Access to Dental Care and Risk of Pneumonia: The Importance of Healthy Teeth

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Background

- Pneumonia affects a million people in the community yearly in the U.S.; even more people are affected in healthcare and institutionalized settings.
- Despite antibiotic therapy, mortality has not dramatically improved since the 1950s.
- Oral hygiene has been increasingly associated with systemic health issues, including endocarditis, stroke, cardiovascular disease, and pneumonias.
- Many pneumonias are the results of aspiration of oral secretions into the respiratory tract.
- Despite the importance of healthy teeth and gums, access to dental care is limited for most of the U.S. population.
- This lack of access may correspond to worse oral health and thus increased pneumonia risk.

Objective

- To determine if lack of access to dental care is associated with pneumonia.

Methods

- The Medical Expenditure Panel Survey (MEPS) is conducted by the Agency for Healthcare Research and Quality (AHRQ).
- MEPS households are followed for a 2 year period and interviewed regarding health status, healthcare access and use, insurance status, and healthcare costs. Additional components of the survey involve administrative data from healthcare systems.
- Data obtained from the 2013 MEPS was used to assess access to dental care as defined by number of dental visits in 2013, frequency of dental check-ups, presence of dental insurance.
- ICD9 codes were used to determine whether or not the participant was treated for pneumonia in the past year. Only bacterial pneumonias were included.
- The presence of pneumonia was analyzed for associations with various social and demographic factors, co-morbidities, as well as dental care indicators.
- Summary statistics were calculated for the pneumonia and non-pneumonia groups. Simple and multiple logistic regression was used to compare dental indicators and other covariates to pneumonia diagnosis. Backward selection with a p to stay of 0.20 was used to select the final multivariable model. All analyses accounted for complex sampling design.
- Sensitivity analysis for multicollinearity was performed via analysis of variance of inflation.

Results

- In the 2013 MEPS Survey, 441 individuals experienced at least one episode of pneumonia (1.68% of the sample), while 26246 did not. Characteristics of the sample for those with and without pneumonia are summarized in Table 1.

In unadjusted analysis (Table 1):

- Age, race, family income, Charlson Co-morbidity Index (CCI), cognitive deficits, perceived health status were significantly associated with pneumonia, but sex was not associated.
- **Decreased frequency of dental check ups** was significantly associated with pneumonia (p<0.0001), as was the **lack of dental insurance** and the inability to access needed care.

Table 1: Characteristics of those with or without Pneumonia

Characteristics	Pneumonia N/441(%)* or Mean (SE)	No Pneumonia N/26246(%)* or Mean (SE)	P value
Sex			0.2125
Male	173(43.0)	11896(47.0)	
Female	268(57.0)	14350(53.0)	
Race			<0.0001
White	242(76.5)	10430(66.0)	
Black	91(9.5)	5338(11.2)	
Hispanic	74(7.5)	2656(7.8)	
Other	34(6.6)	7822(15.0)	
Age	47.03(1.57)	39.94(0.28)	<0.0001
Family Income	$61,850 (3095.97)	$72,968(1138.60)	<0.0136
Cognitive Limitations	57(13.1)	1416(5.2)	<0.0001
Perceived Health Status			<0.0001
Excellent	83(18.2)	7798(31.6)	
Very good	108(28.0)	7862(31.8)	
Good	115(26.2)	6980(24.9)	
Fair	92(18.6)	2799(8.9)	
Poor	43(8.9)	807(2.7)	
CCI**			<0.0001
None	235(53.3)	20670(79.1)	
1-3	199(45.1)	5464(20.4)	
4-6	4(0.8)	97(0.5)	
7 or greater	3(0.8)	15(0.04)	
Freq of Dental Check-ups			<0.0001
More than twice/yr	141(34.2)	10168(45.9)	
Once a year	86(16.4)	6380(21.5)	
Less than once a year	79(19.9)	4449(16.5)	
Never	135(29.4)	4649(16.2)	
# Dental Visits 2013			0.7912
None	263(57.3)	15363(53.0)	
One	96(12.6)	4824(18.9)	
Two	92(12.5)	3208(15.5)	
Three	29(8.2)	1933(9.1)	
Four or more	17(4.5)	918(4.5)	
Dental Insurance	121(35.2)	9185(43.8)	0.0193
Delay in Access	21/450 (4.6%)	1048/26728 (4.2)	0.7533
Unable to Access	32(8.0)	1379(5.0)	0.0212

*Un-weighted N, Weighted %/mean/SE, **Modified Charlson Co-morbidity Index

In adjusted analysis (Table 2):

- White race, increasing age, increasing CCI, and worse perceived health status were significantly associated with increasing pneumonia risk when controlling for each these variables and dental care indicators of insurance, and frequency of dental check-ups.
- Of the dental variables, the reported **frequency of dental check-ups** was significantly associated with pneumonia; those never attending dental check-ups had an 86% increased risk of pneumonia compared to those with check-ups twice yearly (95%CI: 1.30,1.65, p=0.0008).
- Dental insurance was NOT significantly associated with pneumonia risk in the adjusted model. The complete results of the multivariable analysis are shown in Table 2.
- There was no evidence of multicollinearity between variables by variance inflation factors.
- Figure 1 illustrates the association between dental insurance and the frequency of routine dental check-ups; the presence of dental insurance is associated with a greater likelihood of frequent dental check-ups. This association is significant: p<0.0001.

Table 2: Multiple Logistic Regression Model: Pneumonia Risk

Predictors	OR, (95% CI)	p value
Full Model		**<0.0001**
Race (ref=white)		<0.0001
Black	0.66, (0.48,0.90)	0.0080
Hispanic	0.43, (0.30,0.60)	<0.0001
Other	0.75, (0.49,1.16)	0.1900
Age (ref=0-20 years)		0.0015
21-40 years	0.79, (0.53,1.19)	0.2606
41-60 years	0.62, (0.39,1.00)	0.0498
61-80 years	0.81, (0.53,1.24)	0.3393
81+ years	1.58, (0.91,2.75)	0.1050
Perceived Health Status (ref=Excellent)		<0.0001
Very good	1.41, (0.94,2.11)	0.0992
Good	1.45, (0.92,2.28)	0.1130
Fair	2.31, (1.44,3.70)	0.0006
Poor	3.22, (1.93,5.36)	<0.0001
CCI (ref=none)		<0.0001
1-3	2.41, (1.79,3.25)	<0.0001
4-6	1.21, (0.41,3.54)	0.7247
7 or greater	11.72, (2.56,53.64)	0.0016
Freq of Dental Check-ups (ref=2+/year)		0.0018
Once a year	1.04, (0.72,1.52)	0.8220
Less than once a year	1.49, (1.02,2.16)	0.0373
Never	1.86, (1.30,2.65)	0.0008
Lack of Dental Insurance	1.01, (0.73,1.41)	0.9394

Weighted Analysis, *Modified Charlson Co-morbidity Index

Results

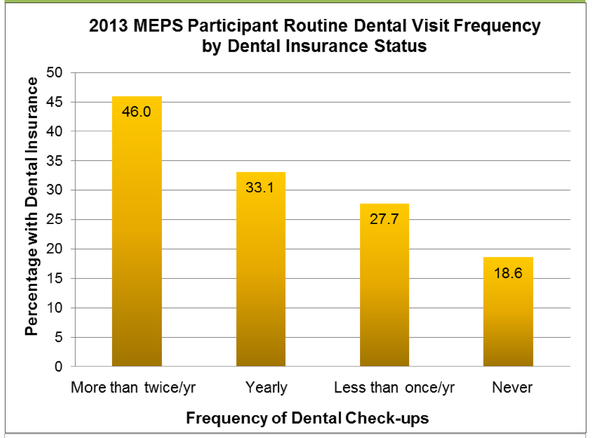

Figure 1: Percentage of persons in each category of check-up frequency with insurance. Dental insurance is more prevalent in those with more frequent routine dental care.

Discussion

- Routine dental visit frequency was the only dental indicator to remain associated with pneumonia after adjustment for various social and demographic factors.
- Routine dental visit frequency may be indicative of more long term healthy oral behaviors. However, it may also be indicative of persons with healthier behaviors in general.
- Dental insurance, while associated with the frequency of dental check-ups, was NOT associated with pneumonia in the final model. It may be that too many other factors determine access to dental care thus diluting the effect insurance may have: ie availability of dentists, type of dental coverage, availability of charity care.

Limitations

- Actual dental visits during the survey year may reflect either good or bad overall dental health, depending on the reason for the visit.
- Relatively small portion of the sample with a pneumonia diagnosis and with dental insurance.

Conclusions

- Pneumonia risk appears to be decreased in those who customarily attend routine dental check-ups, consistent with existing data that good oral health is protective.
- Access to dental services may happen despite lack of insurance (ie via charity care) or may not happen despite having insurance.

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