

# NON-INVASIVE VENTILATORY SUPPORT, TUBE FEEDING & RISK OF ASPIRATION PNEUMONIA

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## Background

- Gastroesophageal reflux (GERD) is a disorder of the lower esophageal sphincter (LES) which is usually diagnosed clinically.
- GERD is one of the most common causes of esophageal dysphagia specially in the elderly in which most of the time goes unrecognized and can lead to aspiration pneumonia (APNA) which accounts for approximately 86% of pneumonia cases in older people (Isao and Takaaki, 2021).
- Other risk factors of aspiration pneumonia (APNA) include neurological diseases, nasogastric tube feeding and tumors in the oral cavity.
- There is limited data regarding aspiration pneumonia (APNA) with Bilevel positive airway pressure (BiPAP)/ Continuous positive airway pressure (CPAP) outside of the critical care setting, and have reported mixed results, which include increased length of stay and poor outcomes.
- Further information is needed regarding incidence of aspiration pneumonia (APNA) in hospitalized patients already diagnosed with GERD that require tube feeds and BiPAP to clarify a potentiated effect of NIPPV and concomitant tube feeding.

## Objective

The purpose of this retrospective study was to determine the association between GERD and Aspiration Pneumonia (APNA) among patients on respiratory support and concomitant tube feeding.

## Methods

A retrospective cohort study within the HCA Healthcare database among Southwest Border region hospitals yielded:

**Total study population 12,250 of >18 years old**  
**Data gathered between 2016-19 (please reference Table 1)**

Exclusion criteria: Hx of cirrhosis/liver, portal hypertension, esophageal varices, prior esophageal CA, esophageal tear/rupture, esophageal/open chest surgery, dysphagia, thyroid disorder/goiter, or Hx of underlying lung diseases.

Chi square analysis, binary logistic regression, as well as a logistic regression were used to analyze the relationship between aspiration pneumonia and GERD while adjusting for age, sex, race, comorbidities score, GERD, Tube Feeding type, respiratory support type, and ARDS.

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**Table 1.** Characteristics of Study Population

Variables	No Aspiration		Aspiration		Overall	
	n	%	n	%	n	%
	n, %					
<b>Race</b>						
Black	193	9.1	47	6.4	240	8.4
Hispanic or Latino	315	14.9	95	13.0	410	14.4
Other	89	4.2	28	3.8	117	4.1
White	1523	71.8	560	76.7	2083	73.1
<b>Ethnicity</b>						
Unknown/Declined to Specify	125	5.9	38	6	169	6
Hispanic or Latino	863	40.7	305	41.8	1168	41.0
Not Hispanic or Latino	1132	53.4	381	52.2	1513	53.1
<b>Sex</b>						
F	970	45.8	295	40.4	1265	44.4
M	1150	54.2	435	59.6	1585	55.6
<b>Admit Year</b>						
2016	483	22.8	170	23.3	653	22.9
2017	535	25.2	187	25.6	722	25.3
2018	486	22.9	175	24.0	661	23.2
2019	616	29.1	198	27.1	814	28.6
<b>Discharge Disposition</b>						
Expired	635	30.0	275	37.7	910	31.9
Home	593	28.0	129	17.7	722	25.3
Transferred to Hospital	41	1.9	8	1.1	49	1.7
Transferred to NFL/LTCH/Rehab	843	39.8	314	43.0	1,157	40.6
Other	8	0.4	4	0.5	12	0.4
<b>Insurance Type</b>						
Gov	48	2.3	12	1.6	60	2.1
MEDICARE/CAID	1620	76.4	607	83.2	2227	78.1
No Insurance	127	6.0	36	4.9	163	5.7
Other	50	2.4	17	2.3	67	2.4
Private Insurance	275	13.0	58	7.9	333	11.7
	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>
Age	66.51	14.65	69.18	15.75	67.2	14.98

## Results

### GERD and APNA

- There was no association between GERD and APNA among patients on respiratory support and concomitant tube feeding.

### Respiratory support type and APNA

- We further supported a significant association between NIPPV support and APNA, and found a significantly higher percentage of APNA with patients on BiPAP compared to CPAP (percentage of those with the outcome = 12.3% vs 9.8%, compared to 2% without respiratory support when, respectively)
- Patients on BiPAP were 1.96 times as likely to have APNA compared to those on CPAP.

### Tube feeding, tube feeding type and APNA

- We further supported a significant association between tube feeding and APNA, showing approximately, 26% of those with the outcome of APNA received tube feedings, compared to 4.7% of those who did not.
- We found a significant association between APNA and tube feeding types, showing approximately 38% receiving PEG tube feedings, 21.6% receiving NG tube feedings, 23.8% receiving OG tube feedings, and only 4.7% of those not receiving tube feedings had the outcome of APNA.
- PEG tube feedings were 3.31 times as likely to have APNA compared to OG tube feedings, 2.80 times as likely then NG tube feedings.

**Additional findings:** Age, sex, race, comorbidity score were also significantly associated with APNA.

## Discussion

- Studies have been limited to patient's with advanced dementia or in the elderly population requiring tube feeding with the outcomes of APNA, among other complications (1,2). Additionally, a study performed on ICU patient's, found no difference in incidence of APNA between post pyloric and gastric tube feeds, however, did not address comparing the types of feeding tubes (3), addressed here.
- Further evidence is needed to identify individual factors involved in increasing the risk of APNA in the hospital setting, beyond the ICU.
- Our pairwise comparison of BiPAP and CPAP identified that there was a 1.96 times likelihood to develop APNA in the was on BiPAP support compared to CPAP while inpatient.
- Here, we further corroborated (6) that age, sex, race, comorbidity scores, in addition to tube feeding type, respiratory support type and ARDS were significantly associated with the outcome of APNA.
- Further clarification is needed to compare patients in ICU vs non-acute units while on tube feeds or noninvasive ventilatory support.
- Identifying the residual volumes, tube feed rates while hospitalized, would further clarify if retention of gastric contents would likely contribute to aspiration risk (i.e. organ dysfunction, sepsis, comorbidities causing gastroparesis, etc.)

## Conclusion

- Patients with a documented history of GERD did not increase incidence of APNA.
- Tube feedings were more likely to be associated with APNA and were directly related to the type of tube used for feeds.
- BiPAP, more than CPAP contributed significantly to the likelihood of APNA.

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