Does Feeding Tube Insertion and Its Timing Improve Survival?

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OBJECTIVES: To examine survival with and without a percutaneous endoscopic gastrostomy (PEG) feeding tube using rigorous methods to account for selection bias and to examine whether the timing of feeding tube insertion affected survival.

DESIGN: Prospective cohort study.

SETTING: All U.S. nursing homes (NHs).

PARTICIPANTS: Thirty-six thousand four hundred ninety-two NH residents with advanced cognitive impairment from dementia and new problems eating studied between 1999 and 2007.

MEASUREMENTS: Survival after development of the need for eating assistance and feeding tube insertion.

RESULTS: Of the 36,492 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 survival between the two groups (adjusted hazard ratio (AHR) = 1.03, 95% confidence interval (CI) = 0.94–1.13). In residents who were tube-fed, the timing of PEG tube insertion relative to the onset of eating problems was not associated with survival after feeding tube insertion (AHR = 1.01, 95% CI = 0.86–1.20, persons with a PEG tube inserted within 1 month of developing an eating problem versus later (4 months) insertion).

CONCLUSION: Neither insertion of PEG tubes nor timing of insertion affect survival. **J Am Geriatr Soc 60:1918–1921, 2012.**

Key words: feeding tubes; timing of insertion; eating problems; dementia; survival

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DOI: 10.1111/j.1532-5415.2012.04148.x

Dementia is a leading cause of death in the United States. 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 insert a percutaneous endoscopic gastrostomy (PEG) feeding tube is one of the sentinel decisions facing families and healthcare providers of these individuals, but the use of PEG tubes in individuals with advanced dementia is controversial.

One perceived benefit of tube feeding by physicians and surrogate decision-makers is longer survival,[1,2] but 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 6-month survival after feeding tube insertion for persons with dementia varies between 10% and 85%.[5–8] Second, because five of these studies were from a single institution,[6–10] and two involved secondary analyses of Minimum Data Set (MDS) information, which does not differentiate nasogastric feeding tubes from 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 in persons who have a PEG feeding tube inserted.[13,14] A recent editorial[15] questioned the interpretation that feeding tubes do not affect survival and called for research to examine whether feeding tubes are effective in prolonging survival.

Using nationwide data that merged Medicare claims files with the MDS nursing home (NH) resident assessments, this study examined whether feeding tube insertion affects survival in NH residents with advanced cognitive impairment. It also examined whether the timing of feeding tube insertion after the development of the need for eating assistance is associated with different patterns of survival.

0002-8614/12/$15.00

METHODS

Sample

The sample was obtained from a national repository of the MDS that was merged with Medicare Part A and 20% of Medicare Part B claims from 1999 to 2007. The study focused on the population most at risk of having a PEG feeding tube inserted: those with advanced cognitive impairment from dementia who developed new eating problems.[16] Thus, the baseline date of study entry is the date of the MDS assessment at which a cohort member has a Cognitive Performance Scale (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 score of 6 indicates that the NH resident needed assistance in eating. Cases in which the MDS reported that the person was comatose, died within 2 weeks of that MDS assessment, or had any evidence of PEG feeding tubes in the prior 6 months based on review of Medicare claims and MDS assessments were excluded. PEG tube insertions were defined in the Medicare files from *International Classification of Diseases, Ninth Revision*, procedure codes 43.1, 43.11, 43.19, and 44.32 and Common Procedural Terminology, Fourth Edition, codes 43,246, 43,653, 43,750, 43,830, 43,832, 44,372, 44,373, and 74,350, 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 number of days between baseline MDS assessment and date of death. Based on previous work,[16,17] the following potential confounding variables were chosen: sociodemographic variables; evidence of advance care planning including advance directives, do-not-resuscitate (DNR) orders, do-not-hospitalize (DNH) orders, and any feeding restrictions; pertinent medical diagnoses from the MDS; clinical conditions including dehydration, inability to consume food or fluids, fever, wound infection, weight loss, swallowing problems, chewing problems, syringe feeding, mechanically altered diet, dietary supplementation, the amount of body fat as measured according to body mass index (BMI), and presence of a pressure ulcer; measures of functional status and disease severity including activity of daily living (ADL) score; and two models that predict mortality (Advanced Dementia Prognostic Tool score[18] and Changes in Health, End-stage disease and Symptoms and Signs score).[19]

Statistical Analysis

The chi-square test was used for categorical variables and the *t*-test for continuous variables in a descriptive analysis of baseline characteristics for persons with and without feeding tubes. In the first analysis, which examined the association between PEG feeding tube insertion and 1-year survival, 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 was used. Inverse probability of treatment weights were calculated from estimating a logistic regression of the probability of tube insertion using individual covariates and weighting each observation with the inverse of the predicted propensity of the treatment that that person received (and scaling with the unadjusted predicted probability of insertion to stabilize the weights in case the estimated probability was close to zero). This technique accounts for potential selection bias by using weights to balance differences in observed covariates between 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 (StataCorp., College Station, TX).

A second goal was to examine whether timing of feeding tube insertion after conversion to a CPS score of 6 was associated with longer survival after insertion of the feeding tube. This model was similar to that used to examine survival in individuals with and without a feeding tube. Inverse probability of treatment weights was used, and clustering of persons in the NH was accounted for. 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 a CPS score of 6 (1, 2, 3, and $\geq$ 4 months from development of eating problems). The Brown University institutional review board approved this research project.

RESULTS

Sample Description

Thirty-six thousand four hundred ninety-two NH residents had advanced cognitive impairment, as defined by an initial CPS score of 4 or 5 that transitioned to 6 (indicating the need for eating assistance and severe cognitive impairment). The mean age for the cohort was 84.9, 8.2% were 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 (Table 1). A greater percentage of residents without feeding tubes also had some documentation of advance care planning (living will, durable power of attorney for health care, DNR order) than of those with feeding tubes.

Survival After PEG Tube Insertion

Median survival from 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, no association was found between insertion of a PEG feeding tube and survival time from development of need for assistance in eating (adjusted hazard ratio (AHR) = 1.03, 95% confidence interval (CI) = 0.94–1.13, Figure 1). Figure 2 shows survival after feeding tube insertion with adjusted survival curves for individuals who had a feeding tube inserted in the 1, 2, 3, and 4 or more months after baseline when the NH resident converted to

Table 1. Baseline Characteristics of Nursing Home Residents with and without Feeding Tubes

Characteristic	Without Feeding Tube, n = 34,536	With Feeding Tube, n = 1,956	*P*-Value
Sociodemographic			
Age, mean	85.0	83.1	<.001
Married,%	24.9	24.6	.79
Female,%	78.5	70.5	<.001
Race,%			
Caucasian	89.9	61.7	<.001
African American	6.9	30.7	<.001
Hispanic	2.1	5.8	<.001
American Indian	0.3	0.1	<.001
Asian	0.7	1.7	<.001
Completed high school	37.4	47.8	<.001
Advance care planning			
Legal guardian	8.4	6.9	.02
Durable power of attorney for health care	41.9	22.8	<.001
Living will	23.5	10.1	<.001
Do-not-resuscitate order	74.3	36.0	<.001
Do-not-hospitalize order	7.1	1.0	<.001
Feeding restrictions	16.5	4.6	<.001
Diagnosis			
Diabetes mellitus	18.1	24.7	<.001
Coronary artery disease	13.7	15.4	.037
Congestive heart failure	17.8	20.2	.006
Chronic obstructive pulmonary disease	10.5	11.5	.163
Cancer, all types	6.4	6.0	.477
Hip fracture	8.2	8.7	.368
Pneumonia	6.8	10.9	<.001
Respiratory infection	2.7	3.2	.16
Septicemia	1.4	3.4	<.001
Clinical conditions and states			
Dehydration	1.4	2.5	<.001
Inability to consume fluids	7.1	7.3	.677
Recurrent aspiration	1.0	1.4	.077
Weight loss	23.4	27.2	<.001
Swallowing problems	32.4	39.4	<.001
Chewing problems	51.4	53.5	.076
Mechanically altered diet	67.1	76.4	<.001
Dietary supplement	41.1	48.5	<.001
Activity of daily living score, mean	26.2	26.5	<.001

a CPS score of 6. AHRs comparing survival from feeding tube insertion of individuals who underwent PEG tube insertion in Months 1 through 3 after baseline with survival of those who received their PEG tube 4 or more months after baseline were 1.01 (95% CI = 0.86–1.20) (Month 1), 1.12 (95% CI = 0.93–1.35) (Month 2), and 0.82 (95% CI = 0.64–1.04) (Month 3).

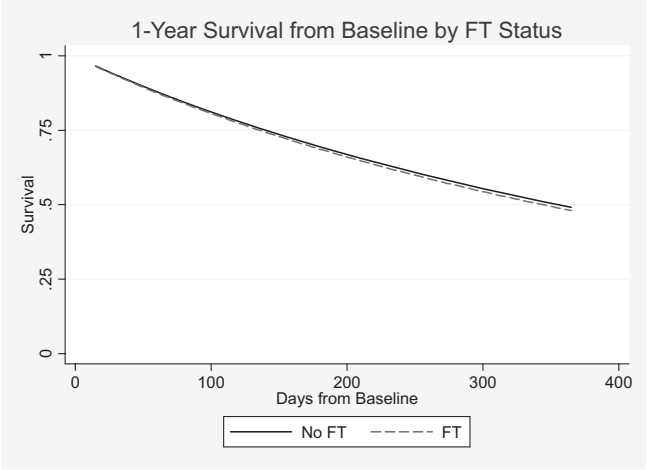

Figure 1. Survival curve comparing 1-year survival from the Minimum Data Set that noted need for assistance in eating in residents with and without a percutaneous endoscopic gastrostomy feeding tube inserted.

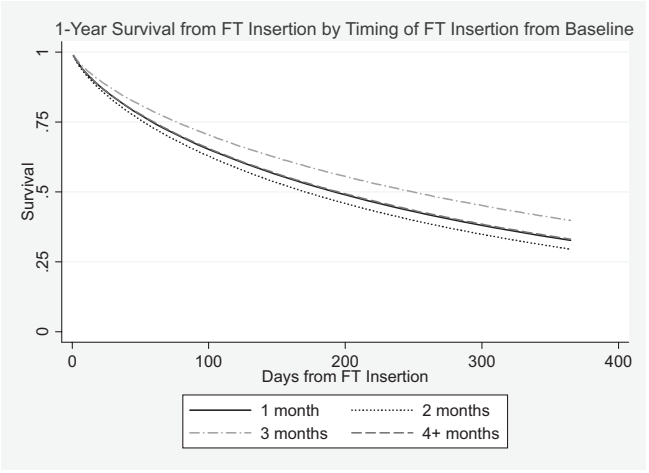

Figure 2. In individuals with a feeding tube (FT), 1-year survival from FT insertion is depicted in four adjusted survival curves that include cohort of persons who had the FT inserted 1 (n = 569), 2 (n = 310), 3 (n = 205), and 4 or more months (n = 872) after development of need for eating assistance (Cognitive Performance Scale score 6).

DISCUSSION

Prior research suggests that feeding tubes are not associated with longer survival,[3,4,22] but there are limitations to these prior studies. Many only examined individuals in a single institution,[6–10] whereas the two studies that used multivariate analysis did not distinguish between nasogastric tubes and PEG tubes.[5,11] None of these studies used techniques to control for potential selection bias. The current study confirms the lack of treatment effect on survival and finds that earlier insertion of a PEG tube after the development of the need for eating assistance is not associated with longer survival after PEG tube insertion. In particular, NH residents who had a PEG tube inserted within 1 month of the onset of needing assistance with eating

experienced similar posttreatment survival as those who had the tube inserted more than 4 months after this baseline.

This study is subject to certain limitations. Despite including a national sample of patients, there was little information on individual or family member preferences for feeding tube placement other than the notation of orders to forego artificial hydration and nutrition on the annual MDS assessment. Additionally, physiological measures of nutrition were not available, although proxies such as body mass index (BMI) were included. Medical diagnoses were based on the MDS, but a previous study found that these diagnoses have positive predictive values of between 0.6 and 0.7.[23] Even with these limitations, this study is the first to examine whether late timing of feeding tube insertion could explain the lack of survival benefit found in the literature and used 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 to be so poor that the insertion of a feeding tube would merely prolong a dying process without meaningful quality of life. Nonetheless, a majority of families cite survival as a principal reason for choosing to insert a feeding tube.[1] This research confirms the findings of previous studies that feeding tube insertion does not confer a survival benefit and suggests that early insertion of feeding tubes is not associated with longer survival. The analysis used statistical techniques to account for the selection bias, an important concern noted in the literature. Because of the methodological rigor of this study, healthcare providers can have confidence that feeding tubes do not prolong survival and that earlier timing of insertion does not affect survival.

ACKNOWLEDGMENTS

Conflict of Interest: This work was funded by National Institute of Aging Research Grants R01AG024265 and 1RC1AG036418–01.

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. Teno, Gozalo, Mitchell, and Mor: Study concept and design. Teno.: Acquisition of data. Teno, Gozalo, Kuo, Mitchell, and Mor: Analysis and interpretation of data. Teno, Gozalo, and Rhodes: Drafting of the manuscript. Teno, Gozalo, Mitchell, Kuo, Rhodes, Bynum, and Mor: Critical revision of the manuscript for important intellectual content. Teno: Obtained funding. Teno.: Supervision.

Sponsor's Role: The funding source had no role in the design or conduct of the study; collection, management, analysis, or interpretation of the data; or preparation, review, or approval of the manuscript.

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