MERCYHEALTH

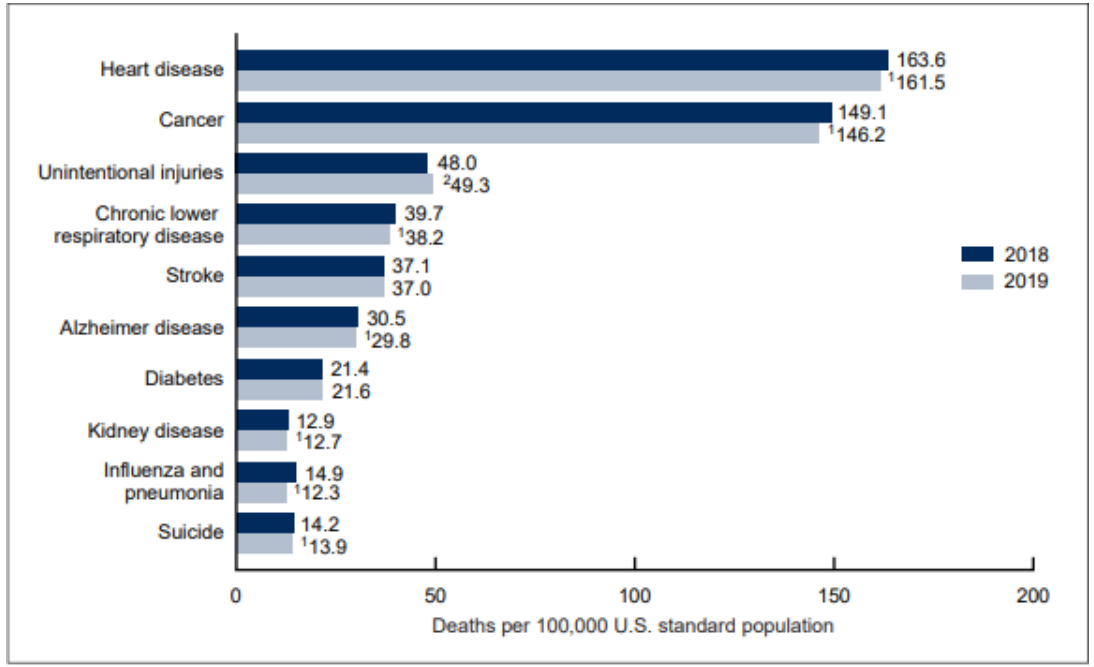
EARLY TRACHEOSTOMY IN STROKE

Stroke and Neurology Emergency Symposium

Friday, September 10th, 2021

Stroke's Epidemiologic and Economic Burden

- Stroke is the No. 5 cause of death and a leading cause of disability in the US
- Economic Impact[1]:
  - Total direct annual costs: Increase from $71.55 billion in 2012 to $184.13 billion in 2030
  - Total indirect annual costs: Increase from $33.65 billion in 2012 to $56.54 billion in 2030
- Stroke is a disease of immense public health importance with serious economic and social consequences
- Strategies to reduce hospital's costs and maintain assistance quality are indispensable to maintain financial viability



[1]Statistically significant decrease in age-adjusted death rate from 2018 to 2019 ($p < 0.05$).
[2]Statistically significant increase in age-adjusted death rate from 2018 to 2019 ($p < 0.05$).
NOTES: A total of 2,854,838 resident deaths were registered in the United States in 2019. The 10 leading causes of death accounted for 73.4% of all deaths in the United States in 2019. Causes of death are ranked according to number of deaths. Rankings for 2018 data are not shown. Data table for Figure 4 includes the number of deaths for leading causes. Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db395-tables-508.pdf#4.
SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

Stroke Recovery

- Adaptation[1]:
  - Reliance on alternative physical movements or devices to compensate for post-stroke deficits
  - Use of non-dominant hand
  - Walker
  - Can be harmful due to learned disuse
- Regeneration[1]:
  - Growth of neurons and associated cells and circuitry to replace those damaged from a stroke
  - Not considered a standard aspect of stroke recovery
- Neuroplasticity[1]:
  - Changes or rewiring of the neural network
  - Considered main component of recovery process
  - Neural networks disrupted by stroke reconnect in areas adjacent to the area of stroke and coincide with clinical recovery

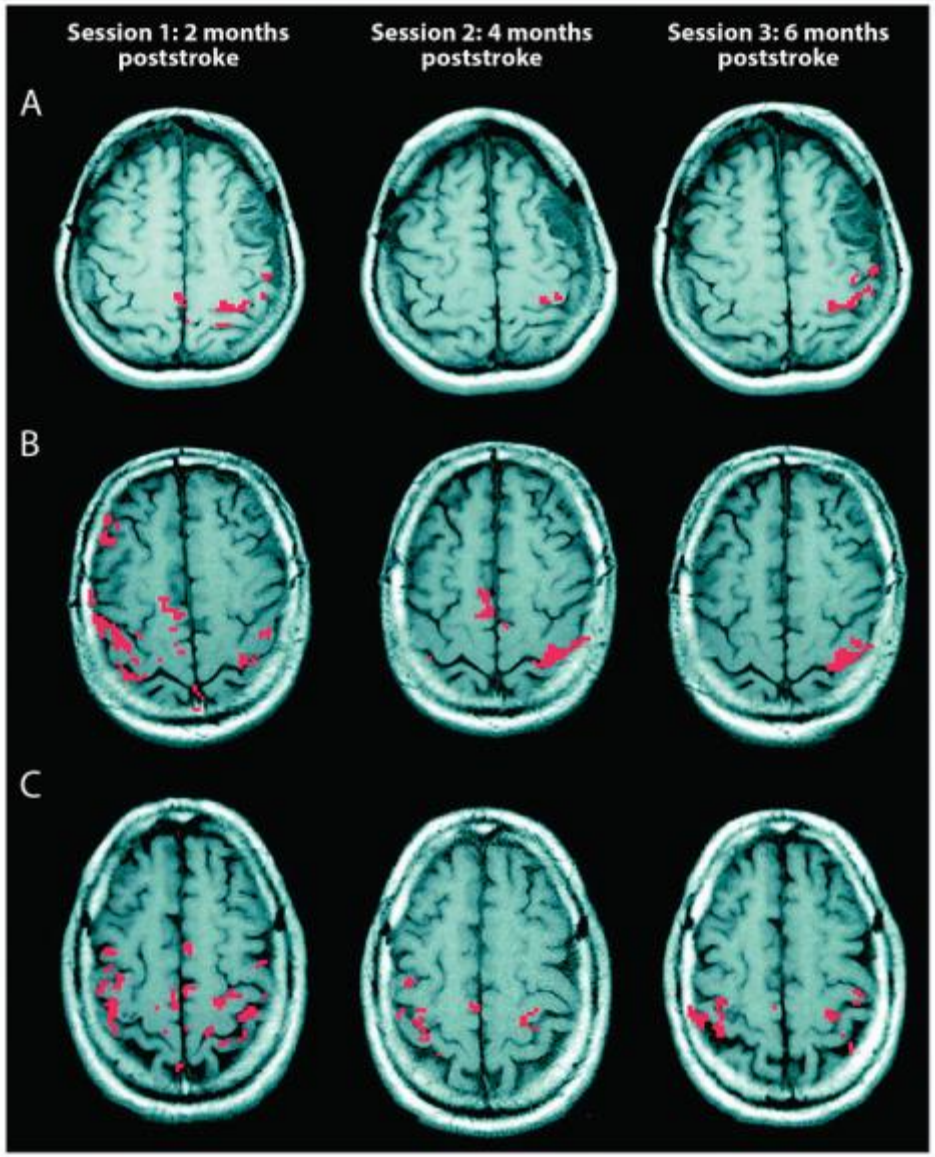
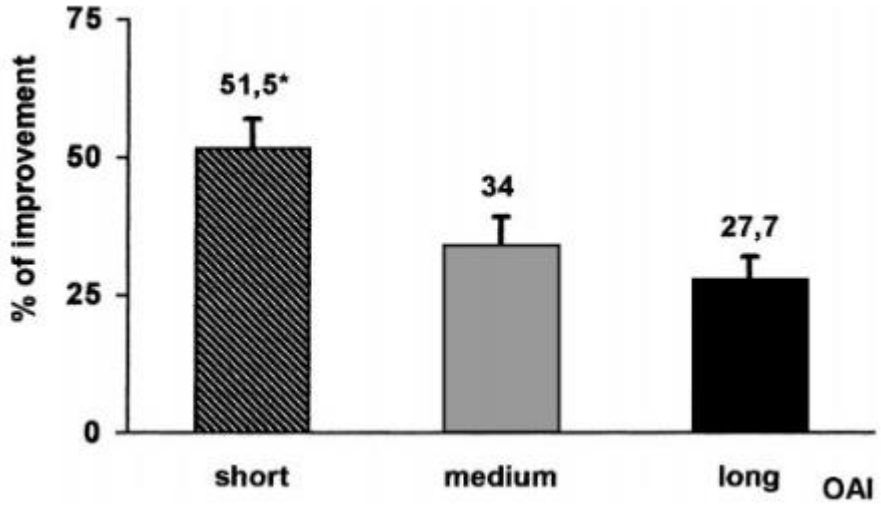


FIGURE 11-1 Three patterns of evolution of functional MRI (fMRI) activation after middle cerebral artery stroke and use of the affected hand for three different patients. As time progresses, the activated sites become more consolidated, lateralized, and smaller.

Timing of Rehabilitation

- Crucial to determine when to begin rehabilitation because best results usually occur within the first few months after stroke
- Study examining differences in outcomes for patients for whom therapy was initiated 20 days apart[3]:
  - Those who initiated therapy soon after stroke onset exhibited significantly higher effectiveness of treatment than did medium or late groups
  - Treatment initiated within the first 20 days was associated with a significantly higher probability of excellent therapeutic response



Airway Protection in Stroke

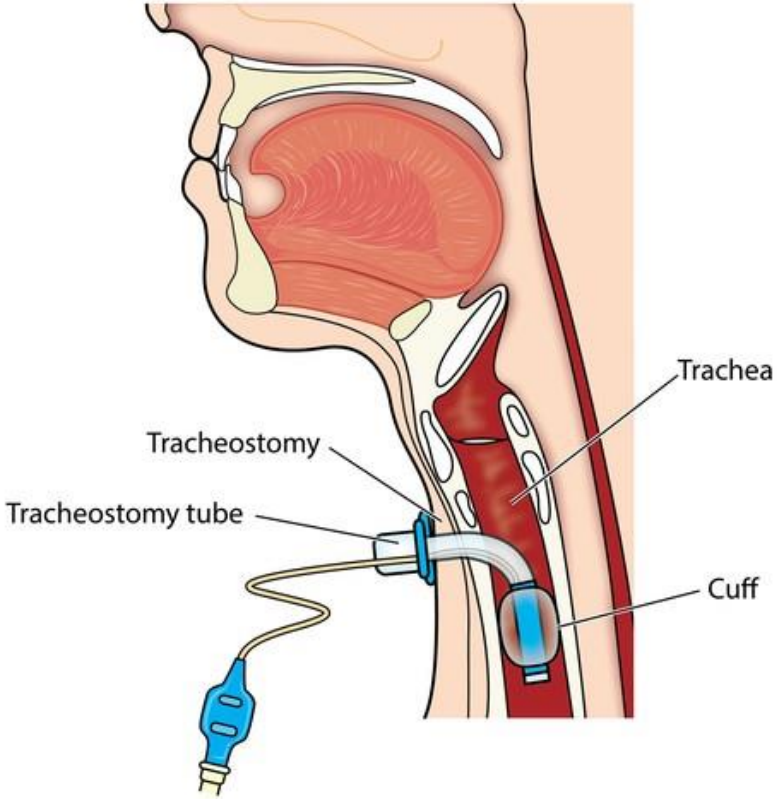
- Ischemic stroke, Intracerebral Hemorrhage and Subarachnoid Hemorrhage patients often require endotracheal intubation
  - Airway protection
  - Aspiration
  - Neurogenic respiratory failure
- Drawbacks of prolonged endotracheal intubation
  - Limit mobility
  - High incidence of pulmonary infections
  - Laryngeal or upper airway damage
  - Increases ventilator dependency prolonging ICU and hospital stays
  - Prolongs periods of sedation

Tracheostomy

- Tracheostomy in the general ICU is performed in approximately 10-15% of patients
- Stroke patients in the neurological ICU, 15-35%[4]
- Unlike the medical and surgical critically ill, many patients with stroke who require prolonged intubation do not necessarily require mechanical ventilation, but have a need for airway protection

Benefits of Tracheostomy

- Advantages of a short tracheal cannula:
  - Less airway dead space
  - Oropharyngeal and laryngeal lesions are avoided
  - Patient comfort is increased
  - Nursing care is facilitated
  - Shortens length of ICU stay
  - Fewer sedative requirements provide an improved mortality benefit[4]
- Short term complications:
  - Pneumothorax
  - Damage to the trachea
  - Bleeding and infection



Optimal Timing of Tracheostomy is Unclear

- Widely agreed that tracheostomy should be performed as soon as its need becomes obvious
- The procedure, either percutaneous or surgical, is commonly performed after 2-3 weeks from intubation, often after extubation attempts have failed
- Predicting the need for prolonged endotracheal intubation is challenging and confounds the optimal timing to perform tracheostomy

Stroke-Related Early Tracheostomy Versus Prolonged Orotracheal Intubation in Neurocritical Care Trial[5] (SETPOINT)

- Prospective, randomized, parallel-group, controlled, open and outcome-masked pilot trial
- Patients with severe ischemic or hemorrhagic stroke and estimated need for at least 2 weeks of ventilation
  - Early tracheostomy: Within day 1-3 from intubation
  - Standard tracheostomy: Between day 7-14 from intubation if extubation could not be achieved
- Primary outcome: Length of stay in the ICU

Setpoint, What was Found

- No differences were observed with regard to the primary outcome length of stay in the ICU
- Significant reduction in sedation use (42% vs 62% of ICU days)
- Reduction in ICU mortality (16% vs 45%)
- Mortality and functional outcome (measured by mRS) at 6 months also trended toward better in the early trach group

SETscore

- As a way to assist judgement for predicting the feasibility, safety and need for early TR
- A non-validated in-house assessment score
- SETscore > 10
- And the judgement of 2 experienced neurological intensive care specialists

Area of assessment	Situation	Points
Neurological function	Dysphagia	4
	Observed aspiration	3
	GCS on admission <10	3
Neurological lesion	Brainstem	4
	Space-occupying cerebellar	3
	Ischemic infarct $>2/3$ MCA territory	4
	ICH volume >25 ml	4
	Diffuse lesion	3
	Hydrocephalus	4
General organ function/ procedure	(Neuro)surgical intervention	2
	Additional respiratory disease	3
	$PaO_2/FiO_2 < 150$	2
	APS (of APACHEII) > 20	4
	LIS > 1	2
	Sepsis	3

External Validation of SETscore[4]

- Retrospective analysis of 511 intubated patients
- SETscore > 10:
  - Sensitivity to predict the need for tracheostomy was 81%
  - Specificity was 57%
- Score had moderate accuracy in correctly identifying those requiring tracheostomy and those successfully extubated at 71%
- Multivariable logistic regression models were used to identify other independent predictors of tracheostomy:
  - BMI
  - African American Race
  - ICH
  - Positive sputum culture
  - Sensitivity improved to 90%
  - Specificity improved to 78%

Early vs Late Trach[2]

- Meta analysis from 2020
- 5636 patients in ET group, mean time of 7.4 days
- 7637 patients in the LT group, mean time of 15.4 days
- ET:
  - Significantly associated with fewer days in the hospital
  - Reduced cases of VAP (primary outcome)
  - No statistical differences in ICU stay duration, mechanical ventilation duration or mortality

SETPOINT2

- Multicenter, prospective, randomized, open-blinded endpoint (PROBE-design) trial
- Evaluated patients with acute ischemic stroke, ICH or SAH
- Patient randomization:
  - Percutaneous tracheostomy within first 5 days after intubation
  - Ongoing orotracheal intubation with consecutive weaning and extubation and, if the latter failed, to percutaneous tracheostomy from day 10 after intubation
- Primary endpoint:
  - Functional outcome
    - mRS 0-4; favorable
    - mRS 5-6; unfavorable
  - 6 months

Conclusion

- Stroke is a disease of immense public health importance with serious economic and social consequences
- Strategies to reduce hospital's costs and maintain assistance quality are indispensable to maintain financial viability
- The earlier rehab starts the better
- Patients with stroke who require prolonged intubation do not necessarily require mechanical ventilation, but have a need for airway protection
- Optimal timing for tracheostomy is unclear
- SETscore
- Early trach:
  - Reduces sedation use
  - Reduces ICU mortality
  - Associated with reduced days in hospital
  - Reduced cases of VAP
- Future directions: SETPOINT2

References

1. Belagaje, S. *Stroke Rehabilitation.* Continuum Review Article. 2017;238-253.
2. Franc, SA. *Early Tracheostomy in Stroke Patients: A Meta-Analysis and Comparison with Late Tracheostomy.* Clinical Neurology and Neurosurgery. 2021;203.
3. Paolucci, S. *Early vs delayed inpatient stroke rehabilitation: A matched comparison conducted in Italy.* Archives of Physical Medicine and Rehabilitation. 2000;6:695-700.
4. Alsherbini, K. *Predictors of Tracheostomy with External Validation of the Stroke-Related Early Tracheostomy Score (SETscore).* Neurocritical care. 2019;30:185-192.
5. Bosel, J. *Stroke Related Early Tracheostomy Versus Prolonged Orotracheal Intubation in Neurocritical Care Trial (SETPOINT).* Stroke. 2013;44:21-28.
6. Schonenberger, S. *Early Tracheostomy in Ventilated Stroke Patients: Study Protocol of the International Multicentre Randomized Trial SETPOINT2 (Stroke-Related Early Tracheostomy vs Prolonged Orotracheal Intubation in Neurocritical Care Trial 2).* International Journal of Stroke. 2016;11:368-379.

Thank you

MERCYHEALTH

Our Mission

We extend the compassionate ministry of Jesus by improving the health and well-being of our communities, and bring good help to those in need, especially people who are poor, dying and underserved.

Our Values

Human Dignity | Integrity | Compassion | Stewardship | Service