

Trauma: The ideal system a view from the West



Trauma System, CRHA

Trauma Patient - EMS Response

$\text{PHI} \geq 4$

**Tertiary Trauma Centre
FMC & ACH**

$\text{PHI} < 4$

**District Trauma Centre
PLC & RGH**

41F Motor vehicle rollover

- Arrives awake. BP 138/76. P 90
- C/o mild diffuse aches and pains.
- CBC, CXR
- Admitted
- Spines cleared.

41F Motor vehicle rollover

- Day 1, Confused
- Repeat CBC, Hgb 66
- Transported by ground, BLS to tertiary trauma centre. 2 hours.

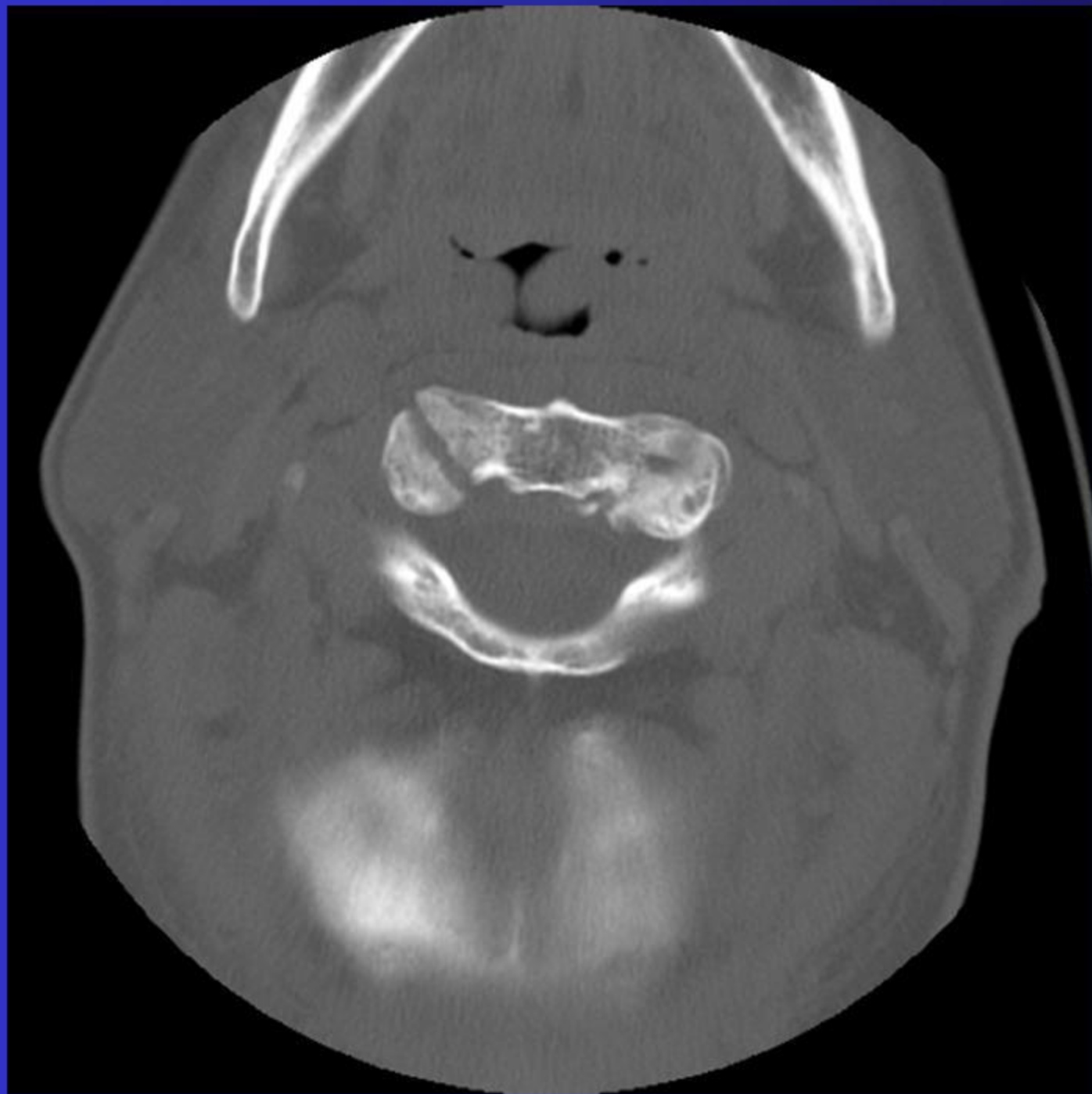
41F Motor vehicle rollover

- Received by trauma Team. ED Physician, RN's, RT, surgery, Radiology tech.
- BP 100/78, P105, GCS 14
- ABC,s. Spinal precautions, CXR,PXR,Complete spines, CT head C spine, abdomen/pelvis.

R







- Ongoing bleeding - Lap/packing for liver injury.
- Additional injuries
 - C2 # - Halo
 - Facial # - Non op



Thag Anderson becomes the first fatality as a result of falling asleep at the wheel.

30M Motor bike crash

- Transported to regional centre
- 20 minutes by EMS, Spine board, IV's, O2
- GCS 8
- 80/60, p130

Excerpt from April 2001 news release:
Potential Years of Life Lost (PYLL)

In Canada, there are approximately 1.04 million potential years of life lost prematurely due to all causes of death. Overall, deaths due to trauma are the second leading cause of potential years life lost (PYLL). There were 305,439 potential years life lost prematurely due to injury in 1996, representing 29% of the total Canadian PYLL in 1996.

For those aged 1 to 44 years, however, deaths due to trauma remain the leading cause of potential years life lost (PYLL). A total of 261,015 potential life years were lost in this age group due to injury accounting for almost half (47%) of the total Canadian PYLL in 1996.

30M Motor bike crash

- ABC's by ED team, Intubated, 2 IV's, crystalloid and blood, initial bloodwork, ABGs, CXR, PXR
- Obvious shock and extremity injuries.
- Trauma Team Activation - GS, Ortho

30M Motor bike crash

- To OR for persistent hypotension 88/60, p120 post 2 units PRBCs
- Laparotomy, Splenectomy, Damage control with pelvic packing for large retroperitoneal hematoma. Pelvis stabilized with Ant. Ext. Fix.
- Transport team activated, transport from ICU immediately post op to Tertiary trauma centre. Ongoing resuscitation and rewarming.

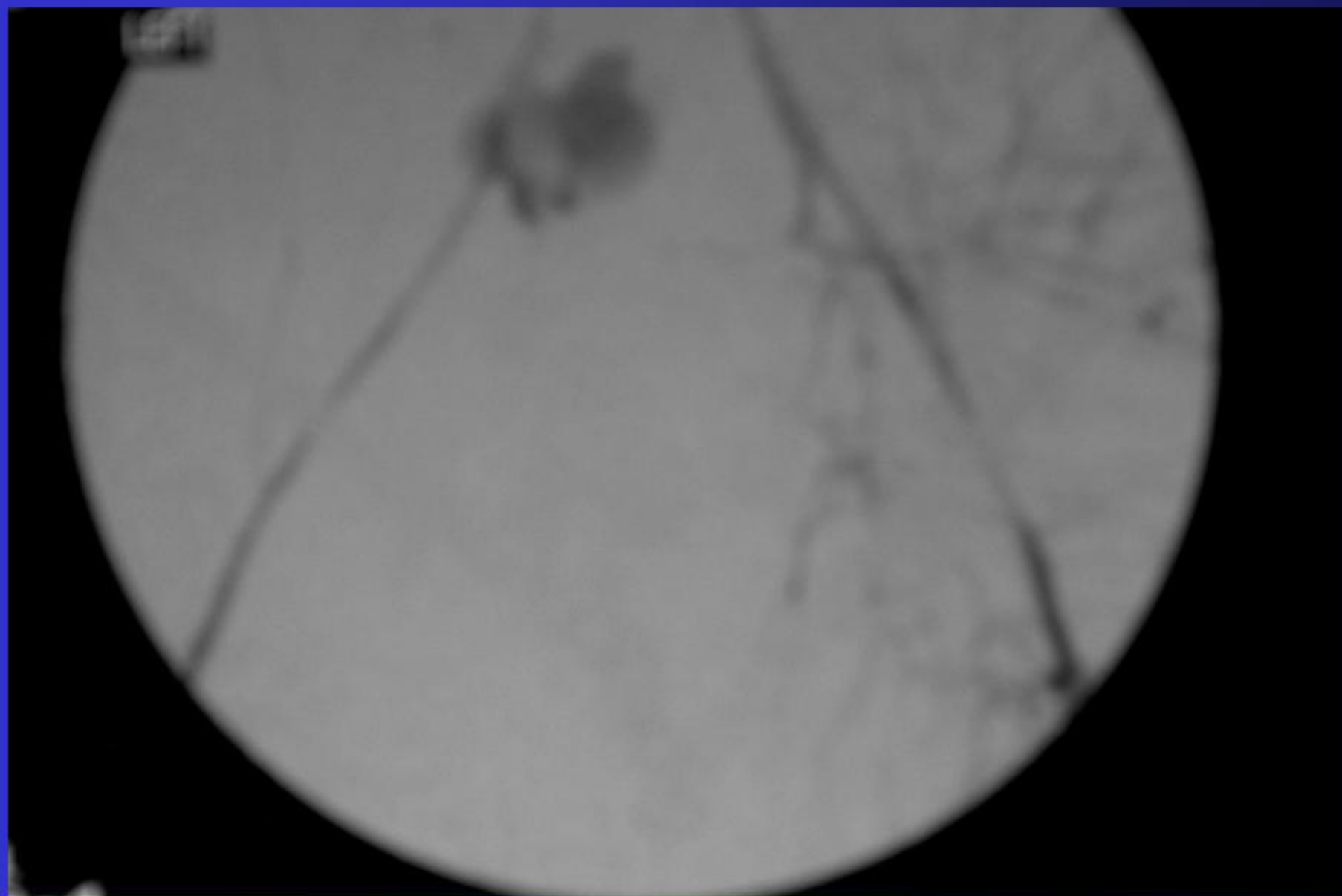




30M Motor bike crash

- Tertiary Trauma team receives patient. CT head, C spine, abdomen pelvis
- CT Head mild diffuse edema, no hemorrhage
- Angio-embolization of R int. iliac, repacked
- To ICU, correct coagulopathy, acidosis
- ORIF Pelvis day 2.







30M Motor bike crash

- ICU day 2-10, SIRS, Sepsis. ARDS, Coma
- Gradual recovery
- Day 11-20 Trauma Service. DVT - PE Anticoagulated. Gradual CNS recovery
- Day 21 transferred to MSSK rehab. Outpatient brain injury follow-up.
- Trauma and Ortho follow-up.



Crown: We would have Dr Kortbeek recognized as an expert in trauma.

Judge: The court recognizes Dr Kortbeek as an expert witness in Trauma for the purposes of these proceedings.

Judge: (To witness) what is Trauma anyway? E.R. right?



Trauma

Triage

Hospital standards

Accreditation

The system

**Trauma System
Accreditation Guidelines**

**THE TRAUMA ASSOCIATION
OF CANADA**



**RESOURCES
FOR
OPTIMAL CARE
OF THE
INJURED
PATIENT:
1999**



**COMMITTEE ON TRAUMA
AMERICAN COLLEGE OF SURGEONS**

The Trauma Centre

- Complete, Coordinated Efficient Care
 - Outreach / Education
 - Research
 - Registry
 - Trauma Systems
-
- Accreditation / Verification
 - Outcomes

Overview FMC



Infrastructure

Admin

Service

Standards

Trauma Bay



Operating Room



ICU
DI





Role of the General Surgeon



1. Attendance at Major Trauma Resuscitations, supports the ED Doc in initial resuscitation

2. Mobilizes the hospitals resources for major trauma

3. Provides Immediate OR access

4. Designated receiving service with expertise in trauma care.

Trauma team Activation

- GCS < 9
- Hypotension with BP < 90
- Blood Transfusion en route or on arrival
- GS wound H&N & Trunk
- ED Discretion
- Intubated Patient or Acute Respiratory Failure
- Severe Hypothermia

How do we know we have good trauma centres?

- A) The region and ministry have designated your hospital a trauma center.
- B) The Federal government says we have the best health care system in the world.
- C) The lobby is very nice and shiny.
- D) Meets national minimum standards, (verified) and standard performance measures are published (and public).

41F Motor vehicle rollover

- Alert, Stable. Fellow passenger deceased at scene.
- 20 minutes from regional centre. 12 minutes from rural hospital.

Performance indicators & Questionnaire

- TTLs and ATLS?
- Road trip, who goes? Who admits? Trauma ward/unit? ICU access?
- Quality council, who, what, where and when?
- Pre-hospital times?
- Resuscitation times?
- Time to OR for shock, fractures, craniotomies?
- Outcomes, dead or alive?
- Unrecognized injuries, complications?

How Do We Perform?



Performance Indicators & Outcomes



Welcome to the Liverpool Trauma Website

Welcome to the Trauma Department at Liverpool Hospital, a teaching hospital of the University of New South Wales in [Sydney](#), Australia.

To enjoy the Liverpool Trauma Web Site fully, we invite you to become a member of **LivTrauma**. You will be able to enjoy Trauma cases and complete multiple choice questionnaires. More interactive sections will be added as we continue to develop the web site. So in the mean time enjoy your Liverpool Trauma web site and click [here](#) to become a member.



The thirteenth SWAN Trauma Conference will be held on 29th and 30th July, 2005. Click [here](#) for details. Seven international speakers have been confirmed. Book early to avoid disappointment and enjoy the benefits of the early bird rate.

- [interim programme for this year's SWAN meeting](#)
- [interim programme for this year's SWAN meeting - REGISTRATION FORM](#)
- [Click here for submission of free papers](#)

HOME



TRAUMA UNIT



LIVERPOOL
HOSPITAL



EDUCATION



PUBLIC
INFORMATION



MEETINGS



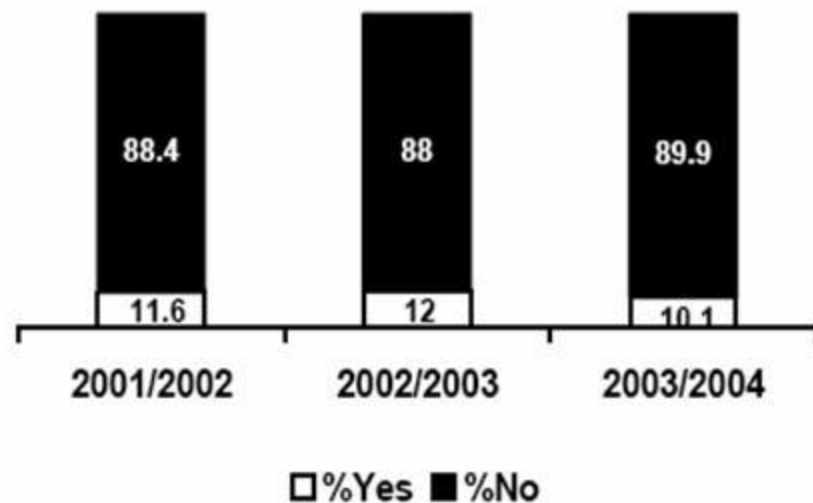
OUTCOME

Mortality

Did the patient die at the FMC trauma centre?

Indicator	Yes	No
2003/2004, n = 860	87	773
2002/2003, n = 767	92	675
2001/2002, n = 790	92	698

n = all patients arriving at FMC trauma centre.



Evaluating Trauma Care: The TRISS Method

Major Trauma Outcome Study (MTOS) - a study in which TRISS scoring, age, and mechanism of injury were used to calculate norms for survival in a regression analysis of 80,000 patients with trauma in 139 North American hospitals. The norms were updated in 1990. Patients with a survival probability (P_s) of 0.5 or less are expected to die and those with a P_s greater than 0.5 are expected to live. The Major Trauma Outcome Study cohort has been widely used as a benchmark for comparing outcomes in patients with trauma using the TRISS methodology. It can be used to identify unexpected outcomes in populations and in individual patients.

- Champion HR, Copes WS, Sacco WJ, et al. The Major Trauma Outcome Study: Establishing national norms for trauma care. J Trauma 1990; 30: 1356-1365.
- Champion HR, Sacco WJ, Copes WS. Injury severity scoring again. J Trauma 1995; 38: 94-95.

FMC TRISS 2004

Fiscal Year: April 1, 2003 - March 31, 2004

	z Score	W Score	Sample Size
Adult Blunt	2.94	2.6	585
Adult Penetrating	0.93	-	24
Paediatric	0.23	-	3
Total Subset	3.06	2.62	612

Data: 1995 – 2004

	z Score	W Score	Sample Size
Adult Blunt	5.54	1.95	3833
Adult Penetrating	1.84	-	166
Paediatric	0.61	-	13
Total Subset	5.80	1.99	4012

For 1995 - 2004, there were 1.99 more survivors per 100 than would have been expected from the major trauma outcome study.

Known Transport Time by Calgary EMS

Time spent transporting patient to trauma centre, direct from scene, by Calgary EMS (responder):

Yes = Transport time is known (time responder left scene *and* time responder arrived at trauma centre);

No = Transport time is unknown (time responder left scene *and / or* time responder arrived at trauma centre).

- Minimum - Time spent transporting patient to trauma centre by Calgary EMS (responder) where transport time is known (time responder left scene *and* time responder arrived at trauma centre).
- Maximum - Time spent transporting patient to trauma centre by Calgary EMS (responder) where transport time is known (time responder left scene *and* time responder arrived at trauma centre).
- Average - Time spent transporting patient to trauma centre by Calgary EMS (responder) where transport time is known (time responder left scene *and* time responder arrived at trauma centre).

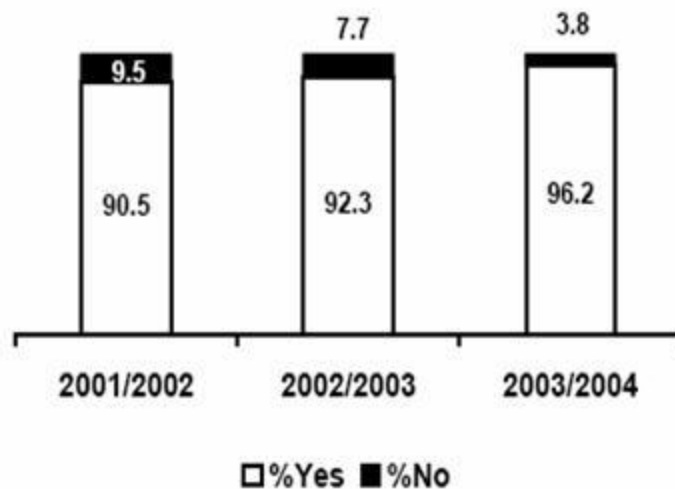
Note: Transport time information provided by Calgary EMS.

n=222				
Indicator	Yes	% Yes	No	% No
Calgary EMS time documentation	183	82.4%	39	17.6%
• Minimum	2 minutes			
• Maximum	47 minutes			
• Average	16.6 minutes			

RESUSCITATIVE PHASE

Trauma Team Leader (TTL) Response TimeWas the TTL response time \leq 20 minutes?

Indicator	Yes	No
2003/2004, n = 210	202	8
2002/2003, n = 196	181	15
2001/2002, n = 231	209	22



n = all patients with trauma team activation and a known trauma team leader response time (excludes direct admits)

Unknown trauma team response times (25) excluded from response time analysis.

41F Motor vehicle rollover

- Destination?
- A) Rural hospital 12 min ←
- B) Regional hospital 20 min ←
- C) Tertiary trauma 90 min ←
- D) Mayo Clinic A long time

DEFINITIVE CARE

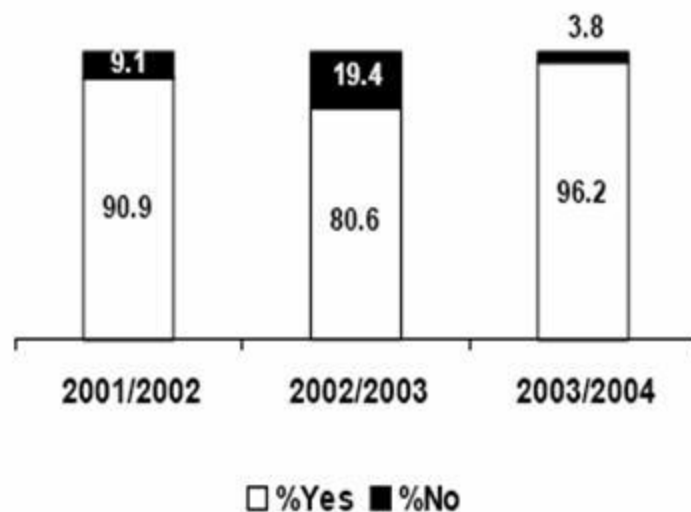
Femur Fracture

Did the patient have operative management of the femur fracture within 24 hours of arrival to FMC trauma centre?

There was a 70.9% increase in the number of patients qualifying for this indicator this year.

Indicator	Yes	No
2003/2004, n = 53	51	2
2002/2003, n = 31	25	6
2001/2002, n = 55	50	5

n= all patients with operative management of femur fracture.



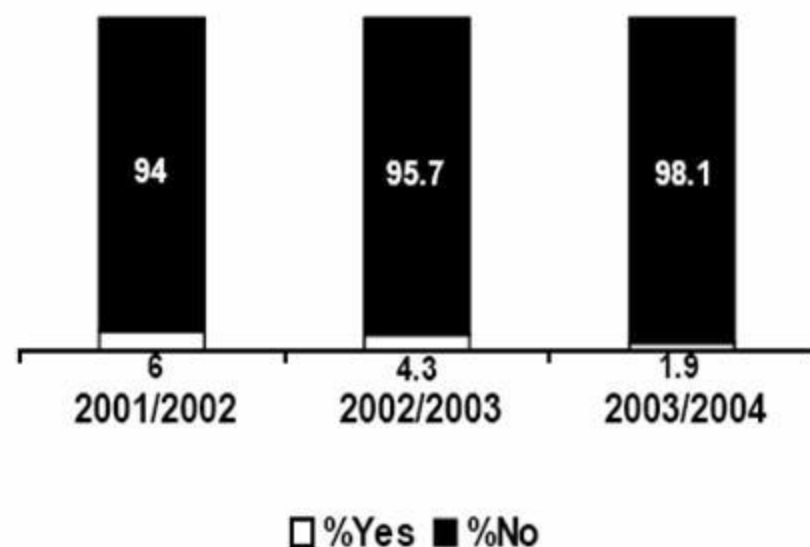
Delayed Diagnosis/Missed Injury

Did the patient have a delayed diagnosis or missed injury during hospitalisation at the FMC trauma centre?

Of the missed injuries, 62.5% were extremity, 18.8% were spinal, 12.5% were thorax, and 6.2% were facial.

Indicator	Yes	No
2003/2004, n = 839	16	823
2002/2003, n = 741	32	709
2001/2002, n = 764	46	718

n = all patients admitted to FMC Trauma Centre.

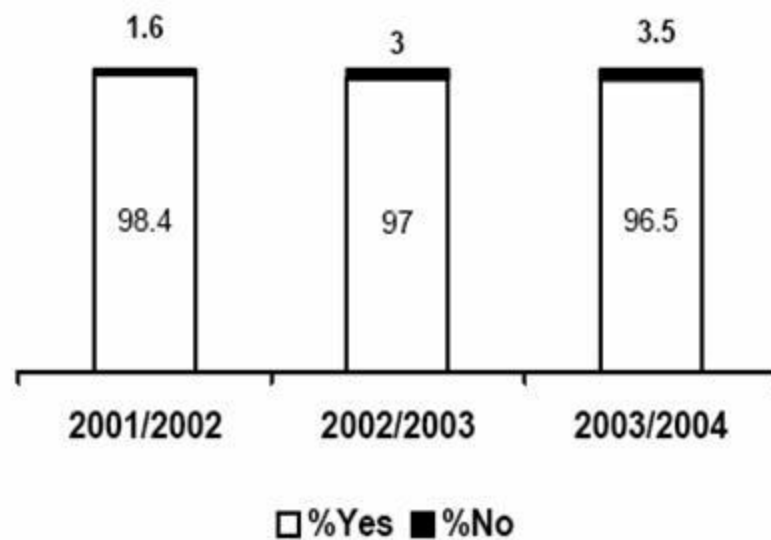


Admitting Physician

Was the patient admitted under a surgeon or intensivist at the FMC trauma centre?

Indicator	Yes	No
2003/2004, n = 838	809	29
2002/2003, n = 740	718	22
2001/2002, n = 764	752	12

n = all patients admitted to FMC Trauma Centre.
NOTE: Excludes patient admitted for palliative care.





What is a trauma system?

- Delivers access to the appropriate level of organized trauma care to the inhabitants of a defined geographic area.
- Right patient, right place, right time!



What Are The Issues?

- Time from injury to tertiary care can be up to 12 hours in Alberta
- Trauma care across Alberta variable
- Tertiary Trauma services are confined to large urban centres
- **Golden hour of trauma care** - Trauma patients must reach definitive care quickly to minimize death or disability.



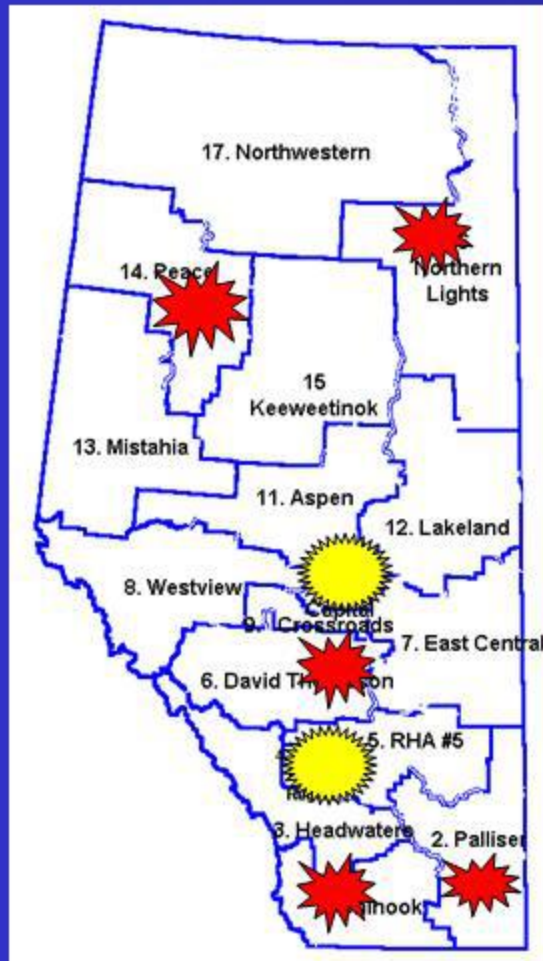


Surface transport extremely difficult or non-existent; winter transportation hazardous, time consuming.

'Golden hour' may extend to hours / days.



Prehospital care provided by municipalities; determined by local medical direction, not provincial or national standards.



Proposed Sites

Level 1 Trauma Centres:

Calgary

Edmonton

Proposed Level II Trauma Centres:

Lethbridge

Medicine Hat

Red Deer

Grande Prairie

Fort McMurray



Merger's & Acquisitions

Committee

Triage

Joint training & research

Policies & procedures

Cross appointments &
privileges

Pre-Hospital Index

Blood Pressure:

>100	0
86-100	1
75-85	2
0-74	3

Pulse:

>120	3
51-119	0
<50	5

Penetrating Trauma Abd/Chest:

No	0
Yes	4

Respiration:

Normal	0
Laboured / Shallow	3
<10 / min or needs intubation	5

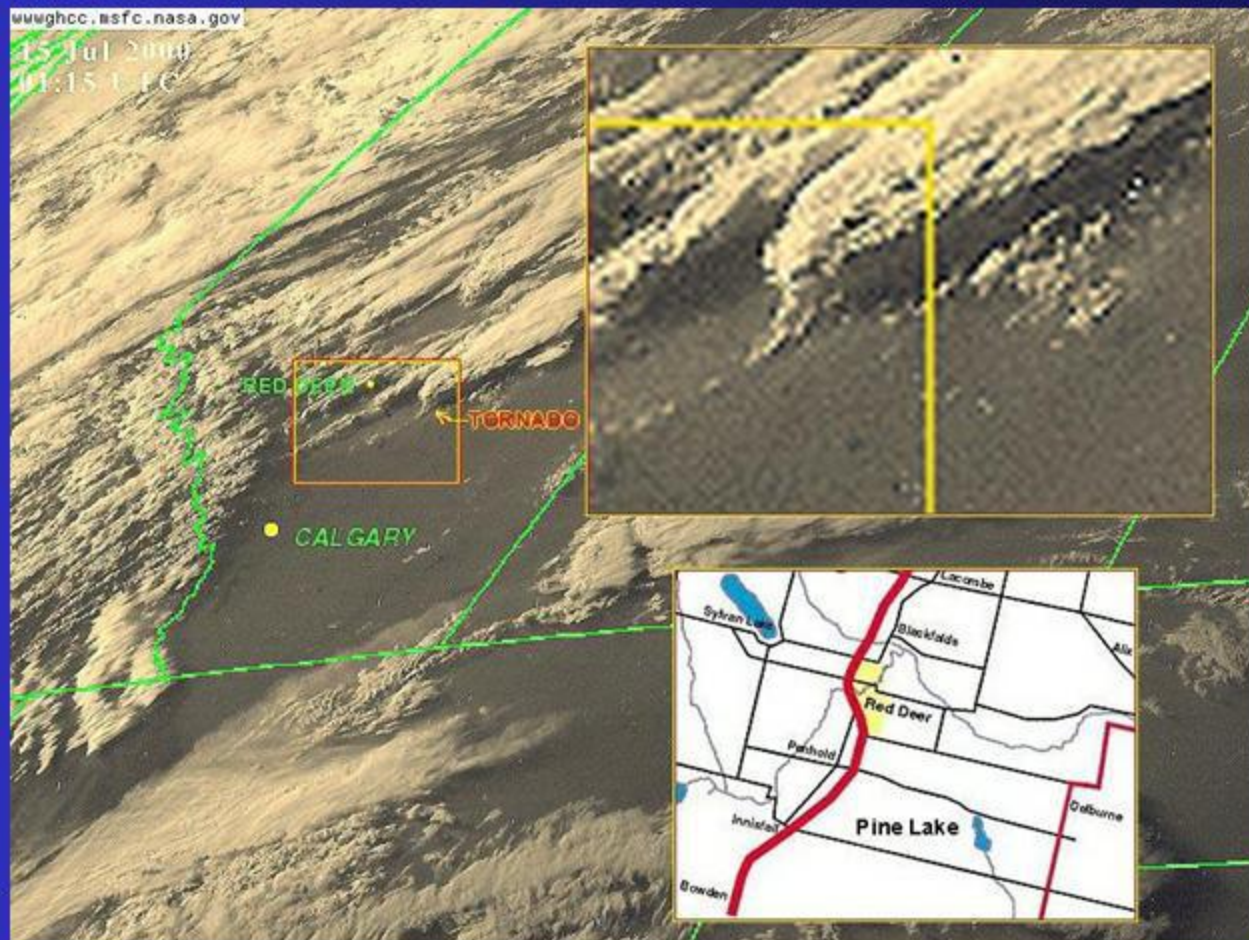
Consciousness:

Normal	0
Confused / Combative	3
No Intelligible Words	5

0-20

The Pine Lake Tornado as viewed from space. The Pine Lake Tornado was rated as an F3 on the Fujita Tornado Damage Scale by Environment Canada. The satellite images show the development of the cell as it travels eastward towards Pine Lake. The cell that spawned the tornado was well lit by a late afternoon sun and was clearly visible from Red Deer, Lacombe and points on Highway 2.

Note the well developed southern edge of the cloud. This cloud formation was clearly visible by several amateurs in Red Deer and Lacombe at around 1830 hrs MDT (0030 UTC) some 45 minutes before this satellite photo was taken. This image was taken some 10 to 15 minutes after touch down as the tornado headed east.





Trauma



Trauma Association
of Canada
L'Association canadienne
de traumatologie

Organized trauma systems, which standardize care of the seriously injured, prioritize access to emergency, diagnostic and surgical services, and rigorously measure performance as part of a trauma quality improvement program have, again and again, reduced mortality and morbidity.

Triage systems are well defined. E.g. PHI and MOI.

National standards for Trauma care organization and infrastructure.

Trauma care processes can be defined and measured.

A Trauma system is much more than a great trauma hospital.



Pre-Hospital Index

- PHI: 0 - 3

Surgery, 3%
Mortality, 0%

- PHI: 4 - 7

Surgery, 22%
Mortality, 0%

- PHI: 8 - 20

Surgery, 57.9%
Mortality, 53%

MOI Criteria With Positive Predictive Values

Criteria	Positive Predictive Value
Extrication Time > 20 min	40.0%
Ejection	22.4%
Occupant Death	21.4%
Steering Wheel Deformity Or Structural Intrusion > 20 in	19.0%
Auto versus pedestrians	17.9%
Fall > 15 ft	14.3%

Predictive Value of Scores

Triage Tool	Sensitivity	PPV	Specificity	NPV	Accuracy
PHI Alone	41%	40%	98%	98%	97%
MOI Alone	73%	18%	91%	99%	90%
Combined Score	78%	17%	89%	99%	89%

Triage Tool	Undertriage	Overtriage
PHI Alone	59%	2%
MOI Alone	27%	9%
Combined Score	22%	11%

$P \leq 0.001$