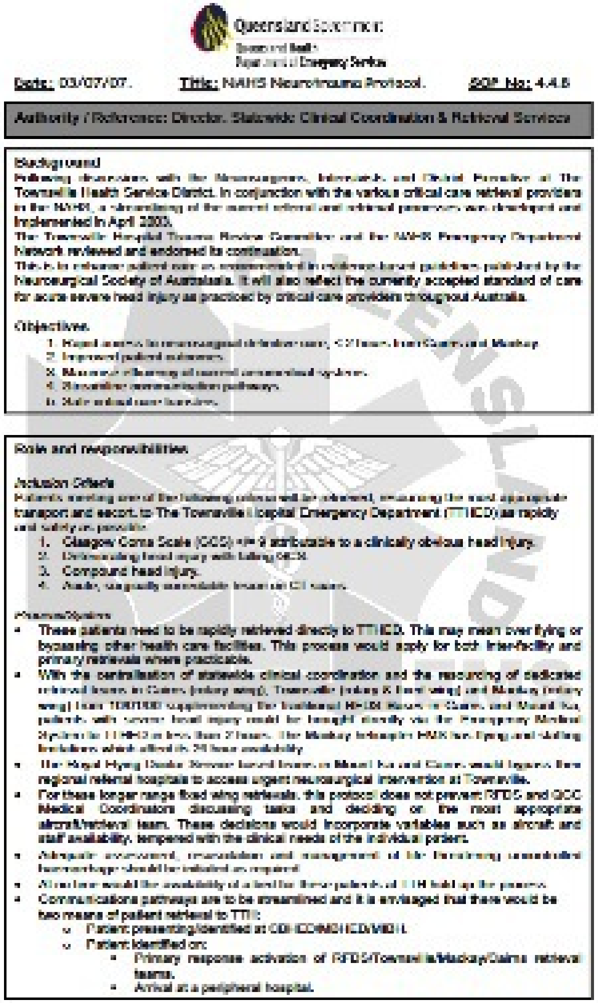
The role of a Neurotrauma Protocol in the retrieval of patients with TBI

Dr Mark Elcock
Senior Director
Retrieval Services & Counter Disaster Unit
Queensland Department of Health

Presentation Outline

- Background and History
- Review of Retrospective Data
- Summary



Retrieval Services in Queensland prior to August 2004

- Emergency Departments
- Intensive Care Units
- RFDS
- Careflight Queensland

- Fragmented & Regional
- Uncoordinated tasking
- No strategic direction or oversight
- Inconsistent decision making
- Inefficient coordination
- Non standardised
  - Credentialing & Training
  - Policy & Operating Procedures
  - Quality & Safety Review
  - Retrieval teams

Evolution of Retrieval Services

- *Between 2004-2006*
  - Consolidation into 2 Hubs (North & South)
  - Separate clinical models and providers
- *Post January 2006*
  - Retrieval Services Queensland and QCC
  - Statewide Coordination with standardised SOP
  - Single retrieval provider and standard datasets
  - Single governance
- Potential for before and after comparisons

North Queensland

- 0.927 (1.7) million km2
- 0.74 (4.66) million people

- 1 Tertiary Centre Townsville (Neurosurgery)
- 3 Regional Centres; Cairns, Mount Isa & Mackay
- Trauma; High death & separation rate
- Relatively self sufficient

By Comparison

North Queensland Neurotrauma Protocol

Background

- Minimal politics and good clinical networks in NQ
- Single neurosurgical centre in NQ
- Neurosurgical Society of Australasia Guidelines.
- Streamlining of processes was commenced in 2003.
- Endorsed by TTHTRC, NAHS ED Network & NAHS CEO

Objectives

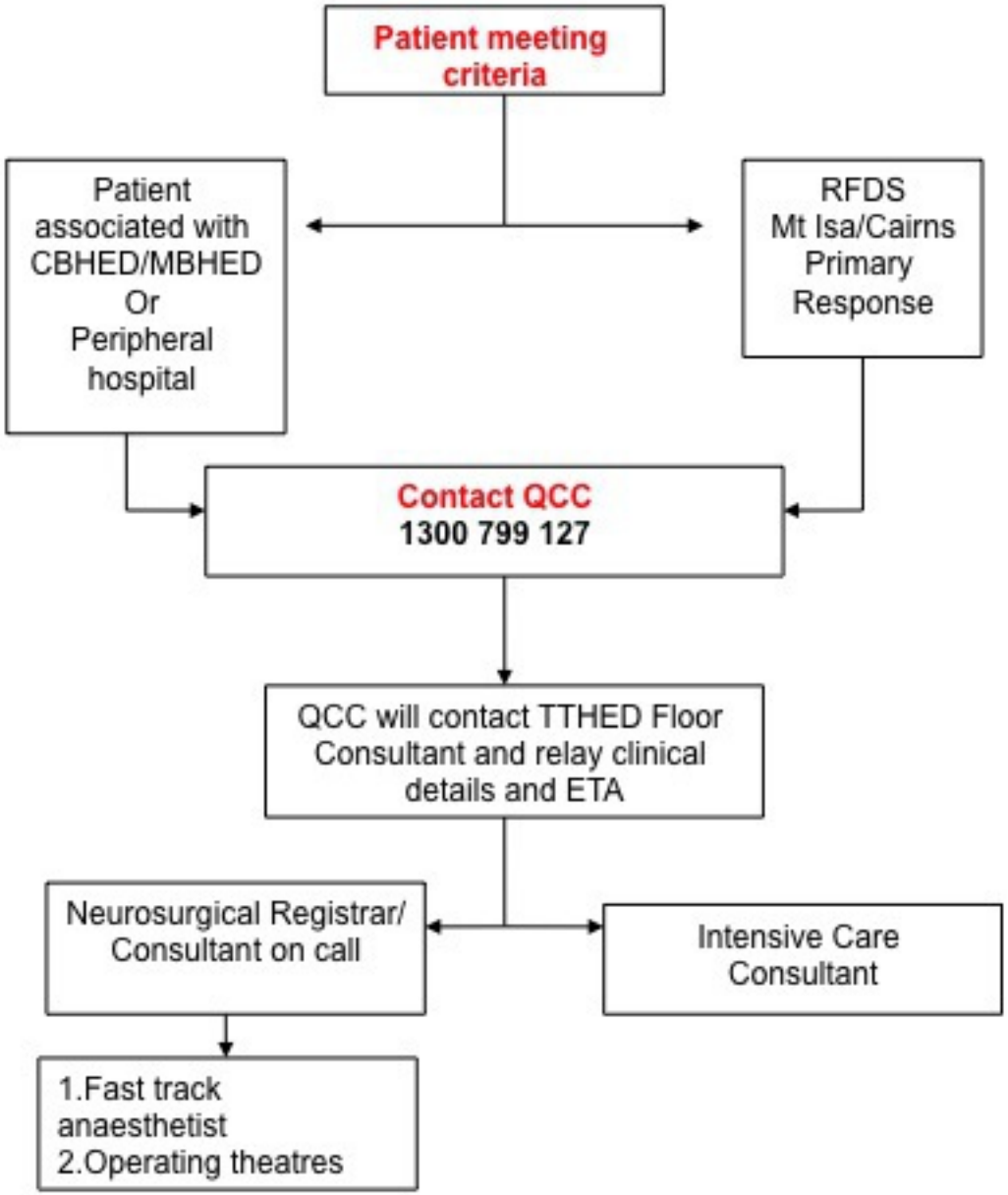
- Reduce time to definitive care & improve patient outcomes.
- Rapid access to neurosurgical definitive care, < 2 hours from Cairns and Mackay.
- Maximise efficiency of aeromedical retrieval systems.
- Simplification of communication and referral pathways.

Inclusion Criteria

- Patients retrieved, resourcing the most appropriate transport and escort, to TTHED as rapidly and safely as possible:
  - Glasgow Coma Scale (GCS) </= 9 attributable to a clinically obvious head injury.
  - Deteriorating head injury with falling GCS.
  - Compound head injury.
  - Acute, surgically correctable lesion on CT scans.

Neurotrauma Protocol Fundamentals

- Aeromedical cases only.
- Bypassing of smaller or usual referral facilities (P or IHT)
- Rapid referral to QCC and Medical Coordinator
- Centralised decision making and tasking
- Retrieval direct to TTH irrespective of ICU bed status
- Streamlined communication (internal and external)
- Consultant to Consultant discussions
- TTHTRC and Queensland Trauma Registry will perform a review of outcomes occurring as a result of the implementation of the Protocol.



Prior to 2006

- Patchy take up and dissemination
- No resources for education
- Evolving system
- Still not fully integrated

Post 2006

- Concerted roll out
- Standardised system
- Dedicated resources
- Improved data
- Central governance

Comparison; Before & After

Combined with other standardised practices,
had it and other initiatives made any difference?

Jan 2009; It was decided to perform a pre and post review of the impact of the NQ Neurotrauma Protocol.

"Do formal protocols reduce the time to definitive care"

- Ethics approval
- Queensland Trauma Registry Reports requested.

Major intracranial injury transferred to The Townsville Hospital for definitive care between 1st January 2004 and 31st January 2008.

- In total, 223 patients transferred to TTH following intracranial injury, as defined by NDSIS V2.1.
- Comparison of two time periods
- Time Period 1
  - 01/01/04 to 15/01/06; 106 patients
- Time Period 2
  - 16/01/06 to 31/01/08; 117 patients

Report and data supplied by the Queensland Trauma Registry (May 09)

Comparative Age/Sex/Mechanism Data

	TIME 1 (n=106)	TIME 2 (n=117)
Males	74% (78)	78% (91)
Predominant Age Group Male.	40-49yrs (19)	20-29yrs (23)
Predominant Age Group Female	0-9yrs (9)	20-29yrs (6)
Injuries < age 50 Male	76%	78%
Injuries < age 60 Female	82%	73%
External Cause of Injury	Falls/Collision 53% RTC 38%	Falls/Collision 55% RTC 40%

Comparative Types of Injury

	Time 1 (n=106)	Time 2 (n=117)
Subdural Haematomas	51	69
Contusions	37	39
Vault Fractures	32	29
Basilar Fractures	27	30
Extradural Haematomas	26	24
SAH	16	27
Oedema	16	15
ICH	13	22
DAI		12

Comparative Referral Patterns

Hospital	Time 1 (n=106)	Time 2 (n=117)
Cairns Base	36	41*
Mackay Base	21	18
Mount Isa Base	7	15
Ayr	6	6
Charters Towers	4	3
Atherton	3	5
Proserpine	1	4
Seen at two Hospitals before referred to definitive care	12	21

Transfer Time Frames

Transfer Time Frame		Time 1			Time 2	
	No Pts	Median	IQR	No Pts	Median	IQR
Time to retrieval time activation	34	110min	38-233min	65	175min	50-325min
Time spent at referring hospital	74	50min	20-96min	102	52min	24-84min
Total Transfer Time	77	121min	100-157min	103	115min	94-144min

Variables to note;

- Improved data collection between T1 & T2
- New CT Scanners (Mt Isa and Proserpine)
- Increased proportion of long distance transfers (Mt Isa doubled in T2)

Outcome Measures

	Time 1 (n=106)	Time 2 (n=117)
LOS		
Median LOS	8.5 days	10 days
IQR LOS	4-18 days	5-17 days
Bed Days	1323 days	2650 days
ICU admission	65% (69)	68% (79)
ICU Median LOS	4 days	4 days
IQR LOS	2-8 days	1-9 days
ICU Bed Days	410 days	446 days
Death Rate	12% (13)	14.5% (17)

"Do formal protocols reduce the time to definitive care"

MEASURE: Time to Urgent Craniotomy

	Time 1 (n=106)	Time 2 (N-117)
Total Patients requiring urgent craniotomy	28	28
Craniotomy within 4 hours	16 (61.5%)	23 (82.14%)
Craniotomy not performed within 4 hours	10 (38.5%)	5 (17.86%)

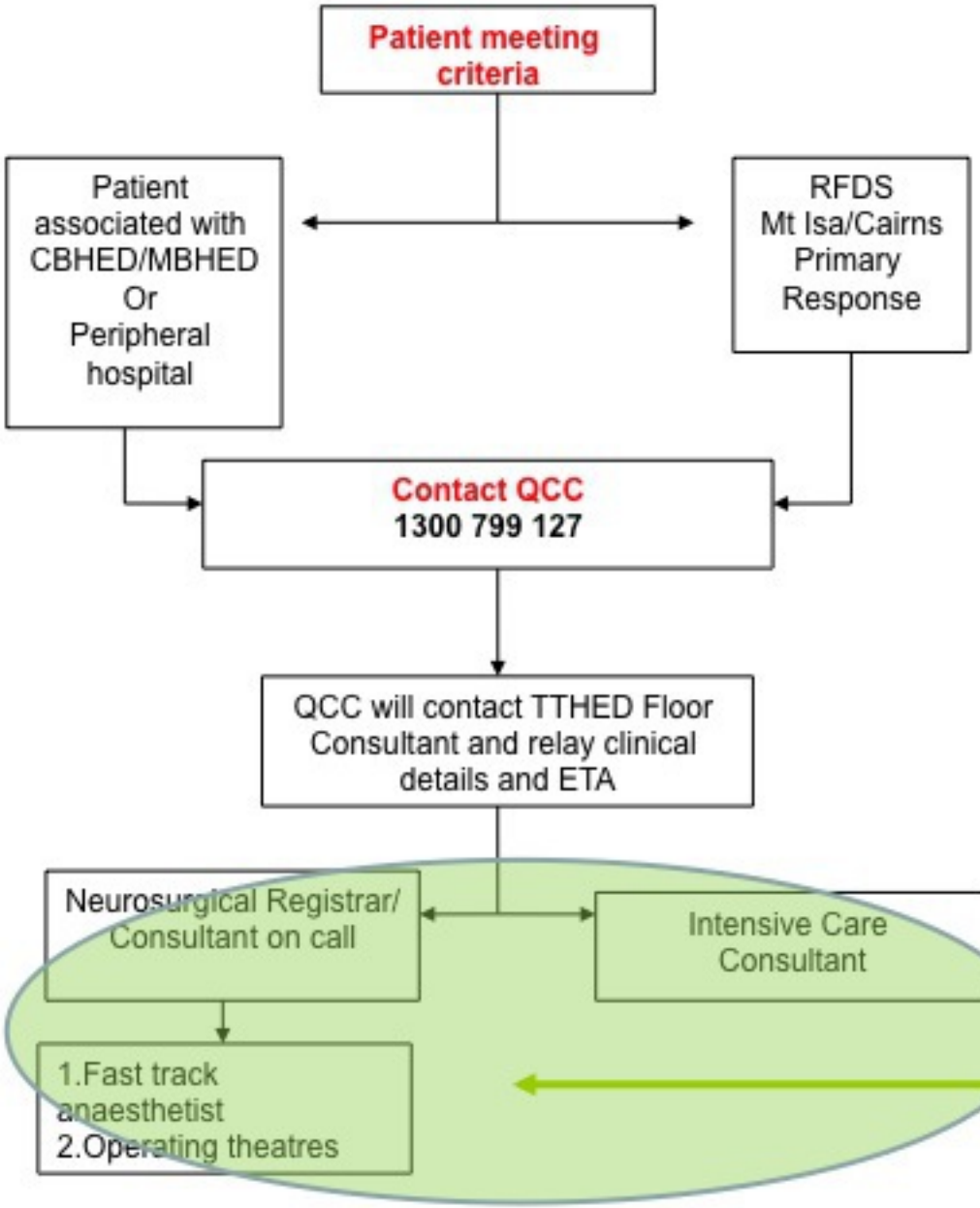
>50% reduction in Craniotomy NOT performed in 4 hours

Summary of Findings

- Age and sex distribution: similar
- External cause and type of injury: similar
- Referral patterns: similar
- Transfer time frames: T2 activation times worse
- Outcome measures and death rates: similar
- Time to urgent craniotomy: Marked Improvement

Needs another review, from 2008 to now, more specific to the urgent craniotomy cohort; Outcomes may be different.

NQ Neurotrauma Protocol



Where was the difference between T1 and T2?

Rate Limiting Step

Summary

- Not particularly scientific
  - Small numbers, incomplete data, multiple variables
- Sadly, no improvement in retrieval time frames but similar review of major non-intracranial injury showed improvement in all transfer time frames (ENoTG).

- A Neurotrauma Protocol does reduce time to urgent craniotomy in NQ, with main improvements due to improved in-hospital communications, processes and logistics.

INTEGRATED TRAUMA AND RETRIEVAL TEAMS AND SYSTEMS WORK

High Performance Teams

Addendum

- Increased education in NQ and statewide roll out of Early Notification of Trauma Guidelines.
- Further alignment and centralisation of RFDS primary and IHT response and procedures in NW Queensland.
- Expanded to all Neurosurgical Emergencies; SAH.
- Principles expanded to South Queensland where there are 3 neurosurgical centres. If all full, QCC decides. Clinician buy in fundamental.
- Similar principles now being implemented in STEMI and CVA across Queensland.
- Translation to New Zealand?

Thank You

Questions/Comments

Thanks to;

Queensland Trauma Registry
- Natalie Dallow
- Judith Brennan