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Does Feeding Tube Insertion and its Timing Improve Survival?

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Abstract

Background/Objectives—The objective of this study was to examine survival with and without a percutaneous endoscopic gastrostomy (PEG) feeding tube using rigorous methods to account for selection bias. A second objective was to examine whether the timing of feeding tube insertion affected survival.

Design—Prospective cohort study

Setting—All U.S. Nursing Homes

Participants—36,492 nursing home residents with advanced cognitive impairment from dementia and new problems eating studied between 1999–2007.

Measurements—Survival following the development of the need for eating assistance and feeding tube insertion.

Results—Of the 36,492 nursing home (NH) residents (88.4% white, mean age 84.9, 87.4% with one feeding tube risk factor), 1,957 (5.4%) had a feeding tube inserted within 1 year of developing eating problems. After multivariate analysis correcting for selection bias with propensity score weights, no difference was found in the survival of the 2 groups (AHR 1.03, 95% CI 0.94–1.13). Among residents who were tube-fed, the timing of PEG tube insertion relative to the onset of eating problems was not associated with improved survival post feeding tube insertion (AHR 1.01, 95% CI 0.86–1.20) comparing those persons with a PEG inserted within a month of developing an eating problem compared to later (4 months) insertion.

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Conflict of Interest

Drs. Teno, Gozalo, Kuo and Mor are affiliated with the Warren Alpert School of Medicine at Brown University; Dr. Mitchell is affiliated with Hebrew SeniorLife Institute for Aging Research; Dr. Rhodes is affiliated with University of Texas Southwestern Medical Center; Dr. Bynum is affiliated with The Dartmouth Institute at Dartmouth Medical School; none of these relationships pose a conflict of interest or potential conflict of interest.

Author Contributions

Drs. Teno, Kuo and Gozalo had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Teno, Gozalo, Mitchell, and Mor. Acquisition of data: Teno. Analysis and interpretation of data: Teno, Gozalo, Kuo, Mitchell, and Mor. Drafting of the manuscript: Teno, Gozalo, and Rhodes. Critical revision of the manuscript for important intellectual content: Teno, Gozalo, Mitchell, Kuo, Rhodes, Bynum, and Mor. Obtained funding: Teno. Supervision: Teno.

Conclusion—This national study confirms that neither insertion of PEG feeding tubes nor the timing of the insertion improve survival.

Keywords

Feeding tubes; timing of insertion; eating problems; dementia; survival

INTRODUCTION

Dementia is a leading cause of death in the US. Dying from dementia is characterized by eating problems, malnutrition, and recurrent infections. Nearly 90% of persons with advanced dementia develop eating problems.¹ Whether to put in a percutaneous endoscopic gastrostomy (PEG) feeding tube is one of the sentinel decisions facing families and health care providers of these patients. However, the use of PEG tubes in patients with advanced dementia is controversial.

One perceived benefit of tube feeding by physicians and surrogate decision-makers is improved survival.^{1,2} However, two qualitative syntheses of the literature based on existing observational data concluded that feeding tubes do not improve survival.^{3,4} There are important limitations to this conclusion. First, the reported six-month survival post feeding tube insertion for persons with dementia varies between 10% and 85%.^{5–8} Second, since five of these studies are from a single institution,^{6–10} and two involved secondary analyses of Minimum Data Set (MDS), which does not differentiate nasogastric feeding tubes versus PEG feeding tubes, conclusions may be of limited generalizability.^{5,11} One explanation for the poor outcomes observed is that persons are referred for feeding tube insertion too late to benefit from nutrition.¹² Two recent studies conducted at single institutions found that after adjusting for nutritional status, age, and other confounders, dementia is not an independent risk factor for survival among persons who have a PEG feeding tube inserted.^{13,14} Indeed, a recent editorial¹⁵ questioned the interpretation that feeding tubes do not affect survival and calls for research to examine whether feeding tubes are effective in prolonging survival.

Using nationwide data that merged Medicare Claims files with the Minimum Data Set (MDS) nursing home resident assessments, our study examined whether feeding tube insertion impacts survival in NH residents with advanced cognitive impairment. Additionally, we examined whether the timing of feeding tube insertion after the development of the need for eating assistance is associated with different patterns of survival.

METHODS

Sample

The sample was obtained from a national repository of the Minimum Data Set (MDS) that was merged with Medicare Part A and 20% of Medicare Part B claims from 1999 – 2007. We focus on the population most at risk of getting a PEG feeding tube, meaning those with advanced cognitive impairment from dementia who newly develop eating problems.¹⁶ Thus, the baseline date of study entry is the date of the MDS assessment in which a cohort member has a CPS score of 6 for the first time (from a prior score of 4 or 5) and a diagnosis of dementia indicated on the MDS. The progression to a CPS 6 indicates the NH resident needed assistance in eating. We excluded those cases where the MDS reported the person was comatose, persons that died within 2 weeks of that MDS assessment, or persons that had any evidence of PEG feeding tubes in the prior six months based on review of both Medicare claims and MDS assessments. PEG tube insertions were defined in the Medicare files from ICD-9 procedure codes of 43.1, 43.11, 43.19, and 44.32, as well as the CPT-4

codes of 43246, 43653, 43750, 43830, 43832, 44372, 44373, and 74350 as identified in previous research.¹⁷

Study Variables

Survival time was based on date of death in the Medicare Denominator File. Survival was measured as the number of days between the baseline MDS assessment and the date of death. Based on our previous work^{16,17}, we chose the following potential confounding variables: 1) socio-demographic variables; 2) evidence of advance care planning including advance directives, Do Not Resuscitate order (DNR), Do Not Hospitalize order (DNH), and any feeding restrictions; 3) pertinent medical diagnoses from the MDS, 4) clinical conditions including dehydration, inability to consume food or fluids, fever, wound infection, weight loss, swallowing problems, chewing problems, syringe feeding, mechanically altered diet, and dietary supplementation, body mass index (BMI) and presence of a pressure ulcer; 5) measures of functional status and disease severity including ADL score; and two models that predict mortality (the ADEPT score created by Mitchell and colleagues¹⁸ and the CHES score¹⁹).

Statistical Analysis

We used the chi-square test for categorical variables and t-test for continuous variables in a descriptive analysis of baseline characteristics for persons with and without feeding tubes. In the first analysis that examined the association of PEG feeding tube insertion with one year survival, we used a multivariate survival model using the Weibull distribution with all the covariates mentioned above and inverse probability of treatment weights to account for the potential selection bias of which NH residents underwent PEG feeding tube insertion treatment. Inverse probability of treatment weights were calculated from (1) estimating a logistic regression of the probability of tube insertion using individual covariates, and (2) weighting each observation with the inverse of the predicted propensity of the treatment actually received by that person (and scaling with the unadjusted predicted probability of insertion to stabilize the weights in case the estimated probability is close to zero). This technique accounts for potential selection bias by using weights to balance differences in observed covariates across those with and without tube insertion.^{20,21} Because all persons resided in a NH, standard errors were adjusted for the clustering of persons within a NH. All statistical analyses were performed using Stata version 11.

A second goal was to examine whether the timing of feeding tube insertion after the conversion to CPS 6 was associated with improved survival post the insertion of the feeding tube. This model is similar to that used to examine survival among those with and without a feeding tube. We utilized inverse probability of treatment weights and accounted for clustering of persons in the nursing home. Again, a multivariate Weibull survival model was estimated with inclusion of indicator variables that noted the timing of feeding tube insertion in terms of months from the transition to CPS of 6 (i.e., 1, 2, 3 months and 4 or more months from development of eating problems). This research project was approved by Brown University Institutional Review Board.

RESULTS

Sample Description

A total of 36,492 nursing home residents had advanced cognitive impairment, as defined by an initial CPS score of 4 or 5 that transitioned to 6 (i.e., indicating the need for eating assistance and severe cognitive impairment). The mean age for the cohort was 84.9 years, 8.2% of the cohort was African American, and 78.1% were female. Residents with feeding tubes accounted for 5.4% of the cohort. African Americans and Hispanics were more likely

to have a feeding tube inserted in the year after the development of the need for assistance in eating (see Table 1). A greater percentage of residents without feeding tubes also had some documentation of advance care planning (i.e., living will, durable power of attorney for health care, Do Not Resuscitate Order) when compared to residents with feeding tubes.

Survival after PEG Tube Insertion

The median survival from the development of need for assistance in eating for those with a PEG feeding tube was 177 days. After adjustment for socioeconomic characteristics, documentation of advance care planning, and clinical characteristics, we found no association between insertion of PEG feeding tube and survival time from development of need for assistance in eating (AHR 1.03 95% 0.94 – 1.13, see Figure 1). Figure 2 examines the survival after feeding tube insertion with adjusted survival curves among those persons who had a feeding tube inserted in the 1,2,3, and >3 months after baseline when the NH resident converted to CPS 6. The adjusted hazard ratio (AHR) comparing survival from feeding tube insertion among subjects who underwent PEG tube insertion in months 1 through 3 after baseline, relative to survival among those who received their PEG tube 4 or more months after baseline, was 1.01 (95% CI 0.86 to 1.20) (month 1), 1.12 (95% CI 0.93 to 1.35) (month 2), and 0.82 (95% CI 0.64 to 1.04) (month 3).

DISCUSSION

Prior research suggests that feeding tubes are not associated with improved survival.^{3,4,22} However, there are limitations to these prior studies. Many only examined patients within a single institution,^{6–10} while the two studies that employed multivariate analysis did not distinguish between nasogastric tubes and percutaneous endoscopic gastrostomy (PEG) tubes.^{5,11} None of these studies used techniques to control for potential selection bias. Our study confirms the lack of treatment effect on survival and further finds that earlier insertion of the PEG tube after the development of the need for eating assistance is not associated with improved survival post PEG tube insertion. In particular, nursing home residents who had a PEG tube inserted within one month of the onset of needing assistance with eating experienced similar post-treatment survival as did those who had the tube inserted more than four months after this baseline.

This study is subject to certain limitations. Despite including a national sample of patients, our data had little information on either the patient or family member preferences for feeding tube placement besides the notation of orders to forego artificial hydration and nutrition on the annual MDS assessment. Additionally, physiologic measures of nutrition were not available, although proxies such as body-mass index (BMI) were included. Medical diagnoses were based on the MDS, but Mor and colleagues found these diagnoses have positive predictive values between 0.6 and 0.7.²³ Even with these limitations, this study is the first to date to examine whether late timing of feeding tube insertion could explain the lack of survival benefit found in the literature and employed statistical techniques to account for the selection bias.

The disease trajectory of dementia includes substantial functional impairment, profound aphasia, loss of mobility, and the development of eating problems in the last year of life.²⁴ Many would perceive this quality of life as so poor that the insertion of a feeding tube would merely prolong a dying process without a meaningful quality of life. Nonetheless, a majority of families cite survival as a principal reason for choosing to insert a feeding tube.¹ Our research confirms previous studies that feeding tube insertion does not confer a survival benefit and suggests that early insertion of feeding tubes is not associated with improved survival. Furthermore, our analysis employed statistical techniques to account for the selection bias that addresses previously noted concerns in the literature. Because of the

methodological rigor, health care providers can have confidence that feeding tubes does not prolong survival and that earlier timing of insertion does not affect survival, as well.

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Sponsor's Role

The funding source had no role design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

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Figure 1. Adjusted Survival Time Among Those With and Without a Feeding Tube Insertion
This survival curve compares the one-year survival from the MDS that noted assistance in eating among those residents with and without a PEG feeding tube inserted.

Figure 2. Adjusted Survival Time after Feeding Tube Insertion Stratified by Timing of Feeding Tube Insertion From Development of CPS Score of 6

Among those with a feeding tube, the one year survival from feeding tube insertion is depicted in 4 adjusted survival curves that include cohort of persons who had the feeding tube inserted one (n=569), two (n=310), three (n=205), and 4 or more months (n=872) after the NH resident need for eating assistance.

Table 1**Baseline Characteristics of Nursing Home Residents with and Without Feeding Tubes**

Characteristics	Without Feeding Tube N = 34,536	With Feeding Tube N = 1,956	p-value
Sociodemographics			
Mean age, years	85.0	83.1	P<0.001
Married	24.9	24.6	0.792
Female	78.5	70.5	P<0.001
Race			
Caucasian	89.9	61.7	P<0.001
African American	6.9	30.7	P<0.001
Hispanic	2.1	5.8	P<0.001
American Indian	0.3	0.1	P<0.001
Asian	0.7	1.7	P<0.001
Education			
Completed High School	37.4	47.8	P<0.001
Advance Care Planning			
Legal Guardian	8.4	6.9	0.017
DPOA (Health Care) *	41.9	22.8	P<0.001
Living Will	23.5	10.1	P<0.001
DNR † Order	74.3	36.0	P<0.001
DNH ‡ Order	7.1	1.0	P<0.001
Feeding Restrictions	16.5	4.6	P<0.001
Diagnoses			
Diabetes	18.1	24.7	P<0.001
CAD §	13.7	15.4	0.037
CHF ¶	17.8	20.2	0.006
COPD **	10.5	11.5	0.163
Cancer, all types	6.4	6.0	0.477
Hip Fracture	8.2	8.7	0.368
Pneumonia	6.8	10.9	P<0.001
Respiratory Infection			
Septicemia	1.4	3.4	P<0.001
Clinical Conditions/States			
Dehydration	1.4	2.5	P<0.001
Inability to consume fluids	7.1	7.3	0.677
Recurrent Aspiration	1.0	1.4	0.077
Weight Loss	23.4	27.2	P<0.001
Swallowing Problems	32.4	39.4	P<0.001
Chewing Problems	51.4	53.5	0.076

Characteristics	Without Feeding Tube N = 34,536	With Feeding Tube N = 1,956	p-value
Mechanically Altered Diet	67.1	76.4	P<0.001
Dietary Supplement	41.1	48.5	P<0.001
Mean ADL ^{††} Score	26.2	26.5	P<0.001

* DPOA, Durable Power of Attorney

[†] DNR, Do Not Resuscitate

[‡] DNH, Do Not Hospitalize

[§] CAD, Coronary Artery Disease

^{//} CHF, Congestive Heart Failure

^{***} COPD, Chronic Obstructive Pulmonary Disease

^{††} ADL, Activities of Daily Living