, seizure, tumor, metabolic or pharmacologic etiologies, is identified

AND:

- Diagnosis is confirmed by neurology or neurosurgical specialist or neuroimaging procedure (MR, CT, angiography,) or lumbar puncture (CSF demonstrating intracranial hemorrhage that was not present on admission.)

Although the neurologic deficit must not present on admission, risk factors predisposing to stroke (e.g., blunt cerebrovascular injury, dysrhythmia) may be present on admission.

Superficial surgical site infection: An infection that occurs within 30 days after an operation and infection involves only skin or subcutaneous tissue of the incision and at least one of the following:

- Purulent drainage, with or without laboratory confirmation, from the superficial incision.
- Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
- At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by the surgeon, unless incision is culture-negative.
- Diagnosis of superficial incisional surgical site infection by the surgeon or attending physician.

Do not report the following conditions as superficial surgical site infection:

- Stitch abscess (minimal inflammation and discharge confined to the points of suture penetration.)
- Infected burn wound.
- Incisional SSI that extends into the fascial and muscle layers (see deep surgical site infection.)

Urinary Tract Infection: An infection anywhere along the urinary tract with clinical evidence of infection, which includes at least one of the following symptoms with no other recognized cause:

- Fever ≥ 38^{o} C
- WBC > 10,000 or < 3,000 per cubic millimeter

- Urgency
- Frequency
- Dysuria
- Suprapubic tenderness

AND:

- Positive urine culture (≥ 100,000 microorganisms per cm3 of urine with no more than two species of microorganisms)

OR:

- At least two of the following signs or symptoms with no other recognized cause:
- Fever ≥ 38^{o} C
- WBC >10,000 or <3,000 per cubic millimeter
- Urgency
- Frequency
- Dysuria
- Suprapubic tenderness

AND at least one of the following:

- Positive dipstick for leukocyte esterase and/or nitrate
- Pyuria (urine specimen with >10 WBC/mm3 or >3 WBC/high power field or unspun urine
- Organisms seen on Gram stain of unspun urine
- At least two urine cultures with repeated isolation of the same unopathogen (gram-negative bacteria or S. saprophyticus) with ≥102 colonies/ml in nonvoided specimens
- ≤105 colonies/ml of a single uropathogen (gram-negative bacteria or S. saprophyticus) in a patient being treated with an effective antimicrobial agent for a urinary tract infection
- Physician diagnosis of a urinary tract infection
- Physician institutes appropriate therapy for a urinary tract infection

Excludes asymptomatic bacteriuria and "other" UTIs that are more like deep space infections of the urinary tract.

Unplanned admission to ICU:

INCLUDE:

- Patients readmitted to the ICU after initial transfer to the floor.
- Patients with an unplanned return to the ICU after initial ICU discharge.

EXCLUDE:

- Patients in which ICU care was required for postoperative care of a planned surgical procedure

Unplanned intubation: Patient requires placement of an endotracheal tube and mechanical or assisted ventilation because of the onset of respiratory or cardiac failure manifested by severe respiratory distress, hypoxia, hypercarbia, or respiratory acidosis. In patients who were intubated in the field or Emergency Department, or those intubated for surgery, unplanned intubation occurs if they require reintubation > 24 hours after extubation.

Unplanned return to the OR: Unplanned return to the operating room after initial operation management for a similar or related previous procedure.