



If early endotracheal intubation and controlled ventilation are so crucial in patients with severe traumatic brain injury, do we know if they get it?

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NO



Is early endotracheal intubation and controlled ventilation are so crucial in patients with severe traumatic brain injury?

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Evidence

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- Head injury 104.077
- Prehospital intubation 562
- And 92
- And Scandinavia 1



Seriously injured patients intubated at the accident site. A three-year survey from the mobile emergency care unit in Aarhus

Hansen TM, Høyer CC, Laustrup TK, Landsfeldt US and Christensen EF

2002 Ugeskr Laeger 164(44) 5123-6 in Danish

13.608 emergency calls with 11.521 patient contacts

2546 trauma patients, 95 (3,7%) intubated at the accident site.

54 of 91 patients had a GCS of 3

60 of the 95 (63%) had severe lesions in the head region

20 anaesthesiologists intubated the 95 patients (1-13)

Unanswered questions



- How many patients with head injuries were not intubated?
- How long did the procedure take?
- Number of intubation attempts?
- Complications?
- CO2 during and after the intubation?
- Saturation?
- Blood pressure?

Why intubate?



- Secure Airway.
- Safeguard against aspiration.
- Administration of 100 % Oxygen.
- Aspiration of blood etc. from the lungs.
- Secure against abdominal distention.
- Hyperventilation if necessary.

Why not intubate



- Lack of skills.
- Risk of hypoxia, hypercarbia and hypotension during intubation.
- Risk of hyperventilation after intubation.
- Esophageal intubation.
- Endobronchial intubation.
- Distance to hospital.



Evidence for intubation

Brain Trauma Foundation Guidelines

- Avoid hypoxemia (and hypotension)

Chesnut et al. The role of secondary brain injury in determining outcome from severe head injury. J Trauma 1993; 34: 216-222.

Stocchetti et al. Hypoxemia and arterial hypotension at the accident scene in head injury. J Trauma 1996; 40: 764-767

Oxygen saturation prior to intubation vs mortality and severe disability outcomes in Italian TBI patients transported by helicopter (Stocchetti)⁶.

Oxygen Saturation	Mortality	Severe Disability
> 90%	14.3% (3/21)	4.8% (1/21)
60-90%	27.3 (6/22)	27.3 (6/22)
< 60%	50 (3/6)	50 (3/6)



Evidence for intubation

Brain Trauma Foundation Guidelines

Retrospective, all trauma patients with GCS < 9.
Outcome parameters: Hospital mortality and discharged to home.
Endotracheal intubation on patients with ineffective ventilation or apnea,
no medication and no intubation with intact gag reflexes.
3 intubation attempts.

Prehospital endotracheal intubation and outcome in severe head injury patients
(Winchell)⁹.

	Intubated	Not Intubated
All Patients - Mortality	26%	36.2%
Isolated TBI - Mortality	22.8	49.6

No detailed information on the procedure
No information on patients not intubated

Winchell RJ et al. Endotracheal intubation in the field improves survival in patients with severe head injury. Arch Surg 1997; 132: 592-7



Evidence for intubation

- 120 patients, level 1 trauma center.
- Either prehospital intubation or intubation within 30 minutes of arrival at trauma center.
- A significant number of patients with a GCS < 9 required emergent intubation

Field GCS score and the need for prehospital endotracheal intubation in TBI patients (Hsiao)¹⁰.

	GCS Score			
	3-5	6-7	8-9	10-13
Field intubation	27%	27%	8%	2%
ED intubation	73	45	53	18
CT scan positive	73	36	62	23

Hsiao AK et al: Emergent intubation and CT scan pathology of blunt trauma patients with Glasgow Coma Scale Scores of 3-13. Prehosp Disaster Med 1993; 8 (3): 229-36

Effect of Out-of-Hospital Pediatric...



- Los Angeles and Orange Counties.
- 12 million people
- More than 100,000 pediatric 911 calls annually
- More than 10 years of paramedic adult intubation

Gausche M et al. Effect of out-of-hospital pediatric endotracheal intubation on survival and neurologic outcome: a controlled clinical trial.

JAMA 2000 Feb 9; 283(6): 783-90.

Scandinavian update April 2009

regionmidtjylland **midt**



Effect of Out-of-Hospital Pediatric Endotracheal Intubation on Survival and Neurological Outcome

- This study compared the survival and neurological outcomes of pediatric patients assigned to receive mask ventilation with those of patients assigned to receive intubation in the out-of-hospital setting

Conclusion by Gausche et al



- Addition of ETI to a practice of BVM does not improve survival.
- The results call into question the practice of paramedics and emergency medical technicians to intubate children.

Participants and education



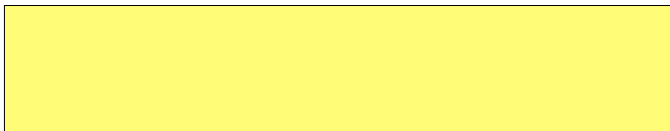
- 3084 paramedics
- Two, 3 hour educational sessions with skill stations and testing.
- No information on prior experience.

830 patients included



410 patients enrolled
on mask days

391 Maskventilated



420 patients enrolled
On intubation days

177 Intubated



830 patients included



410 patients enrolled
on mask days

391 Maskventilated
9 received mask after
intubation?
10 Intubated

6 lost to follow-up

404 available for evaluation

420 patients enrolled
On intubation days

115 Maskventilated
128 Maskventilated after
Intubation?
177 Intubated

4 lost to follow-up

416 available for evaluation

Results



Intention to treat intubation:

OR of survival 0.82 (0.61-1.1)

OR of good N. outcome 0.87 (0.62-1.22)

Treatment received intubation:

OR of survival 0.32 (0.20-0.50)

OR of good N. outcome 0.26 (0.15-0.45)

Prehospital intubation and complications



- 57% successful intubations
- 3 esophageal intubations
- 33 main stem intubations
- 12 unrecognized dislodgments
- 15 recognized dislodgments

- 33 % major complications

Conclusion by Juul



- Do not start something that you can not finish.
- Use the international guidelines to work for a better local system.
- Make local protocols based on available resources.

GCS as intubation criterion?



- GCS is an excellent tool for prediction of outcome after head injury
- GCS does not give information on isolated injuries (brain stem)
- No direct relation between GCS and normal/abnormal gag reflex.

Jensen JV, Rosenstock CV. GCS < 9 as a criterion for tracheal intubation of patients with traumatic brain injuries. Ugeskr Laeger 2007; 169:397-9

GCS as intubation criterion?



1. Actual or impending airway compromise
2. Ventilatory failure
3. Airway soiling (blood, vomit etc.)
4. Unconsciousness
5. Humanitarian indications
6. Patient unmanageable or severely agitated after head injury.
7. Expected clinical course

Ellis et al. Prehospital rapid-sequence intubation of patients with trauma with a Glasgow Coma Score of 13 or 14 and the subsequent incidence of intracranial pathology. Emerg Med j 2007; 24: 139-41



Prehospital intubation



Europe

No rigorous guideline.

Anesth. trained.

All drugs available.

Minor diff. on scene.

High success rate.

Few adverse events.

North America

Rigorous guidelines.

EMS personnel.

Few drugs available.

Extended on scene time.

Low success rate

Many adverse events.

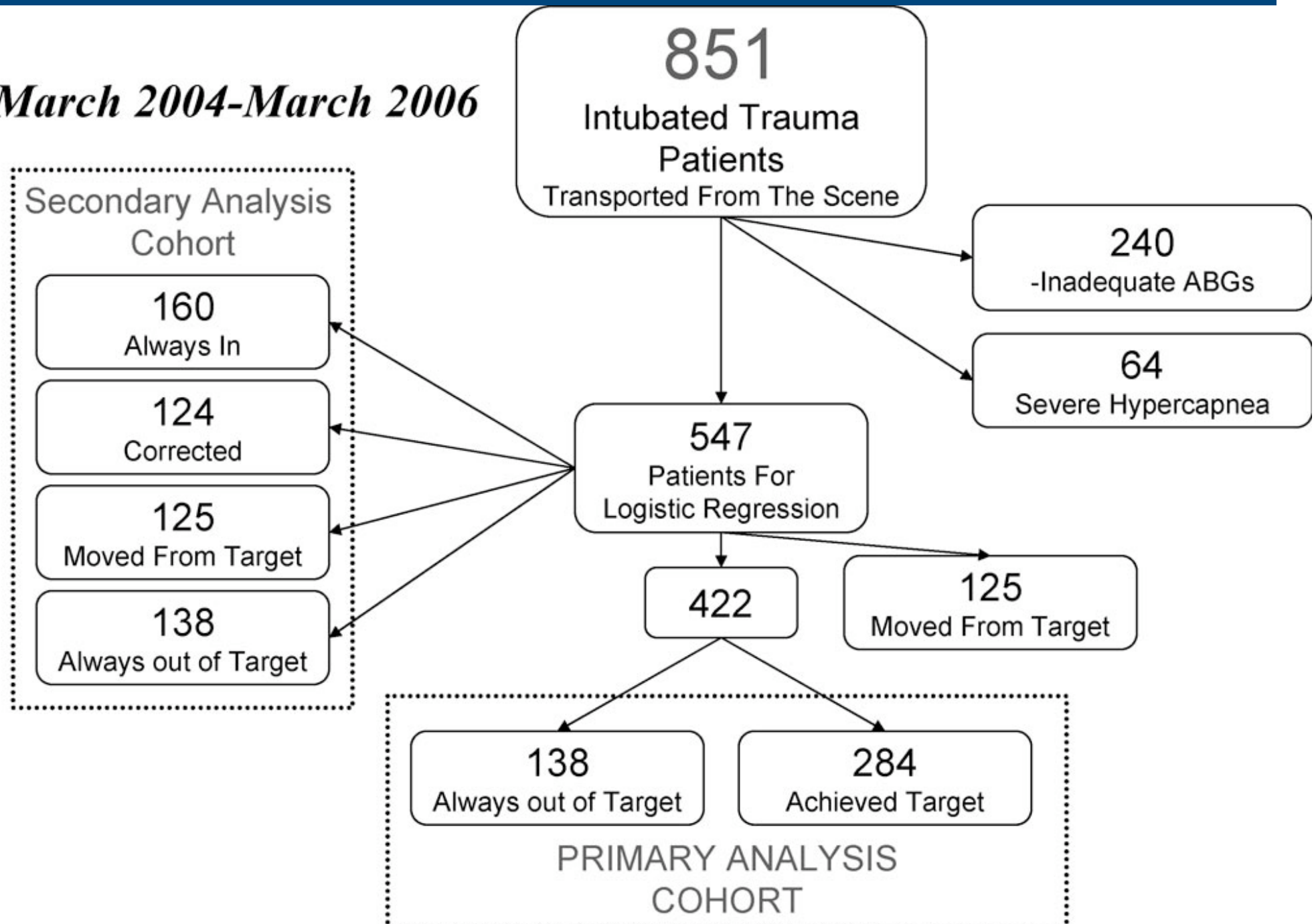
Should we do it anyway?



- Harborview Medical Center, Seattle.
- Trauma patients during 24 months.
- Intubated at accident site
- PCO₂ target 30 - 39 mm Hg (4 – 5.2 Kpa).
- Prehospital GCS: 17% 14-15
 12 % 9-13
 71% ≤ 8

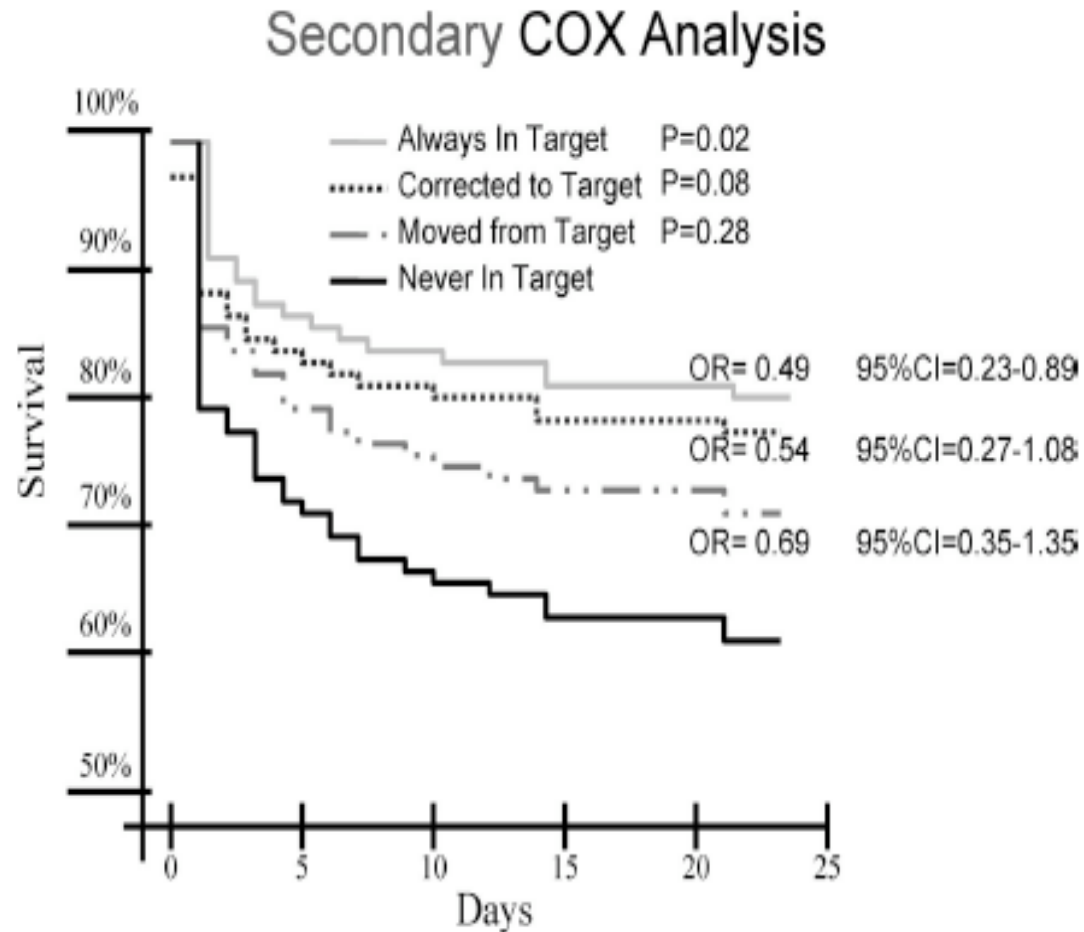
Warner Kj et al: Emergency department ventilation effects outcome in severe traumatic brain injury. J Trauma 2008; 64: 341-47

March 2004-March 2006





Should we do it anyway?



Warner Kj et al: Emergency department ventilation effects outcome in severe traumatic brain injury. J Trauma 2008; 64: 341-47

Finland



- Prehospital intubation by anaesthesiologists and paramedics.
- Intubation frequency 0-2 times/year/person*

* M Castrén. Acta anaesthesiologica Scandinavia 2008; 52: 877-878

Sweden



- Intubation done by anaesthesiologists (ground and air)
- Intubation done by nurse anaesthetists*

*Instruction for prehospital workers

Norway



- Anaesthesiologists in HEMS service
- Patients directly admitted to neurosurgeon or transferred from a local hospital

Directly admitted patients were more severely injured, got more advanced treatment en route to neurosurgeon and had surgery earlier than transferred patients

Moen KG et al. Direct transport versus interhospital transfer of patients with severe head injury in Norway. Eur j Emerg med 2008; 15: 249-55

Denmark



- Copenhagen prehospital mobile unit

66.058 emergency calls (2002-2008)

10.891 accidents

1.123 head injury

245 intubations (0.4% of all, 22 % of HI)

Personal communication from Søren Loumann Copenhagen mobile unit

Scandinavian guidelines



The best person to manage the prehospital airway should be a dedicated specialist, trained for the prehospital environment, experienced in medical emergencies and critical care, with a daily routine in the induction of anaesthesia and advanced airway management

Berlac et al: "Prehospital airway management: guidelines from a task force from the Scandinavian Society for Anaesthesiology and Intensive Care Medicine
Acta Anaesthesiol Scand 2008; 52: 897-907

Scandinavian guidelines



- Insufficient data to support level I or II recommendations on airway management
- All patients with severe head injury should be given oxygen
- Avoid hypoxemia and correct immediately when identified

Juul et al: Scandinavian guidelines for prehospital management of severe traumatic brain injury. Ugesk for Læger 2008 jun 23; 170: 2337-41

Scandinavian guidelines



- An airway should be established if
 - GCS < 9 and
 - The airway is obstructed or
 - It is impossible to maintain sat > 90
- When endotracheal intubation is used to establish an airway, confirmation of placement of the tube in the trachea should include lung auscultation and end-tidal CO₂ determination

Sollid et al: Scandinavian guidelines for prehospital management of severe traumatic brain injury. Tidsskr Nor laegeform 2008 jun 26; 128: 1524-27

Scandinavian guidelines



- In ground transported patients in urban environments, the routine use of paralytics to assist endotracheal intubation in patients who are spontaneously breathing, and maintaining an SaO₂ above 90% on supplemental oxygen, is not recommended, **unless used by rigoursley trained and skilled paramedics/nurses or doctors with intubation skills (emergency physiscians and anaesthesiologists)**

Bellander BM et al: Scandinavian guidelines for prehospital management of severe traumatic brain injury. [Lakartidningen](#). 2008 Jun 11-24;105:1834-8.

Clinical studies



- Prospective randomized controlled studies have never been conducted in the prehospital setting on the effects of hypoxemia and hyperventilation.
- Retrospective studies of out of hospital intubation are of dubious quality.

The study to end all studies!!



- Prospective randomized (blinded) controlled study.
- International, transcontinental multicenter trial.
- Start the minute the decision to intubate is made.
- End in the emergency room after x-ray of the thorax.
- Include all decisive time points.
- Number of intubation attempts.
- Used medication.
- Bloodpressure, saturation, ETCO₂, blood gases.
- All complications.
- X-ray confirmed tube placement.
- GCS and 6 months outcome.
- Information on patients not treated.

