# Prediction of Outcome in Neurogenic Oropharyngeal Dysphagia within 72 Hours of Acute Stroke

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*Background:* Stroke is the most frequent cause of neurogenic oropharyngeal dysphagia (NOD). In the acute phase of stroke, the frequency of NOD is greater than 50% and, half of this patient population return to good swallowing within 14 days while the other half develop chronic dysphagia. Because dysphagia leads to aspiration pneumonia, malnutrition, and in-hospital mortality, it is important to pay attention to swallowing problems. The question arises if a prediction of severe chronic dysphagia is possible within the first 72 hours of acute stroke. *Methods:* On admission to the stroke unit, all stroke patients were screened for swallowing problems by the nursing staff within 2 hours. Patients showing signs of aspiration were included in the study (n = 114) and were given a clinical swallowing examination (CSE) by the swallowing/speech therapist within 24 hours and a swallowing endoscopy within 72 hours by the physician. The primary outcome of the study was the functional communication measure (FCM) of swallowing (score 1-3, tube feeding dependency) on day 90. *Results:* The grading system with the FCM swallowing and the penetration–aspiration scale (PAS) in the first 72 hours was tested in a multivariate analysis for its predictive value for tube feeding–dependency on day 90. For the FCM level 1 to 3 ($P < .0022$) and PAS level 5 to 8 ($P < .00001$), the area under the curve (AUC) was 72.8% and showed an odds ratio of 11.8 ($P < .00001$; 95% confidence interval 0.036-0.096), achieving for the patient a 12 times less chance of being orally fed on day 90 and therefore still being tube feeding–dependent. *Conclusions:* We conclude that signs of aspiration in the first 72 hours of acute stroke can predict severe swallowing problems on day 90. Consequently, patients should be tested on admission to a stroke unit and evaluated with established dysphagia scales to prevent aspiration pneumonia and malnutrition. A dysphagia program can lead to better communication within the stroke unit team to initiate the appropriate diagnostics and swallowing therapy as soon as possible. **Key Words:** Acute stroke—aspiration pneumonia—neurogenic dysphagia—stroke unit—swallowing endoscopy—swallowing examination.


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## Introduction

Evidence exists that bronchopneumonia is a frequent complication in the first days after stroke and that it is associated with a higher rate of mortality and increased long-term impairment.[1] Up to 20% of stroke patients who are admitted to a stroke unit suffer from early pneumonia after a stroke.[2,3] Studies show that 60% of acute stroke patients with dysphagia suffer from silent aspiration, with the consequence of increased morbidity and mortality. Neurogenic oropharyngeal dysphagia (NOD) is considered a marker for the prognosis of stroke.[4-6] Walter et al[3] identified independent clinical predictors of pneumonia: the presence of dysphagia with a relative risk (RR) of 9.9, the existence of a severe neurologic deficit (National Institutes of Health Stroke Scale [NIHSS] score ≥10) with a RR of 6.6 and signs of an infection (e.g., elevated level of c-reactive protein on admission) with a RR of 3.8. The location of the brain infarct also had an influence on the risk of pneumonia because it increased with the existence of a basal ganglia infarct (RR = 3.1). These findings could be confirmed in a follow-up study of dysphagic stroke patients.[7] Prospective studies linked certain cerebral infarct localizations with specific, clinically and endoscopically characterized patterns of dysphagia. Right parietotemporal cerebral infarcts were associated with an attention deficit, left-sided middle cerebral artery (MCA) infarcts with buccofacial apaxia, cerebral infarcts in the region of the upper motoneuron with orofacial paresis, and lateral medullary brainstem infarcts with an inadequate opening of the upper esophagus sphincter (UES) during swallowing.[8-10]

Data obtained regarding the outcome after an acute stroke with severe neurogenic dysphagia show that specific swallowing observations[11] can provide important information, in order to effectively plan the further use of diagnostic and therapeutic measures regarding NOD. Studies demonstrated that stroke mortality during a 2-year investigation correlates significantly with signs of aspiration in the clinical swallowing examination (CSE) and with signs of aspiration in the videofluoroscopic swallowing evaluation (VFS).[12] These studies were designed in a neurorehabilitation setting 10 days post-stroke. For our prospective study in an acute stroke unit setting we established a dysphagia program to identify patients with neurogenic oropharyngeal dysphagia (NOD) and nursing staff, swallowing/speech therapists and physicians were trained according to the NOD step-wise concept enabling them to initiate the appropriate dysphagia diagnostics and therapy.[13,14] Since half of acute stroke patients recover from neurogenic dysphagia spontaneously within 14 days while the other half stay chronic[4,8,15] the null hypothesis of this study was that an early prediction of outcome within 72 hours of acute stroke isn't sufficiently possible.

## Methods

During a 6-month recruiting phase in a comprehensive stroke unit center, patients were screened for signs of aspiration by nursing staff within 2 hours of admission.[14] Stroke patients who showed signs of aspiration according to Perry et al.[16] were included in the study (Table 1).

The investigation protocol was authorized by the Ethics Commission of the Dresden University of Technology (EK 246112006). Informed consent was carried out with all patients (if necessary, in the presence of the statutory guardian), and all data were recorded by a certified study nurse using computer-supported data collection in accordance with good clinical practice guidelines. For the 90-day outcome measure, a standardized telephone interview was performed using the swallowing functional communication measure (FCM).[17,18] Following the guidelines of the German Stroke Society (www.info-dsg.de), patients were treated on the stroke unit until transfer of the patient for early rehabilitation.[14] The status of all stroke patients was monitored using the NIHSS,[19] the functional independence measure (FIM), and the Barthel Index, an 18-part functional assessment that measures the independence of the patient in carrying out tasks involved in taking food, care, getting dressed, keeping clean, mobility, and the ability to recognize.[20] The vital parameters were measured every 6 hours with control of cardiovascular parameters, blood pressure, heart rate, temperature, oxygen saturation, continual electrocardiographic monitoring, and a pneumonia assessment[15] within the context of the neurological complex treatment (German Procedure Standard [OPS] 8-981). The duration of the complex treatment was more than 72 hours (OPS 8-981.1), and the overall degree of swallowing impairment was documented using the

**Table 1.** *Modified swallowing assessment (MSA) according to Perry et al [16]*

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| A. Swallowing checklist |
| a. Is the patient alert and responding to speech? |
| b. Can the patient cough when asked to? |
| c. Is the patient able to maintain some control of saliva? |
| d. Is the patient able to lick their top and bottom lips? |
| e. Is the patient able to breathe freely (i.e., has no problem breathing without assistance and maintaining adequate oxygen saturation)? |
| f. Are signs of a wet- or hoarse-sounding voice absent? |
| B. Swallowing test with water (terminate assessment if '' yes'' for any function) |
| a. No evident swallowing activity? |
| b. Water leaks out of the mouth? |
| c. Coughing/throat clearing? |
| d. Increase in respiratory rate? |
| e. Wet/gurgly voice 1 minute immediately after swallowing? |
| f. Have you doubts or a bad impression? |