Nutrition support in acute stroke - when and how

R. Wirth (DE)
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Disclosure of speaker‘s interest

• No conflict of interest

• Incidental speakers honoraria from
  
  Nutricia, B.Braun, Fresenius kabi, Nestle, Shire, CocaCola, Bayer HealthCare, Bundesverband Medizintechnik, AOK Bundesverband
Outline – Nutrition support after stroke

• Relevance

• Pathophysiology
  – How stroke impairs nutrition
  – Why malnutrition impairs recovery

• Diagnosis
  – Diagnosis of malnutrition
  – Diagnosis of dysphagia

• Therapy
  – When and how
Outline – Nutrition support after stroke

• **Relevance**

• **Pathophysiology**
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• **Therapy**
  – When and how
Stroke epidemiology

- Worldwide, 15 million people suffer a stroke each year; one-third die and one-third are left permanently disabled.
- The World Health Organization (WHO) predicts that disability-adjusted life years (DALYs) lost to stroke (a measure of the burden of disease) will rise from 38 million in 1990 to 61 million in 2020.

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Stroke

Neuropsychological deficits
- Somnolence
- Anxiety
- Depression
- Delirium
- Neglect
- Apraxia
- Anopsia

Paralysis

Neuropsychological deficits

Immobility

Malnutrition

Dehydration

Dysphagia

Aspiration

Outcome
- Mortality
- Mobility
- Functionality
- Complications
- Length of hospital stay
Which reported estimate of the prevalence of malnutrition after stroke is valid?
Foley et al. Stroke 2009

• 18 Studies
• Varying time after stroke
• 17 different assessment methods
• 4 Studies with validated tools (SGA, MNA, NRS)
• Prevalence 1 – 73 %
Which reported estimate of the prevalence of malnutrition after stroke is valid?

Foley et al. Stroke 2009

10 % within the first days

25 % after 2 weeks

45 % in rehabilitation period
A review of the relationship between dysphagia and malnutrition following stroke

• Malnutrition on admission: 8 – 26 %
• Dysphagia on admission: 24 – 53 %

• Dysphagia accounts for 2,5-fold risk of malnutrition in the weeks after stroke
  (OR 2,45; 95% CI 1,01 – 5,93; p < 0,048)
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Prognostic impact of weight change on short-term functional outcome in acute ischemic stroke


Prospective observational study
654 patients with ischemic stroke
Length of stay = 9 days
Modified ranking scale after 3 months

Table 2: Effect of weight changes on short-term outcomes (compared with favorable three-month mRS)

<table>
<thead>
<tr>
<th>Variables</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, per one-year</td>
<td>1.04</td>
<td>1.01–1.06</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Hospital duration, per one-day</td>
<td>1.09</td>
<td>1.04–1.14</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BMI at admission, per 1 kg/m²</td>
<td>0.90</td>
<td>0.83–0.97</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Type of meals at three-days after stroke onset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General diet</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Tube feeding</td>
<td>3.12</td>
<td>1.34–7.28</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Fasting</td>
<td>1.45</td>
<td>0.27–7.81</td>
<td>0.67</td>
</tr>
<tr>
<td>Initial neurological severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIHSS at admission, 0–7</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>NIHSS at admission, 8–14</td>
<td>5.29</td>
<td>2.79–10.03</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>NIHSS at admission, ≥ 15</td>
<td>3.97</td>
<td>1.51–10.40</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Weight-change group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable weight</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Pronounced weight loss, &gt;0.1 kg/baseline BMI-unit</td>
<td>2.43</td>
<td>1.12–5.25</td>
<td>0.02</td>
</tr>
<tr>
<td>Mild weight loss, 0.05–0.1 kg/baseline BMI-unit</td>
<td>1.31</td>
<td>0.71–2.40</td>
<td>0.39</td>
</tr>
<tr>
<td>Weight gain, ≥ 0.05 kg/baseline BMI-unit</td>
<td>0.57</td>
<td>0.25–1.31</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Adjusted for age, gender, hypertension, diabetes, dyslipidemia, smoking, atrial fibrillation, stroke subtype, hospital days, comorbid disease, BMI at admission, caloric surplus at three-days after stroke onset, type of meals at three-days after stroke onset, initial neurological severity, and weight change.

BMI, body mass index; CI, confidence interval; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; OR, odds ratio.
Sarcopenia and aging

Muscle mass (kg)

Age (y)

Sarcopenia threshold

1 % / a
Sarcopenia and catabolic crises

![Graph showing muscle mass (kg) vs. age (y). The red line indicates sarcopenia threshold with a decrease of 1% per year.]
Sarcopenia and catabolic crises

Sarcopenia threshold

Muscle mass (kg)

Age (y)

1% / a
Change in muscle mass, fat mass, and bone mineral content in the legs after stroke

Jørgensen L et al. Bone 2001
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Dysphagia after stroke and mortality

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mortality (%)</th>
<th>Mortality (%) - dysphagia</th>
<th>Mortality (%) + dysphagia</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gordon 1987</td>
<td>91</td>
<td>33</td>
<td>22</td>
<td>46</td>
<td>2.1</td>
</tr>
<tr>
<td>Smithard 1996</td>
<td>121</td>
<td>21</td>
<td>6</td>
<td>37</td>
<td>6</td>
</tr>
<tr>
<td>Mann 1999</td>
<td>128</td>
<td>4</td>
<td>0</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Broadley 2003</td>
<td>149</td>
<td>17</td>
<td>1.3</td>
<td>32</td>
<td>24.1</td>
</tr>
<tr>
<td></td>
<td>489</td>
<td>18</td>
<td>6</td>
<td>30</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Stroke with dysphagia = 5-fold increased mortality!
- (in)voluntary
- 56 muscles
- 1 swallow/minute
- 750 ml saliva/day
Prevalence of dysphagia after stroke
Martino R. et al. Stroke 2005

- screening techniques: 37% - 45%
- clinical testing: 51% - 55%
- instrumental testing: 64% to 78%
Fiberoptic endoscopic evaluation of swallowing (FEES)
Video of Prof. Dr. med. Rainer Dziewas, University Münster, Germany
### Fiberoptic Endoscopic Dysphagia Severity Scale predicts outcome after acute stroke

Warnecke et al. Cerebrovasc Dis 2009

<table>
<thead>
<tr>
<th>FEDSS Protocol</th>
<th>Main findings</th>
<th>Score</th>
<th>Clinical implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saliva</td>
<td>Penetration/aspiration</td>
<td>6</td>
<td>No oral food, tube feeding, consider intubation</td>
</tr>
<tr>
<td>Purree</td>
<td>Penetration/aspiration without or insufficient cough (reflex)</td>
<td>5</td>
<td>No oral food, tube feeding</td>
</tr>
<tr>
<td>Purree</td>
<td>Penetration/aspiration with sufficient cough (reflex)</td>
<td>4</td>
<td>Tube feeding, purree only during swallowing therapy</td>
</tr>
<tr>
<td>Liquid</td>
<td>Penetration/aspiration without or insufficient cough (reflex)</td>
<td>4</td>
<td>Tube feeding, purree only during swallowing therapy</td>
</tr>
<tr>
<td>Liquid</td>
<td>Penetration/aspiration with sufficient cough (reflex)</td>
<td>3</td>
<td>Oral purreed food and fluids i.v.</td>
</tr>
<tr>
<td>Soft solid food</td>
<td>Penetration/aspiration or massive residues</td>
<td>2</td>
<td>Oral purreed food and oral fluids</td>
</tr>
<tr>
<td>Soft solid food</td>
<td>No penetration/aspiration</td>
<td>1</td>
<td>Oral soft solid food and oral fluids</td>
</tr>
</tbody>
</table>
### Dysphagia Bedside Screening for Acute-Stroke Patients – The Gugging Swallowing Screen

Trapl M et al. Stroke 2007

1. **Preliminary Investigation/Indirect Swallowing Test**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vigilance</strong> (The patient must be alert for at least for 15 minutes)</td>
<td>1 □</td>
<td>0 □</td>
</tr>
<tr>
<td><strong>Cough and/or throat clearing (voluntary cough)</strong></td>
<td>1 □</td>
<td>0 □</td>
</tr>
<tr>
<td>(Patient should cough or clear his or her throat twice)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Saliva Swallow:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Swallowing successful</td>
<td>1 □</td>
<td>0 □</td>
</tr>
<tr>
<td>• Drooling</td>
<td>0 □</td>
<td>1 □</td>
</tr>
<tr>
<td>• Voice change (hoarse, gurgly, coated, weak)</td>
<td>0 □</td>
<td>1 □</td>
</tr>
<tr>
<td><strong>SUM:</strong> (5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 - 4 = Investigate further
5 = Continue with part 2

2. **Direct Swallowing Test** (Materials: Aqua b, flat teaspoon, food thickener, bread)

<table>
<thead>
<tr>
<th>DEGLUTITION:</th>
<th>1 →</th>
<th>2 →</th>
<th>3 →</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swallowing not possible</td>
<td>0 □</td>
<td>0 □</td>
<td>0 □</td>
</tr>
<tr>
<td>Swallowing delayed (&gt; 2 sec) (Solid textures &gt; 10 sec.)</td>
<td>1 □</td>
<td>1 □</td>
<td>1 □</td>
</tr>
<tr>
<td>Swallowing successful</td>
<td>2 □</td>
<td>2 □</td>
<td>2 □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COUGH (involuntary):</th>
<th>1 →</th>
<th>2 →</th>
<th>3 →</th>
</tr>
</thead>
<tbody>
<tr>
<td>before, during or after swallowing – until 3 minutes later</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yes</td>
<td>0 □</td>
<td>0 □</td>
<td>0 □</td>
</tr>
<tr>
<td>• No</td>
<td>1 □</td>
<td>1 □</td>
<td>1 □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DROOLING:</th>
<th>1 →</th>
<th>2 →</th>
<th>3 →</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>0 □</td>
<td>0 □</td>
<td>0 □</td>
</tr>
<tr>
<td>No</td>
<td>1 □</td>
<td>1 □</td>
<td>1 □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VOICE CHANGE:</th>
<th>1 →</th>
<th>2 →</th>
<th>3 →</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Listen to the voice before and after swallowing - Patient should speak “OK”)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yes</td>
<td>0 □</td>
<td>0 □</td>
<td>0 □</td>
</tr>
<tr>
<td>• No</td>
<td>1 □</td>
<td>1 □</td>
<td>1 □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SUM:</strong> (5) (5) (5)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4 = Investigate further*</td>
<td>1 - 4 = Investigate further*</td>
<td>1 - 4 = Investigate further*</td>
<td></td>
</tr>
<tr>
<td>5 = Continue Liquid</td>
<td>5 = Continue Solid</td>
<td>5 = Normal</td>
<td></td>
</tr>
</tbody>
</table>
## Dysphagia Bedside Screening for Acute-Stroke Patients – The Gugging Swallowing Screen

Trapl M et al. Stroke 2007

<table>
<thead>
<tr>
<th>RESULTS</th>
<th>SEVERITY CODE</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
</table>
| 20      | Semisolid / liquid and solid texture successful | Slight / No Dysphagia minimal risk of aspiration | • Normal Diet  
• Regular Liquids (First time under supervision of the SLT or a trained stroke nurse!) |
| 15-19   | Semisolid and liquid texture successful and Solid unsuccessful | Slight Dysphagia with a low risk of aspiration | • Dysphagia Diet (pureed and soft food)  
• Liquids very slowly – one sip at a time  
• Functional swallowing assessments such as Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopic Evaluation of Swallowing (VFES)  
• Refer to Speech and Language Therapist (SLT) |
| 10-14   | Semisolid swallow success and Liquids unsuccessful | Moderate dysphagia with a risk of aspiration | Dysphagia diet beginning with:  
• Semisolid textures such as baby food and additional parenteral feeding.  
• All liquids must be thickened!  
• Pills must be crushed and mixed with thick liquid.  
• No liquid medication!  
• Further functional swallowing assessments (FEES, VFES)  
• Refer to Speech and Language Therapist (SLT)  

Supplementation with nasogastric tube or parenteral |
| 0-9     | Preliminary investigation unsuccessful or Semisolid swallow unsuccessful | Severe dysphagia with a high risk of aspiration | • NPO (non per os = nothing by mouth)  
• Further functional swallowing assessment (FEES, VFES)  
• Refer to Speech and Language Therapist (SLT)  

Supplementation with nasogastric tube or parenteral |
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  – When and how
Improving post-stroke dysphagia outcomes through a standardized multidisciplinary protocol
Gandolfi M et al. Dysphagia 2014

Table 2 Odds ratios for the effect of the standardized clinical protocol implementation on outcome variables

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>All stroke patients (n = 84)</th>
<th>Ischemic stroke patients (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR unadjusted (95% CI)</td>
<td>OR adjusted(^a) (95% CI)</td>
</tr>
<tr>
<td>Death</td>
<td>0.20 (0.53–0.78)</td>
<td>0.16 (0.03–0.78)</td>
</tr>
<tr>
<td>Pneumonia(^c)</td>
<td>0.33 (0.10–1.03)</td>
<td>0.34 (0.07–1.49)</td>
</tr>
<tr>
<td>Respiratory support(^c)</td>
<td>0.48 (0.14–1.66)</td>
<td>0.29 (0.04–1.84)</td>
</tr>
<tr>
<td>NFT versus no NFT on discharge(^c)</td>
<td>0.30 (0.09–0.91)</td>
<td>0.17 (0.03–0.77)</td>
</tr>
</tbody>
</table>

\(^a\) Adjusted for sex (male), age ≥80 years, previous stroke or TIA, dementia, dysarthria, type of stroke and Barthel index score on admission.

\(^b\) Adjusted for Bamford classification.

\(^c\) Calculated on survivors (n = 68).

NTF nasogastric tube feeding, OR odds ratio, CI confidence interval.
Fig. 2 Flow chart of the clinical protocol for dysphagia rehabilitation. *NTF* nasogastric tube feeding, *BI* Barthel Index, *DOSS* Dysphagia Outcome Severity Scale, *TCT* Trunk Control Test, *PEG* percutaneous endoscopic gastrostomy, *FEES* fiber-optic endoscopic evaluation of swallowing, *VFSS* videofluoroscopic swallow study
Guideline of the German Society for Nutritional Medicine (DGEM) in cooperation with the GESKES, the AKE, the DGN and the DGG Clinical Nutrition in Neurology – Part of the Ongoing S3-Guideline Project Clinical Nutrition

Autoren
R. Wirth¹, R. Dziewas², M. Jäger³, T. Warnecke², C. Smoliner⁴, K. Stingel⁵, A. H. Leischker⁶ und das DGEM Steering Committee*

Institute
Die Institute sind am Ende des Artikels gelistet.
Guideline clinical nutrition in patients with stroke

Rainer Wirth¹,²*, Christine Smoliner¹, Martin Jäger³, Tobias Warnecke⁴, Andreas H Leischker⁵, Rainer Dziewas⁴ and The DGEM Steering Committee*

Abstract

Stroke is regularly accompanied by dysphagia and other factors associated with decreased nutritional intake. Dysphagia with aspiration pneumonia and insufficient nutritional intake lead to worse outcome after stroke. This guideline is the first chapter of the guideline “Clinical Nutrition in Neurology” of the German Society for Clinical Nutrition (DGEM) which itself is one part of a comprehensive guideline about all areas of Clinical Nutrition. The thirty-one recommendations of the guideline are based on a systematic literature search and review, last updated December 31, 2011. All recommendations were discussed and consented at several consensus conferences with the entire DGEM guideline group. The recommendations underline the importance of an early screening and assessment of dysphagia and give advice for an evidence based and comprehensive nutritional management to avoid aspiration, malnutrition and dehydration.

Keywords: Dysphagia, Guideline, Stroke, Tube feeding
Some recommendations I

- A formalised screening for dysphagia should be performed in all stroke patients (B).
- All stroke patients should be screened for nutritional risk within the first days after hospital admission (CCP).
- Severe swallowing difficulties that do not allow sufficient oral food intake and are anticipated to persist for more than one week require early enteral nutrition via feeding tube (at least within 72 hours) (C).
- If a sufficient oral food intake is not possible during the acute phase of stroke, enteral nutrition shall be preferably given via a nasogastric tube (A).
- If enteral feeding is likely for a longer period of time (> 28 days), a PEG should be chosen and shall be placed in a stable clinical phase (after 14 – 28 days) (A).
Some recommendations II

• Nasogastric tube feeding does not interfere with swallowing training. Therefore, dysphagia therapy shall start as early as possible also in tube-fed patients (A).

• The majority of conscious dysphagic stroke patients with tube feeding should have additional oral intake, according to the kind and severity of dysphagia (B).

• Stroke patients, who are able to eat and who have been identified to be at risk of malnutrition, who are malnourished or who are at risk for pressure sores should receive oral nutritional supplements (B).

• After assessment of the swallowing act (e.g. careful evaluation by the speech-language pathologists and/or video- fluoroscopic or endoscopic examination) a texture modified diet and thickened fluids of a safe texture should be given to patients (CCP).
Dysphagia Aspiration risk

No (FEDSS 1; GUSS 20)

Mild (FEDSS 2; GUSS 15-19)

Moderate (FEDSS 3; GUSS 10-14)

Severe (FEDSS 4-6; GUSS 0-9)

Pre-existing nutritional risk (NRS, MNA, SGA)

Oral food

Oral food + ONS

Texture modified diet (safe texture)

Texture modified diet + ONS + fluids i.v.

Tube feeding

Intensive swallowing training
Thank you for your attention!