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Trauma Audit for Hospital Care Improvement at Khon Kaen Hospital

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Abstract **Trauma management system is complicated and critical. Many stations must be involved in the system. Any pitfall that happens in any station of the management system may result in mortality or serious morbidity. In order to enhance the quality of care of trauma patients, Khon Kaen Hospital has set up "Trauma audit for hospital care improvement project" to establish a system of monitoring the quality of trauma care and build up the trauma audit filter as a hospital guideline for management of trauma patients.**

The system for grading the severity of injury had been set up by TRISS methodology in our trauma registration system. The outcome and pitfalls of trauma management had been analyzed 6 months period before and after the implementation of hospital trauma audit filter.

After the implementation of the trauma audit filter, the preventable death rate had been decreased from 3.2 to 2.7 per cent and the pitfall in the management and factor contribute to mortality had been decreased from 407 points to 301 points and 265 points to 217 points respectively.

This project had created a standard model to evaluate the quality of trauma care. It had also given a set of knowledge about the pitfall in the management of traumatic patients with was the valuable information to set up the truama audit filter for trauma care. The usage of this filter resulted in better quality of care.

Accident causes many deaths and injured people each year. Some of trauma patients are critical and need prompt treatment. If there is any pitfall in the therapeutic process, it may result in mortality or morbidity.

Numerous reports from various institutes throughout the world indicated that the cause of death in some trauma patients is the result from some preventable pitfalls in the therapeutic process[1,2,8].

In 1955 Zollinger presented report about pitfall in trauma care process.

In 1964 Fitts et al[2] analyzed 950 dead patients related to accident and found that 51 patients (11%) died from the pitfall of diagnosis, 7 per cent died from pitfall of treatment and 12 per cent died from the pitfall of diagnosis and treatment.

In 1972 Gartner et al[3] analyzed 33 dead patients related to abdominal injury and found that the cause of death of 17 patients was preventable and half of this number resulted from delay of operation and one third of this number died from the delay of shock intervention.

In 1982, Neuman and team[4] reported that 20 of 177 deaths in San Diego died due to the delay of

diagnosis of internal bleeding, hemo-thorax, pneumothorax, and epidural hematoma.

In 1985, Cales and Trunky[5] reported that the death of 11-85 per cent of traumatic patient was preventable death. Cales also reported that after the establishing regionalised trauma care system in California, it resulted in decreasing preventable death from 35 to 3 per cent.

Trauma Care Quality Development

In 1966 National Academy of Science - National Research Council in United State reported that trauma care quality development was composed of 3 elements: trauma registry, trauma audit and integrated regional trauma service.

In 1990 National Health and Medical Research Council reported that to evaluate the quality of trauma care in health facilities, the health facilities should have the same model of grading severity of injury which would enable us to compare quality of each health facility. The best way of grading severity of injury system in the present are trauma score and injury severity score which indicate the post injury physiological status and anatomical injury of the patient[6-14].

Major Trauma Outcome Study (MTOS) of American College of Surgeon invented the method of calculating the survival probability (Ps) by using Triss analysis[13] which could be calculated by using 6 variable i.e.:- blood pressure, respiration rate, Glasgow coma score, injury severity score, age and mechanisms of injury (Appendix 1).

Knowing the patient's Ps score enables us to group the patient according to the severity of injury and to evaluate the result of treatment as follows:

- Patient who has Ps > 0.5 has opportunity of survival more than 50%. If the patient in this group dies, the death of this case is preventable death resulting from the pitfall of treatment.

- If patient who has Ps score between 0.25-0.5 dies, the death of this case is regarded as potentially preventable death.

- If patient who has Ps < 0.25 dies, the death of this case is regarded as non preventable death.

In Thailand, there have not been any development of system of grading severity of injury, systematic study on the cause of morbidity and mortality and trauma audit.

Objective

1. Study the death rate of admitted trauma patient classified by the severity of injury.

2. Study the factor contributing to mortality and morbidity which brings about the development of trauma care system.

3. Set up the trauma audit filter which conforms to the present situation.

4. Study the result of implementation of trauma audit filter in hospital.

Method

1. Preparation phase *(Duration 3 months, April 1-June 30, 1994)*

1.1 Set up the hospital trauma audit committee,

1.2 Creat trauma registration form conforming to the project (Form 1, Appendix 2),

1.3 Creat death of trauma patient form (Form 2, Appendix 3),

1.4 Creat assessment form of factor contributing to mortality assessed by the trauma audit committee (Form 3, Appendix 4) and the guideline for assessing and definition (Appendix 5),

1.5 Hold the meeting of involved persons to explain the objective and method of implementation of the project.

2. Baseline data study *(Duration 6 months, July 1-December 31, 1994)*

2.1 Inclusion criteria

- All cases of trauma patient attending to Emergency Department of Khon Kaen Hospital from July 1 to December 31, 1994.

- All dead trauma patients in Khon Kaen Hospital from July 1 to December 31, 1994.

2.2 Exclusion criteria

Patient who had chronic disease (hypertension, diabetic, heart disease, etc).

2.3 Evaluation

The data of all trauma patients in Emergency Department were recorded in trauma registration form (Form 1) and patients admitted to hospital were required to have records of important data for calculating the Ps score (systolic BP, respiration rate, Glasgow coma score, injury severity score, age, mechanism of injury). The data in trauma registration was used for calculation of Ps of all patients and their

death rates as related to different Ps.

The trauma audit committee held the meeting to assess the death of patient by using the data from the death form of trauma patient (Form 2), the patient file and Ps score in trauma registration and to group the type of mortality (preventable, potentially preventable and non preventable) and to study the pitfall of treatment in each station such as Emergency Department, Trauma Surgical Department, Operating Room, Intensive Care Unit or the pitfall in the therapeutic system. The result of analysis was recorded in the assessment form of factor contributing to mortality (Form 3) and data in this form was analyzed and tabulated to show the pitfall of treatment in each station.

3. Trauma audit filter implementation *(Duration 2 months, January 1-February 28, 1995)*

3.1 Hold the meeting of trauma audit committee to set up the trauma audit filter in Khon Kaen Hospital (Appendix 6),

3.2 Hold the meeting of involved persons to explain about the change in working system by using trauma audit filter as a guideline for management of trauma patients,

3.3 Provide training for personnel to enable them to know and understand the process of accident control and all steps of trauma care process,

3.4 Implement according to trauma audit filter.

4. Outcome study *(Duration 4 months, May 1-August 31, 1995)*

4.1 Inclusion criteria

- All cases of trauma patient attending to Emergency Department, Khon Kaen Regional Hospital between July 1 - December 31, 1995.
- All cases of dead trauma patient in Khon Kaen Hospital between July 1 - December 31, 1995.

4.2 Exclusion criteria

Patients who had chronic disease (hypertension, diabetic, heart disease and etc.).

4.3 Evaluation

The process was as same as the baseline data study phase.

5. Analysis and Making Report *(Duration 4 months, September 1-December 31, 1995)*

Statistic used in calculation and analysis are Percentage and Z test

Results

1. General data

Before trauma audit filter implementation, there were 8,578 trauma patients attending to Khon Kaen Hospital, 2,710 trauma patients admitted and 217 trauma patients (8.01%) died.

After trauma audit filter implementation, there were 7,967 trauma patients attending to Khon Kaen Hospital, 2,492 trauma patients admitted and 206 trauma patients (8.27%) died (Table 1).

2. Death Rate

After grading severity of injury by using Ps score of patient, it was found that the death rate of patient who had Ps>0.5 decreased from 3.5 to 2.8 per cent as shown in Table 2.

3. Result of trauma patient's death analysis

After analysis of trauma audit committee, the grouping for type of mortality of patient was readjusted. From the result of analysis, it was found that the preventable death rate before audit filter implementation was 3.2 per cent but after audit filter implementation it was 2.7 per cent as shown in Table 3

4. Factor contributing to mortality

The pitfall of medical care in each station before and after trauma audit filter implementation was shown in Tables 4 and 5. It was found that before

Table 1 Number of injured and dead person related to accident attending to Khon Kaen Hospital from July 1 to December 31, 1994 and May 1-August 31, 1995.

	July 1 - December 31, 1994			May 1 - August 31, 1995		
	Number	Admission	Death	Number	Admission	Death
Male	6,491	2,171	171	6,055	2,117	168
Female	2,087	539	46	1,912	375	38
Total	**8,578**	**2,710**	**217**	**7,967**	**2,492**	**206**

trauma audit filter implementation there were 407 pitfalls in treatment process and 256 pitfalls contributing to mortality but after audit filter implementation there were 301 pitfalls in treatment process and 217 pitfalls contributing to mortality.

Discussion

1. After trauma audit filter implementation, the preventable death rate classified by the severity of injury reduced from 3.5 to 2.8 per cent and that

Table 2 Death rate of patient classified by the severity of injury.

Ps	Before Audit Filter Implementation			After Audit Filter Implementation		
	Number	Death	Per cent	Number	Death	Per cent
0.00-0.25	89	80	89.9	113	99	87.6
>0.25-0.50	75	49	65.3	62	42	67.7
>0.50-1.00	2,546	88	3.5	2,317	65	2.8

Table 3 Grouping for type of mortality by trauma audit committee.

Type of Mortality	Before Audit Filter			After Audit Filter		
	Number	Death	Per cent	Number	Death	Per cent
non-preventable death	85	76	89.4	108	94	87.0
potentially preventable death	85	59	69.4	70	50	71.4
preventable death	2,540	82	3.2	2,314	62	2.7

Table 4 The pitfall of trauma care in each station before and after trauma audit filter implementation.

Time	Station	Type of Pitfall					
		Delay Dx No/c*	Error Dx No/c*	Error Rx	Error Technique No/c*	System Inadequacy No/c*	Total
Before	Pre Hospital	2/2	4/4	81/51	-	25/4	112/61
Trauma	ER	1/1	1/-	14/3	2/-	24/2	42/6
Audit	Trauma ward	7/7	18/9	93/80	-	19/51	197/147
Filter	OR	-	-	-	10/10	3/3	13/13
Implementation	ICU	-	-	28/24	-	1/-	29/24
	Ortho ward	-	1/1	6/6	-	7/7	14/14
	Total	**3/3**	**24/14**	**222/164**	**12/10**	**153/77**	**407/265**
After	Pre Hospital	4/3	1/1	50/33	-	20/-	75/37
Trauma	ER	1/1	1/1	9/6	1/-	4/-	15/8
Audit	Trauma ward	8/5	6/5	100/84	6/4	60/46	180/144
Filter	OR	-	-	-	12/11	5/4	17/15
Implementation	ICU	-	-	14/13	-	-	14/13
	Ortho ward	-	-	-	-	-	-
	Total	**13/9**	**8/7**	**173/136**	**19/15**	**89/50**	**301/217**

**C = Contribute to death*

Remark One patient may have more than one pitfall.

Table 5 Details in pitfall of care in each station before and after trauma audit filter implementation.

	Pitfall	Before Audit Filter No/c*	After Audit filter No/c*
1. The pitfalls in pre-hospital care			
Delay Dx.	Dx. ICH	2/2	2/2
	Dx. of hemothorax	-/-	2/1
Error Dx.	missed hemopneumothorax	2/2	1/1
	missed ICH	2/2	-/-
Error Rx.	Fluid resuscitation problem	24/14	32/21
	Respiratory care	29/22	10/6
	Delay transfer	18/10	3/3
	Wound care	4/-	2/1
	Other	1/1	1/1
2. The pitfalls in Emergency Room			
Delay Dx.	Dx. ICH	1/1	-/-
	Dx. abd injury	-/-	1/1
Error Dx.	missed hemothorax	1/-	-/-
	missed ICH	-/-	1/1
Error Rx.	Fluid resuscitation	6/-	3/2
	Respiratory care	4/1	2/2
	Delay admission	1/1	1/1
	delay treatment	1/-	1/1
	Wound/fracture care	5/2	1/-
	Other	1/1	-/-
Error technique	missed fracture C spine	1/-	-/-
	intubation failure	1/1	-/-
	can not check pupil size	1/1	-/-
3. The pitfalls in trauma ward			
Delay Dx.	Dx. ICH	7/7	5/2
	Dx. abdominal injury	-/-	2/2
	dx. ARDS	-/-	1/1
Error Dx.	missed ICH	14/5	1/1
	missed abd. injury	3/3	4/3
	missed thoracic injury	1/1	-/-
	missed C spine injury	-/-	1/1
4. The pitfalls in operating room			
Error technique	Can't stop bleeding	4/4	9/8
	Technique in abd. operation	2/2	-/-
	Judgment error	4/4	1/1
	Neuro opreation	-/-	1/1
5. The pitfalls in ICU			
Error Rx.	Infectious Control Care	12/9	5/5
	Fluid management	7/7	3/3
	Airway care	5/4	5/4
	Others	4/4	1/1
6. System inadequacy			
	Lack of neurosurgeon	29/28	23/17
	Lack of experience	5/5	-/-
	Lack of equipment	6/2	16/9
	Waiting for operation for a long time due to a lot of patients	18/11	9/8
	No bed for patient in ICU	17/12	17/16
	Admit patient to the wrong word	8/8	-/-
	Incompleted data record	55/-	24/-
	Others	1/1	-/-

**Contribute to death*
ICH = Intra Cerebral Hemorrhage

assessed by trauma audit committee reduced from 3.2 to 2.7 per cent but this reduction has no statistical difference.

2. When we considered the number of pitfall in treatment process, we found that number of pitfall reduced from 407 to 301 and number of pitfall which contributed to mortality reduced from 265 to 217.

3. The pitfall in treatment process at each station had specific characteristics as follows:

3.1 Pre hospital care

Pitfalls which often occurred and caused mortality are as follows:

- miss and delay organ injury diagnosis especially of hemothorax, pneumothorax, abdominal injury and intracerebral hemorrhage,
- error in IV fluid resuscitation,
- error in stop bleeding and immobilization,
- error in respiratory care,
- poor medical care during transferring patient to hospital.

3.2 Emergency room

Pitfalls which often occurred are as follows:

- miss and delay organ injury diagnosis especially of hemothorax, pneumothorax,
- error in IV fluid resuscitation,
- error in respiratory care.

3.3 Trauma ward

Pitfalls which often occurred are as follows:

- miss or delay organ injury diagnosis especially of hemothorax, pneumothorax, abdominal injury and intracerebral hemorrhage,
- delay making decision for operation,
- fluid resuscitation problem,
- delay diagnosis and treatment of fluid electrolyte imbalance,
- respiratory problem,
- error in technique.

3.4 Operating room

All pitfalls found in this unit were technique error resulting from lacking experience and judgment error.

3.5 ICU

The most significant problem of this unit was respiratory problem because the complication in the patient who had respiratory problem was leading cause of death.

3.6 System problem

- Lacking surgeon and specialist such as neuro-surgeon,
- Lacking equipment which was used in diagnosis and critical care such as CT scan, blood gas analysis and hemodialysis,
- Inadequate number of bed, operating room, ICU and personnel which has an effect to the quality of medical care.

4. Outcome from this study

4.1 Acquire the model and guideline of trauma care assessment which is universal and could be used in other hospitals.

4.2 Know the trauma care problem in each station.

4.3 Set up the trauma audit filter by studying the trauma care problem in each station.

4.4 Improve the efficiency of trauma care in Khon Kaen Hospital to gain more patient survival.

5. Problem and lesson learned from this study

Although Khon Kaen Hospital has implemented trauma audit filter, the rate of preventable death was still high about 2.7 per cent. The problems were as follows:

1. There were the unsolved problems such as inadequate equipment; CT scan, hemodialysis, blood gas analysis and insufficient number of surgeon and man power.

2. The created trauma audit filter did not cover all trauma care process.

3. There was no evaluation on coverage and compliance of implementation of surgeon according to trauma audit filter.

4. The trauma care process must rely on various working groups especially doctor and nurse, but this study covered only doctor group. There was no trauma audit filter for nurses whose services had an effect to the reduction of complication of patient.

6. Future trend

From the outcome of implementation and evaluation on problem of this project, the trauma audit committee planned to conduct the new projects as follows:

1. Medcal audit for trauma patient.
2. Nursing audit for trauma patient.

By improving the coverage of the trauma audit filter and evaluating the coverage and compliance of

using trauma audit filter by aiming to reduce the death rate of trauma patient.

Conclusion

The accident prevention committee of Khon Kaen Hospital has set up the trauma audit committee to set Trauma Audit for Hospital Care Improvement project in order to enable all trauma patients to receive treatment in the same standard.

The principles of such implementation are as follows:

1. To create the method of calculation for indicator for quality of trauma care that is the Probability for survival (Ps) which can be obtained by Triss methodology from trauma registry.

2. To study the problem of trauma care system and use the result of study to set up the trauma audit filter.

3. To reorganize the working system in order to conform to the created trauma audit filter.

4. To make all doctors and nurses in the team realize the significance of cooperation in improving the trauma care process.

From the result of implementation, it was found that after trauma audit filter implementation, the quality of trauma care was improved and the rate of preventable death decreased.

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Appendix 1: TRISS methodology[13]

TRISS score is the combination index based on revised trauma score (RTS), injury severity score, age and mechanism of injury.

TRISS score is calculated by using method

Ps = 1/(1+e)-b where as,

Ps = Probability of survival

e = 2.7183 (based on Napierian logarithms)

b = $b_0 + b_1$ (RTS) + b_2 (ISS) + b_3 (A)

RTS = Revised trauma score (on emergency department admission)

ISS = Injury severity score

A = 1 if age >54

A = 0 if age <54

The scores of b_0, b_1, b_2, b_3 are different according to mechanism of injury and are derived from Walker Duncan regression algorithm as shown in Table 1.

Table 1 TRISS regression weights

	b_0	b_1	b_2	b_3
Blunt	-1.2470	0.9544	-0.07768	-1.952
Penetrating	-0.6029	1.1430	-0.1516	-2.6676

Revised trauma score is calculated by using following method

RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR where as,

GCS = Glasgow coma score coded value

SBP = Systolic blood pressure coded value

RR = Respiratory rate coded value

The value of GCS, SBP and RR are shown in Table 2.

Table 2 Coded value for GCS, SBP and RR

GCS	SBP	RR	Coded Value
13-15	>89	0-29	4
9-12	76-89	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
0	0	0	0

Appendix 2

Form 1

TRAUMA REGISTRATION

KHON KAEN HOSPITAL

1993

Name _____ Age _____

Occupation _____ HN _____

Accident scene _____ House No. _____ Road _____

Tumbon _____ District _____ Province _____

Date of occurrence _____ Time of occurrence _____

Date of arrival at hospital _____ Time of arrival at hospital _____

Person taking patient to hospital _____

Part 1

( ) drinking ( ) no alcohol ( ) unknown

Accident scene

* ( ) road ( ) home

( ) store, restaurant, hotel ( ) plant

( ) school ( ) stadium

( ) office, government office ( ) farm

( ) others

* ( ) accident occurring in Khon Kaen Province

( ) in sanitation district ( ) outside sanitation district

* ( ) accident occurring outside Khon Kaen Province

( ) in municipal area ( ) outside municipal area

( ) in sanitation district ( ) outside sanitation district

Referring

( ) referred

referred from hospital _____

( ) not referred

Type and cause of accident

1. Traffic accident

Patient ( ) walking
( ) driving
specify____

Mechanism of Injury
( ) occur by oneself
( ) crash at intersection
( ) crash with the car in the same direction
( ) crash with the car coming from opposite direction
( ) unknown direction
( ) others

Party's vehicle
Specify_____

Type of patient ( ) driver ( ) passenger ( ) unknown

Anti-knock helmet ( ) wearing helmet ( ) not wearing helmet ( ) unknown

Cause of accident _____

(if there is more than 1 cause, please specify all causes)

2. Others specify the detail _____

Cause _____

Part II DIAGNOSIS

( ) Blunt ( ) Penetrating

Coma score _____ BP _____ RR _____ ISS _____

Discharge diagnosis

1. _____ AIS _____
2. _____ AIS _____
3. _____ AIS _____

Treatment

( ) No ( ) Medicine ( ) Dressing-splint

( ) Admitted to ward _____ Discharge date _____

Treatment ( ) Observe

( ) Operation specify _____

Result ( ) Recover ( ) Nearly die, want to go home

( ) Dead ( ) Refer

Appendix 3
Form 2: Hospital trauma audit committee assessment I

Death of Trauma Patient Form

Name _____ HN _____ Age _____

Mechanism of injury ( ) Blunt ( ) Penetrating

Type of injury _____

Time of accident _____ Date _____

Time of arrival at hospital _____ Date _____

BP _____ PR _____ RR _____

GCS _____ RTS _____ ISS _____ TRISS _____

Diagnosis _____ Operation _____

Date _____

Surgeon _____

Team _____

Complication _____

Discharge date _____

Appendix 4
Form 3: Hospital trauma audit committee assessment II

Name _____ HN _____

1. Is there any pitfall of treatment in this case? ( ) Yes ( ) No
2. If there is pitfall of treatment, please specify the cause in the following table

	Delay Diagnosis	Error in Diagnosis	Error in Treatment	Error in Technique	System Inadequacy	Contribute to death
a Pre-hospital						
b ER						
c Trauma Dept.						
d Operation						
e ICU						

Recommendation This case is in the group of

( ) Preventable death
( ) Potentially preventable death
( ) Non preventable death

Appendix 5: Guideline for assessing and definition

5.1 Guideline for assessing contributing factors related to morbidity/mortality

Contributing factors	*Definition*
Delay in Diagnosis	Diagnosis is not made in a timely fashion when considered in context of the patient's overall condition.
Error in Diagnosis	Injury missed because of misinterpretation, inadequacy or lack of physician examination or diagnostic procedure.
Error in treatment	Therapeutic or diagnostic decision made contrary to available data.
Error in technique	Technical error occurring during the performance of a diagnostic or therapeutic procedure.
System inadequacy	Failure or insufficiency of trauma system to deliver care appropriately and timely.

5.2 Guideline for assessing morbidity/mortality

Judgment	*Guideline*	*Documentation*
Non preventable	1. Anatomic injury or combination of injuries considered unsurvivable with optimal care and/or,	1. Finding at operation, post mortem examination, ISS.
	2. Physiologic state at time of arrival of first responder important but not critical to judgment of non preventability and/or,	2. Field and admission RTS; Vital signs.
	3. Evaluation and management appropriate to EMST guideline; suboptimal care, its identification is deemed not to have influenced outcome,	3. Pre-hospital - hospital record.
	4. Survival probability using TRISS<0.25, if TRISS>0.25 explanation required for conclusion that death is not preventable.	4. Age, RTS, ISS.

Judgment	*Guideline*	*Documentation*
Potentially Preventable	1. Anatomic injury or combination of injuries considered to be very severe but survivable under optional conditions and/or,	1. Findings at operations, post mortem examination, ISS
	2. Physiologic state at time of first responder critical to judgment of potential survivability,	2. Field and admission RTS, vital signs
	3. Evaluation and management generally appropriate to EMST guidelines, and suboptimal care directly or indirectly implicated in patient's demise,	3. Pre-hospital, hospital records
	4. 0.50>Ps>0.25, if TRISS is outside limits, explanation is required for conclusion that death is possibly preventable.	4. Age, RTS, ISS

Judgment	*Guideline*	*Documentation*
Preventable	1. Anatomic injury or combination of injury considered survivable and/or,	1. Findings at operation, post mortem examination, ISS
	2. Physiologic state at time of arrival or first responder critical to judgment of preventability, patient generally stable, if unstable, patient becomes stable with treatment and/or,	2. Field and admission RTS, vital signs
	3. Suboptimal care clearly related to unfavorable outcome,	3. Pre-hospital and hospital records
	4. Ps>0.5, if TRISS < 0.5 explanation is required for conclusion that death is preventable	4. Age, RTS, ISS

Appendix 6: Trauma audit filters; Khon Kaen Hospital 1995

Audit filter in the management of multiple injured patient

1. No C spine film
2. No CXR
3. No cervical support
4. No O_2 administration
5. No intubation when GCS<10
6. Cannot diagnose abdominal injury within 24 hr.
7. Cannot detect hemo-pneumothorax
8. A patient seen in Emergency Department, discharged home and then readmitted to the hospital within 72 hr of initial evaluation
9. A patient requiring emergency laparotomy which is not performed within 2 hr. of arrival at the hospital
10. A patient with epidural or subdural hematoma undergoing a craniotomy more than 4 hr.
11. Interval more than 8 hr. between arrival and treatment of a blunt compound tibial fracture or open laceration of a joint
12. Abdominal, thoracic, vascular or cranial surgery performed more than 24 hr. after arrival
13. Unplanned return to OR within 48 hr. of the initial procedure
14. Any patient requiring reintubation within 48 hr. of the initial procedure
15. Specific complication - list

16) Cardiac/circulation: Shock, cardiac arrest, myocardial infarction, coagulopathy, compartment syndrome, major arrhythmia, CHF, acute arterial obstruction, DVT of lower extremities or central veins.

17) Wound: Abdominal wound dehiscence, evisceration, infection

18) Skin: Decubiti

19) Renal/Urinary tract: Renal failure and UTI

20) Respiration: Acute respiratory failure, pneumothorax, hemothorax, pulmonary embolus and pneumonia

21) Sepsis: Empyema. intra abdominal abscess. Other abscess, septicemia, sepsis like syndrome and fungal sepsis

22) GI tract : GI bleeding, small bowel obstruction, fistula, acalculous cholecystitis and inadvertent enterotomy

23) Hepatic: hyperbilirubinemia

24) Neurogenic: stroke and CVA

25. Death
26. No interval record