TRAUMA SYSTEMS: What works – what doesn't?

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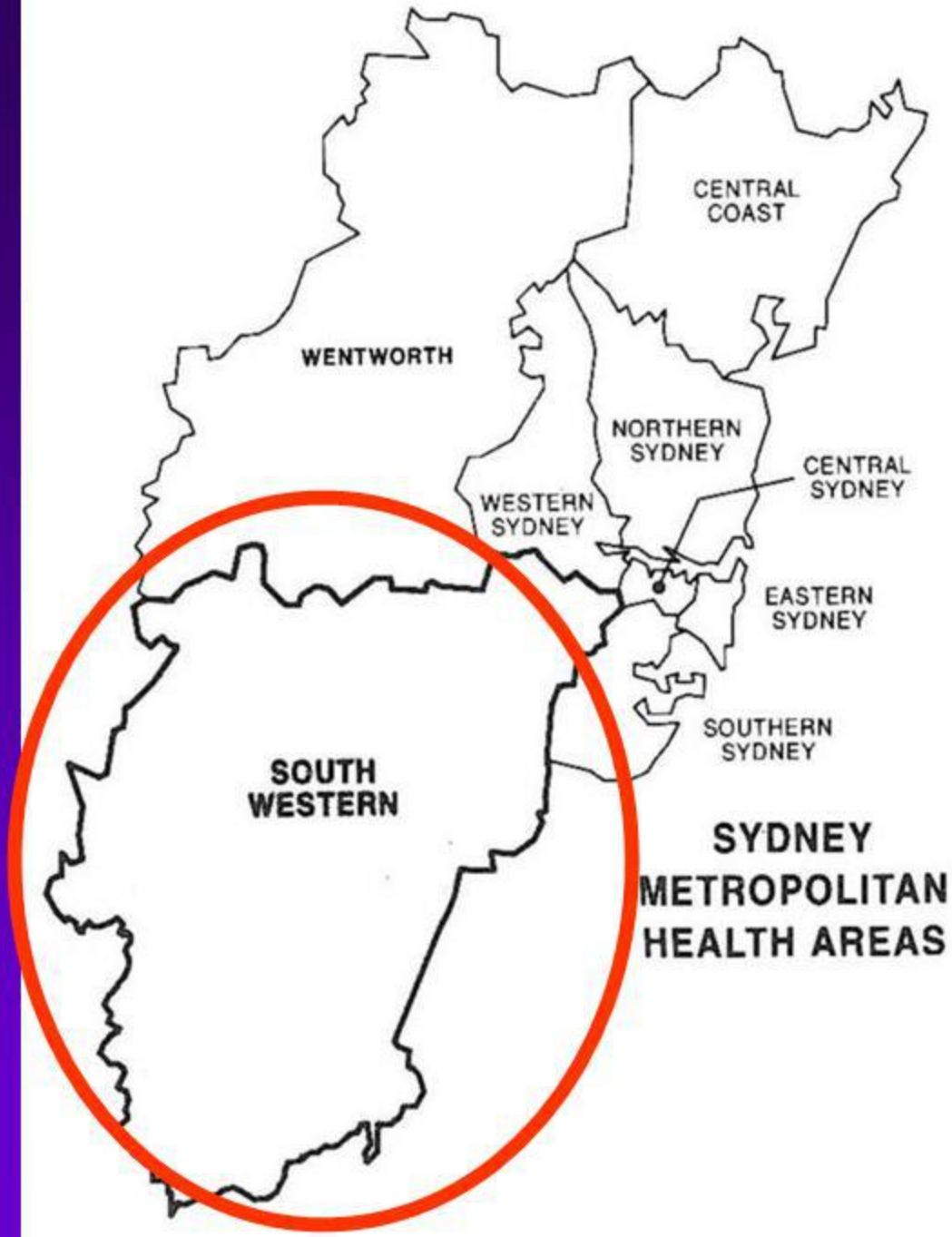
Timor Sea
Melville Island
Bathurst Island
Darwin
Arnhem Land
Gulf of Carpentaria
Groote Eylandt
Wellesley Islands
Cape York Peninsula
Pacific Ocean
Great Barrier Reef
Coral Sea
Indian Ocean
Derby
Tanami Desert
Northern Territory
Cairns
Karumba
Port Hedland
Barrow Island
Great Sandy Desert
Tennant Creek
Townsville
Hamersley Range
Macdonnell Ranges
Mackay
Alice Springs
Rockhampton
Western Plateau
Central Lowlands
Great Dividing Range
Queensland
Carnarvon
Gibson Desert
Ayers Rock
Simpson Desert
Western Australia
Birdsville
Cunnamulla
Brisbane
Gold Coast
Lismore
Great Victoria Desert
Lake Eyre
Geraldton
New South Wales
South Australia
Perth
Port Augusta
Broken Hill
Sydney
Newcastle
Great Australian Bight
Darling Range
Wollongong
Albany
Spencer Gulf
Kangaroo Island
Canberra
Capital Territory
Adelaide
Melbourne
Mt. Kosciuszko (2,229M)
Geelong
Victoria
Bass Strait
Flinders Island
King Island
Cape Barren Island
Tasman Sea
Tasmania
Hobart
0
400 miles
0
400 km
Indian Ocean
AUSTRALIA


CENTRAL COAST
WENTWORTH
NORTHERN SYDNEY
CENTRAL SYDNEY
WESTERN SYDNEY
EASTERN SYDNEY
SOUTHERN SYDNEY
SOUTH WESTERN
SYDNEY METROPOLITAN HEALTH AREAS


CENTRAL COAST
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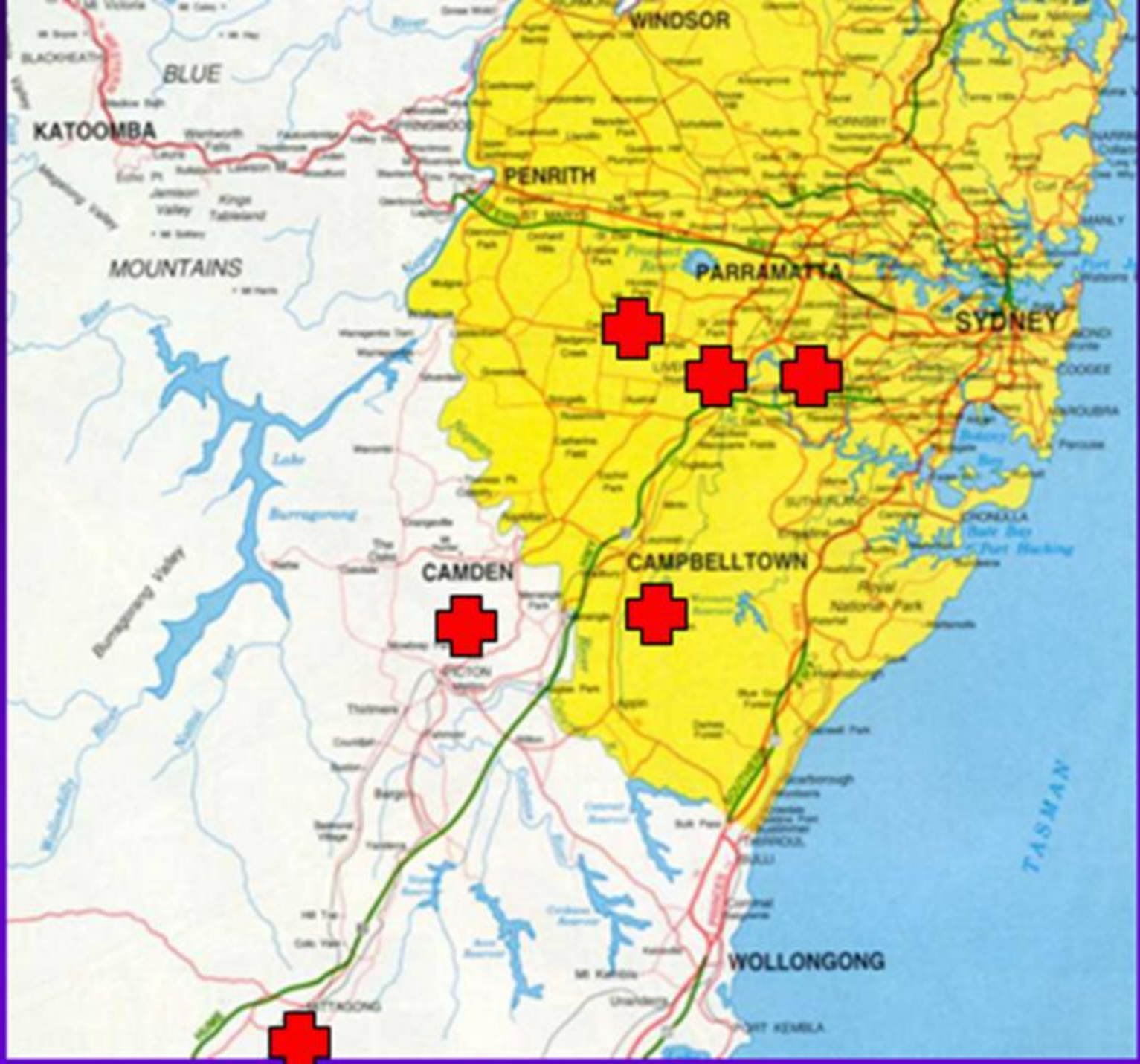
CAR PARK


WINDSOR
BLUE
KATOOMBA
PENRITH
MOUNTAINS
PARRAMATTA
SYDNEY
CAMDEN
CAMPBELLTOWN
WOLLONGONG
TASMAN

Major Trauma Service
Liverpool

Urban
Bankstown
Campbelltown
Fairfield
Camden

Rural
Bowral

Pre hospital Trauma Management

- Identify treat life-threatening
- Prevent secondary injury

A C-spine

B

C

Deliver to appropriate hospital


AMBULANCE

Prehospital

Works	Doesn't Work
Triage protocol	Fail to recognise high risk patient
Recognise high risk pt	Fail to bypass
Bypass to MTS	Futile attempts to intubate
Maintain airway	Long scene time
Short scene time	Fail to notify hospital
MIST Radio	Inadequate documentation
MRT	

Pre hospital Information

- M -Mechanism
- I -Injuries
- S -Vital Signs
- T -Treatment at scene

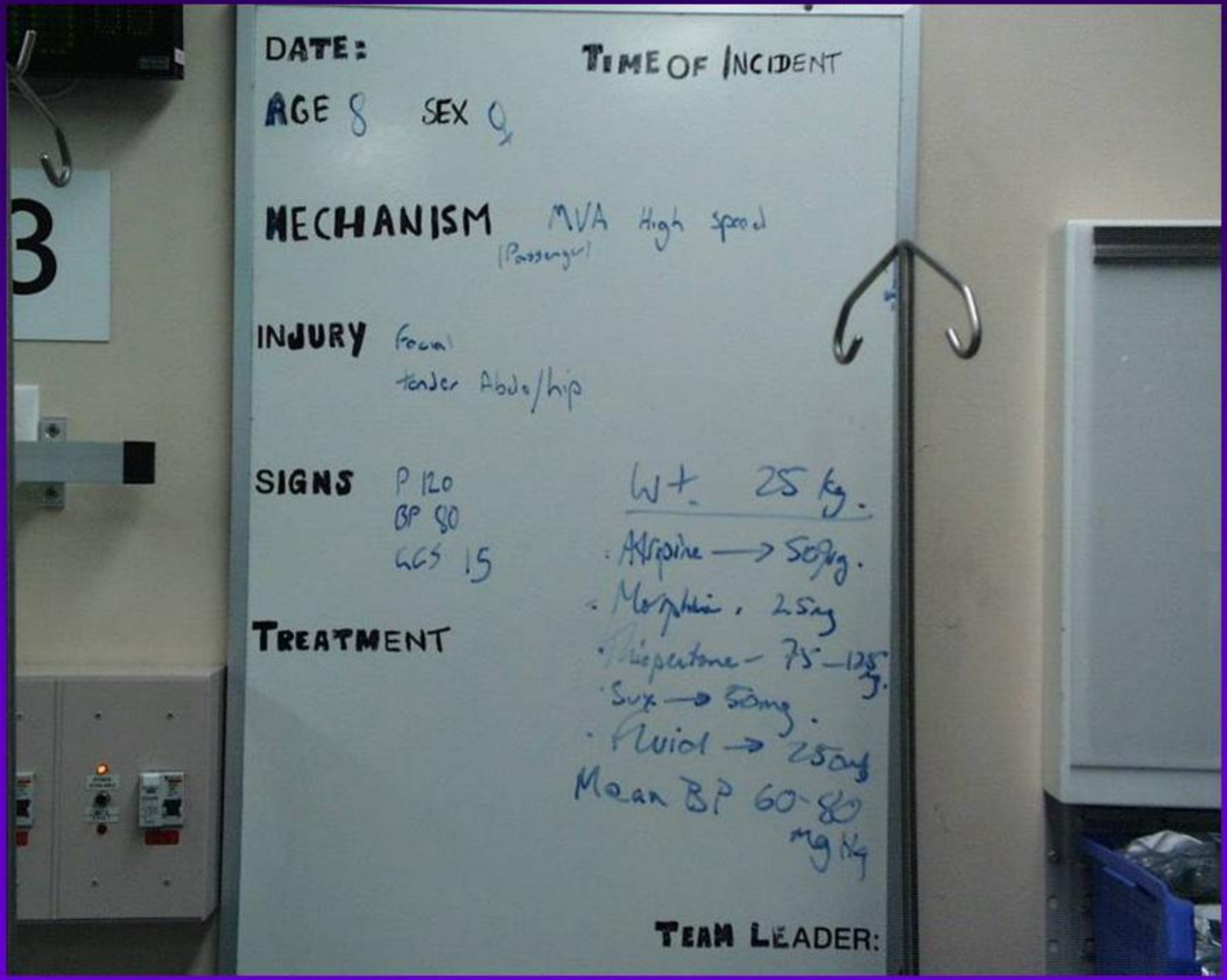
Aim

Describe Trauma systems

Ways to Determine Effectiveness

Limitations

The Way Forward


DATE:
TIME OF INCIDENT
AGE 8 SEX ♀
MECHANISM MVA High speed
(Passenger)
INJURY Facial
tender Abdo/hip
SIGNS P 120
BP 80
GCS 15
TREATMENT
Wt 25 kg.
· Atropine → 500µg.
· Morphine. 2.5mg
· Diazepam - 75-125 µg.
· Sux → 50mg.
· Fluid → 250ml
Mean BP 60-80 mg Hg
TEAM LEADER:

Trauma Team Criteria

- History
- Vital Signs
- Injuries

Resuscitation

Works	Doesn't Work
Radio	Not receiving notification
Criteria TT Activation	"Wait and see" what pt looks like
Team Leader	No predefined roles
Allocate roles and responsibilities	
PPE before arrival	
MIST Whiteboard	Fail to anticipate
Notify surgeon if BP<90 (other)	Fail to call early for help
Set-ups:airway	Not anticipate need for surgical airway
Chest drain	
Warm fluids primed	
Plan - algorithms	Delay to call surgeon, interventional radiologist etc
Pelvic binder	
Drug keys	
Warm blankets	

Trauma Team

- ED Doctor
- ED nurses
- Surgical Registrar
- ICU Registrar

Wardsman

Social Worker

Clerk

Trauma Fellow
Coordinator
Others?


3

Assessment

Primary Survey

Secondary Survey


MALIGNANT
HYPERTHERMIA

Tertiary Survey

- Review all investigations and x-rays
- Consults
- Injuries missed on secondary survey
- Requires multi disciplinary team approach

Tertiary Survey

Janjua KJ, Sugrue M, Deane S "Prospective Evaluation of Early Missed Injuries and the Role of Tertiary Trauma Survey." JTrauma 1998 44(6):1000-1007

PHYSICAL ASSESSMENT					
	PR	BP	RR	Temp	Sa02

PHYSICAL EXAMINATION	
BODY REGION	Findings
Head/Neck	
Face	
Thorax	
Abdomen	
Extremities	
Spine	
Per Rectum	

Medical Imaging	Date	Result	What additional imaging requested?	Date performed
CXR				
c-spine				
PXR				
Other				
CT scans				
MRI				
Other				

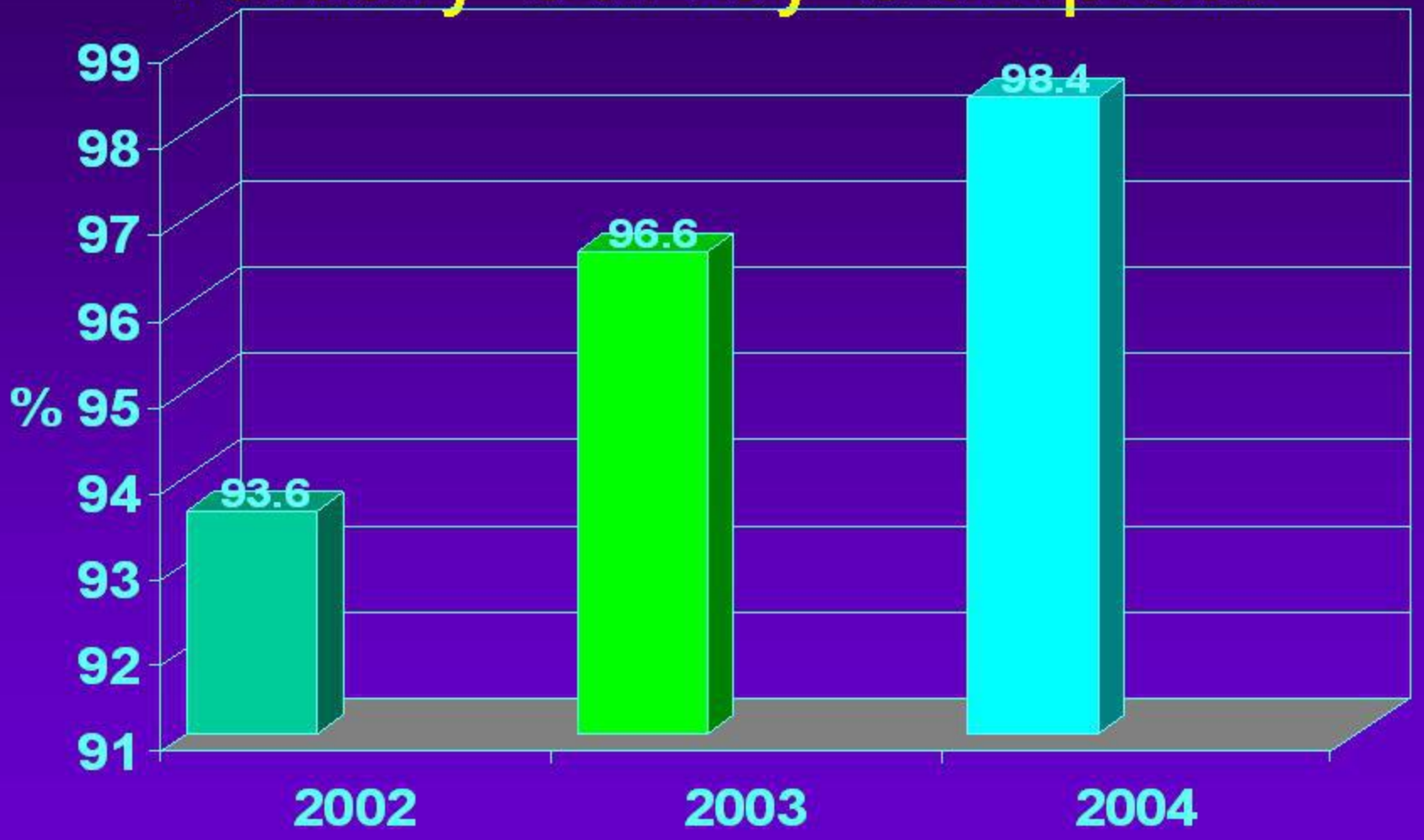
Operative procedures	
New injuries discovered or suspected?	
Most Recent Pathology Results	URINALYSIS: Blood NO/YES (macro/micro)
Plan for further management	

Worldwide

- Violence is leading public-health problem
- Road traffic injuries cause extensive and serious public-health problems
- Annually >100 million sustain injuries
- >5 million die from violence and injury
- 90% global burden of violence and injury mortality in low and middle-income countries

www.WHO.int/gb/ebwha/pdf_files/WHA60/A60_R22-en.pdf

Tertiary Survey Complete



Clinical Pathways

- Ribs
- Blunt abdominal trauma
- Fractured Pelvis
- Severe head injury
- Fractured Femur shaft
- Elderly

Sesperez J and Wilson S. Jalaludin B, Seger M, Sugrue M. Trauma Case Management and Clinical Pathways: Prospective Evaluation of Their Effect on Selected Patient Outcomes in Five Key Trauma Conditions. JTrauma 2001;50: 643-649

Elements

- Assessment
- Tests
- Nutrition-hydration
- Mobility
- Medications
- Pain
- Education
- Discharge planning

CLINICAL PATHWAY

FRACTURED RIBS

Date _____	Expected Outcomes Day of Admission	AM Sign	PM Sign	ND Sign	Action if Outcomes not met
Assessment / Observations	Medical Assessment Surgical Team assessment and definitive plan documented in notes Medication chart attended Medical Admission attended Consults attended if required Nursing Assessment History taken Oxygen therapy commenced Vital signs recorded 1/24 to achieve: • Sats > 95% * HR <100 • RR 12-24 * SBP > 100 *Temp 36-38.5C Measure & apply 1/2 length TEDS if ordered				
Investigations/ Tests	Tests Ordered and Reviewed C-spine x-ray ☐ CXR ☐ PXR ☐ ECG ☐ Urinalysis ☐ Other _____				
Nutrition/ Hydration	Tolerating diet Input and output on Fluid Balance Chart				
Activities of Daily Living	Encouraged to mobilise if able Encourage deep breathing & coughing				
Medications	Patient's regular medications DVT prophylaxis Stool softeners NSAIDS are charted (unless contraindicated)				
Pain Management	Pain score is <3 and documented 1/24 Regular analgesia is ordered & administered PCA or epidural is commenced				
Patient Education	Give and explain handouts • Information pamphlet ☐ • Hospital/Ward Information ☐ • Explain admission procedure ☐ • Patient treatment & status explained to patient and family/significant others ☐				
Discharge	Discuss length of stay and discharge				

Interhospital Transfers

Works	Doesn't Work
Guidelines Criteria Dedicated phone MTS accepts Capacity for conference calls Confirm who is arranging transport Policy Hotline Feedback	Sending everything Delay recognise needs transfer Direct to ward /ICU (bypass Resus)

High Dependency Trauma Patients

- Trauma patients at higher risk of developing life threatening complications
  - Multiple injuries
  - Those at risk of bleeding
  - Significant co-morbidities
  - Elderly
- Very few trauma specific HDU in Australia.

Tools

- Injury and management list
- Spinal clearance and positioning
- Tertiary survey
- Clinical Pathways
- “Fast Hugs”
- Clinical Practice Guidelines

Injury and management list

Mechanism	Treating teams	
	Surgical	.....
	Ortho	.....
	Neuro	.....
	Vascular	.....
	Plastics	.....
	Other	.....

	Injury	Management plan
Head		
Face		
Chest		
Abdo		
Pelvis		
Upper		
Lower		

Spinal Clearance Form

SPINAL CARE FORM

CERVICAL SPINE

CT Scan Yes ☐ No ☐				Plain films Yes ☐ No ☐	
Cleared:	Radiologically	Yes	No	Comments	
	Clinically	Yes	No		
Cleared by:	Name			Date	Neurosurgical ☐
	Designation				Radiologist ☐

THORACIC SPINE

CT Scan Yes ☐ No ☐				Plain films Yes ☐ No ☐	
Cleared:	Radiologically	Yes	No	Comments	
	Clinically	Yes	No		
Cleared by:	Name			Date	Neurosurgical ☐
	Designation				Radiologist ☐

LUMBAR SPINE

CT Scan Yes ☐ No ☐				Plain films Yes ☐ No ☐	
Cleared:	Radiologically	Yes	No	Comments	
	Clinically	Yes	No		
Cleared by:	Name			Date	Neurosurgical ☐
	Designation				Radiologist ☐

PATIENT POSITIONING PLAN

Jordan frame permitted	Yes	No	Not apply
Log roll permitted	Yes	No	Not apply
Philadelphia collar required	Yes	No	Not apply
Sand bags	Yes	No	Not apply

Position patient	Supine Head of bed can be raised ____^{0}C Can sit without restrictions

SPECIAL INSTRUCTIONS

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*

*

*

ICU – HDU - Ward

Works	Doesn't Work
Tertiary survey Clinical pathways Monitor in-out Documented management plan Early referral allied health, rehab TEP FASTHUGS Injury List Spinal clearance form	Poor documentation and communication between teams

In Australia and New Zealand

Leading cause of death in 1-44 age group

Across all ages represents a major proportion of mortality and disability

Populations at Risk

Works	Doesn't Work
Recognise Develop policies Elderly - HDU On warfarin - INR Pelvic fractures – find source Pregnancy - FHM Clinical pathways	Fail to: •Provide adequate analgesia •Monitor fluid balance •Suture scalp laceration •Admit elderly pts to HDU

Performance Improvement

- Identify, track, analyze
- PI meetings
- Peer Review deaths
- Follow up on system issues
- Monitor trends
- Practice guidelines: develop, implement, monitor
- Loop closure

Education

- EMST
- TNCC
- CATN
- DSTC -DPNTC
- ACS
- SWAN

www.swsahs.nsw.gov.au/livtrauma

Research

- Registry
- 10 year report
- Changes in Practice
- Prevention
- Peer Review Process
- Key Performance Indicators

Administration

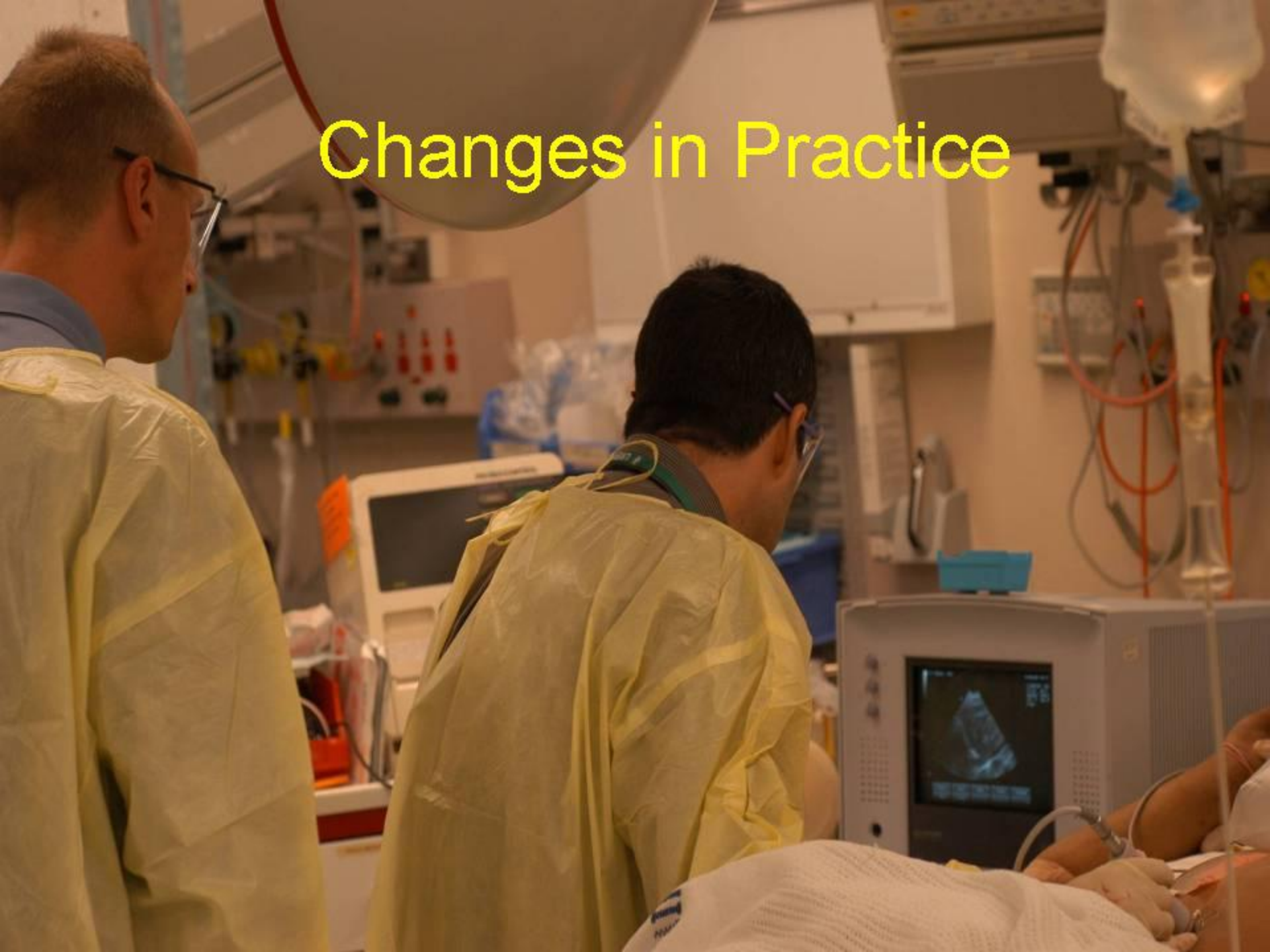
- Committees
- Policy Review
- Hospital function
- Verification

Registry

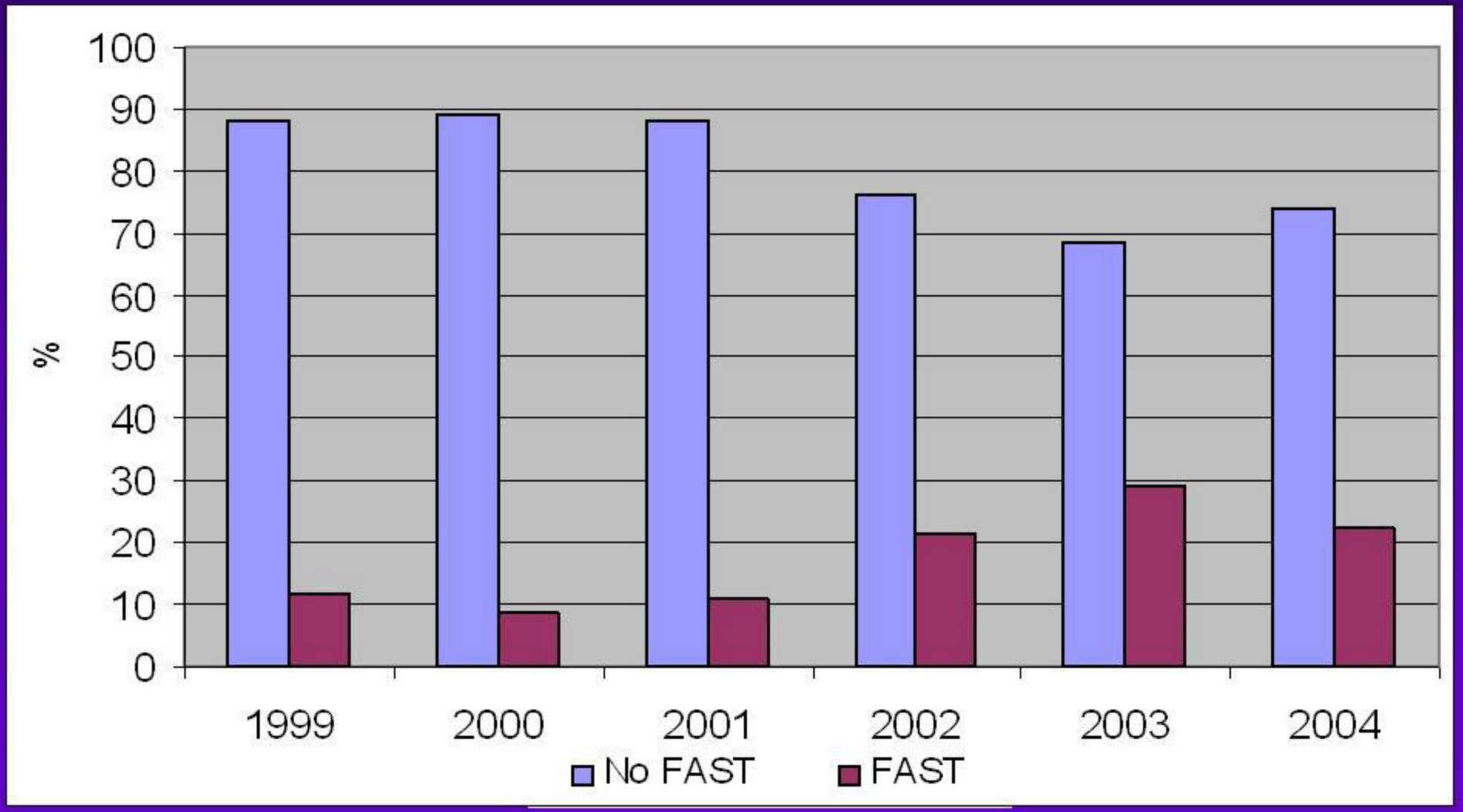
- Data collection
- Key Performance Indicators
- Clinical Pathways
- PIP

PIP

iption	Code	Description	Code
of Reduction/fix	6506	Delay in MD response	9004
nion	6507	Delay Obtaining consult	9005
myelitis	6508	Delay in Diagnosis	9006
baedic Wound on	6509	Error in Diagnosis	9007
	6594	Error in Judgement	9008
blogic	70	Error in Technique	9009
l Withdrawal	7001	Incomplete Record	9010
Encephalopathy	7002	No Tertiary survey	9011
Death	7003	Not under General Surgeon	9012
es Insipidus	7004	Delay suture laceration	9013
gitis	7005	Communication failure	9016
praxia (iatrogenic)	7006	Not referred to Coroner	9017
perative SDH/EDH	7007	Abdominal Compartment	91
ss n original insult	7008	Cohort At risk for ACS	9101


Changes in Practice

F.A.S.T.


100
90
80
70
60
50
40
30
20
10
0
%
1999
2000
2001
2002
2003
2004
No FAST
FAST

Fundamental principle of trauma systems

- Concentrate severely injured patients to a limited number of higher level facilities
- Increase volume and experience at these centres
- Improve patient outcomes

ACS

	Abdominal Compartment	91
8	Cohort At risk for ACS	9101
9	IAP measures taken	9102
0	ACS Primary	9103
1	ACS Secondary	9104
2	Temp abdominal closure	9105
3	Operation Ref. Hospital	92
	Craniotomy	9201
1	Thoracotomy	9202
2	Laparotomy	9203
3	ORIF fracture	9204
4	Other	9205
5	C-Spine	94
6	Missed c-spine Injury	9411
7	Not missed c-spine	9412
9	Suspect c-spine NAD	9413
1	Delay clearing C-spine	9414

Effective Trauma System

- Incorporate care providers into organised integrated framework.
- Prehospital, hospital, transport, rehab
- Statewide structure - non-institutional
- Rapid, efficient movement of patients

Outcome Measures

- MTOS established norms
- ISS
- TRISS Ps
- Z scores SMR

Effectiveness

- Jurkovich, 1999 Systematic review - registry based assessments provide evidence
- Nathans, 2000 Comparison national rates NCHS and FARS. States with trauma systems had 9% reduced mortality (>17% road)
- Mann, 1999 Effectiveness is based on hospital deaths: recommend expand outcomes measures to assess entire continuum of care

Is There a Problem?

- Fail to limit number of MTS
- Trunckey JAMA 1995
- Metropolitan Sydney has 8
- Qld
- Victoria
- WA

The Way Forward

- Strengthen links and share knowledge
- Local and regional
- National, Bi-national
- NTDB, TARN, EuroTARN

- ACS,TAC, ATS, RACS, STN
- Trauma.org

Registry data

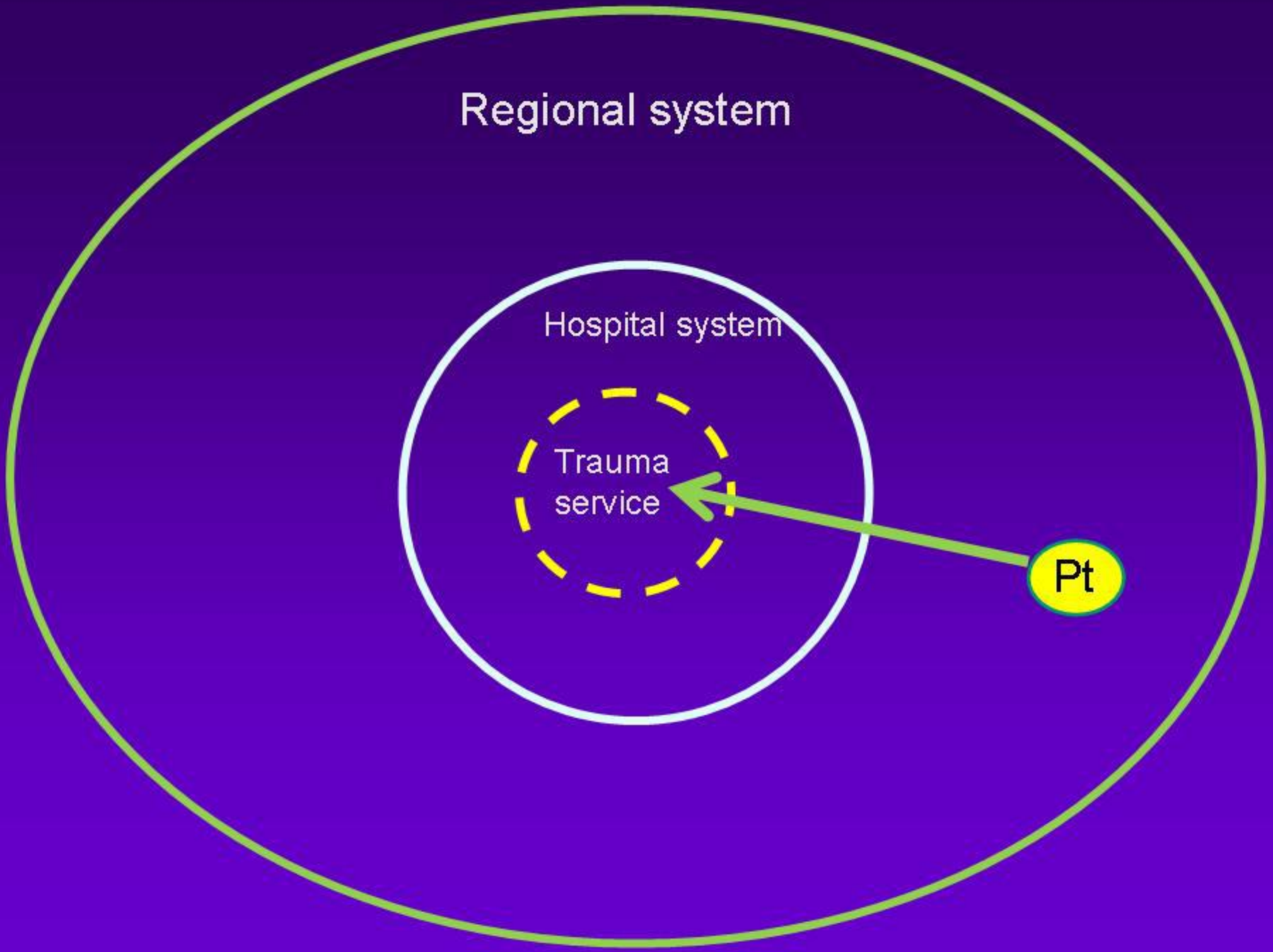
- Common inclusion criteria
- Consistent definitions
- Outcome measures other than survival
- Deaths pre hospital and post discharge

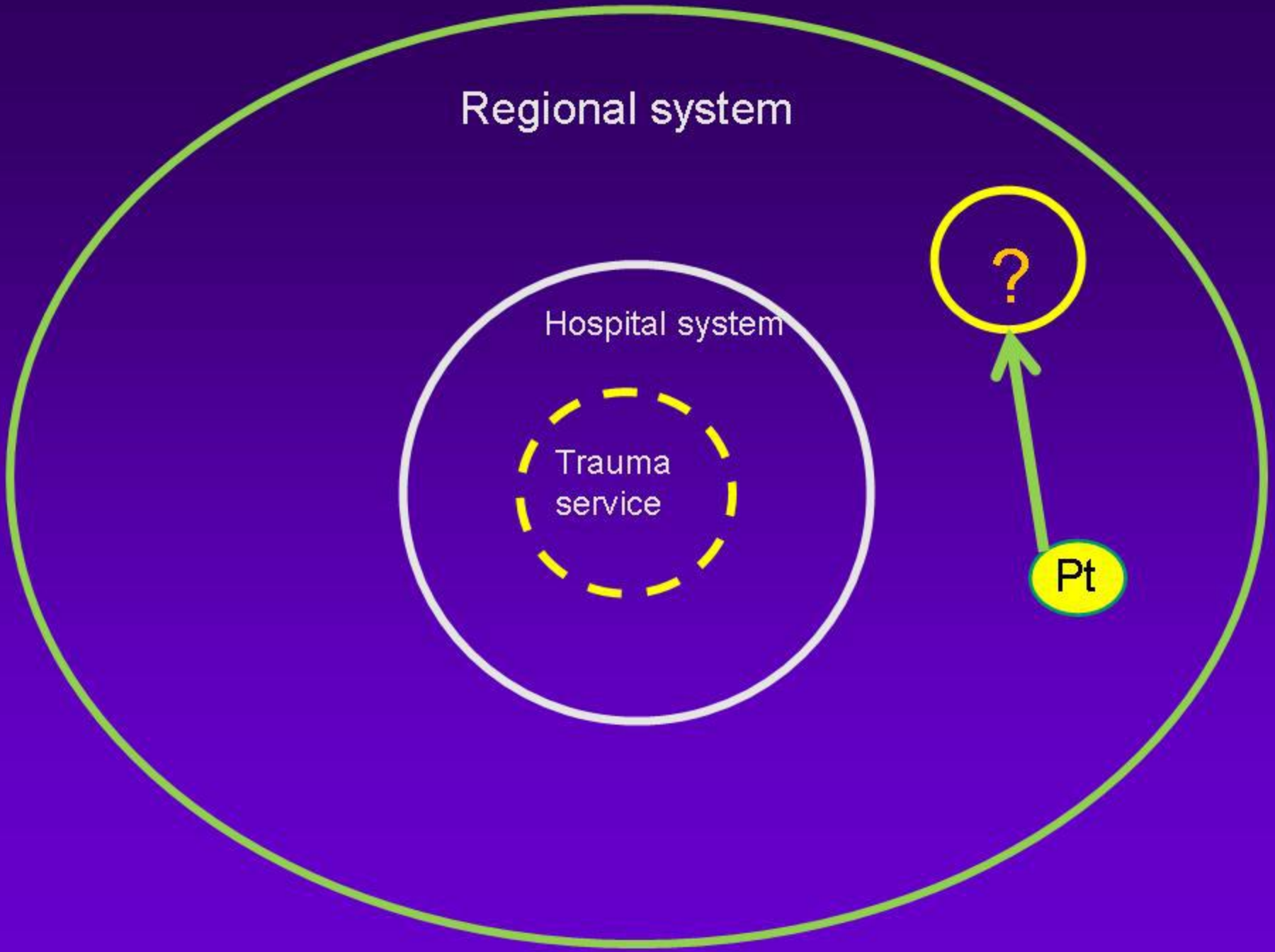
Ultimate Reward

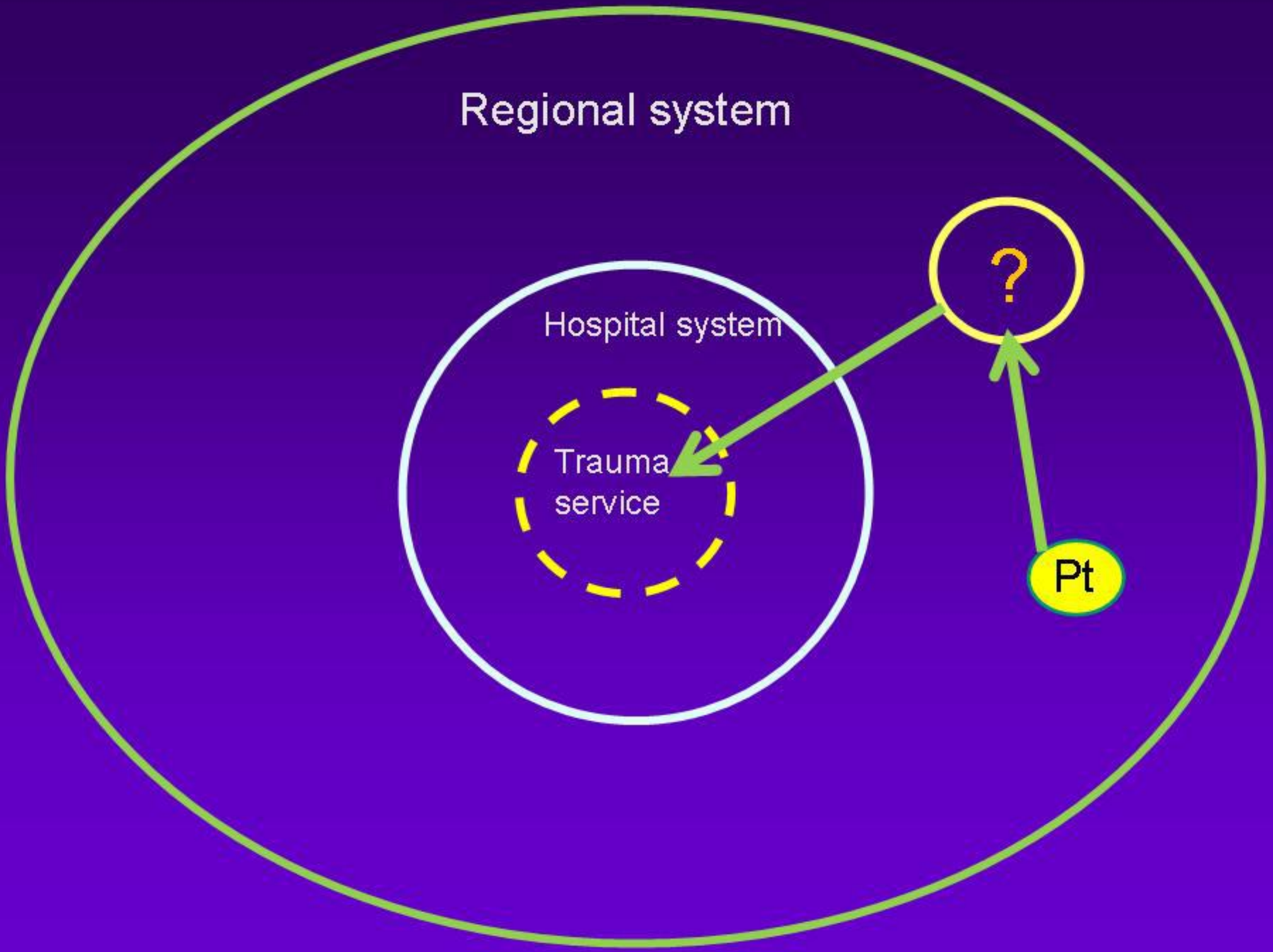
"The ultimate reward of trauma surgery is the opportunity to restore the previously healthy individual to a productive life after sustaining a devastating injury from a random unanticipated moment of human error."

Ernest Moore JTrauma 1995


THANKS MATES !
swsahs.nsw.gov.au/livtrauma


Regional system
Hospital system
Trauma service
Pt


Regional system
Hospital system
Trauma service
?
Pt


Regional system
Hospital system
Trauma service
?
Pt

Consequently…

- Those hospitals designated to receive a high volume of patients with multiple injuries or severe single injuries should be clearly identified as having additional expertise in the area of trauma care.