

One-Year Risk of Pneumonia and Mortality in Patients with Poststroke Dysphagia: A Nationwide Population-Based Study

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Background: In the early stages of stroke, the use of a nasogastric tube can reduce complications such as malnutrition, dehydration, and pneumonia. However, its long-term efficacy is controversial. **Methods:** This retrospective cohort study used Taiwan's National Health Insurance Research Database to investigate associations among dysphagia, rate of readmission due to pneumonia, and mortality 1 year after stroke. Patients who had received their first stroke diagnosis and inpatient rehabilitation from January 1, 2006, to December 31, 2010, were enrolled. The presence of dysphagia was determined by the number of nasogastric tubes received (≥ 2 was classified as dysphagia, < 2 as control). Kaplan-Meier plots with log-rank tests revealed differences between the 2 groups, and a Cox regression model was used to estimate the hazard ratio. **Results:** There were 5032 patients in the dysphagia group and 52,323 patients in the control group. The dysphagia group had a higher probability and incidence of pneumonia (18.78% versus 6.52%, $P < .001$ and adjusted hazard ratio [AHR] = 2.00, 95% confidence interval [CI] = 1.84-2.16) and a higher mortality rate (10.45% versus 4.77%, $P < .001$; AHR = 1.61, 95% CI = 1.46-1.79) 1 year after stroke. **Conclusions:** The association persisted until the 5-year poststroke time point. Our results suggest that prolonged nasogastric tube use has negative effects. Intensive evaluation of dysphagia and removal of the nasogastric tube in the early stages of stroke might reduce pneumonia incidence and mortality. **Key Words:** Mortality—nasogastric tube—poststroke dysphagia—pneumonia—population-based study.

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Introduction

Poststroke dysphagia results in the dysfunction of the oral, pharyngeal, or esophageal phases of swallowing. The clinical incidence of dysphagia has been reported to range from 16.5% to 55%, and patients can experience persistent swallowing dysfunction from 1 month to more than 6 months after stroke.¹⁻³ Different severity levels of dysphagia are closely related to complications such as malnutrition, dehydration, choking, aspiration, pneumonia, and death.^{2,4,5} Dysphagia is also an important factor in affecting functional outcomes after stroke, such as Barthel Index scores,⁶ and medical care, such as transition to palliative care.⁷ In addition, patients with dysphagia have significantly greater medical costs than patients without dysphagia.⁸

Patients with dysphagia can also require modified diet consistencies⁹ or enteral tube feeding to provide nutritional supplementation and hydration.^{10,11} In large clinical trials, patients with early enteral tube feeding have been found to have lower death and poor outcome events at 6 months after stroke than those without tube feeding; this implies that patients with stroke with dysphagia rather need early temporary nasogastric tube (NGT) feeding (2-3 weeks after stroke) to reduce case fatality.¹¹ According to the previous studies,⁹⁻¹¹ the effect of NGT feeding seems to be beneficial for patients with acute stroke, but a poor prognostic factor with prolonged use. Indeed, in a prospective 18-month follow-up study, patients with acute stroke with prolonged NGT use had a significantly higher incidence of pneumonia and poorer outcomes than those with short-term NGT use.¹²

We hypothesized that patients with prolonged NGT use after stroke would have more hospital readmissions and a higher mortality rate than patients with stroke that did not require an NGT (or required only short-term NGT feeding). Previous studies concerning prolonged NGT use have been relatively limited in terms of patient numbers and generally have short follow-ups. Here, we aimed to investigate the associations between poststroke dysphagia, readmission due to pneumonia, and mortality rate 1 and 5 years afterstroke.

Methods

Data Source

In this cohort study, data were obtained from the Taiwan's National Health Insurance Research Database. The National Health Insurance Research Database, established by Taiwan's National Health Research Institute for medical research and which has enrolled 99% of the inpatient and outpatient medical benefit claims in the Taiwanese population, has been used extensively in various published studies.¹³ The database contains detailed information about each insured individual, including dates of clinical visits, diagnostic codes according to the

International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9CM), and treatment costs. All identifying personal information were encrypted to protect patient privacy. This study was approved by the Institutional Review Board of Chi-Mei Medical Center (IRB number: 10403-E06).

Patient Selection and Definition

The inpatient medical claims data between 2006 and 2010 were analyzed in this study. We retrieved data from patients who had had their first-time diagnosis of stroke (ICD-9-CM: 430-437) and who received intensive inpatient rehabilitation from January 1, 2006, to December 31, 2010. The exclusion criteria included the following: (1) patients who were under the age of 18 years; [2] previous history of stroke before 2006; (3) previous central nervous system disease or cancer history before the diagnosis of their first stroke (hereditary and degenerative disease of central nervous system, dementia, head, neck, and respiratory system cancer); (4) patients who had received tracheostomy, endotracheal tube insertion, more than 2 NGT insertions, or gastrostomy tube insertion (percutaneous endoscopic gastrostomy [PEG]), or admission for pneumonia in the year preceding their stroke; and [5] patients who received tracheostomy or endotracheal tube insertion and received PEG during this period. All diseases were coded based on the ICD-9-CM, listed in [Table S1](#).

We then selected 57,355 patients with first-event stroke who received in-hospital rehabilitation. The comorbidities of hypertension (HTN), coronary artery disease (CAD), cardiac dysrhythmia, hyperlipidemia, valvular heart disease, renal disease, diabetes mellitus, and chronic obstructive pulmonary disease (COPD) were based on the records from 1 year before the date of stroke diagnosis. HTN included hypertensive disease, hypertensive encephalopathy, and hypertensive retinopathy. CAD included myocardial infarction, angina pectoris, and chronic ischemic heart disease. Cardiac dysrhythmia included cardiac dysrhythmia and atrial fibrillation. Valvular heart disease included disease of the mitral valve and aortic valve, endocardium, and congenital abnormalities of heart. Renal disease included nephritis and nephropathy, chronic kidney disease, and disorders resulting from impaired renal function. COPD included bronchitis, emphysema, asthma, bronchiectasis, extrinsic allergic alveolitis, and chronic airway obstruction. In addition, the Charlson Comorbidity Index (CCI)¹⁴ was used to summarize important concomitant diseases based on the ICD-9-CM codes. All diseases were coded based on the ICD-9-CM, listed in [Table S1](#).

The Management of Dysphagia in Stroke in Taiwan

According to the guidelines for the general management of patients with acute ischemic stroke, NGT could be used for patients with unconsciousness and remarkable dysphagia for suitable oral hydration, medication, and

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