29th Japanese Association for The Surgery of Trauma

Current Status of Korean Trauma Care System

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It is a great pleasure and privilege for me to attend the 29th annual meeting of The Japanese Association for The Surgery of Trauma, in Hokkaido. This is truly the most beautiful place to be in, especially at this time of year.
My talk is about the current status of trauma care system in Korea.

A brief introduction of myself

- 1992-2014 National Delegate, International Society of Surgery
- 1994-present
  - Member, Society of Critical Care Medicine
  - Member, American Shock Society
  - Faculty, American College of Surgeons

- 2003-2005 President, Korean Society of Traumatology
- 2005-2007 President, Korean Society of Emergency medicine
- Feb 2006 Founded the department of Emergency medicine in SNUH
- 2007-2009 President, Korean Association for Disaster and Emergency medicine

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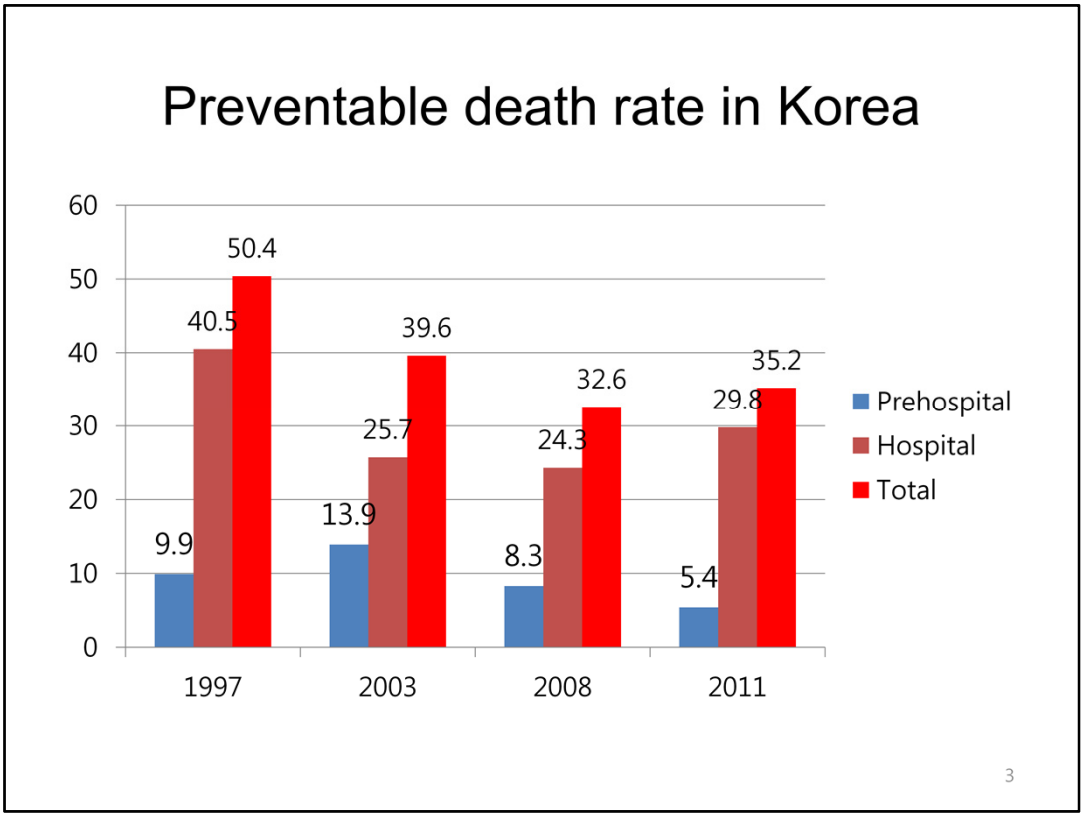
Until the early 90's, there were no emergency medicine specialists in Korea. After I served as president of the Korean Society of Traumatology from 2003 to 2005, I founded the department of emergency medicine at Seoul National University Hospital in February 2006. Furthermore, I served as president of the Korean Society of Emergency Medicine (2005-2007), and the Korean Association for Disaster and Emergency Medicine (2007-2009). I think this is why I was given the opportunity to talk about my experience in this great meeting.

Let's move on the main topic.



#2. This slide shows preventable death rate in Korea. Blue bar is prehospital preventable death rate, purple bar is hospital preventable death rate, and red bar is total preventable death rate, that is prehospital + hospital death reate. As you can see, Preventable death rate was 50.4% in 1998. It was so high compared with those of the developed countries, such as US or European countries which is 10 to 20%. Fortunatelly, the preventable death rate has gradually decreased, and it was 32.6% in 2008. The decrease of the preventable death rate was due to the introduction of National EMS fund which was made for the improvement of emergency medical service system. However, after then, the preventable death rate has slightly increased again to 35.2% in 2011. The main cause of the increase in the preventable death rate was lack of trauma care system and trauma center in Korean.

Problems in Trauma System in Korea

- Prehospital
  - Shortage of dedicated EMS personnel
  - Absence of training programs for paramedics & air medical physicians
  - Insufficient helicopter transport system
- Hospital
  - Lack of Level 1 trauma center & manpower
  - Insufficiencies of government financial & legal support
- Fragmentation
  - Lack of coordination between EMS and trauma services providers

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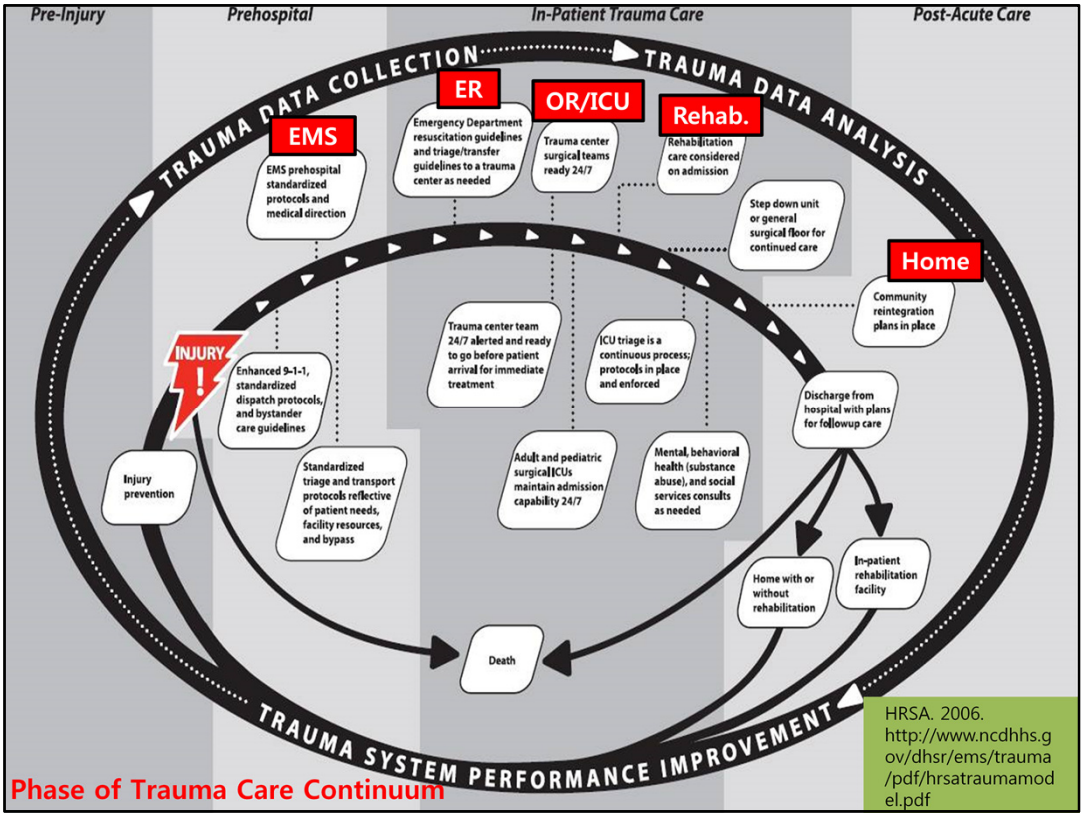
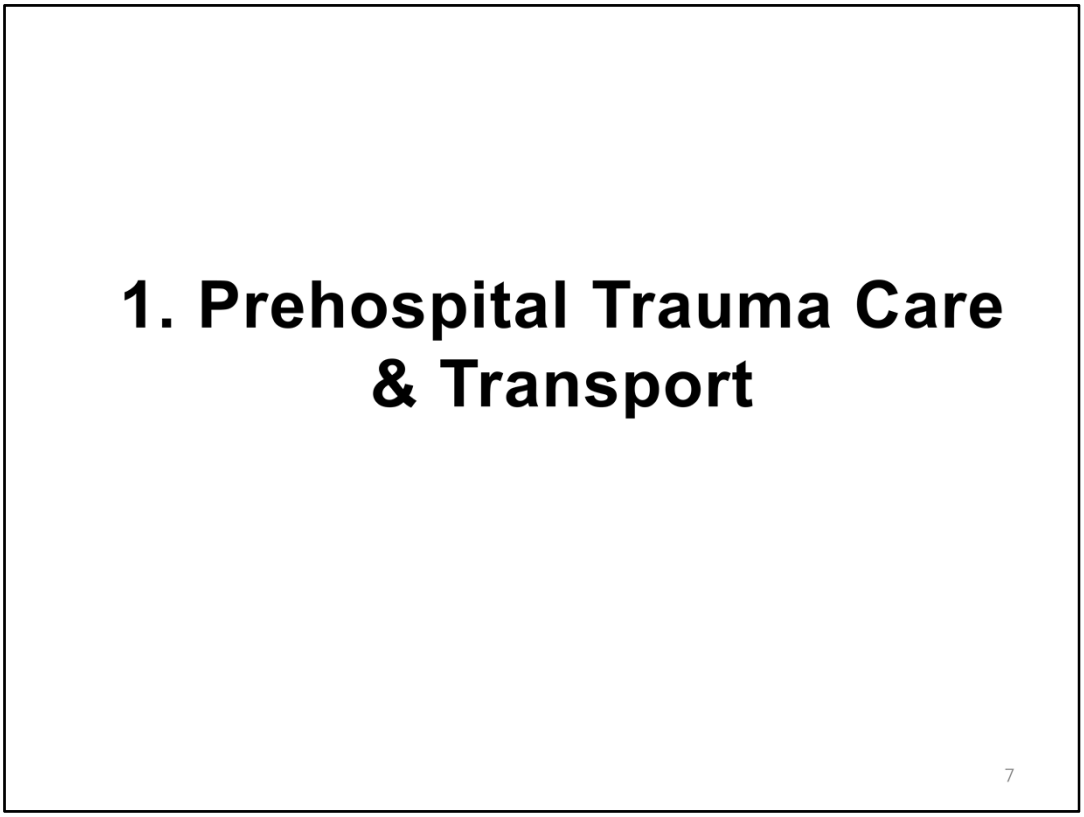
#3. Problems in trauma care system in Korean can be categorized as follows: prehospital, hospital and fragmentation problems.
Prehospital problems were shortage of dedicated EMS personnel such as paramedics, absence of training programs for paramedic and air medical physicians, and insufficient helicopter transport system. Hospital problems were lack of Level 1 trauma center and manpowers including dedicated trauma surgeons, and insufficient government financial and legal support. Fragmentation is another problem which means lack of coordination between EMS and trauma service providers.



#4. To solve these problems, we need to have pre-planned trauma care delivery system.
A trauma care system has many components such as injury prevention, standardized EMS protocol, ER resuscitation, OR, ICU and rehabilitation, which require a multidisciplinary team approach. Trauma data collection and analysis are also needed for the trauma system performance improvement.

#5. What is the direction of trauma care system in Korea? It should develop
1. Prehospital trauma management & transport
2. Designaton & operation of trauma centers
3. Training of dedicated manpowers
4. Government financial & legal support

From now, I will briefly introduce the current status of Korean trauma care system.



#6. First, I will talk about our effort to improve Prehospital trauma care and transport system

Prehospital care (2005)

Conditions	Needed intervention	intervention		Appropriateness N (%)
		N	%	
Cardiac arrest (N=79)	Confirm arrest	70	89.7	0 (0.0)
	intubation	0	0.0	
	IV access	1	1.3	
	AED apply	4	5.3	
	Chest compression	52	67.5	
Cardiac chest pain (N=49)	Oxygen supply	26	55.3	3 (11.5)
	NG SL apply	5	10.6	
Hypoglycemia (N=80)	Check BSL	26	32.9	0 (0.0)
	Glucose infusion	0	0.0	
Hypovolemic shock (N=31)	IV access	1	3.2	1 (3.2)
	Fluid infusion	1	3.2	
Asthma (N=28)	B2 inhalation	0	0.0	0 (0.0)
	Oxygen supply	22	84.6	
Multiple trauma (N=267)	Cervical immobilization	113	42.3	99 (37.1)

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#7. Surprisingly In 2005, a famous research institute reported very low appropriateness of prehospital intervention for the emergency conditions. As you can see, in cardiac arrest, there was no appropriate intervention for the victim. Among 80 hypoglycemic patients, there was no case who glucose was infused. This result gave a shock to all Korea EMS system as well as fire department which is responsible for the prehospital care.

Hospital-based EMT Training

- Introduced in 2006
- EMT-B (119 fire department)
- Participation hospitals : 20 regional EDs
- Course duration : 9 wks
- Prehospital assessment & intervention
  - PHTLS
  - Shock management
  - Field triage

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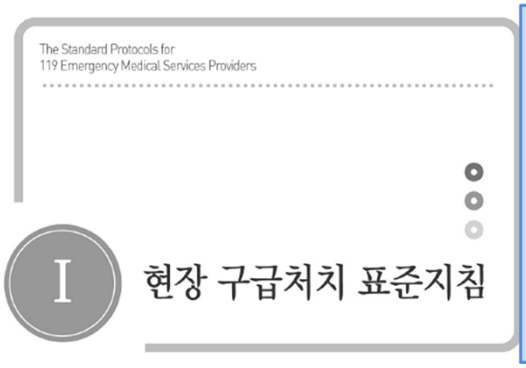
#8. In 2005, Ministry of Health and welfare decided to establish the EMT-B training program for the quality improvement at the scene. 20 regional emergency centers were assigned as a EMT training centers in 2006. Eligible EMTs have been trained in the ED for 9 weeks. Emergency physicians should teach EMTs on prehospital assessment and intervention such as PHTLS, Shock management, and Field triage.

Development of EMS Protocols

- Standardized dispatch protocol
- Field triage protocol
- Medical direction

2011. Nov.



상급응급의료기관으로 직접 이송이 필요한 심각한 징후 또는 손상양상

1. GCS≤13 또는 SBP<90mmHg 또는 RR<10 or >29회
2. 몸통부분의 관통상 또는 자상
3. 동요가슴
4. 두개 이상의 근위부 장골골절
5. Crushed, degloved, mangled 사지
6. 손목, 발목 상단의 절단 또는 골반골 골절
7. 개방성 혹은 함몰 두개골골절
8. 사지마비

상급응급의료기관으로 직접 이송이 필요한 심각한 손상 기전

1. 차량으로부터 튕겨져 나감.
2. 동승자의 사망
3. 차량의 전복
4. 고속도로 사고 또는 고속차량 추돌사고
5. 심한 차량파손 또는 30cm 이상 눌림
6. 인도로 침입한 손상
7. 자동차와 자전거 또는 보행자 사고
8. 오토바이 사고
9. 6M (3M) 또는 환자 키의 3배 이상 높이에서 추락

#9.
We also developed EMS protocols such standadized dispatch protocol, field triage protocol and medical direction.

Doctor Heli

- 2011. 9 by Ministry of Health & Welfare
- 2 Doctor Heli (Incheon, Mokpo) → 4 Doctor Heli until 2013 (Wonju, Andong)
- EC-135 helicopter
- Patient & crew
  - 1 patient
  - 2 doctors
  - 1 nurse or EMT
  - 2 pilots
- Round flight time : 60 min
- Flight distance : 100 km
- No. of flight transport

	Incheon	Mokpo	Wonju	Andong
2011. 9 - 12	30	51		
2012. 1 - 12	146	208		
2013. 1 - 12	113	203	70*	125*
2014. 1 - 5	66	71	132	138

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#10. Doctor Heli was introduced by the Ministry of Health and Welfare in Sep. 2011. At first, 2 doctor heli were operated at Mokpo and Incheon area to transport emergency patients at numerous islands. After July 2013, another two doctor heli were operated at Wonju and Andong. Round flight time is usually within 60min, and flight distance within 100 km. Until May this year, there were 1353 flight transports.

HEMS by Fire Department

- Number of EMS Helicopter : 27
- HEMS personnel : 270
- Number of HEMS transport
  - 2728 (2012) → 3202 (2013)

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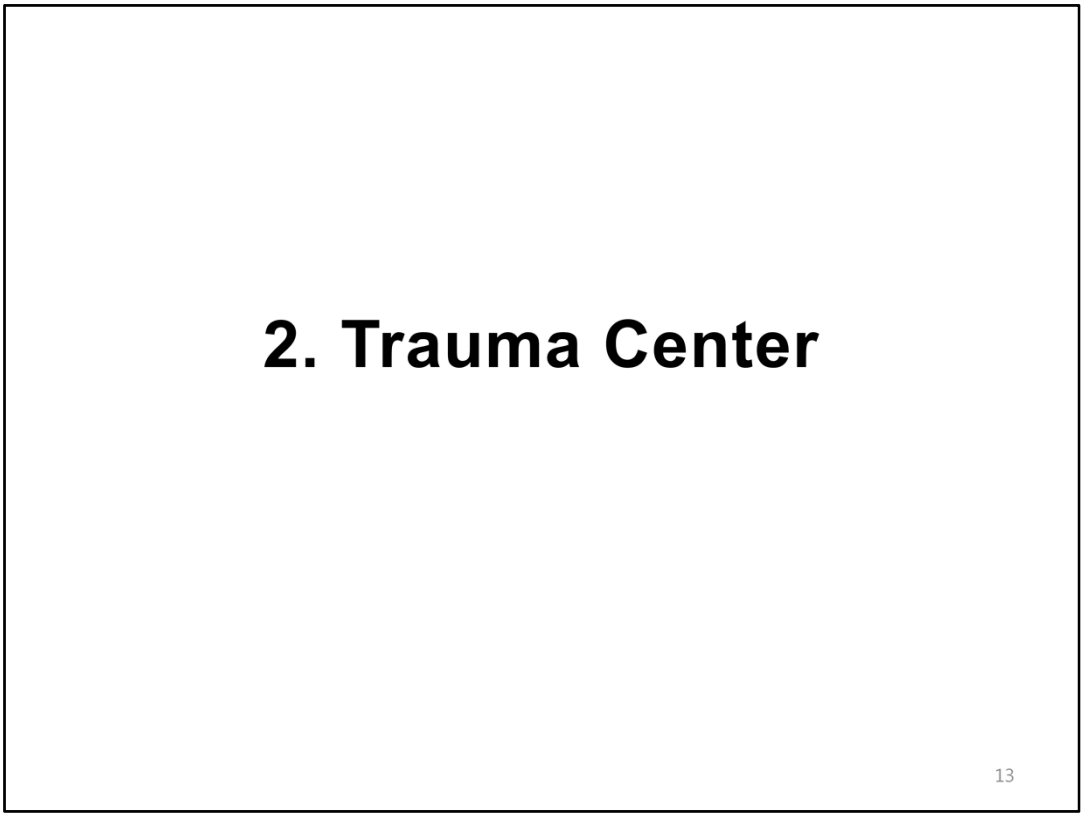
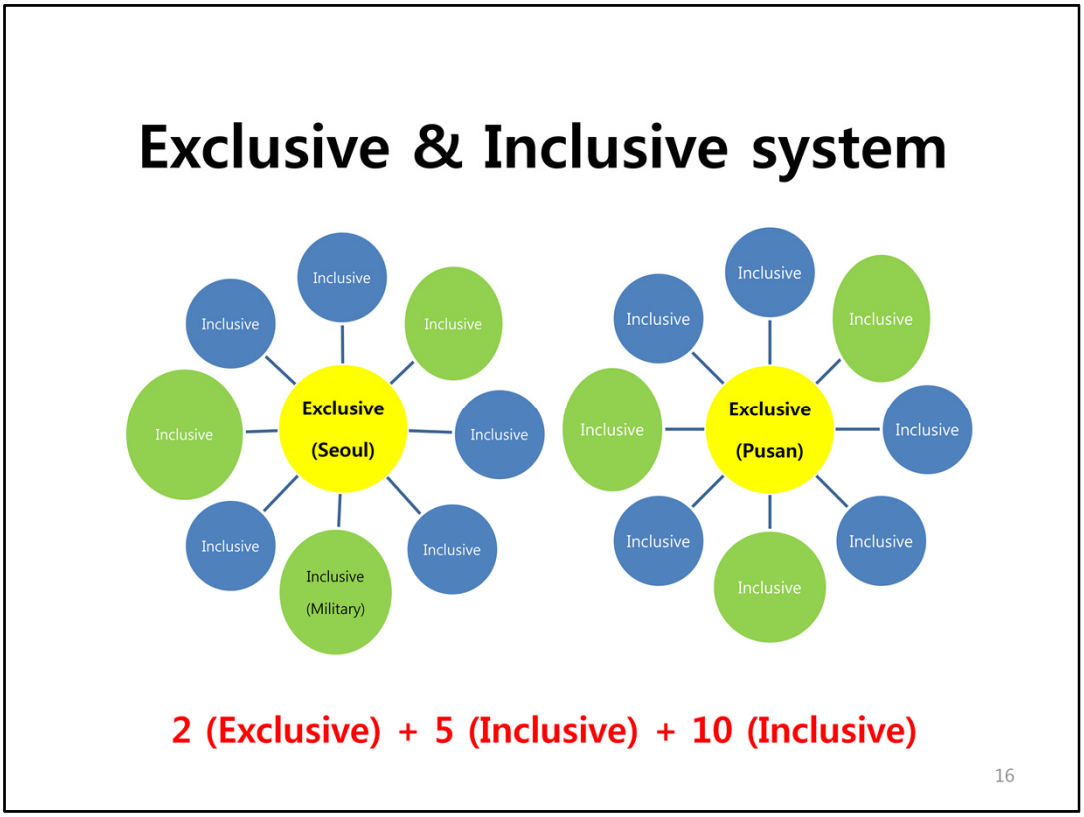
#11. In addition to Doctor Heli, we have 27 EMS helicopters which are operated by 119 fire department. Red dots show the distribution of HEMS. At present, 270 personnel are working at 119 HEMS.
The number of HEMS transport has been gradually increased from 2700 in 2012 to 3200 in 2013.



#12. Next, I will talk about trauma center.

#13. What is ideal trauma center?
I think that Ideal trauma center should be rapid, organized, coordinated, and accountable

#14. In May 2012, EMS law was revised. It contains the designation of trauma centers. Regional trauma centers should be designated by minister of Health and Welfare, and Local trauma centers should be designated by governor of city or province. Revised EMS law also states dedicated medical staffs, facilities, equipments, and financial and administrative support from central and local government.



#15. The Ministry of Health & Welfare has planned to develop trauma system until 2016. In this plan, 2 exclusive (it means independent) trauma centers and 15 inclusive trauma centers. Among 15 inclusive trauma centers, 5 trauma centers will be more bigger than other 10 centers.
In addition, the ministry of National defense are planning to set up the inclusive type trauma center in military hospital (Korean Armed Forces Capital Hospital) which is located near Seoul.

Regional Trauma Center

- Exclusive (2)
  - Pusan
    - Designated 2010 → open in 2015
  - Seoul (NMC)
    - Seoul, Designated 2011 → open in 2018
    - 50 ICU beds
    - 200 ward beds

- Inclusive (15)
  - 5 centers in Oct. 2012
  - 4 centers in July 2013
  - 6 centers added until 2015
  - Financial support (EMS fund)
    - Facilities: $8,000,000
    - Manpower support : $2,700,000

	Region	Hospital	Open
2012	Incheon	Gil Hosp	0
	Wonju	Wonju Severance Hosp	2014. 9
	Kyoungbuk	KUH	
	Chungnam	Dankook univ. Hosp	2014. 7
	Mokpo	Mokpohankook Hosp	0
2013	Kyeonggi	Ajou Univ. Hosp	0
	Gwangju	JUH	
	Ulsan	Ulsan Univ. Hosp	2015. 2
	Daejeon	Ulsi Univ. Hosp	

#16. Two exclusive type regional trauma center will open at Pusan and Seoul in 2015 and 2018, respectively. These centers have more than 50 ICU beds and 200 admission ward beds.
During last 2 years, 9 Inclusive type regional trauma centers were designated. 5 in 2012, 4 in 2013, respectively.
Another 6 regional center will be designated until 2015. Until now, 3 trauma center were opened. Each inclusive type regional trauma centers receives financial support from government. ($8,000,000 for facility support , and $2,700,000 for annual manpower support, respectively)

Regional Trauma Center (Facilities & Staffs)
- Exclusive *vs.* Inclusive -

		Exclusive	Inclusive
Building		Independent	Involved in main hospital
ICU (beds)		> 50	> 20
Ward (beds)		> 200	> 40
Op. room		> 6	> 2
Resuscitation room		> 6	> 2
Helipad		+	+
CT		> 1	1
MRI		1	-
Angio room		>1	1
Doctor	GS or TS	22	8
	OS	6	4
	NS	6	3
	EM	8	4
	Anesth	6	4
	Radiology	8	3
	Intensivist	6	-
	Total	62	26

At least, half of medical doctors should be certified trauma surgeons

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#17. This slide shows the difference between exclusive and inclusive type regional trauma centers.
And at least, half of medical doctors should be certified trauma surgeons.

Patients Volume of Regional Trauma Center

Year	Total No. of trauma Patients		Patients with ISS >15	
	Chungnam	Incheon	Chungnam	Incheon
2010	1732	25,532	122	265
2011	2303	25,548	251	268
2012	2361		240	
2013	2191	26,208	298	446

* Chungnam : Dankook University Hospital
  Incheon : Gil Hospital

#19. This slide shows example of regional trauma centers which already opened.

Staffs in Regional Trauma Center

	Department	No. of staff	
		Gil Hosp.	Dankook Hosp.
Doctor	GS	6	3
	TS	4	2
	NS	1	2
	OS	1	1
	Anes	1	
	Radiologist		3

	Area	No. of staff (GIL)
Nurse	Trauma bay	12
	Trauma ICU	41
	Trauma Ward	20
	Certified Trauma Nurse	5
	Coordinator	2

#20.

Facilities in Gil Hospital


Trauma Bay


TICU

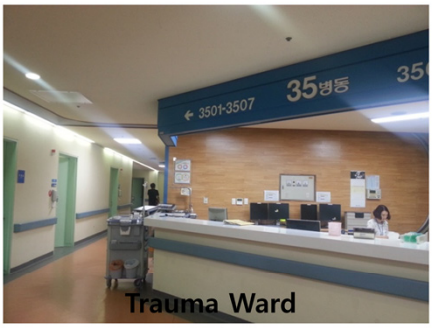

Angio-room

OR

#21

Facilities in Dankook University Hospital


TICU



Trauma Ward


Angio-room


Trauma bay

#22

3. Trauma Team

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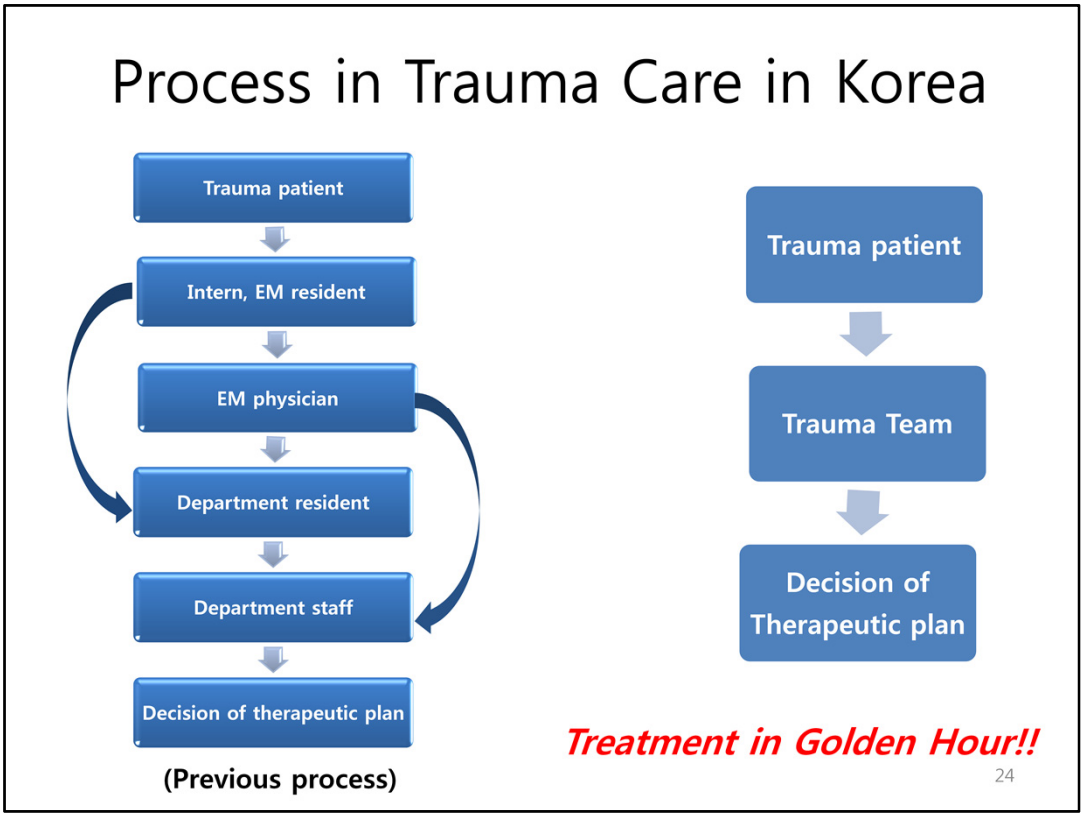
#24.

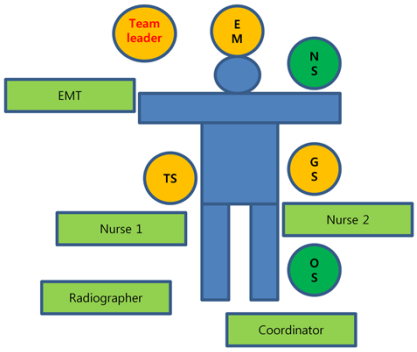


#26. Previously, when trauma pts was brought to hospital, initially intern or EM resident saw the patient, and reported to EM physician or residents in a related department. EM physician or related residents then, reported to staffs in a related department, who finally decided treatment plan. In this process, treatment plan was delayed. In contrast, when trauma team see the trauma patient, decision of treatment plan should be done rapidly within golden hour.

Guidelines for Trauma Team

(MHW 2013, 10)

- Trauma Team
  - **GS, TS, OS, NS**
- "Primary trauma team" & "Backup trauma team"
  - Available 24hours a day



- Support Team
  - **EM, Anes, Radiolody**
  - PS, IM, Oph, Uro, OB & GY, Ped, ENT, Dental Surgery
  - On call duty system
    - EM, Anes : within 10 min after call
    - Others : within 30 min after call

27. The ministry of Health and Welfare released guidelines for trauma team at regional trauma centers.
Trauma team is usually composed of GS, TS, OS, and NS.
Primary trauma team should be present in-hospital to meet all trauma patients in the trauma resuscitation area at the time of the trauma patient's arrival. Primary trauma team should not perform no elective surgery or procedures, during the on-call period.
When primary trauma team takes a trauma patient, backup trauma team shall become the primary trauma team and shall arrive promptly when summoned.
Support team is usually composed of EM, Anes, radiology, and so on. They also should be available within 30 min when called.

Role of Trauma Team

- Rapid decision of diagnostic or therapeutic plan
- Minimize chaos
- Improved treatment system
- Training of trauma surgeon
- Education for student and residents
- Quality evaluation
- Development of trauma registry

Decreased Preventable Death Rate!!

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#28.

4. Training of Trauma Surgeon

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#29.

Certified Board System of Trauma Surgeon - The Korean Society of Traumatology-

- 2008. Draft for training program of trauma surgeon
- 2009.12. Agreement by related societies
  - GS, OS, NS, TS, EM, URO
- 2010.3. Accreditation from Korean Academy of Medical Sciences
- 2010. 12. Production of 1st certified board of trauma surgeon
- 2011. 2. Designation of training hospitals
  - 22 (2011) → 21 (2012) → 24 (2013) → 35 (2014)
  - Designated every year by evaluation of training quality

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#30. In 2008, the Korean Society of Traumatology planned to introduce certified Board System of Trauma Surgeon. So, it made draft for training program of trauma surgeon. The agreement by related societies including GS, OS, NS, TS, EM, and Urology and the accreditation from the Korean Academy of Medical Sciences were done. At last, In Dec. 2010, 1st certified board of trauma surgeons were produced. In Feb. 2011, 22 training hospitals for trauma surgeon were designated by the Korean Society of Traumatology. Now, The number of training hospital is increased to 35. Each training hospital should be evaluated every year for designation.

Certified Board of Trauma Surgeon

	2010(1st)	2011 (2nd)	2012(3rd)	2014(4th)
GS	30	17	8	17
TS	18	12	2	2
OS	16	8	1	4
NS	10	5	-	3
PS	2	3	-	
URO	2	-	-	
ENT		1	-	
Double Board	7	2	-	1
Total	**85**	**48**	**11**	**27**

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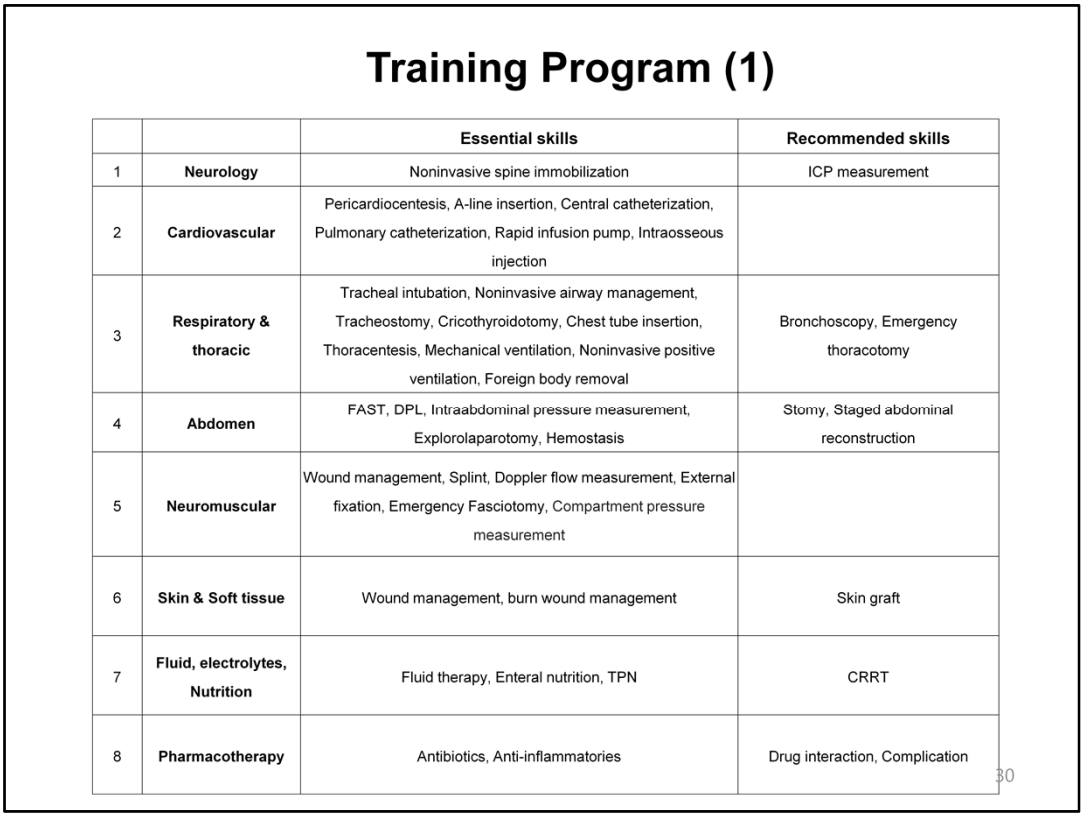
#31. This slide shows the distribution of certified board of trauma surgeons according to the clinical department. As you can see, most of trauma surgeons are GS and TS.
Until now, 171 trauma surgeons have been produced.
85 1st and 48 2nd certified board of trauma surgeons were produced in 2010 and 2011, respectively. They were produced only by Document screening & oral test without written examination because there was no training program for trauma surgeon until 2010.



Training Program (1)

		Essential skills	Recommended skills
1	**Neurology**	Noninvasive spine immobilization	ICP measurement
2	**Cardiovascular**	Pericardiocentesis, A-line insertion, Central catheterization, Pulmonary catheterization, Rapid infusion pump, Intraosseous injection	
3	**Respiratory & thoracic**	Tracheal intubation, Noninvasive airway management, Tracheostomy, Cricothyroidotomy, Chest tube insertion, Thoracentesis, Mechanical ventilation, Noninvasive positive ventilation, Foreign body removal	Bronchoscopy, Emergency thoracotomy
4	**Abdomen**	FAST, DPL, Intraabdominal pressure measurement, Explorolaparotomy, Hemostasis	Stomy, Staged abdominal reconstruction
5	**Neuromuscular**	Wound management, Splint, Doppler flow measurement, External fixation, Emergency Fasciotomy, Compartment pressure measurement	
6	**Skin & Soft tissue**	Wound management, burn wound management	Skin graft
7	**Fluid, electrolytes, Nutrition**	Fluid therapy, Enteral nutrition, TPN	CRRT
8	**Pharmacotherapy**	Antibiotics, Anti-inflammatories	Drug interaction, Complication

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#32. Training program is composed of Essential skill & Recommended skill part program. Essential skills should be done by all trauma surgeons.

Training Program (2)

- 2 years of fellowship program
- Applicants : certified board of GS, TS, OS, NS, URO, PS, ENT, OPh
- Obligation course (22 months)
  - 6 months in-depth training in SICU
  - 10 months at one's department
  - 6 months at 3 other departments (among GS, TS, OS, NS)
- Elective course (2 months)
  - Other hospitals
  - Oversea training : self expense

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#33. Applicants who become to be trauma surgeon should have certified board in GS, TS, OS, NS, URO, PS, ENT and Oph. and finish 2 years of fellowship program. Two years of fellows program is composed of 22months of obligation course and 2 months of elective course, respectively. In obligation course, trauma surgeons should do for 6 months in-depth training in SICU, 10 months at one's department, and 6 months at other departments (among GS, TS, OS, NS). Elective course can be done at other hospital including oversea training.

Fellowship Program by EMS Fund

- Introduced in 2011(Ministry of Health & Welfare)
- 2 years financial support from National EMS fund (70,000 $/year)
- Obligation duty work
  - 2 years of work at designated trauma centers after acquisition of certified board

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#34. Another fellowship program is supported financially by EMS fund. This program was introduced in 2011 by the Ministry of Health & Welfare. About 70,000$/year is supported from Nation EMS fund for 2 years. As obligation, however, certified trauma surgeons should work at the designated trauma centers for 2 years after the acquisition of certified board.

Education Programs

- Korean Trauma Assessment and Treatment Course **(KTAT)**
- Advanced Trauma Life Support **(ATLS)**
- Advanced Trauma Operative Management **(ATOM)**
- Pre-hospital Trauma Life Support **(PHTLS)** for pre-hospital care providers
- Definitive Surgical Trauma Care Course **(DSTC)** : IATSIC (International Association for Trauma Surgery and Intensive Care)
- Essential Surgical Procedures in Trauma **(ESPIT)**

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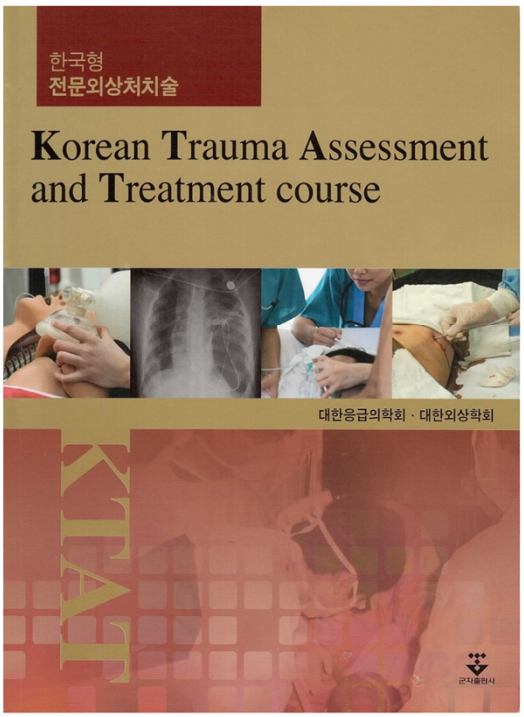
KTAT from 2010



This is a textbook of KTAT

This is pictures of 1st ATOM which was held at Pusan National University Yangsan Hospital last year.

5. Trauma Registry

#36

Korean Trauma Data Bank (KTDB)

- Developed by National EMS & Korean Society of Traumatology
- An opening day : 2013. 4. 1
- Data submitting trauma centers
  - 10 designated regional trauma centers

    → expand to all trauma centers until 2017

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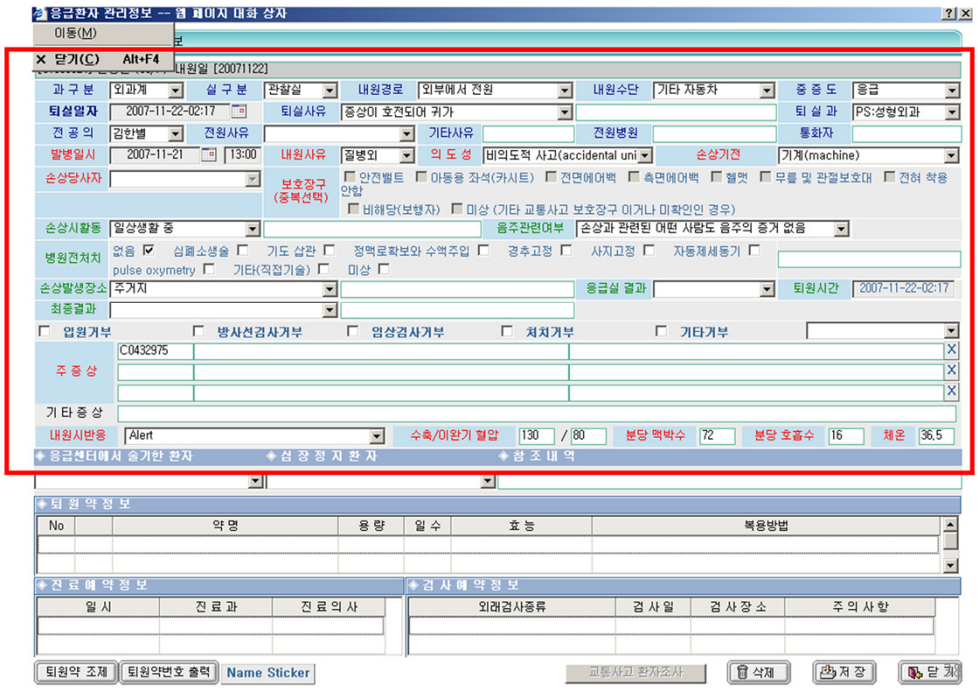
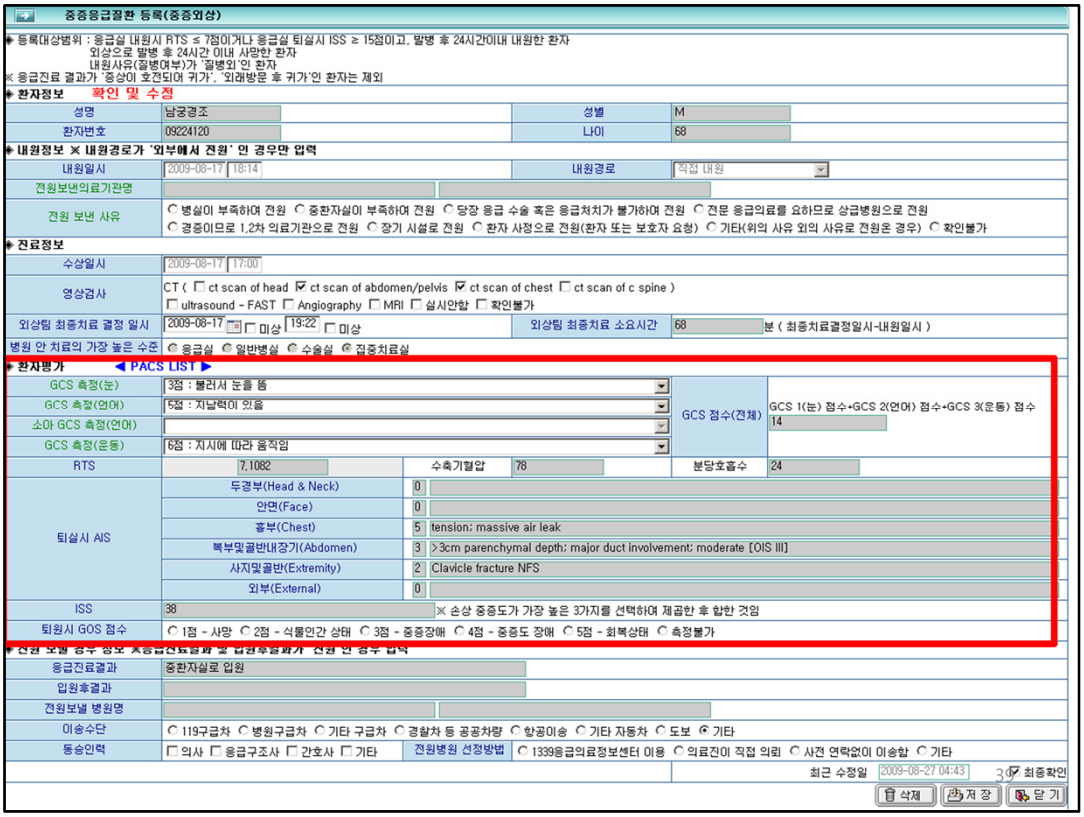
#37. 1st version of Korean Trauma Data Bank was developed by National Emergency Medical Center and the Korean Society of Traumatology, and completed on the end of Feb. 2013. At present 10 regional trauma centers are submitting data to KTDB, and all trauma centers will submitting data until 2017.

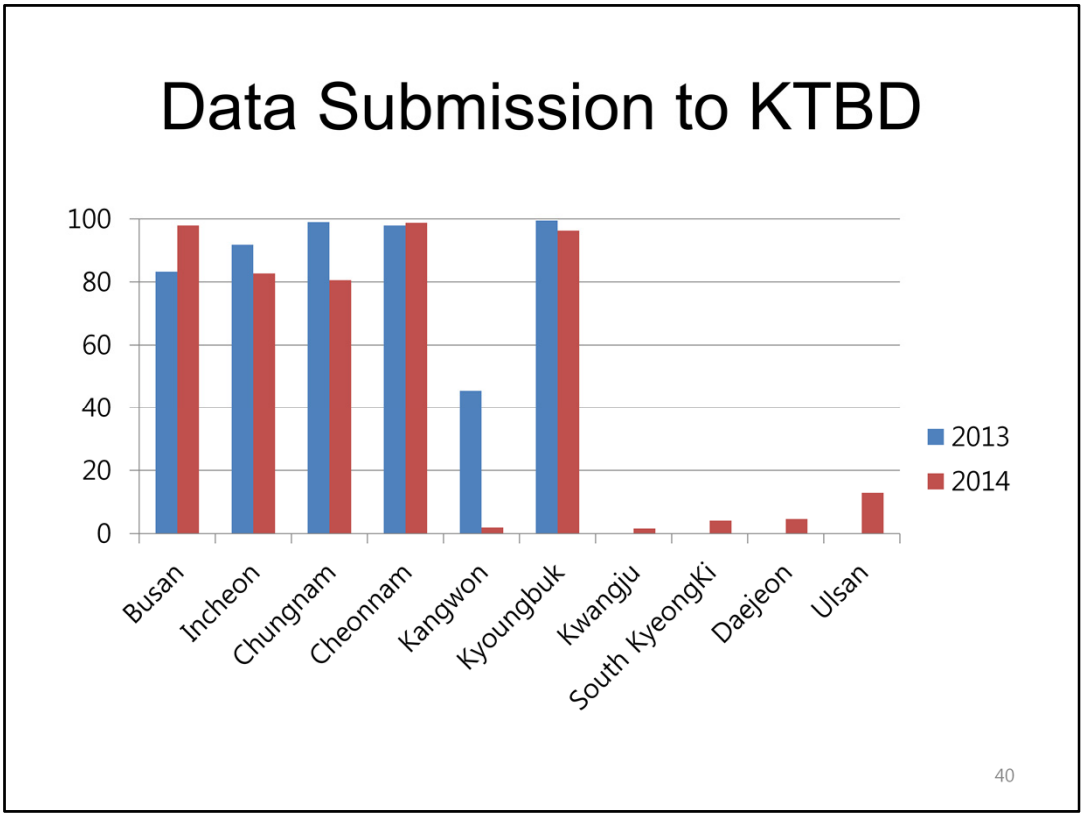
Trauma Registry



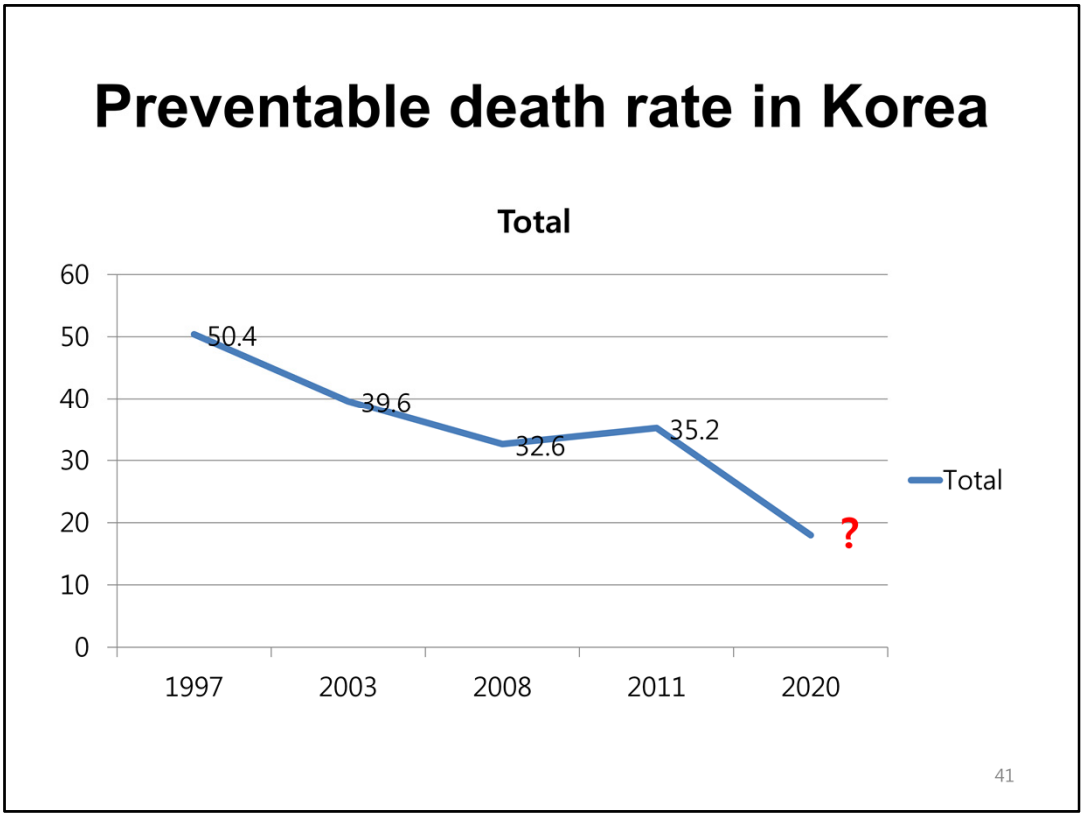
#38. This is a part of KTDB. Type of injury, mechanism of injury, Intention of injury, vital sign, Response on arrival in ED, and so on should be input in trauma registry.



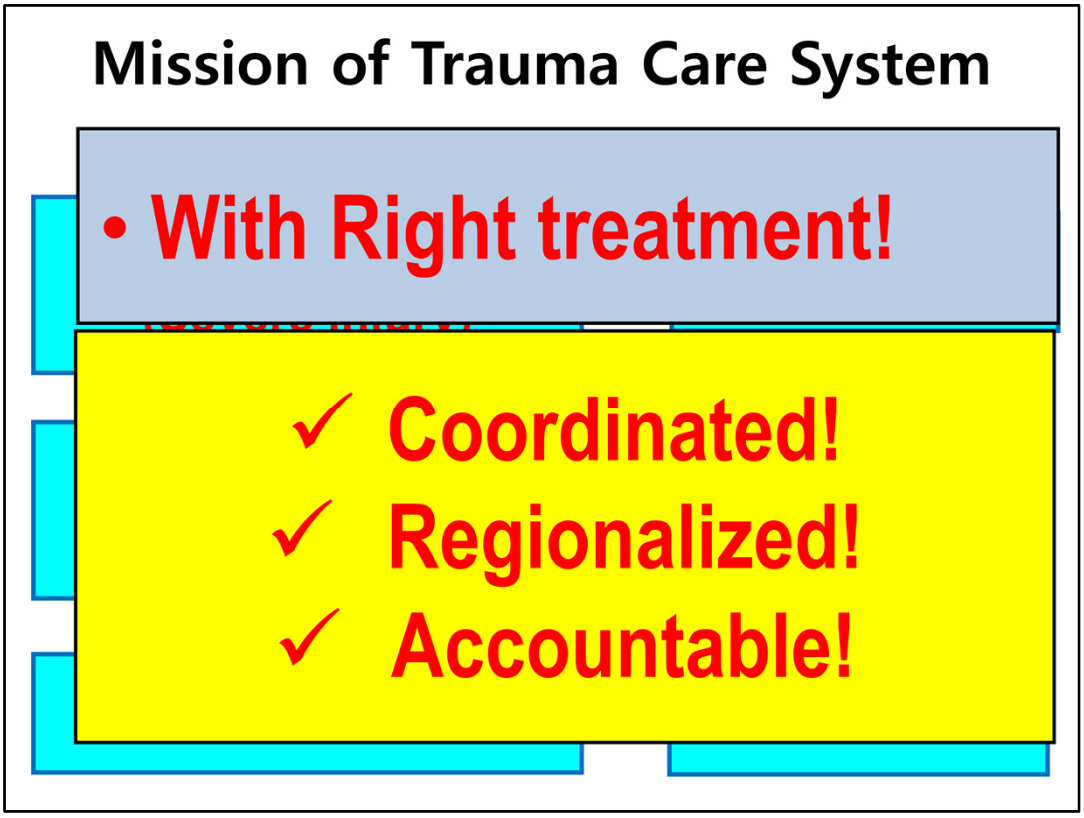
#39. GCS (eye opening , verbal, and motor response), RTS, AIS at discharge, ISS, Glasgow outcome score at discharge also be input.



#40. Now, 10 regional trauma center are submitting data to KTDB. As you can see, data submission rates are different among trauma centers. Especially, 4 trauma centers which were designated last year show low data submission rate. To improve the data submission rate and quality of KTDB, we need dedicated personnel and education.



#41. Until now, the preventable death rate in Korea is 35.2%. However, through our effort to improve trauma care system, the preventable death rate will go down below 20% in the near future.



#. The mission of Trauma care system can be summarized as 3 R, right person, right time and right place.
Right person means that severity of trauma patients should be assessed by field triage protocol. Right time means that severe trauma patient should be transported to trauma center rapidly (usually within 1 hr). Right place means that trauma patient should be transported to the different level of trauma center for human resources and facilities, that is, severe trauma patient should be transported to level 1 trauma center. In conclusion, desirable trauma care system should be coordinated, regionalized, and accountable.


Thank You !!