CURSO DE VMNI

NIPPON 2026

Indicações e controle da ventilação mecânica por traqueostomia no paciente crónico

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FMUP

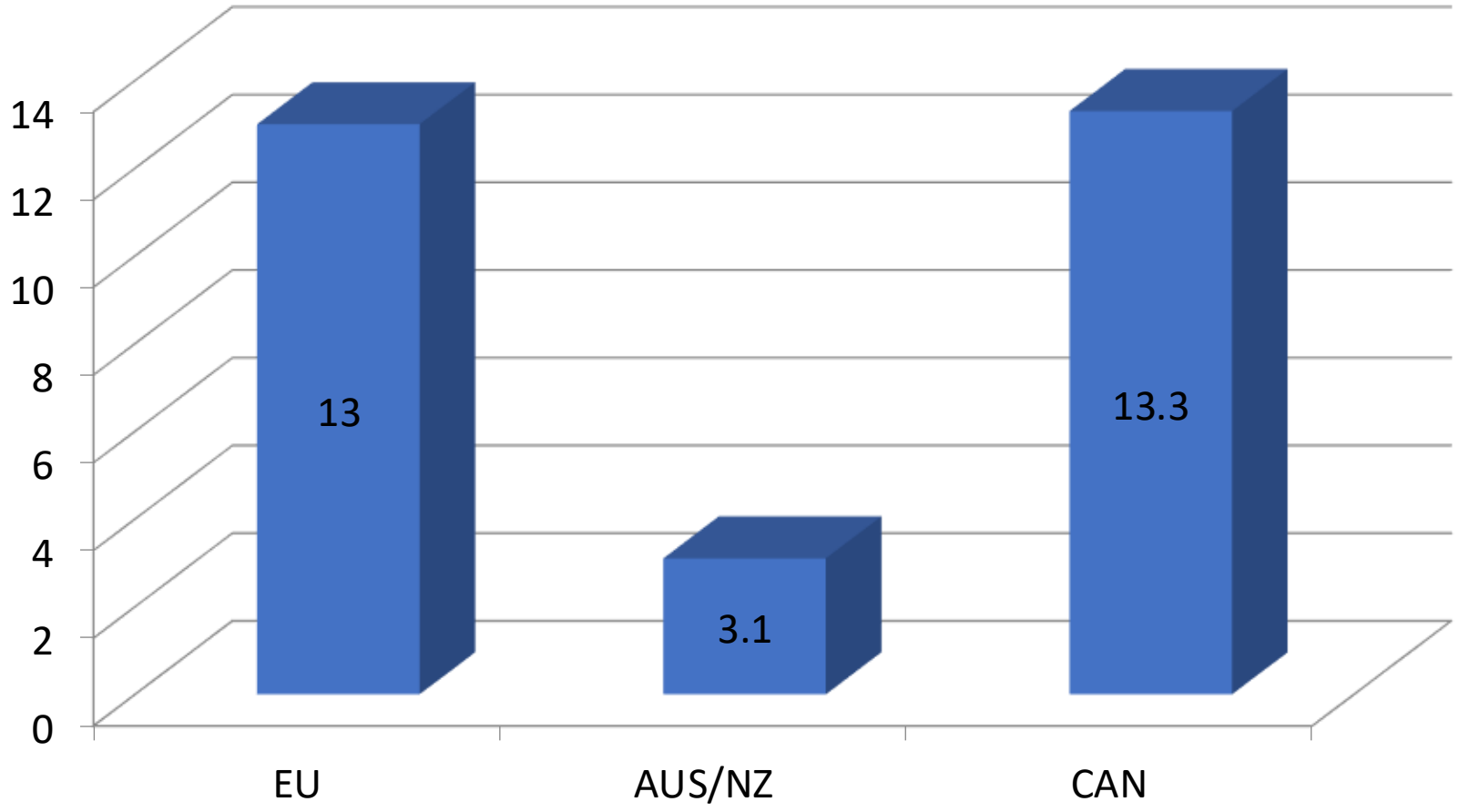
NIPPON GASES
Healthcare

Agenda

AIMS

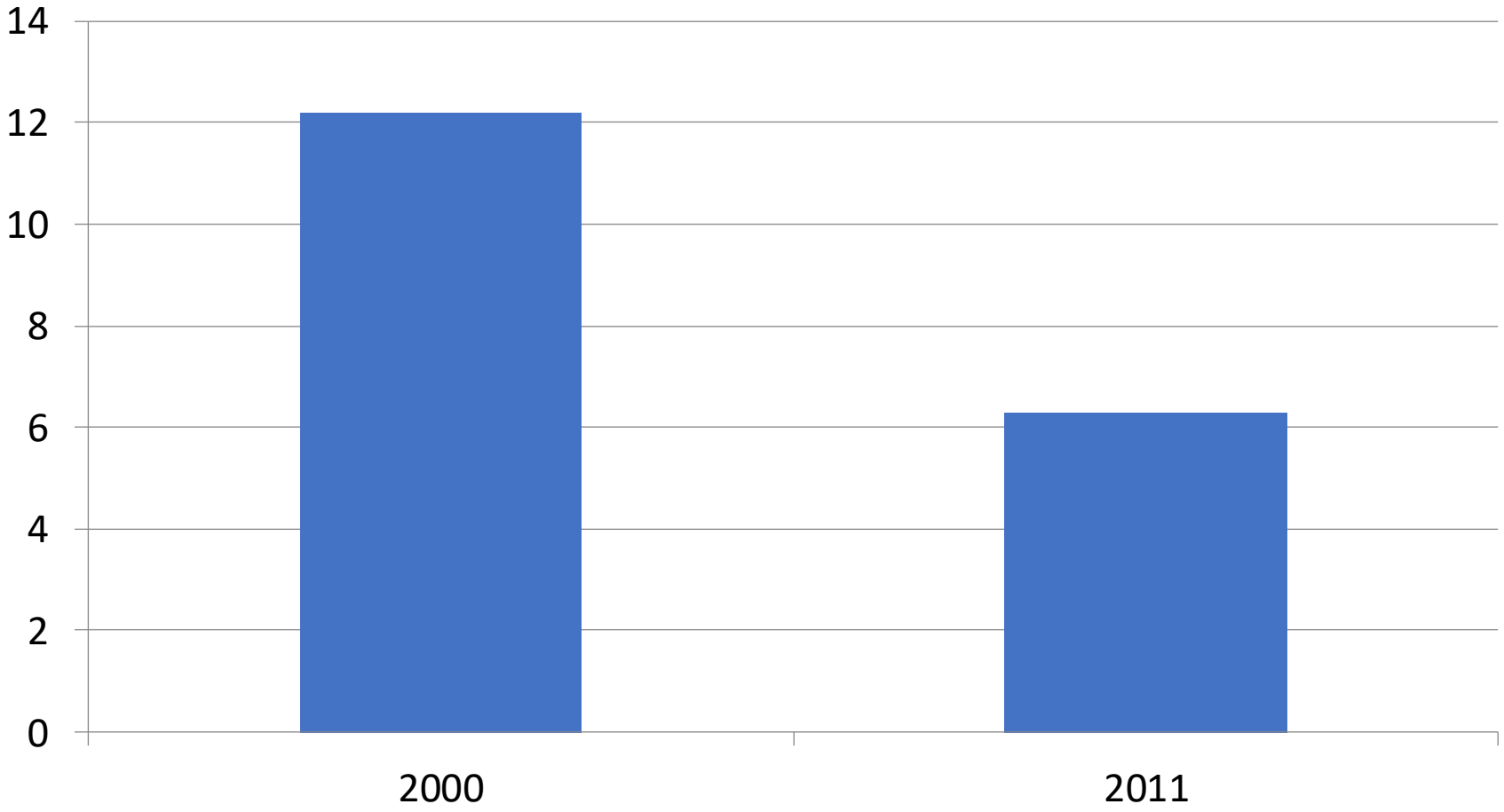
1-Introduction
2-Indications
3-Home Invasive mechanical ventilation: decision making
4-Practical aspects of HIMV
5-Complications and cause for readimssion
6- Conclusions

Global prevalence of Tracheostomy HMV



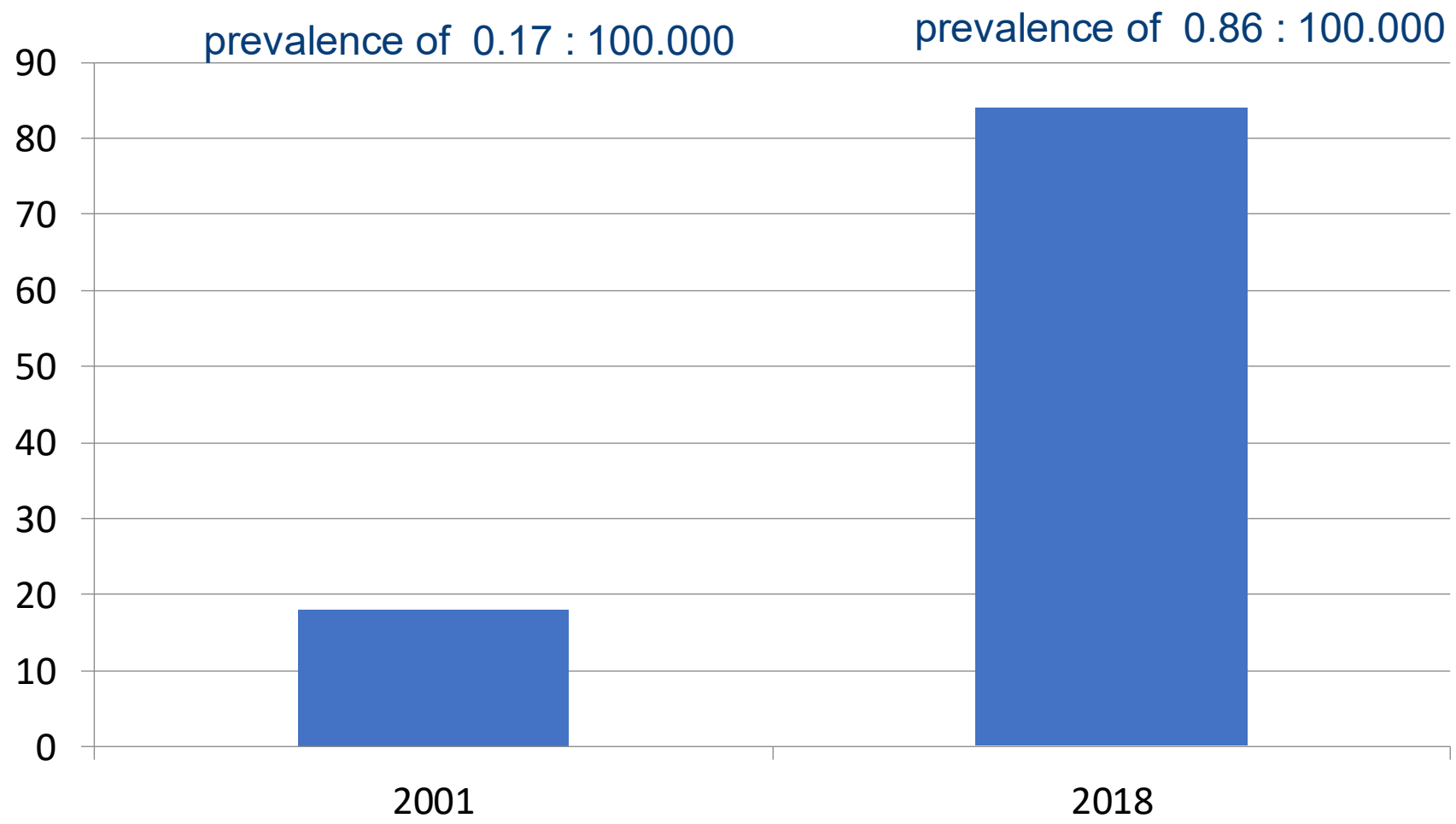
Divo M. Respir Care 2010;55(12):1693–1698, Lloyd-Owen Eur Respir J. 2005 Jun;25(6):1025-31
Garner DJ Eur Respir J. 2013 Jan;41(1):39-45

Prevalence (%) LTV in Ontario



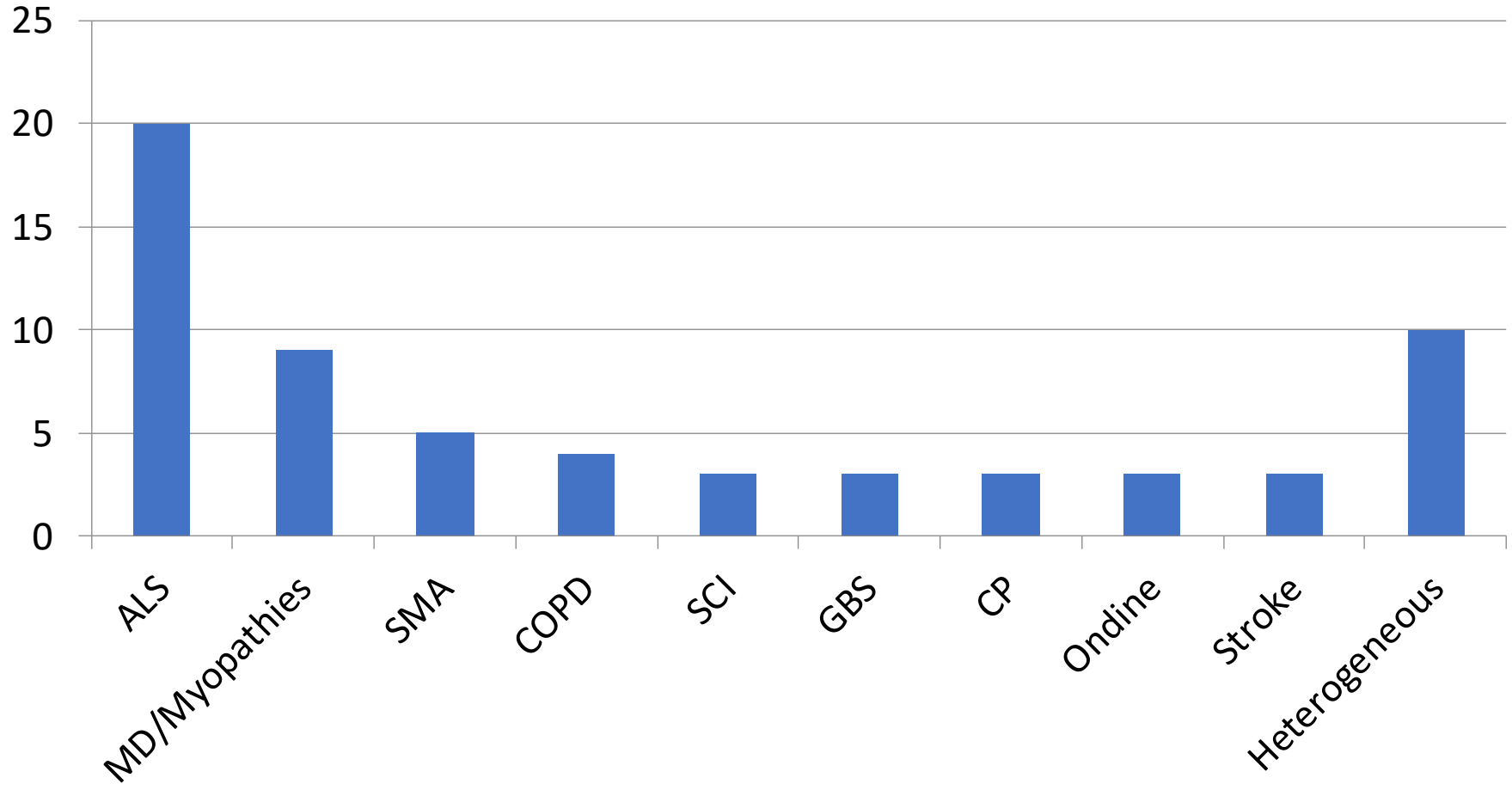
Povitz M et al Respir Care 2018;63(4):380–387

LTV in Portugal



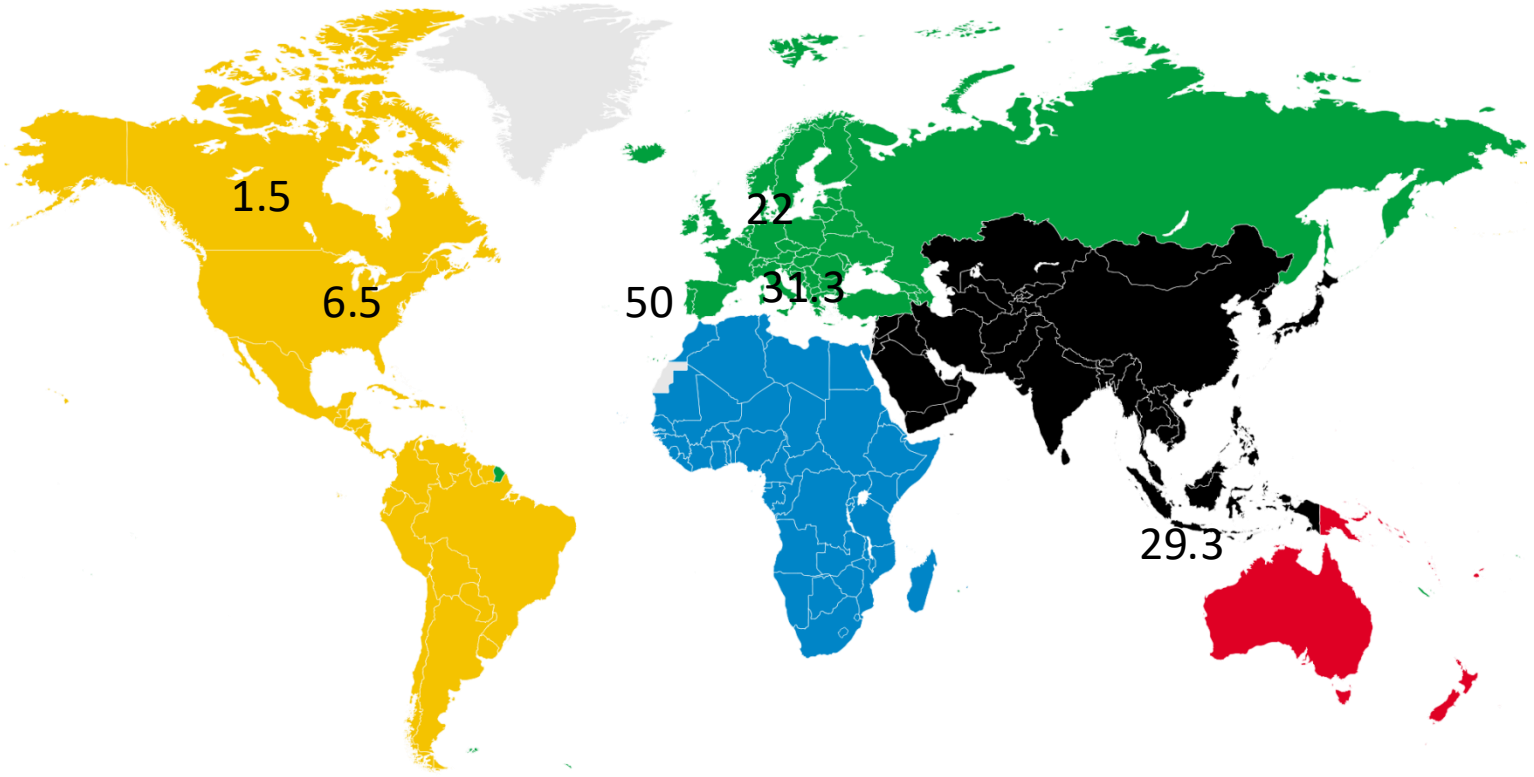
Winck JC, Pulmonology 2019 Feb 26. pii: S2531-0437(19)30020-0

LTV in Portugal: disease cathegories



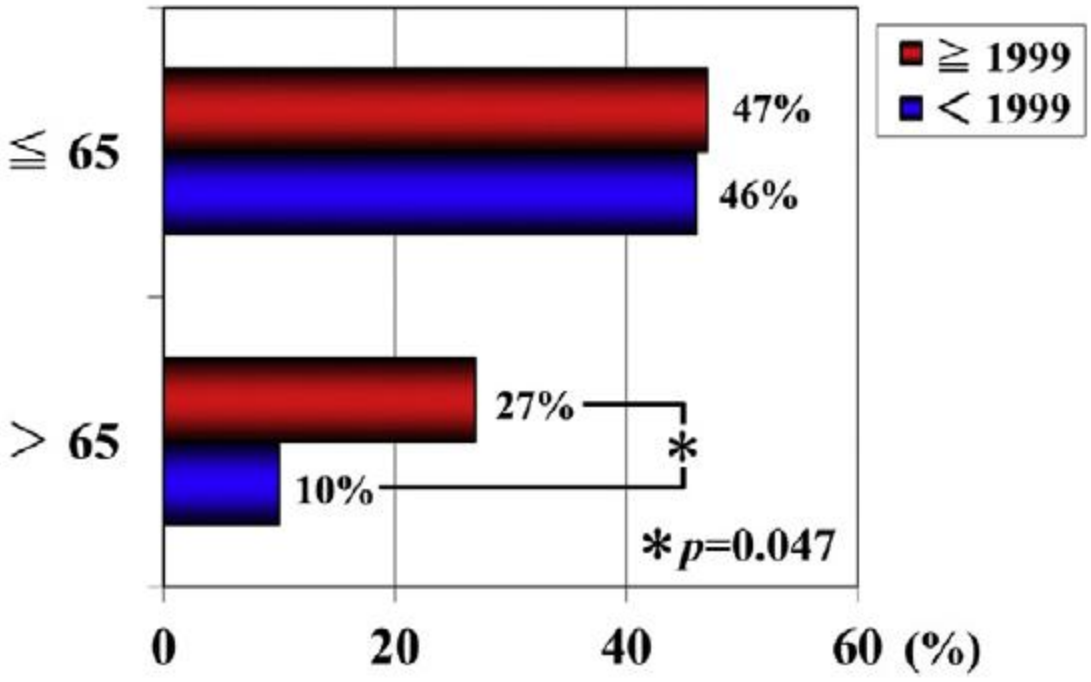
Winck JC, Pulmonology 2019 Feb 26. pii: S2531-0437(19)30020-0

Prevalence of TIV IN ALS (%)



Sapataro, J Neurol Sci 2012;66-70 (IT), Sancho, Thorax 2011:948-52 (SP)
Ritsma, Can J Neurol Sci 2010; 37: 54-60 (CAN), Dreyer, ALS Frontotemporal Degener 2014: 62-7 (DEN) Tsou, Amyotroph Lateral Scler. 2012 May ; 13(3): 318–325 (US) Atsuta, J Neurol Sci 2009: 163-9 (JAP)

Use of Invasive ventilation in ALS over the past two decades in Osaka (Japan)



Tagami , Journal of the Neurological Sciences 344 (2014) 158–164

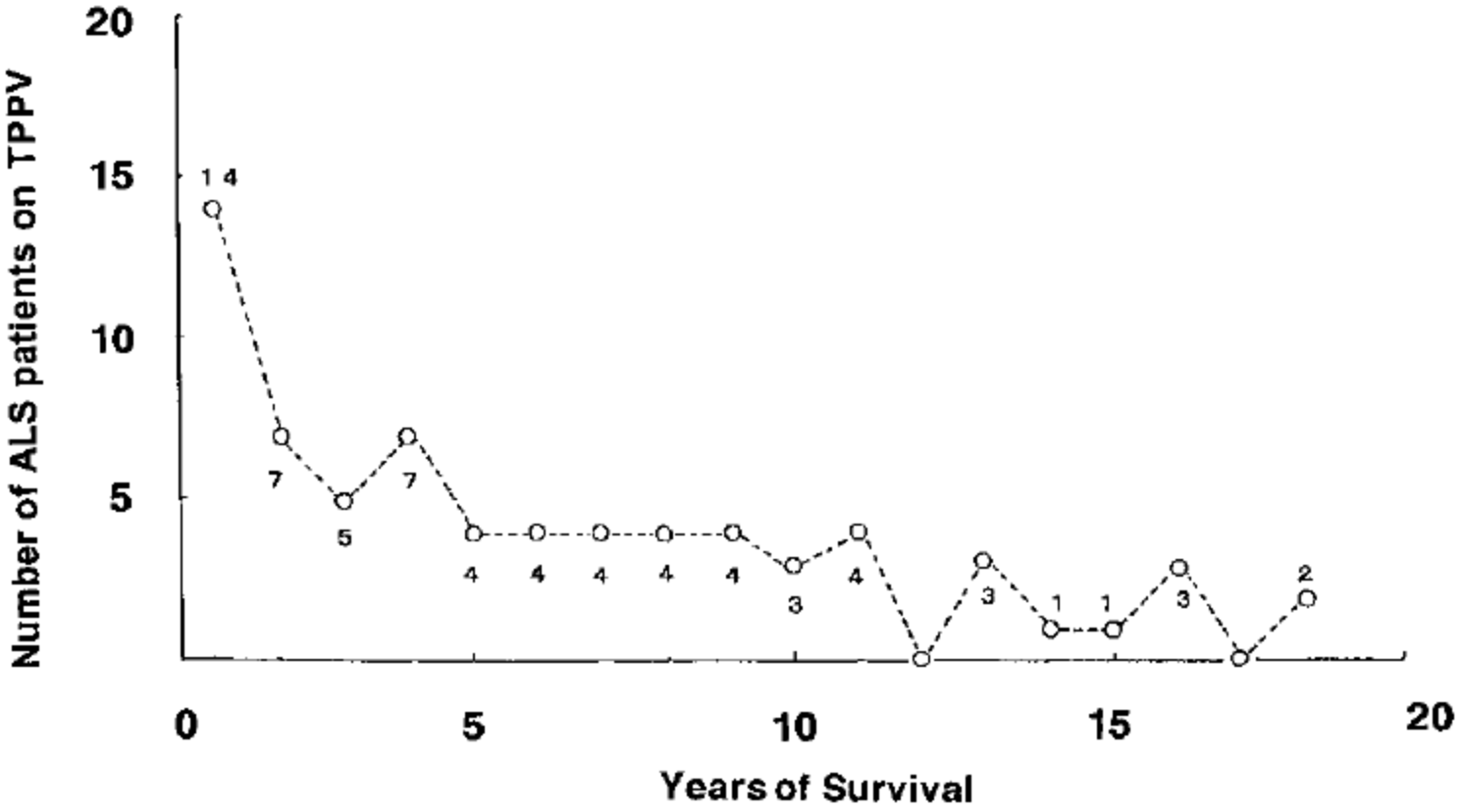
Survival after Tracheostomy Ventilation in ALS

Author (year)	N	Survival (months) from symptom onset or trach*	Respiratory status after discharge
Kaub-Wittemer (2003)	21	34.6	NR
LoCoco(2007)	30	37	NR
Vianello (2011)	60	30.3	42 (>18h) 17(4-18h)
Sancho (2011)	76	10.4*	NR
Spataro (2012)	87	47	80 (>18h) 7 (4-16h)

Informed consent:Tracheostomy Ventilation in ALS

Author (Year)	Informed consent (%)
Kaub-Wittemer (2003)	19%
LoCoco (2007)	?
Vianello (2011)	No advanced directives; One declined trach (1.6%)
Sancho (2011)	100%
Spataro (2012)	40.3%

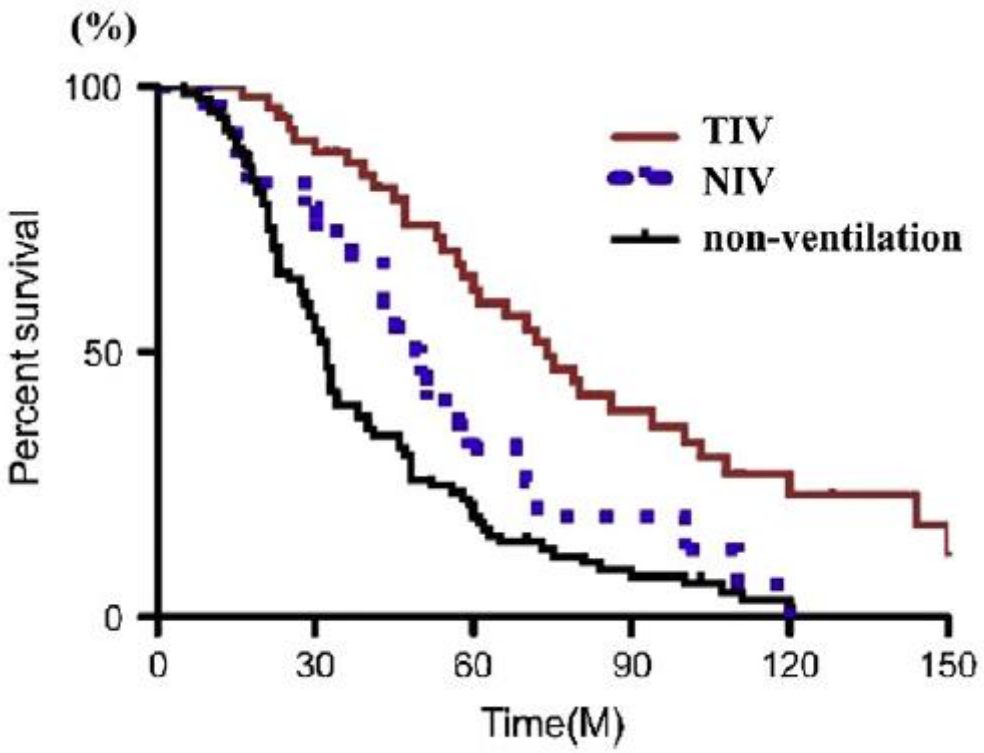
Distribution of years survived by 70 patients on TPPV



Hayashi, *Neurology 2003;61;135-137*

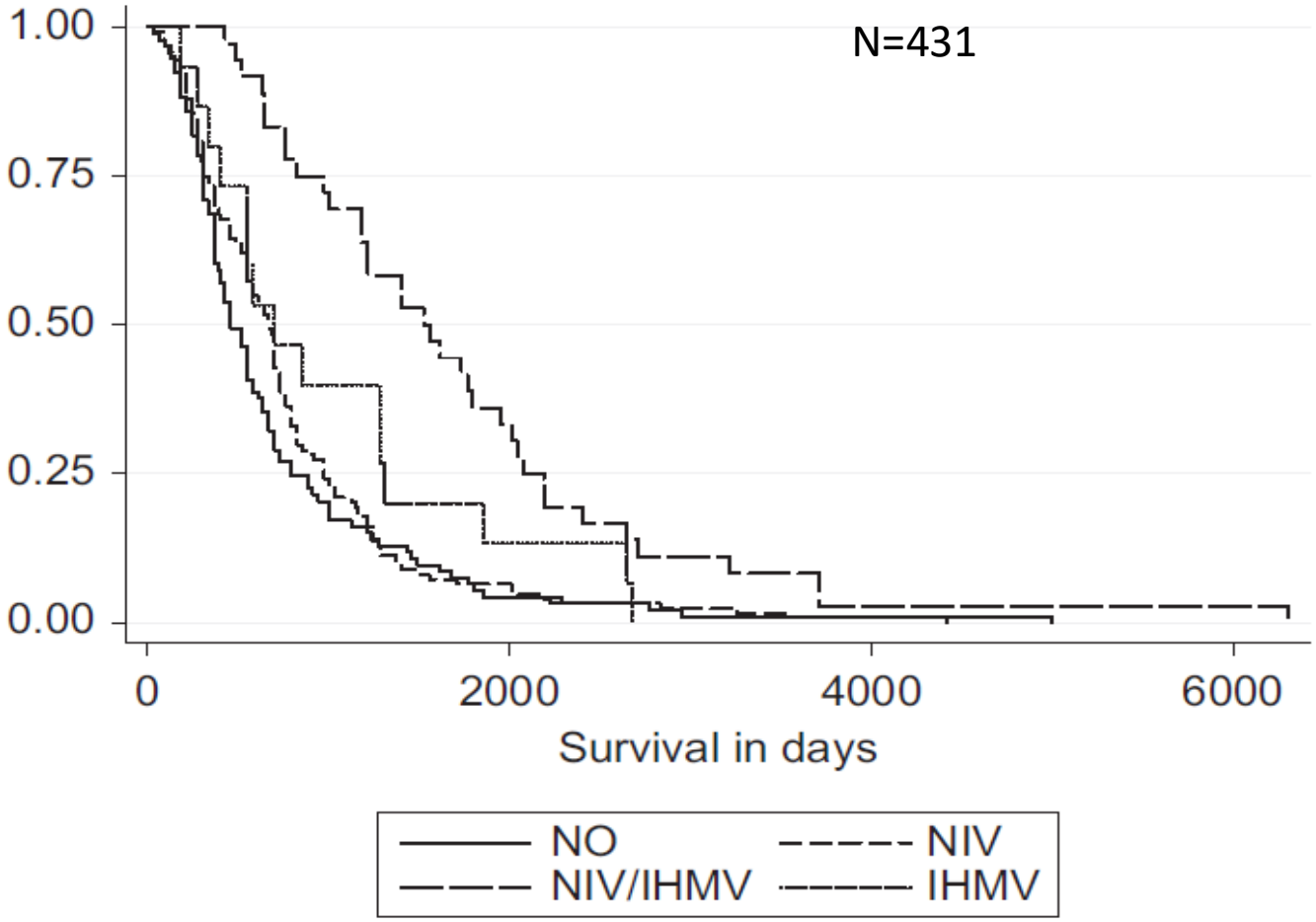
Survival rates: TIV versus NIV

N= 160



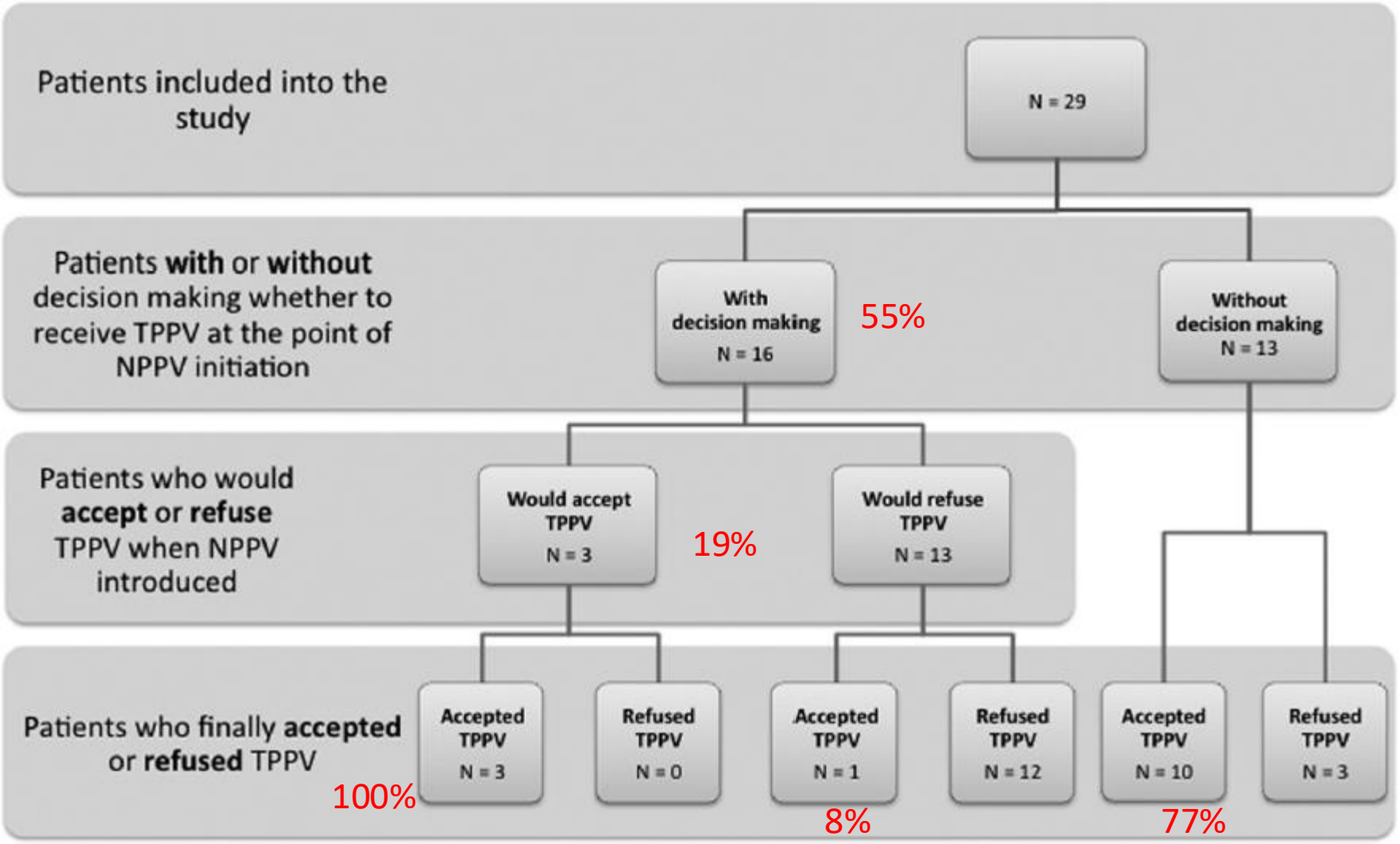
Tagami , Journal of the Neurological Sciences 344 (2014) 158–164

Switching from NIV to Invasive Ventilation extends survival in ALS



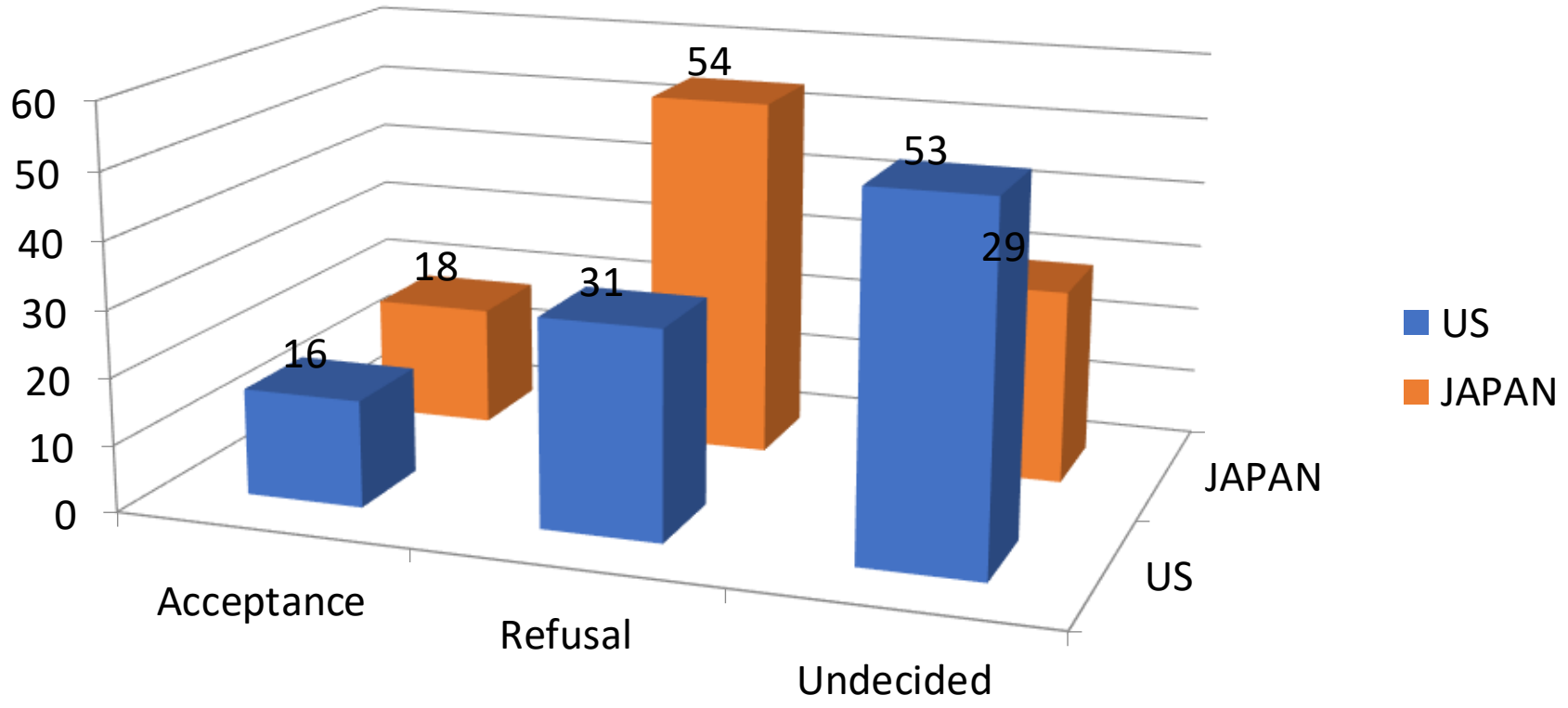
Dreyer , Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration, 2014; 15: 62–67

Decision making of ALS patients on NIV to receive tracheostomy positive pressure ventilation



Kurisaki, Clinical Neurology and Neurosurgery 125 (2014) 28–31

TV in ALS: Patients' preference



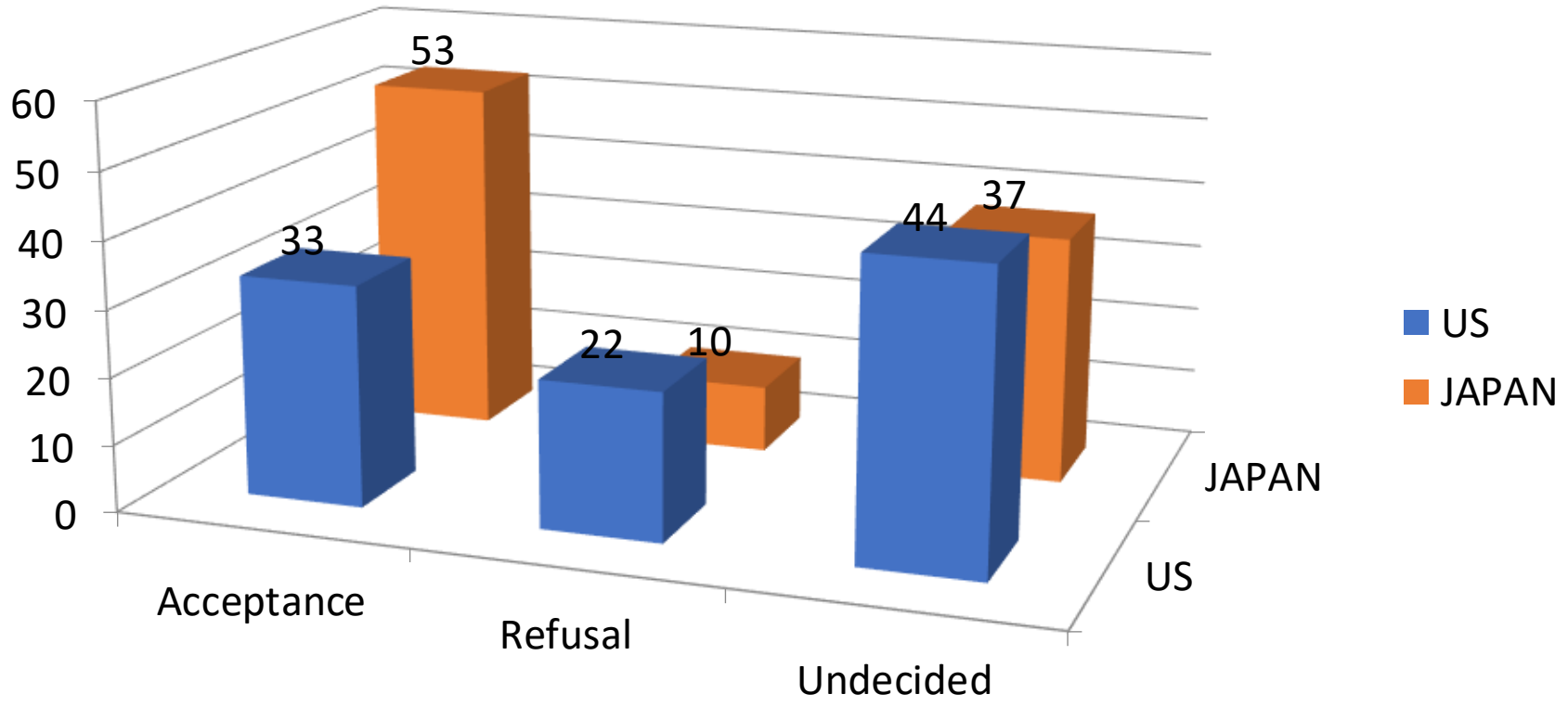
Rabkin, Amyotroph Lateral Scler Frontotemporal Degener. 2014 Jun;15(3-4):185-91

Why is taking decisions so difficult with these patients?

- The stakes are high: life, quality of life, the future, the consequences for relatives, etc.
- Feelings, especially fear, can weigh heavy in these situations and their influence on medium and long term decisions may be too great.
- The issues are not easy to understand and, if the physician is not an expert in this area, a poor explanation of them may be offered.

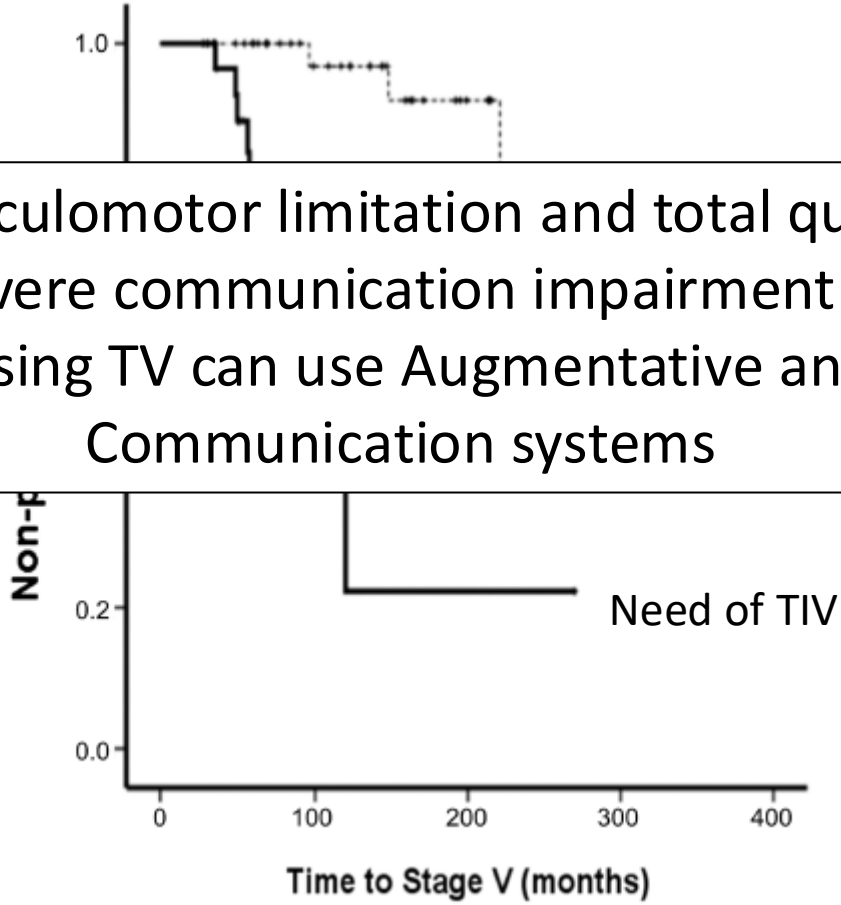
Modified from P. Arranz et al. 2004

TV in ALS: Caregivers'preference



Christodoulou, Amyotroph Lateral Scler Frontotemporal Degener. 2015;17(1-2):47-54

Impaired communication and TV in ALS

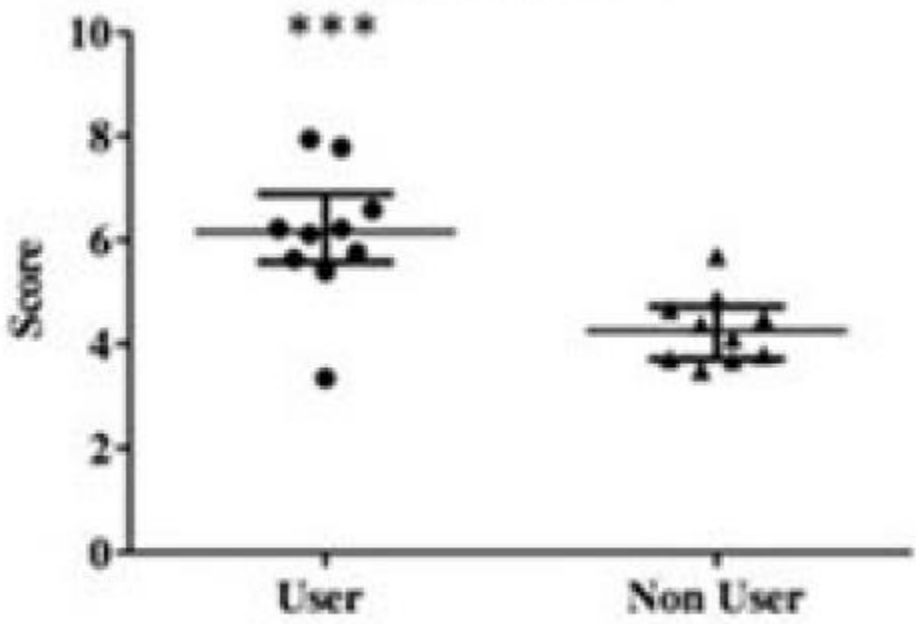


TV, impaired occulomotor limitation and total quadriplegia are predictors of severe communication impairment. About 80% of ALS patients using TV can use Augmentative and Alternative Communication systems

Nakayama, Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration, 2016; 17: 38–46

An Eye-Tracking Assistive Device Improves the Quality of Life for ALS Patients and Reduces the Caregivers' Burden

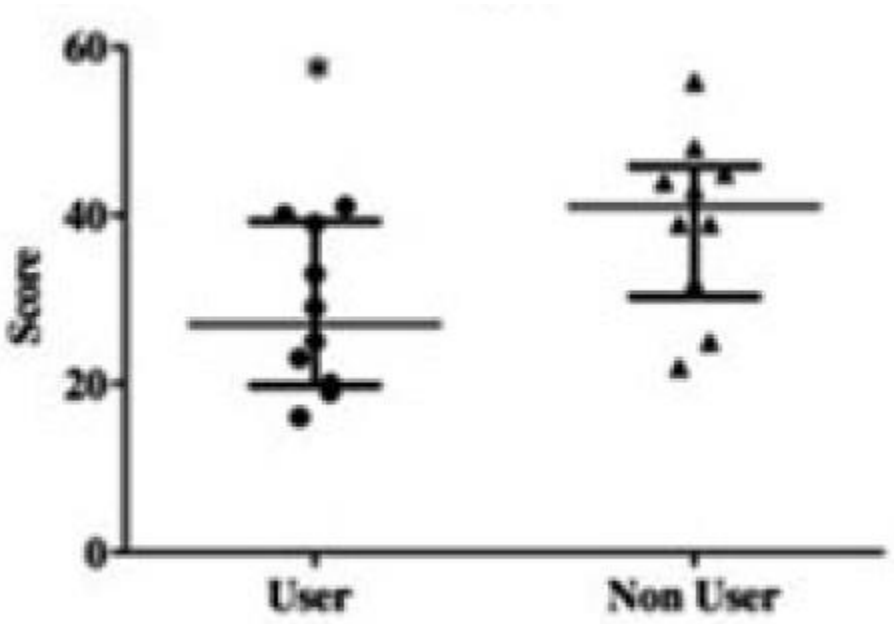
ALS Specific Quality of Life Instrument



Eye-tracking system

Phonetic board

Caregiver Burden Scale

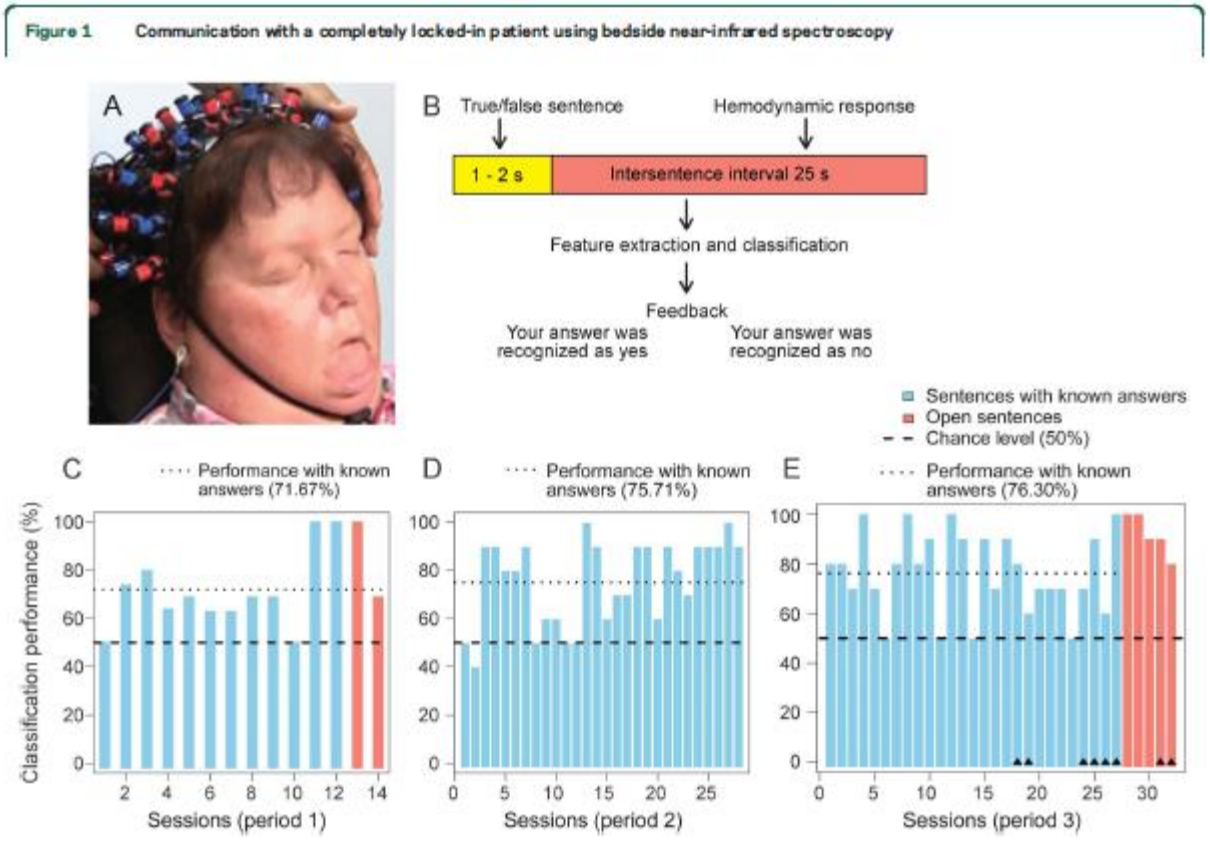


Eye-tracking system

Phonetic board

Hwang, Journal of Motor Behavior, 2014: 233-238

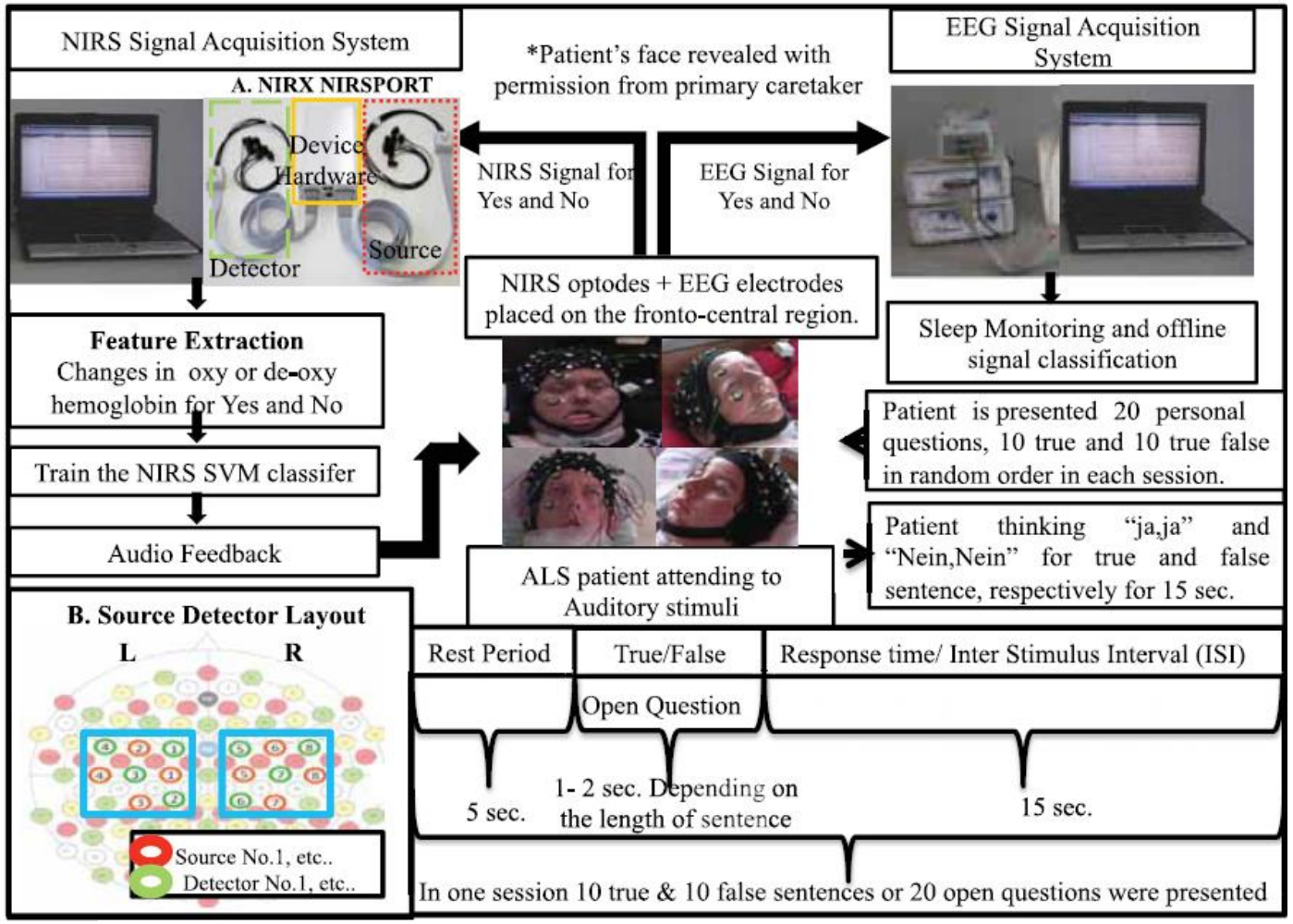
Brain communication in a completely locked-in patient using bedside near-infrared spectroscopy



Gallegos-Ayala , Neurology 82 May 27, 2014

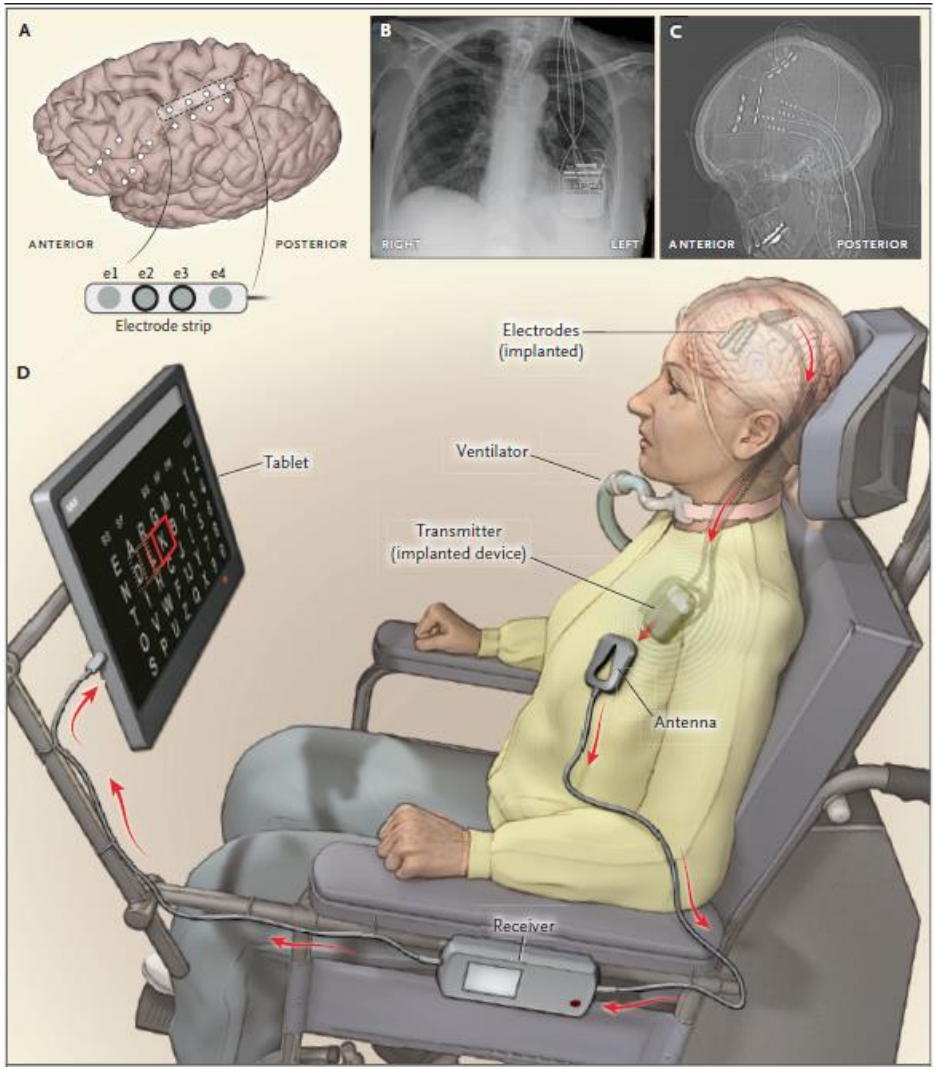
Brain–Computer Interface–Based Communication in the Completely Locked-In State

Ujwal Chaudhary[1]*, Bin Xia[2], Stefano Silvoni[3], Leonardo G. Cohen[4], Niels Birbaumer[1,5,6]*



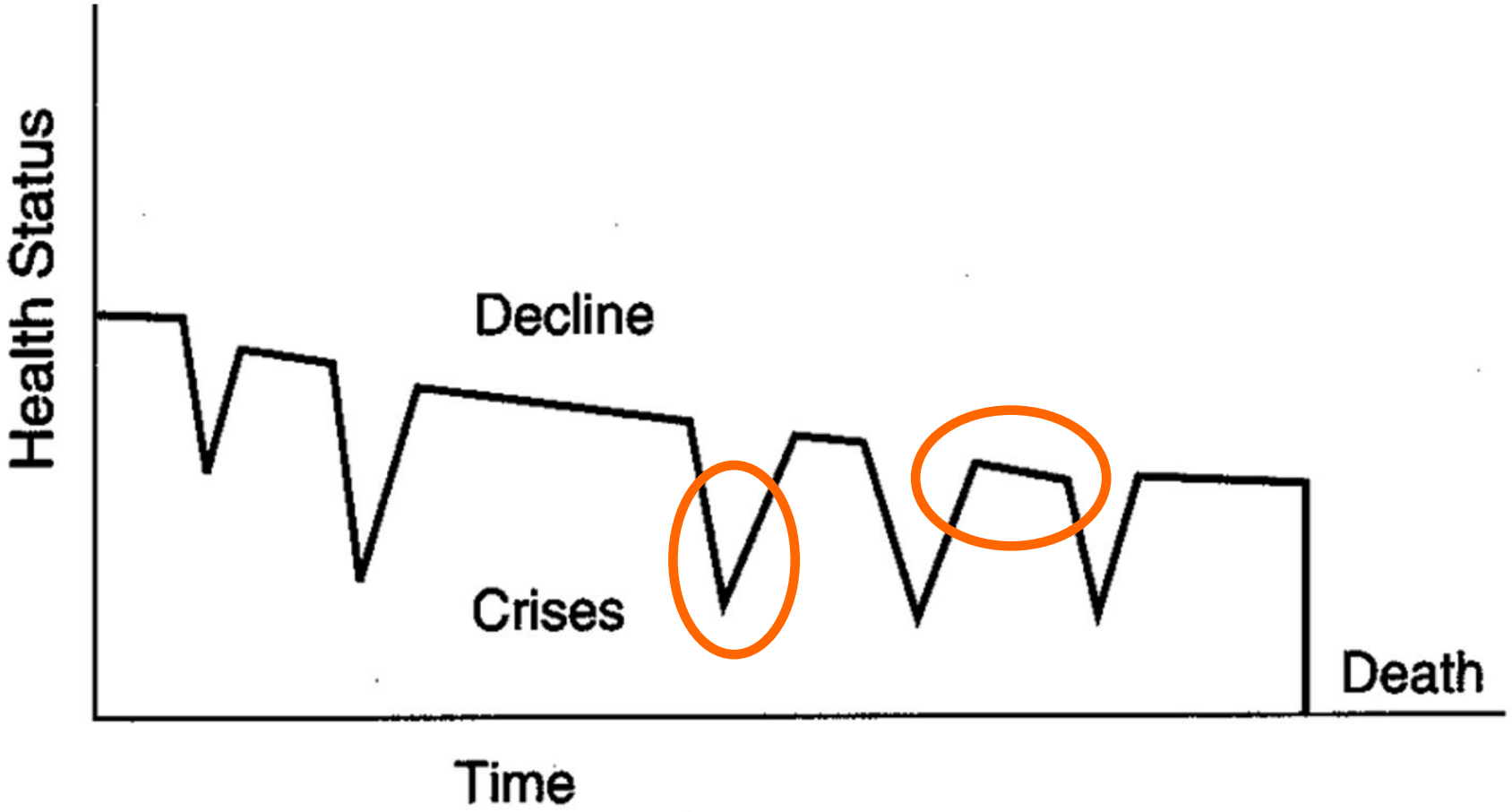
PLOS Biology | DOI:10.1371/journal.pbio.1002593 January 31, 2017

Fully Implanted Brain–Computer Interface in a Locked-In Patient with ALS

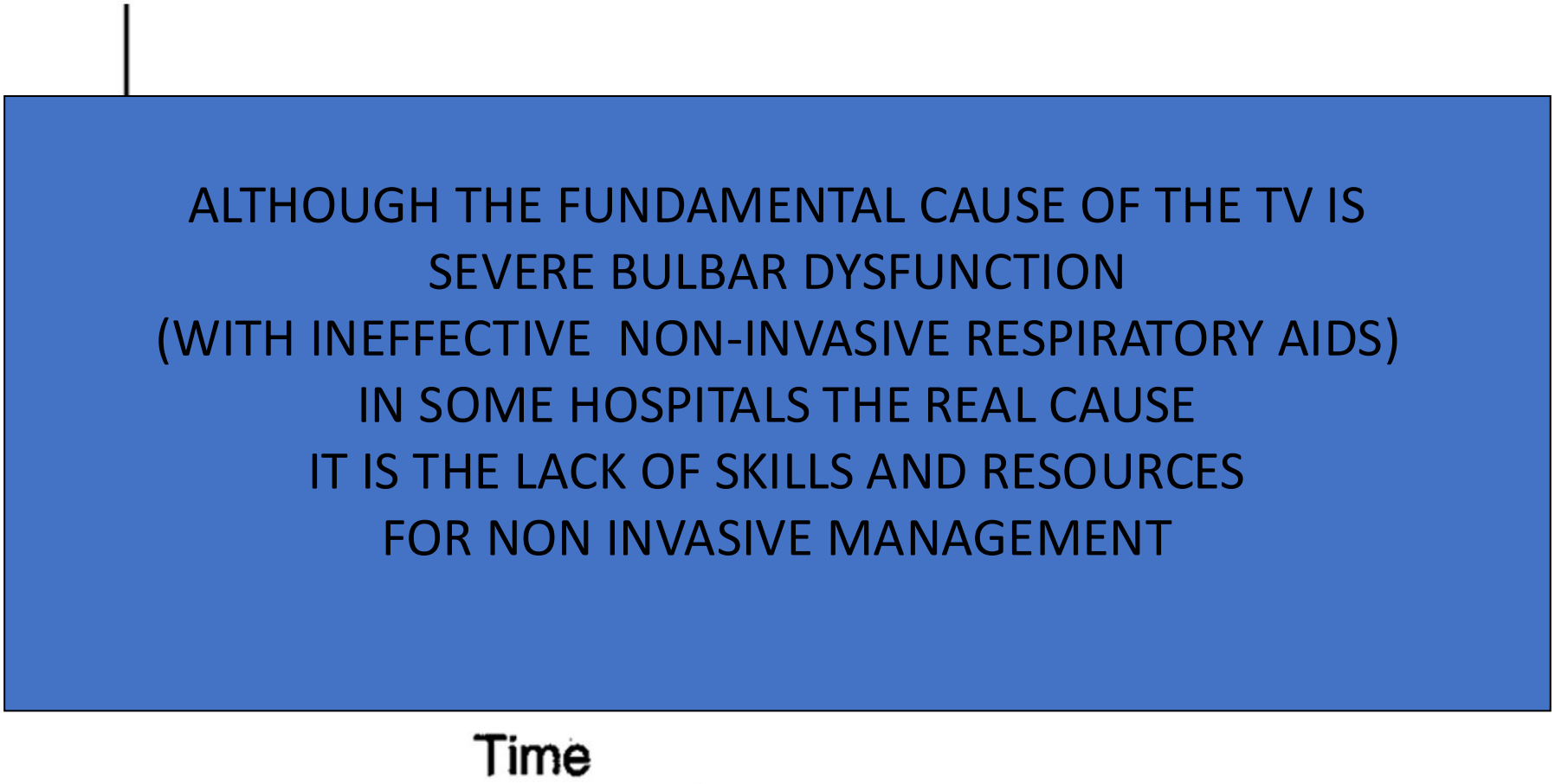


Vansteensel, **N Engl J Med 2016;375:2060-6.**

When is Tracheostomy indicated



When is Tracheostomy indicated



Predictors of need of tracheostomy

- SpO2 <95% under full time NIVS and MI-E
- Decline in PCF under MI-E

Bach JR, et al **Chest**. 2004 Nov;126(5):1502-7.

. Bach JR, et Am J Phys Med Rehabil 2018 Apr;97(4):e20-e22

One-year survival

ALS with tracheotomy mechanical ventilation: 79%

Sancho et al, Thorax 2011

Glioblastoma multiforme: 62%

European Organisation for Research and Treatment of Cancer Brain Tumour and Radiation Oncology Groups. Lancet Neurol 2009

Lung transplant: 82.7%

Registry of the International Society for heart and lung transplantation: twenty fourth official adult lung and heart lung transplant report-2007. J Heart Lung Transplant 2007

NEUROLOGY

Practice Parameter update: The care of the patient with amyotrophic lateral sclerosis: Report of the Quality Standards Subcommittee of the American Academy of Neurology

Neurology 2009;73;1218-1226

Recommendations

1. NIV may be considered to enhance QOL in patients with ALS who have respiratory insufficiency (Level C).
2. TIV may be considered to preserve QOL in patients with ALS who want long-term ventilatory support (Level C).

Patients With Amyotrophic Lateral Sclerosis Receiving Long-term Mechanical Ventilation*

Advance Care Planning and Outcomes

Alvin H. Moss, MD; Edward Anthony Oppenheimer, MD, FCCP; Patricia Casey, MSOT; Pamela A. Cazzolli, RN; Raymond P. Roos, MD; Carol B. Stocking, PhD; and Mark Siegler, MD

CHEST / 110 / 1 / JULY 1996

Of the 36 families who cared for a patient at home, 42% considered having the patient at home with LTMV as a "major burden, which changed their entire life and was stressful". However, 83% of family caregivers would have encouraged their family member with ALS to choose LTMV again. On average, patients receiving LTMV at home were more satisfied than those living in an institution.

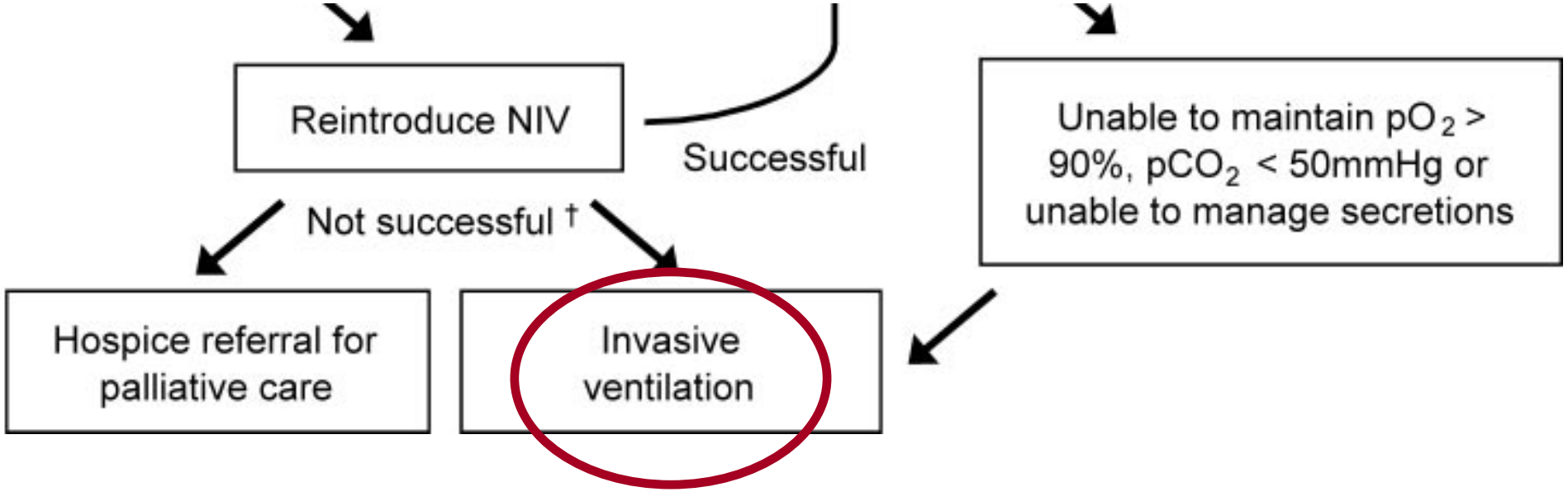
Key issues to take into account in order to take decisions in an ethical manner

- **Understand that the patients have a right to know their future: they must be informed.**
- **Understand that they have the right to choose from the options: we must not impose our choices on them**
- **Understand that they have the right to be given the best possible treatment: *hi-tech treatment*.**
- **Understand that avoiding suffering and being compassionate is an essential part of best practice**

NEUROLOGY

Practice Parameter update: The care of the patient with amyotrophic lateralsclerosis: Report of the Quality Standards Subcommittee of the American Academy of Neurology

Neurology 2009;73;1218-1226



THORAX

Home tracheotomy mechanical ventilation in patients with amyotrophic lateral sclerosis: causes, complications and 1-year survival

Jesús Sancho,[1,2] Emilio Servera,[1,2,3] José Luis Díaz,[1,2,3] Pilar Bañuls,[1,2] Julio Marín[2,3]

Thorax 2011;**66**:948–952.

Methods A prospective study of all patients needing HTMV was performed in a referral respiratory care unit (RCU) from April 2001 to January 2010. Patients' informed decisions about HTMV were fully respected. Caregivers were trained and could telephone the RCU. Hospital staff made home visits.

Needed tracheotomy: 78 patients
Elected to have a tracheotomy: 38 patients

Situations in which a tracheotomy was required

In acute settings (n: 21)

- Trigger: Acute lower respiratory tract infection
- Immediate cause
  - Refusal of NIV: 1
  - NIV failure: 8
  - Failure of mechanical coughing aids: 3
  - Failure of both coughing aids and NIV: 9

THORAX

Situations in which a tracheotomy was required

In acute settings (n: 21)

-
-
  -
  -
  -
  -

N: 60

A cut-off point of 12 for NBS was the best predictor for the identification of the ALS patients for whom continuous NIV would become ineffective during an acute lower respiratory respiratory tract infection **(sensitivity 0.90; specificity 0.92; positive predictive value 0.76; negative predictive value 0.97).**

Servera et al. To be submitted

Norris FH, Calanchini PR, Fallat RJ, *et al*. The administration of guanidine in amyotrophic lateral sclerosis. *Neurology* 1974;**24**:721–8.

Situations in which a tracheotomy was required

In non-acute settings (n: 17)

- Primary cause: Progression of the disease
- Immediate cause:
  - Refusal of NIV: 1
  - Surgery: 1
  - NIV failure: 5
  - Failure of mechanical coughing aids: 10
  - Failure of both NIV and coughing aids: 4

THORAX

Situations in which a tracheotomy was required

In non-acute settings (n: 17)

- Primary cause: Progression of the disease
- Immediate cause:

FAILURE TO CLEAR SECRETIONS IS AN IMPORTANT FACTOR FOR TRACHEOTOMY IN ALS PATIENTS

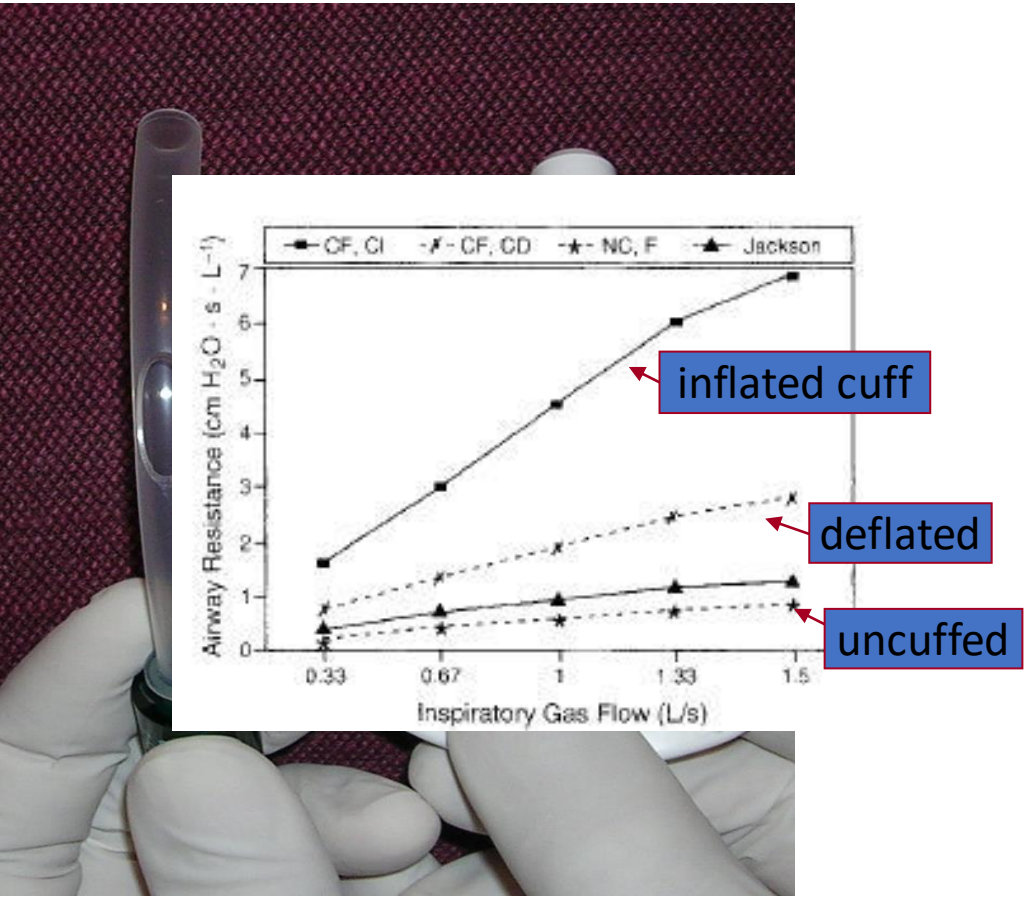
THORAX

LONG-TERM MANAGEMENT

- **CHOICE OF CANNULA**
- **CUFF MANAGEMENT**
- **MALPOSITION**
- **REPLACEMENT**
- **HUMIDIFICATION**
- **DYSPHAGIA**
- **PHONATION**

Jackson size	ID with inner cannula	ID without inner cannula	ED
4	5.0 mm	6.7 mm	9.4 mm
6	6.4 mm	8.1 mm	10.8 mm
8	7.6 mm	9.1 mm	12.2 mm
10	8.9 mm	10.7 mm	13.8 mm

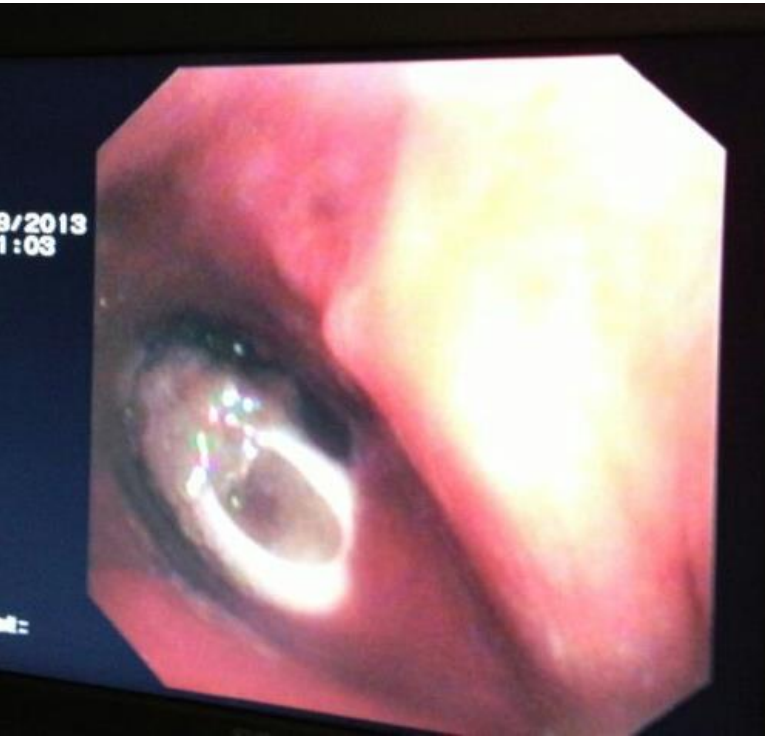
Uncuffed fenestrated cannulas

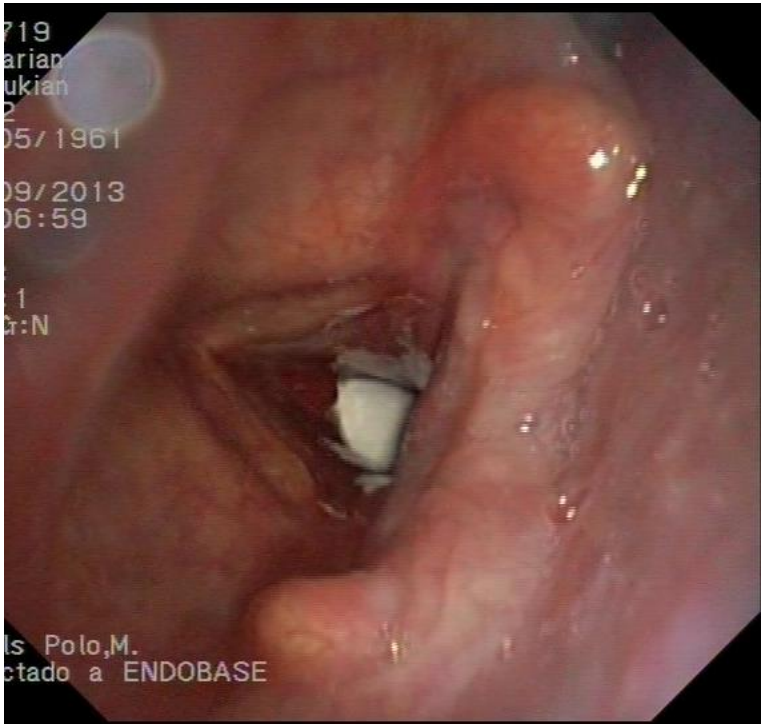


B Beard et al, Respir Care 1993

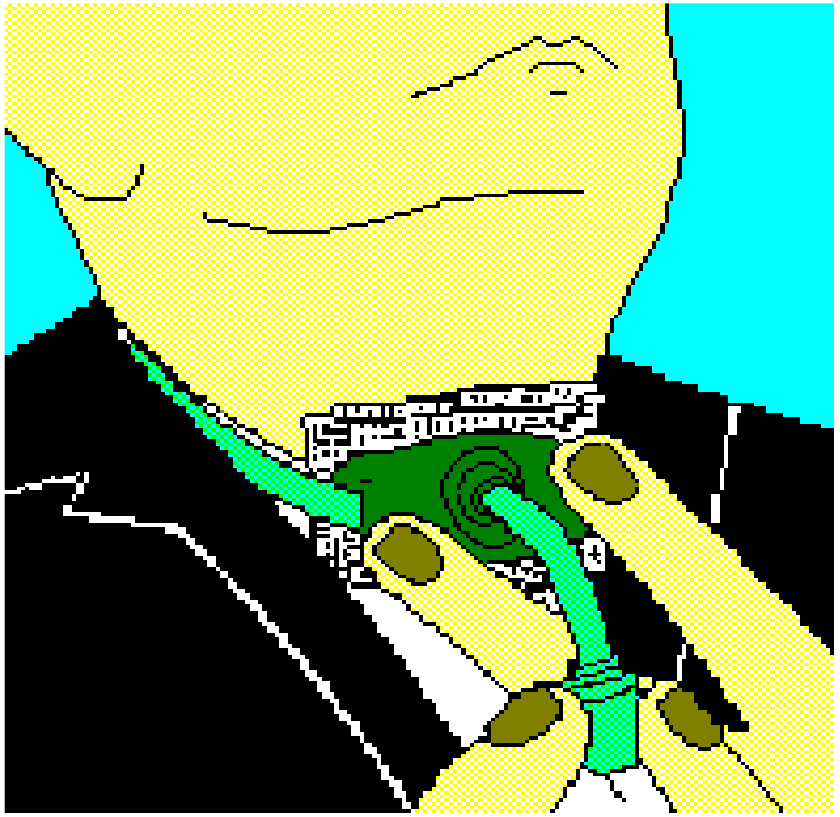
assist-control mode

Importance of fenestra location

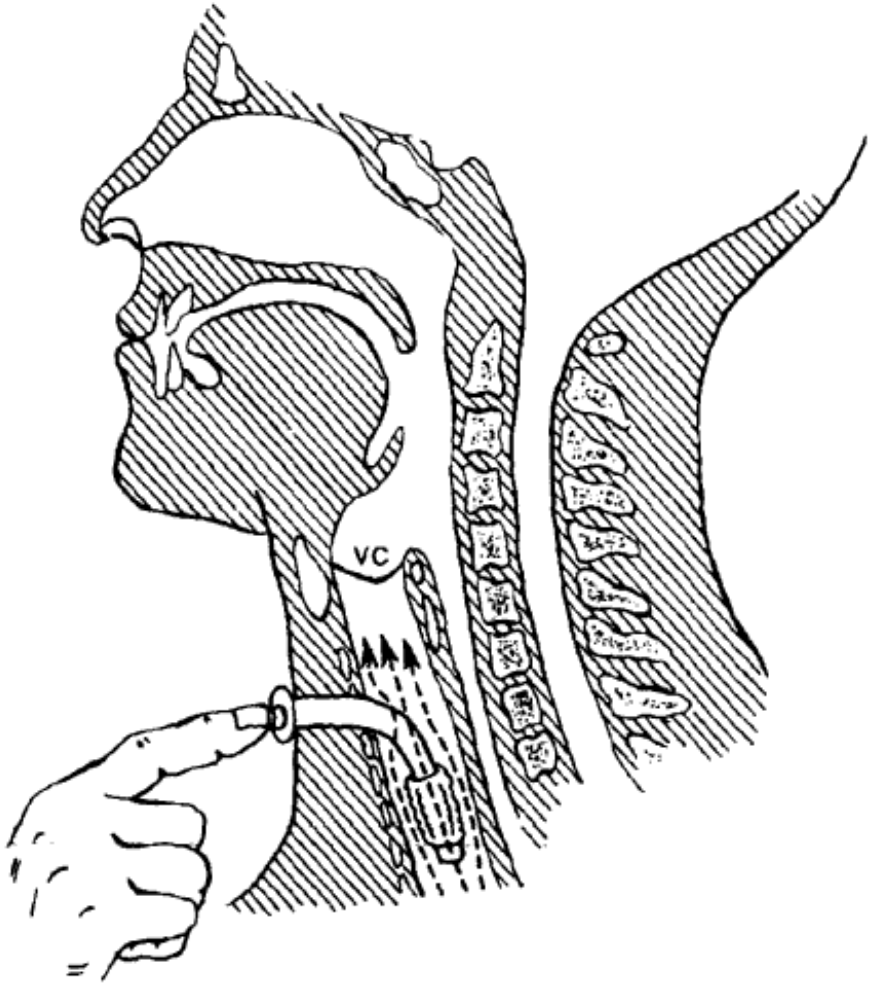


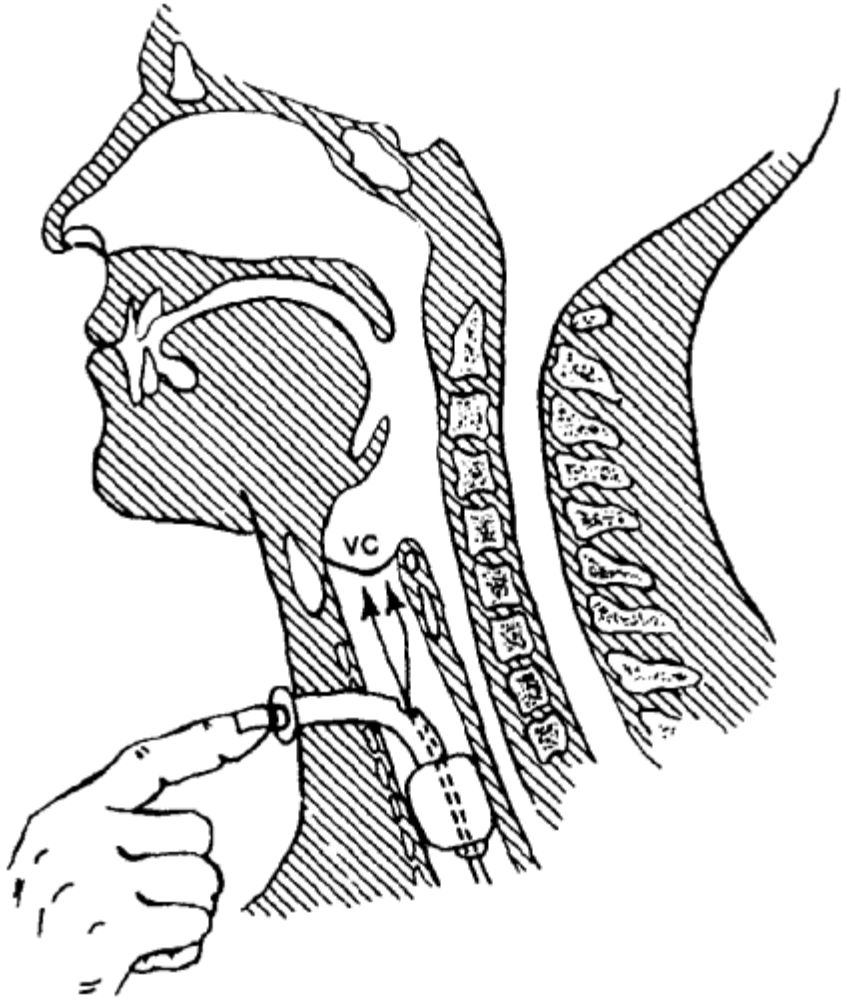


INNER CANNULA

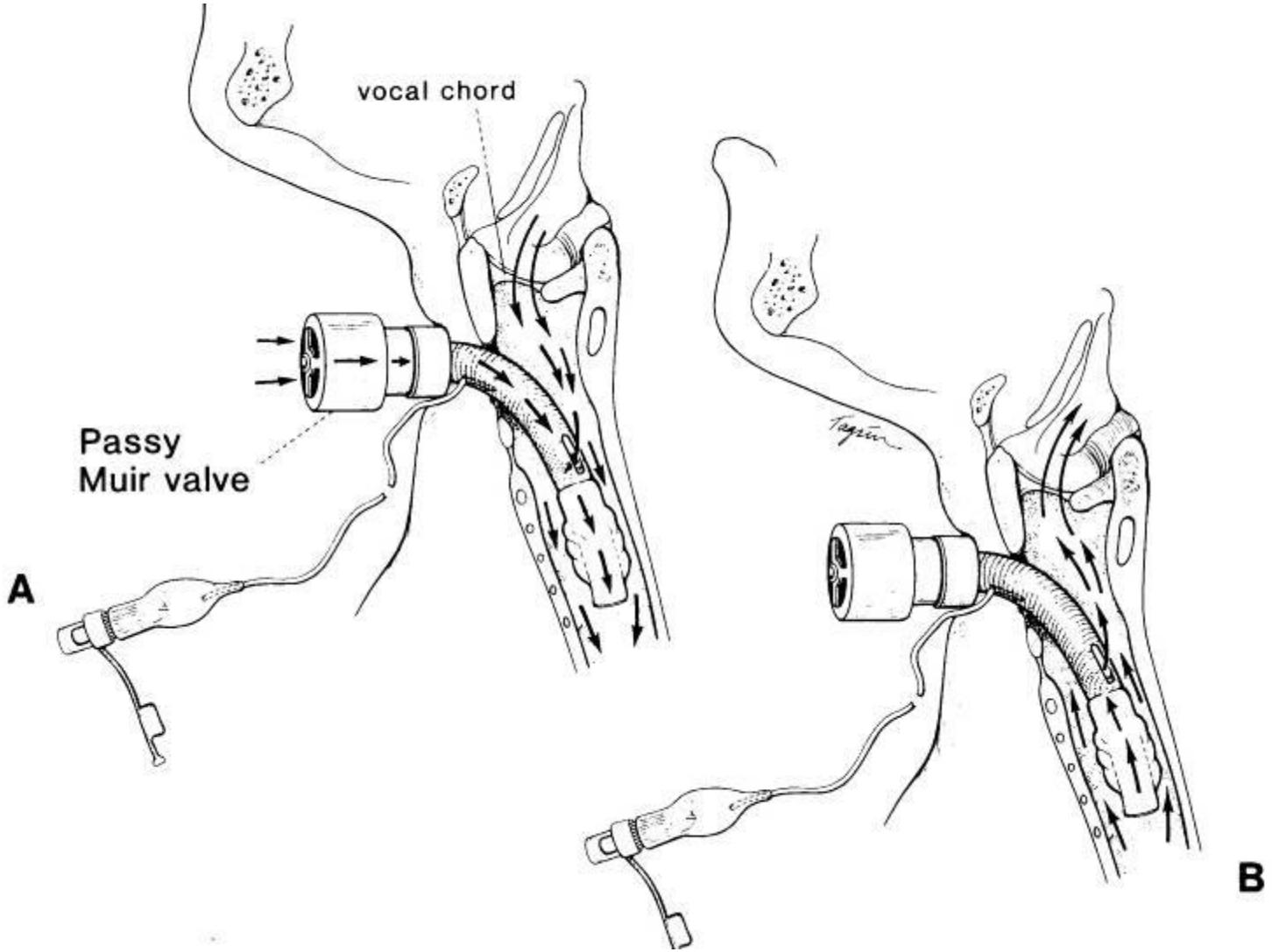


Capping

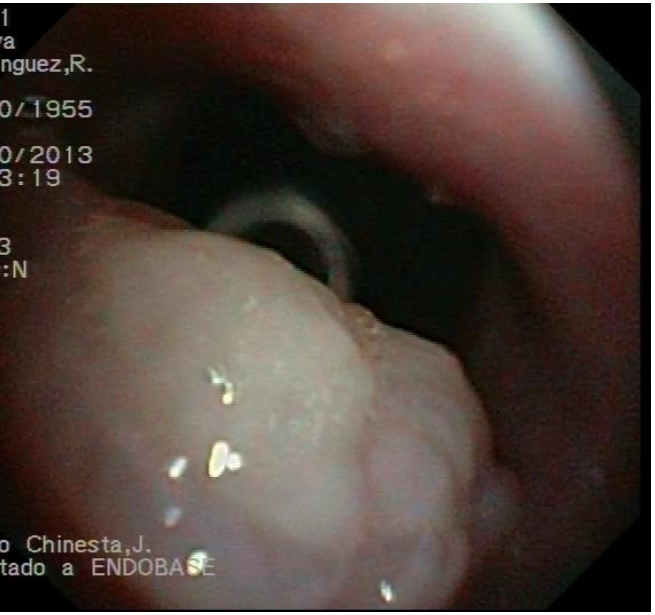

VC

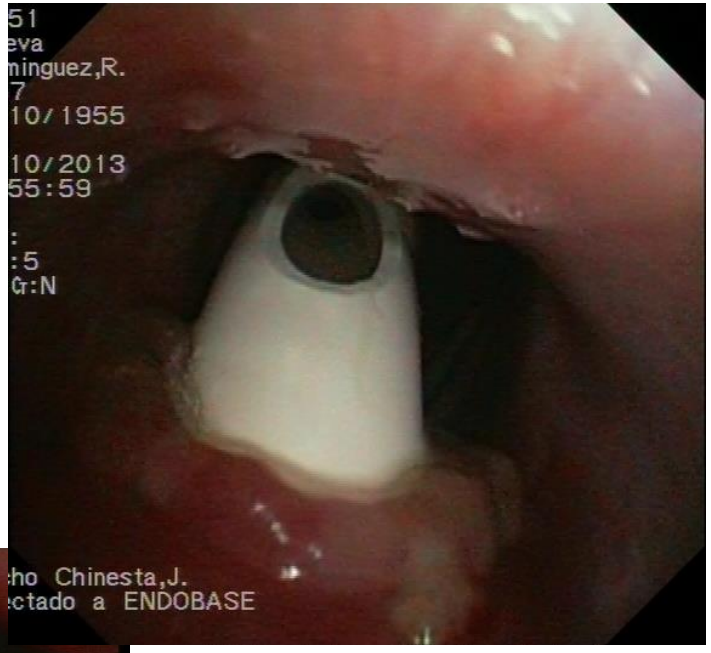

VC

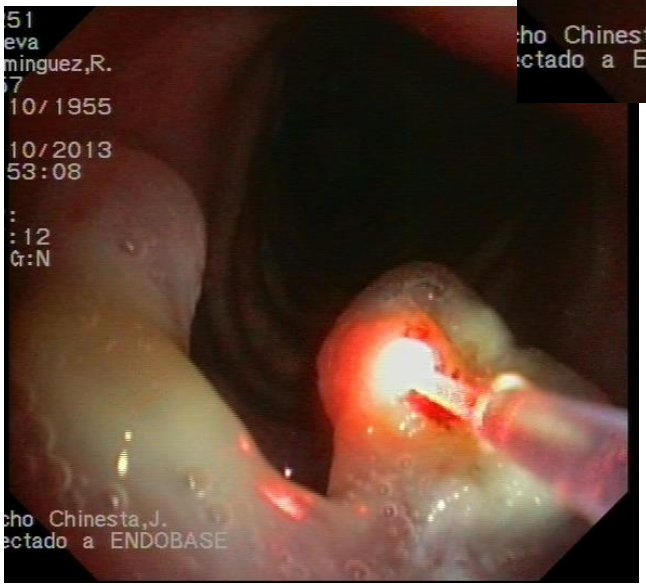
Speaking during spontaneous breathing



Granuloma and tracheal obstruction







Prolonging Survival in Amyotrophic Lateral Sclerosis

Efficacy of Noninvasive Ventilation and Uncuffed Tracheostomy Tubes

Sancho J, Servera E, Bañuls P, Marín J: Am J Phys Med Rehabil 2010;89:407–411.

- 28 ALS patients
- NBS: 9.39 ± 6.32

- Vt: 874 ± 130 mL, RR: 14.24 ± 1.08 rpm
- I/E ratio: 1/1 (26 pat.) and 1/1.25 (2 pat.)
- Peak inspiratory pressure:18.57 ± 1.91 cmH2O
- EtCO2 36.7 ± 2.7 mm Hg, SpO2 97.1 ± 0.7%.

After 5.65 ± 7.80 mos, 10 patients changed to cuffed cannulas (9 hypercapnic -EtCO2: 55.7 ± 3.3 mmHg-)

NBS was significantly lower when cuffed tubes were required: 3.20 ± 1.30 vs 8.00 ± 3.20, ($p < 0.05$).

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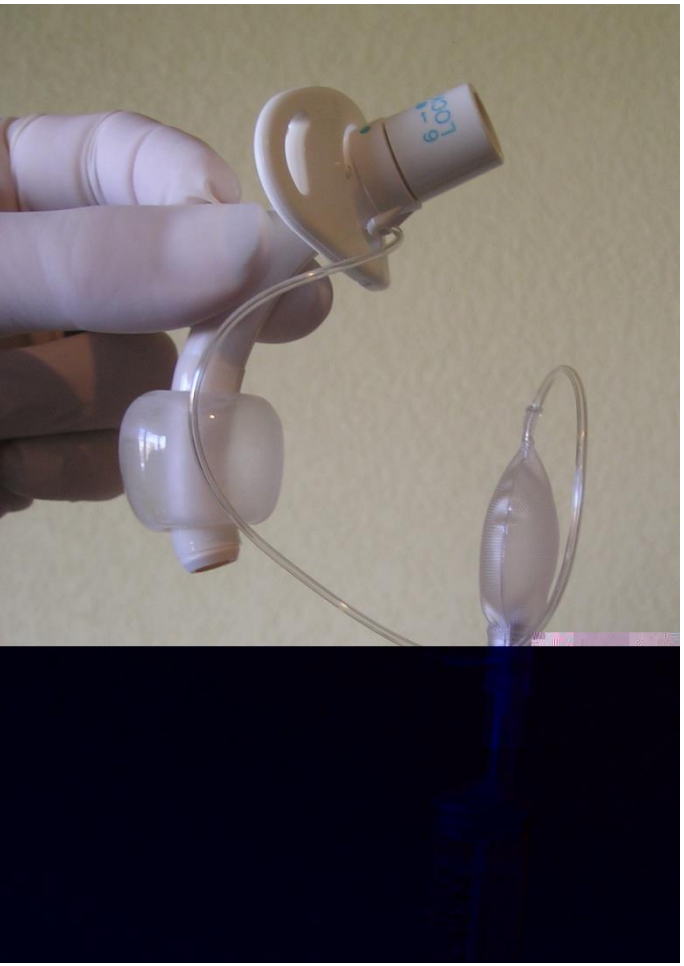
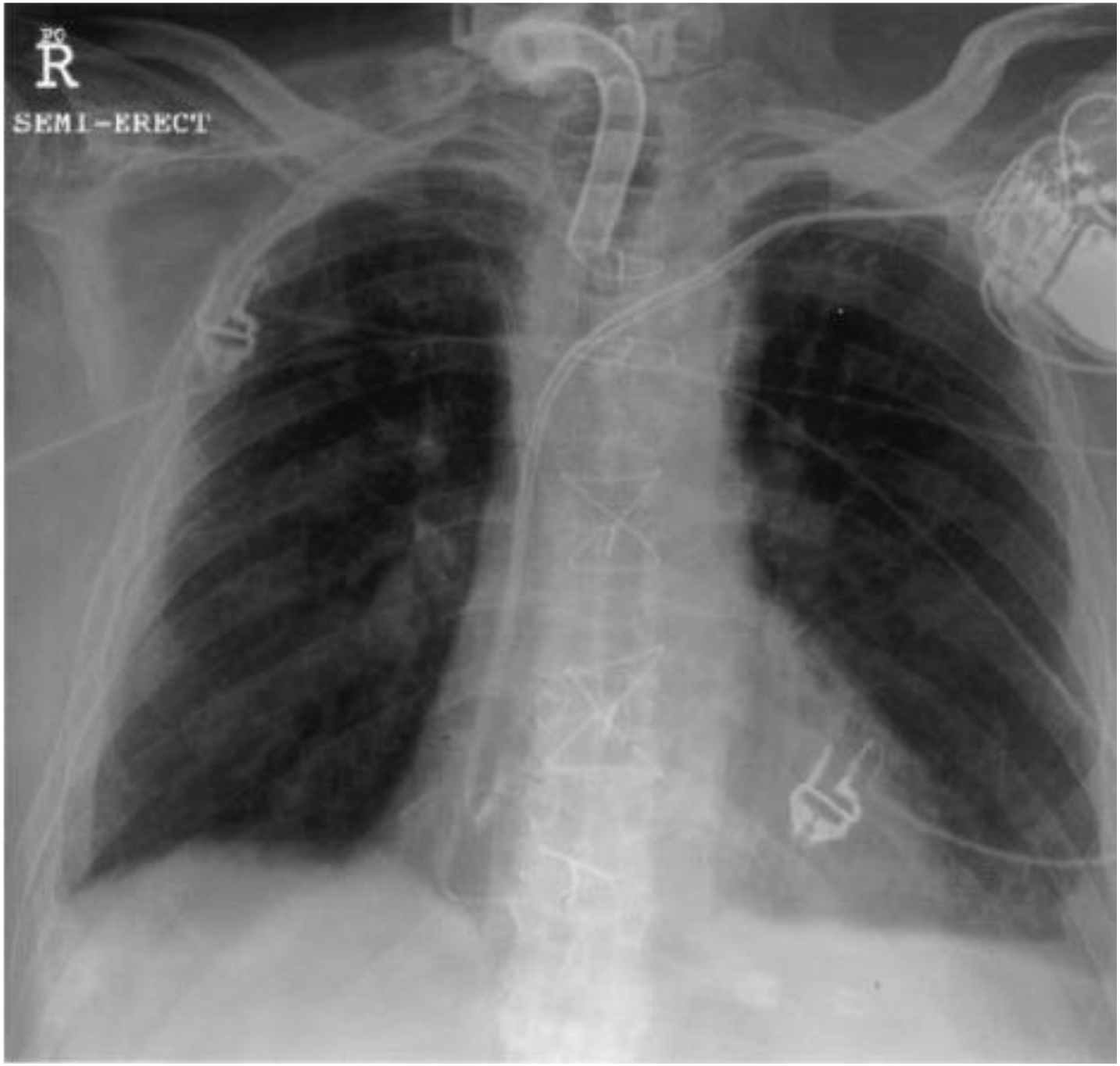
Cuffed cannulas

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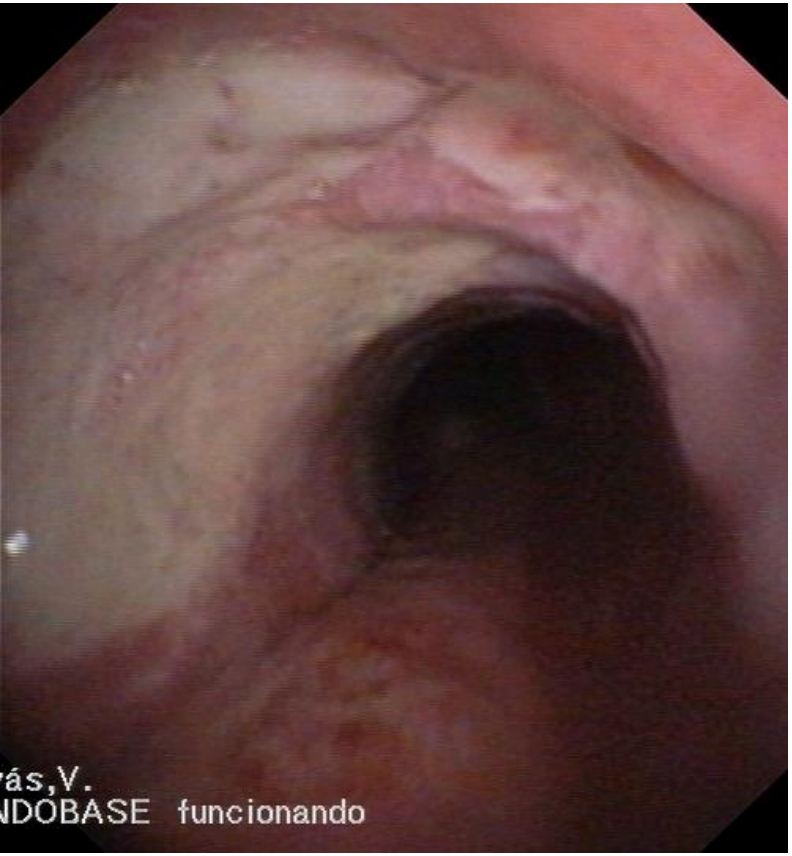
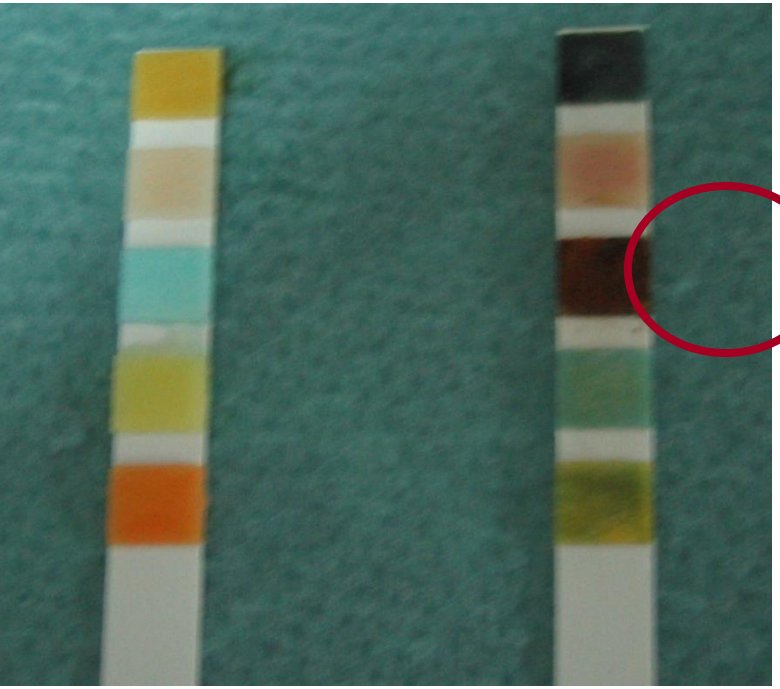
SEMI-ERECT

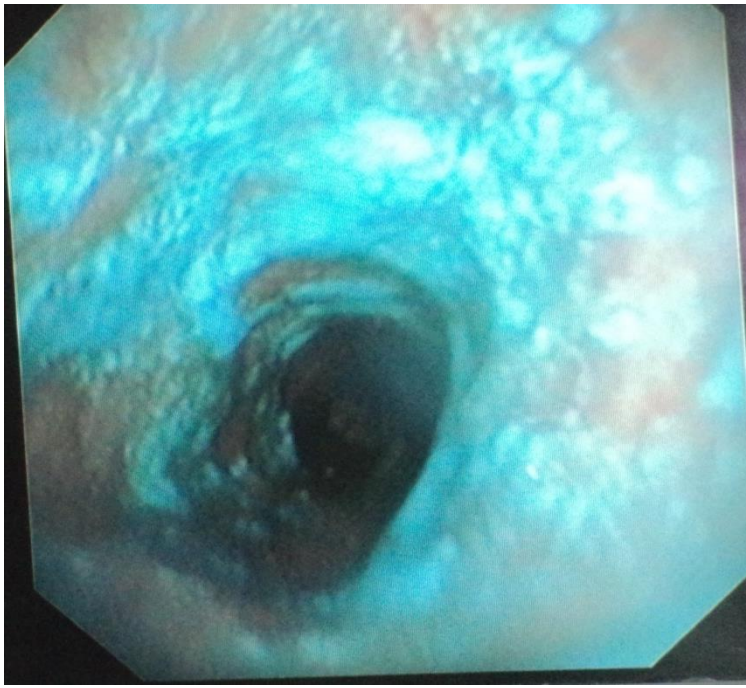
Tracheal lesions due to cuff



Food aspiration

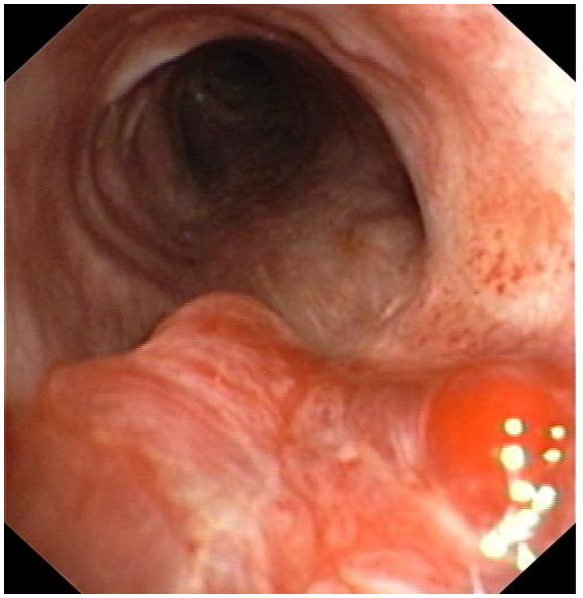


Positive glucose strip in contact with tracheal aspirate

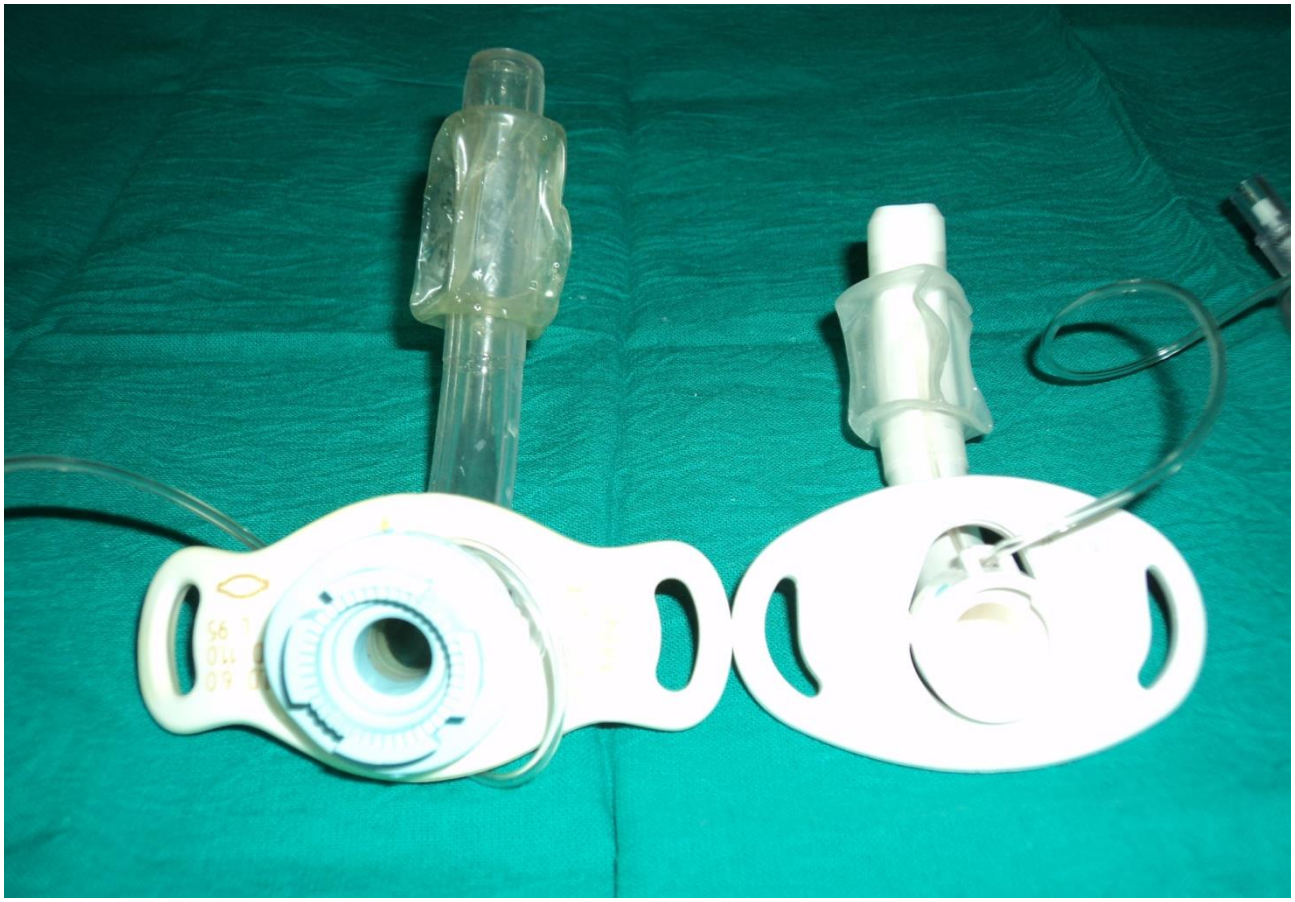


Patient did not cough after eating

Tracheal lesions due to cannula tip



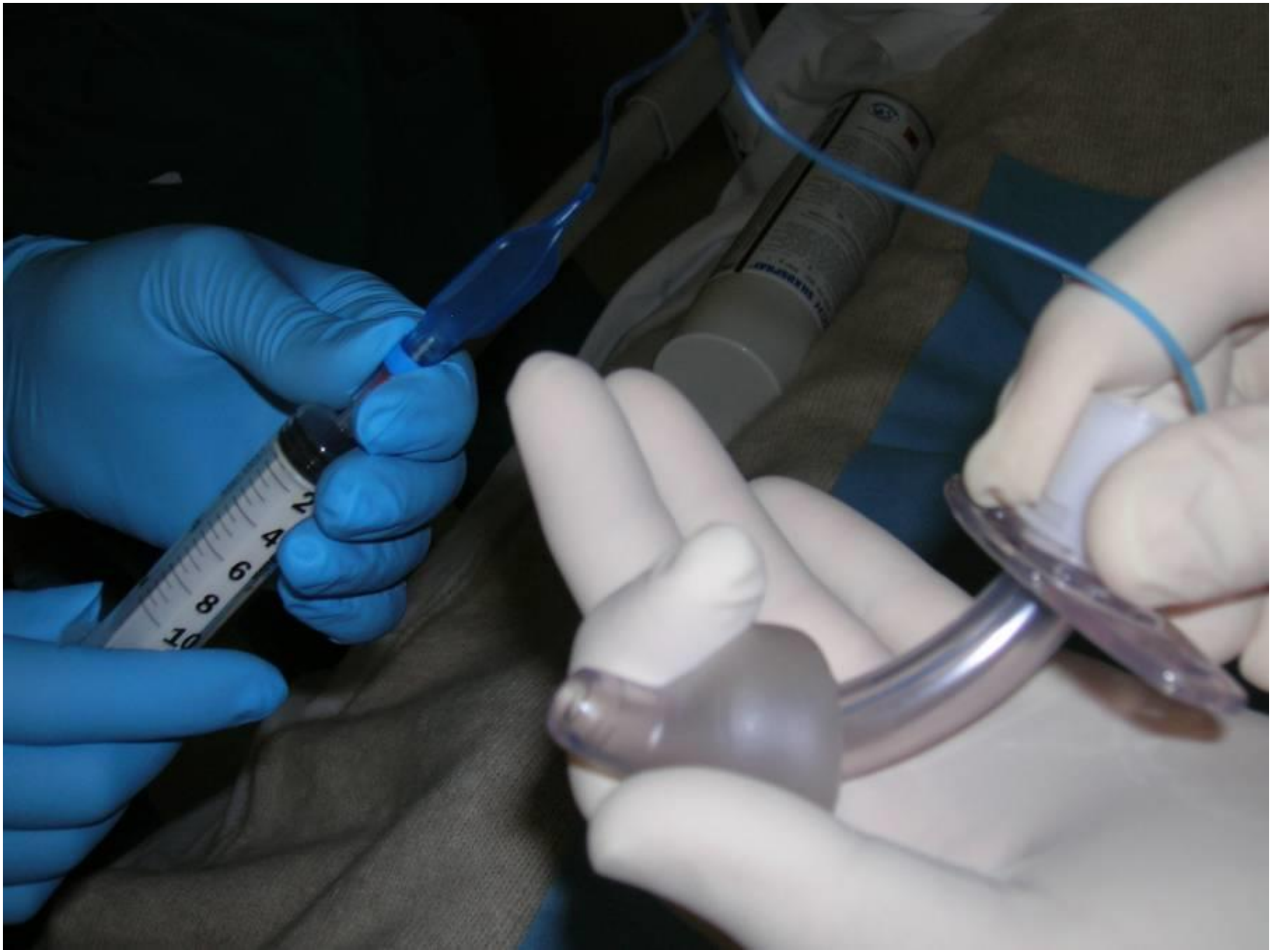
Long cannulas as alternative



MJ Rumbak et al, CHEST 1999

TUBE REPLACEMENT

- **FIRST CHANGE ADVISABLE > 10-15 DAYS AFTER TRACHEOSTOMY**
- **NO FIXED SCHEDULE FOR REPLACEMENT BUT HIGHLY DEPENDENT ON LOCAL POLICY**
- **CLOSELY LINKED TO THE TYPE OF CANNULA (INNER CANNULA etc) AND TO THE QUALITY OF DOMICILIARY MANAGEMENT**




Trademark
Johnson Consumer France s.a.s.
Sézanne (France)
Johnson & Johnson MEDICAL Limited,
Skipton, BD23 3RX, U.K.
7.5
Soft-Seal
30

Secretion clearance in tracheostomized patients

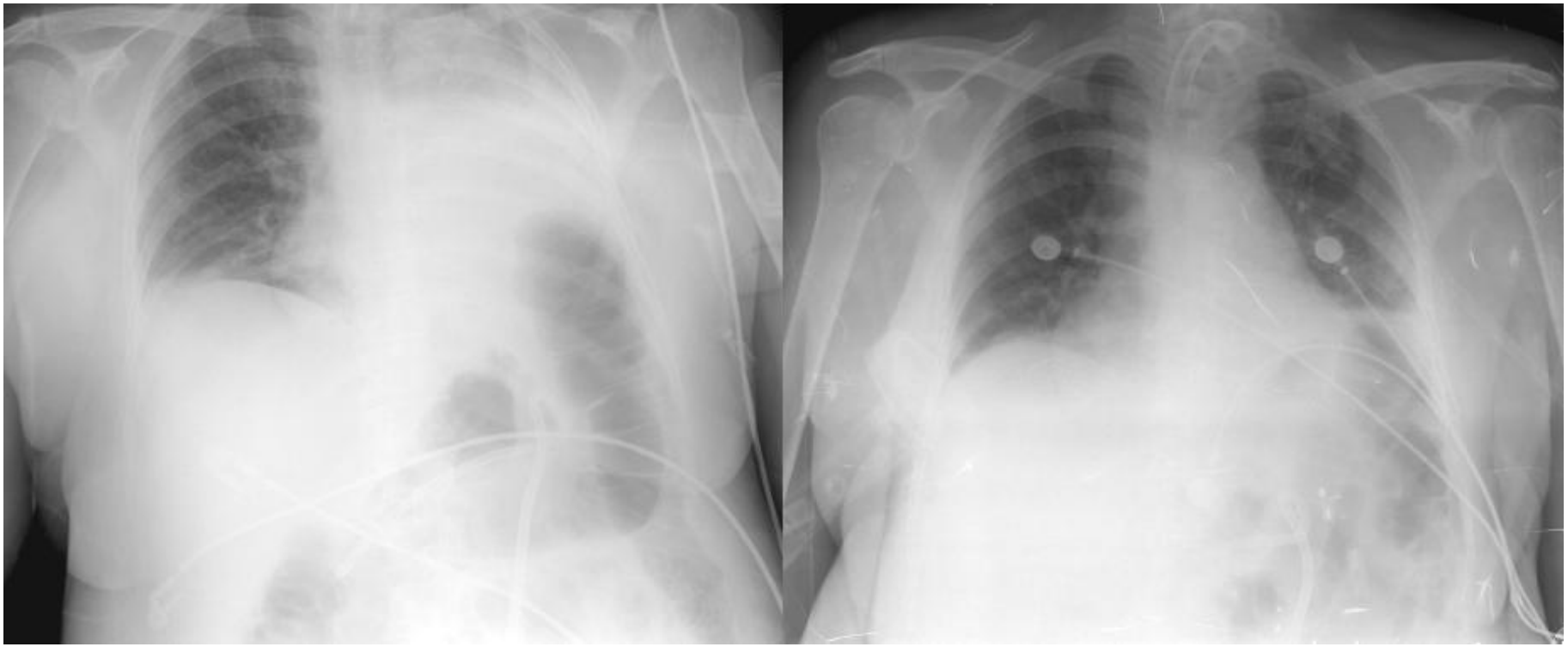
- Ambient humidity> 60%
  Systemic hydration
  SpO2 and pressure spikes
  Sensations of the patient
  Scheduled aspirations, using mechanical aids
  Filters to retain moisture
  Humidification and heated systems?
  Avoid the routine use of physiological saline instillation

Tracheal suctioning

J Sancho et al, AJPMR 2003

WARNING: tracheal suctioning can damage tracheal wall

In-exsufflation through Tracheostomy



24-2-08 **25-2-08**

Hospitalization cause

- Total number of patients admitted: 19 (50%)
  Total admissions: 31

  Causes
  Respiratory infection: 58% of the admissions (35% pneumonia).
  58% of the patients were colonized by pseudomonas
  Psychiatric evaluation / treatment: 6 patients
  Trache problems: 2 patients
  Miscellaneous: cranial trauma, gastroenteritis, hypokalemia

THORAX

Causas de muerte

- **Total de muertes:** 8 (de 38 enfermos)
- **Causas**
  - Muerte súbita: 4
  - Retirada de ventilación: 1
  - Abdomen agudo atendido por SAMU: 1
  - Parada cardíaca en insuficiencia cardíaca aguda, atendido por MC: 1
  - Infección respiratoria con rechazo a hospitalización: 1

THORAX

Causas de muerte

- **Total de muertes:** 8 (de 38 enfermos)
- **Causas**
  - Muerte súbita: 4
  - Retirad
  - Abdom
  - Parada
  - Infecci

En la literatura, las infecciones respiratorias son la causa del 45% de las muertes

Supervivencia al año 20-65%

THORAX

Stephen Hawking

Stephen Hawking tells how doctors offered to turn off life support in 1985

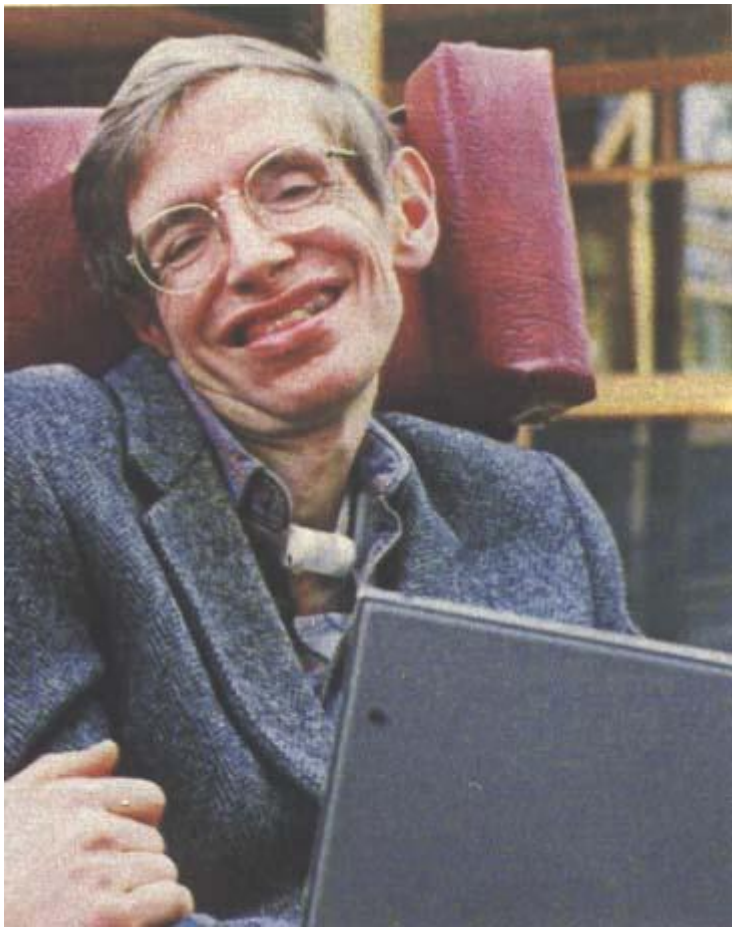
Physicist says first wife refused to end his life when he became seriously ill and he recovered to complete A Brief History of Time

" I was in Geneva at CERN, the great particle acceleration centre, in the summer of 1985.

" ... I caught pneumonia and I was admitted to hospital. At the hospital in Geneva, my wife was advised that starting mechanical ventilation would not be worthwhile.

" But she did not agree at all. I was taken to Addenbrooke's hospital back in Cambridge, and there a surgeon named Roger Grey performed a tracheotomy. That operation saved my life.

Stephen Hawking, Autobiography.



Conclusions I

- Current practice in certain countries favour THMV while in others tends to be discouraged
- Tracheostomy HMV in ALS increases survival
- HRQoL in ALS under Tracheostomy HMV is not worse than ALS controls (with or without NIV)
- The decision-making process regarding tracheostomy with invasive ventilation (TIV) is of great complexity
- Every patient must make an informed decision about Tracheostomy HMV (signing advanced directives)

Conclusions II

- Healthcare professionals should not to facilitate the choice of THMV, but rather facilitate the decision-making process on the basis of patient autonomy.
- Maintaining an effective method of communication is a primary requirement for achieving a reasonable QoL in ALS patients using THMV

Tracheostomy is not the “

" Look up at the stars and not down at your feet "