

The Influence of Comorbid Mood and Anxiety Disorders on Outcomes of Pediatric Patients Hospitalized for Pneumonia

Stephanie K. Doupnik, MD,^{a,b} Nandita Mitra, PhD,^{b,c} Chris Feudtner, MD, PhD, MPH,^{a,b,d,e} Steven C. Marcus, PhD^{b,f,g}

ABSTRACT

OBJECTIVES: Mood and anxiety disorders are associated with greater inpatient care utilization in children with chronic illness. We sought to investigate the association of mood or anxiety disorders and outcomes for hospitalized pediatric patients, using pneumonia as a model.

METHODS: We conducted a retrospective, cross-sectional study of pneumonia hospitalizations in patients 5 to 20 years old, using the nationally representative Healthcare Cost and Utilization Project's 2012 Kids' Inpatient Database. We used multivariable logistic and linear regression models stratified by age group to determine the independent association of mood or anxiety disorders with complications and length of stay, adjusted for clinical, demographic, and hospital characteristics.

RESULTS: Of 34 794 pneumonia hospitalizations, 3.5% involved a patient with a comorbid mood or anxiety disorder. Overall incidence of complications was 13.1%. Mean length of stay was 4.5 days. In adjusted models, comorbid mood or anxiety disorders were associated with greater odds of pneumonia complications in school-aged children (odds ratio 1.80; 95% confidence interval, 1.20–2.71) and adolescents (odds ratio 1.63; 95% confidence interval, 1.31–2.02). Hospitalizations with an associated mood or anxiety disorder were longer than those without, by 11.2% in school-aged children and 13.6% in adolescents ($P < .001$). The association of mood and anxiety disorders with longer hospital stay was not modified by the presence of pneumonia complications.

CONCLUSIONS: In pediatric patients hospitalized for pneumonia, a comorbid mood or anxiety disorder is associated with greater odds of complications and longer hospital stay. The presence of pneumonia complications did not influence the relationship between mood or anxiety disorders and length of stay.



^aDivision of General Pediatrics and Center for Pediatric Clinical Effectiveness, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; ^bLeonard Davis Institute, ^cDepartment of Medical Ethics and Health Policy, and ^dSchool of Social Policy and Practice, University of Pennsylvania, Philadelphia, Pennsylvania; ^eDepartments of Biostatistics and Epidemiology, and ^fPediatrics, The Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; and ^gCenter for Health Equity Research and Promotion, Philadelphia, Virginia Medical Center, Philadelphia, Pennsylvania

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Address correspondence to Stephanie K. Doupnik, MD, Division of General Pediatrics, Children's Hospital of Philadelphia, CHOP North, 3535 Market St, Suite 1550, Philadelphia, PA 19104. E-mail: doupniks@chop.edu

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Children and adolescents with physical illness and comorbid mental health conditions have unique clinical care needs. Approximately 8% of US children have a mood or anxiety disorder,^{1,2} and mood and anxiety disorders account for two-thirds of the mental health disorders associated with pediatric hospitalizations.³ In hospitalized adults, having a co-occurring mood or anxiety disorder is associated with higher inpatient utilization, morbidity, and mortality.^{4–10} Among children with complex chronic illnesses, comorbid mood and anxiety disorders are associated with more inpatient utilization (eg, more admissions,^{11,12} longer admissions,¹³ and more rehospitalizations).¹⁴

Emerging evidence suggests that inpatient interventions can improve the hospital course in children with mental health needs¹⁵; however, limited evidence or best practice guidelines are available to guide the comanagement of mental health conditions in hospitalized youth. The role of factors modifiable in the inpatient setting in driving the higher rates of hospital utilization among youth with mood and anxiety disorders is not known. Little is known about the effect of mental health conditions on inpatient clinical and quality outcomes, such as medical complications, particularly in general pediatric conditions.

We conducted a retrospective cross-sectional study to test the effect of a comorbid mood or anxiety disorder on the incidence of complications and length of stay in school-aged children and adolescents hospitalized for pneumonia. We chose pneumonia as a disease model to study this question for 2 practical reasons. First, we considered complications an important outcome; therefore, we chose a condition where discharge diagnosis codes had previously been used to reliably identify complications.¹⁶ Second, pneumonia remains a common reason for hospitalization of both healthy children and children with chronic illness.¹⁷ We hypothesized that pneumonia hospitalizations involving patients with a comorbid mood or anxiety disorder are longer and involve more pneumonia complications and that the effect of a

comorbid mood or anxiety disorder on length of stay would be greater in hospitalizations involving pneumonia complications.

METHODS

Design

We conducted a retrospective, cross-sectional study of hospitalized school-aged children and adolescents with a primary discharge diagnosis of pneumonia. The exposure of interest was the presence of any comorbid mood or anxiety disorder as a hospital discharge diagnosis, and the outcomes of interest were pneumonia complications and length of stay.

Data Sources

We identified a sample of pneumonia hospitalizations in the 2012 Kids' Inpatient Database (KID), made available by the Agency for Healthcare Quality and Research Healthcare Cost and Utilization Project (HCUP). The 2012 KID contains administrative data on a nationally representative sample of pediatric discharges for patients 0 to 20 years of age from 4100 hospitals in 44 states. The database includes free-standing children's hospitals and excludes stand-alone psychiatric hospitals. The stratified sampling frame samples 80% of nonnewborn pediatric discharges, with sampling weights provided by HCUP to create nationally representative statistics. KID includes hospital information, patient demographic information, and discharge diagnoses in an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) format.

Eligibility Criteria

Hospitalizations were included in the analysis if the patient had a primary diagnosis of pneumonia, had ≥ 1 comorbid condition in addition to pneumonia, and was 5 to 20 years old. We excluded patients < 5 years old because mood and anxiety disorders are uncommon and difficult to diagnose in this age group, and we included patients up to age 20 because they are classified as adolescents in both HCUP data and the American Academy of Pediatrics Ages and Stages model.¹⁸ We limited the sample to hospitalizations where patients

had comorbid conditions to ensure that patients with the exposure of interest were compared with patients with other comorbidities. Hospitalizations were excluded from the analysis if the patient was transferred to or from another health care facility or if he or she was discharged somewhere other than home, such as law enforcement or a long-term care facility (Fig 1), to ensure that the study sample captured a patient's full inpatient hospital course, and to ensure that any observed differences in length of stay were not driven by availability of beds in a transfer facility. Pneumonia hospitalizations were identified through a previously validated algorithm.^{17,19} Hospitalizations were considered to have a primary discharge diagnosis of pneumonia if they met 1 of 2 criteria: if the primary ICD-9-CM diagnosis code indicated pneumonia (codes 480–483 and 485–486), influenza with pneumonia (487.0, 488.01, 488.11, 488.81), empyema (510), or pleural effusion (511.0, 511.1, 511.9, 513), or if the primary diagnosis was for a symptom of pneumonia such as fever, cough, or tachypnea (780.60, 780.61, 786.00, 786.05–7, 786.2–4, 786.50–52, 786.7), and any secondary diagnosis indicated pneumonia, empyema, or pleural effusion.^{17,19}

Primary Predictor Variable

Comorbid mood disorders (eg, bipolar disorder, major depressive disorder) and anxiety disorders (eg, generalized anxiety disorder, panic disorder, specific phobias) were identified with ICD-9-CM codes 293.83, 293.84, 296, 300.0, 300.10, 300.2–5, 300.89, 300.9, 308, 309.81, 311, 313.0, 313.1, 313.21, 313.22, 313.3, 313.82, and 313.83.²⁰ The mood or anxiety disorder designation did not include attention-deficit/hyperactivity disorder, autism, or psychoses. We did not distinguish between types of mood and anxiety disorders, because these conditions have significant symptom overlap in children and adolescents and are commonly grouped together within the category of emotional, or internalizing, disorders.^{21,22}

Outcomes

Pneumonia complications were identified according to previously described criteria¹⁷ by discharge ICD-9-CM codes. We classified pneumonia complications in 3 groups:

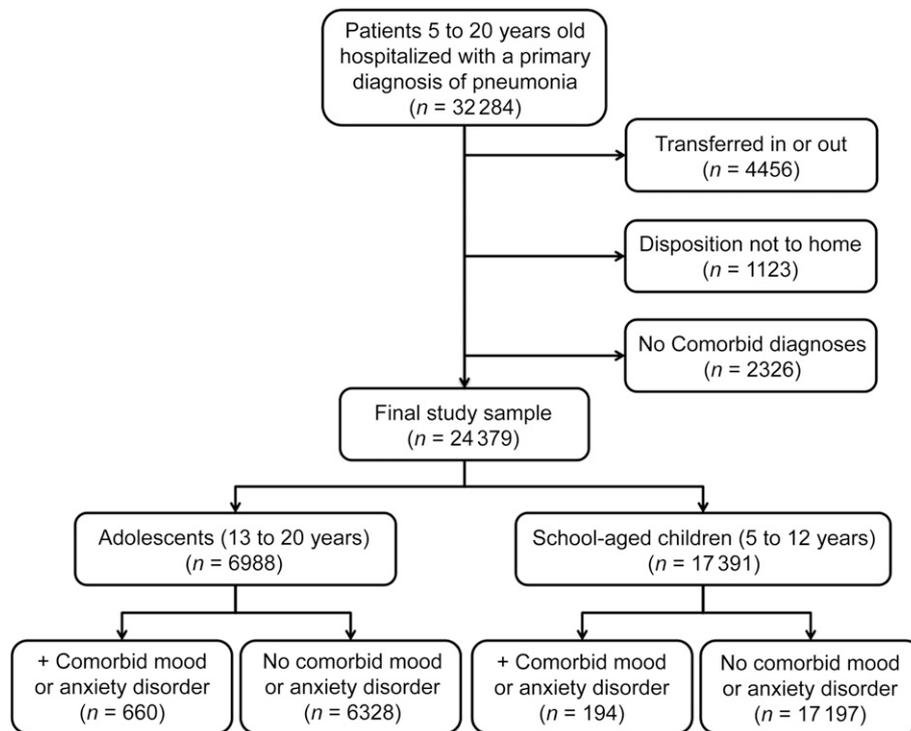


FIGURE 1 Unweighted study sample of patients with pneumonia hospitalizations.

respiratory failure, sepsis, and suppurative complications (eg, empyema, pulmonary abscess). Length of stay was provided in HCUP data; the unit of analysis was a hospital day.

Covariates

We identified 5 types of medical comorbidities predisposing patients to pneumonia complications with ICD-9-CM codes: asthma,²⁰ cancer,²⁰ chronic lung disease,²⁵ immunocompromised status,²⁵ and other complex chronic conditions.²⁴ Complex chronic conditions falling into 1 of the other 4 diagnosis categories (eg, cystic fibrosis, which was included with chronic lung disease) were excluded from the complex chronic condition category. We identified 2 types of mental health comorbidities predisposing patients to hospital complications with ICD-9-CM codes and HCUP Clinical Classifications Software: intellectual disability and substance use disorders.²⁰ We determined the count of a patient's comorbid conditions by counting the number of unique conditions identified through HCUP Clinical Classifications

Software. Demographic covariates were used as provided by HCUP.

Statistical Methods

All analyses of KID data were weighted with survey weights provided by HCUP, and all results are reported for the weighted study population. We calculated summary statistics for age, gender, race, payer, geographic region, hospital characteristics, and patient clinical characteristics. We compared the distribution of categorical variables for hospitalizations involving comorbid mood and anxiety disorders and those without by using the Rao-Scott χ^2 test. We compared continuous variables by using the adjusted Wald test.

We estimated unadjusted odds ratios (ORs) of complications by using logistic regression and unadjusted length of stay differences by using the adjusted Wald test. We developed multivariable logistic regression models to estimate adjusted ORs of complications adjusting for relevant covariates. We developed linear regression models to predict length of stay by using natural logarithmic transformation and adjusting for relevant covariates. A priori, we specified

that models would include patient age, race, and gender, as well as indicator variables for the presence of the 5 previously described medical comorbidities and intellectual disability. We included substance abuse disorder as a covariate in adolescent models but not among school-aged children. In addition, we included covariates that had a *P* value < .2 in bivariate comparisons for the group with and without mood or anxiety disorders. Missing data were minimal, with < 1% missing in each variable, except race. Race was not reported for 7.2% of hospitalizations but was evenly balanced between comparison groups. We tested for interactions between covariates and the predictor variable of comorbid mood or anxiety disorders by using the Wald test. All analyses were conducted separately within age groups defined by the American Academy of Pediatrics,¹⁸ that is, 5 to 12-year-old school-aged children and 13- to 20-year-old adolescents.

All tests were 2-sided, and a *P* value < .05 was considered statistically significant. Analyses were conducted with Stata 13 (StataCorp LP, College Station, TX).

The Children's Hospital of Philadelphia Institutional Review Board determined that this study did not constitute human subjects research.

RESULTS

Study Sample

The sample included 24 379 hospitalizations, weighted by HCUP survey weights to represent a population of 34 794 hospitalizations. In the weighted study population, 71.5% of hospitalizations involved 5- to 12-year-old school-aged children, and 28.5% involved 13- to 20-year-old adolescents. Comorbid mood or anxiety disorder diagnoses were present in 1.1% of hospitalizations involving school-aged children and in 9.3% of hospitalizations involving adolescents. In both the school-aged and adolescent sample, patients with mood or anxiety disorders were more likely to be older and white and to have chronic lung disease. In the school-aged sample, hospitalizations involving comorbid mood or anxiety disorders were more likely to occur in free-standing children's hospitals and teaching hospitals. In the adolescent sample, patients with comorbid mood or anxiety disorders were more likely to be female and to have cancer and substance use disorders. Among both school-aged patients and adolescents, 65% had 1 of the medical comorbidities included in our analysis (Table 1).

Complications

Pneumonia complications were present in 4541 hospitalizations, affecting 10.7% of school-aged children and 18.7% of adolescents. In both age groups, the most common complication type was suppurative complications such as empyema or pulmonary abscess. Respiratory failure was less common than suppurative complications, and sepsis was the least common. In both age groups, complications were more common in hospitalizations involving patients with comorbid mood or anxiety disorders compared with patients with other comorbid conditions.

In school-aged children, analyses adjusted for confounding clinical, demographic, and hospital factors showed a statistically significant association of comorbid mood or

anxiety disorders with the composite outcome of any pneumonia complication (OR 1.80; 95% confidence interval [CI], 1.20–2.71) and with the outcome of respiratory failure (OR 2.54; 95% CI, 1.21–4.59); there was no significant association with suppurative complications or sepsis (Table 2). These associations were also found in unadjusted analyses, and in unadjusted analyses the association between suppurative complications and mood and anxiety disorders was also significant. Sepsis was an uncommon outcome, and differences in cases of sepsis were not statistically significant in unadjusted analyses.

For adolescents, suppurative complications, respiratory failure, and sepsis were all significantly more common in hospitalizations involving patients with comorbid mood or anxiety disorders. All differences remained statistically significant after we adjusted for confounding clinical, demographic, and hospital factors (Table 2).

Length of Stay

For school-aged children, unadjusted mean length of stay was significantly different between groups: 3.2 days among children with no comorbid mood or anxiety disorder and 4.9 days among children with a comorbid mood or anxiety disorder ($P < .001$). An adjusted model accounted for 22% of the variation in length of stay ($R^2 = 0.22$). After we adjusted for patient demographic and clinical characteristics, the presence of complications, and hospital factors, length of stay was 11% longer in children with comorbid mood or anxiety disorders (95% CI, 2.5%–20%; $P = .009$). (Table 3)

For adolescents, unadjusted mean length of stay was significantly different between groups: 4.2 days among adolescents with no comorbid mood or anxiety disorder and 6.0 days among adolescents with a comorbid mood or anxiety disorder ($P < .001$). An adjusted model accounted for 33% of the variation in length of stay ($R^2 = 0.33$). After we adjusted for patient demographic and clinical characteristics, the presence of complications, and hospital factors, length of stay was 13% longer in adolescents with comorbid mood or anxiety disorders (95% CI, 7.7%–17%; $P < .001$). (Table 3)

Influence of Pneumonia

Complications on Length of Stay

We found no statistically significant effect modification between presence of complications and mood or anxiety disorder diagnoses in either age group ($P = .93$ for school-aged children, $P = .44$ for adolescents).

DISCUSSION

We studied the role of comorbid mood and anxiety disorders in pediatric hospital outcomes, using pneumonia as a disease model. Pneumonia is a useful model for this question because it can occur both in healthy children and in children with a variety of underlying chronic illnesses, and it is a common reason for pediatric hospitalization. After adjusting for possible confounding clinical, demographic, and hospital factors, we found pneumonia hospitalizations were longer and had greater risk of pneumonia complications when they involved patients who had a comorbid mood or anxiety disorder. These findings are consistent with previous studies finding longer hospital stays and higher inpatient utilization rates in children and adolescents who have chronic medical illness and comorbid mood and anxiety disorders.^{11–14} We also found no difference in the degree to which mood and anxiety disorders were associated with longer hospital stay in hospitalizations with and without pneumonia complications, suggesting that factors other than pneumonia complications contribute to prolonged hospital stays.

In this nationally representative sample, the prevalence of mood and anxiety disorders in adolescent hospitalizations for pneumonia was 9.3%. Mood and anxiety disorder diagnoses were much less common in school-aged children, with only 1.1% prevalence. The incidence of emotional disorders increases with age, which partially explains the higher prevalence in adolescents compared with younger children. Although the KID has no data on medication use, we suspect that mood and anxiety disorders are more often noted as discharge diagnoses in patients receiving antidepressant, mood-stabilizing, or

TABLE 1 Characteristics of Pneumonia Hospitalizations of Patients With and Without Comorbid Mood or Anxiety Disorders

	5- to 12-y-Old Patients			13- to 20-y-Old Patients		
	No Comorbid Mood or Anxiety Disorder	Comorbid Mood or Anxiety Disorder	<i>P</i> ^a	No Comorbid Mood or Anxiety Disorder	Comorbid Mood or Anxiety Disorder	<i>P</i> ^a
Weighted population size (95% CI)	24 592 (22 864–26 320)	275 (226–324)		9000 (8445–9554)	927 (823–1031)	
Age in y, mean (SE)	7.5 (0.03)	9.3 (0.15)	<.001 ^b	16.6 (0.4)	17.6 (0.9)	<.001 ^b
Male, %	52.9	56.9	.27	52.5	43.3	<.001
Publicly insured, %	49.3	46.6	.49	40.5	44.9	.056
Race or ethnicity, %			<.001			<.001
White	47.5	62.9		54.6	65.6	
Black	17.5	9.5		17.3	11.6	
Hispanic	20.4	13.4		14.9	11.9	
Other	14.4	14.0		13.0	10.7	
Urban–rural classification, %			.08			.12
>1 million	50.9	53.9		48.8	49.1	
250 000–999 999	18.0	23.4		18.3	21.6	
50 000–249 999	9.3	6.5		10.1	11.8	
10 000–49 999	12.6	12.2		11.0	9.1	
<10 000	3.8	3.8		8.6	8.2	
Patient ZIP code income quartile, %			.08			.29
0%–25%	34.7	25.8		32.6	30.7	
26%–50%	23.6	25.9		23.3	22.1	
51%–75%	21.9	25.0		23.4	23.0	
76%–100%	19.6	23.1		20.6	24.1	
Number of secondary diagnoses, mean (SE)	4.1 (0.06)	4.5 (0.25)	.07 ^b	5.2 (0.08)	5.4 (0.18)	.02 ^b
Asthma, %	49.5	45.5	.28	32.5	33.8	.52
Cancer, %	2.3	4.1	.08	3.4	5.7	.003
Chronic lung disease, %	4.4	11.3	<.001	10.2	17.8	<.001
Immunocompromised status (nononcologic), %	6.0	8.3	.17	11.1	12.7	.23
Other complex chronic condition, %	15.5	21.9	.02	27.1	25.4	.36
Substance use disorder, %				2.3	8.7	<.001
Intellectual disability, %	5.0	14.0	<.001	7.8	4.4	.003
Admitted to children's, hospital %	19.4	29.4	<.001	15.4	15.2	.94
Hospital location and teaching status, %			<.001			.020
Urban teaching	57.3	72.1		57.3	59.6	
Urban nonteaching	25.3	17.1		27.9	29.9	
Rural	17.2	10.7		14.7	10.3	

CI, 95 % confidence interval.

^a Rao–Scott χ^2 , except where otherwise noted.^b Adjusted Wald test.

anxiolytic medications. Because psychoactive medications are prescribed more commonly to adolescents than to younger children,²⁵ higher rates of identification of mood and anxiety disorders among discharge diagnoses in hospitalized adolescents may, in part, be related to higher rates of medication use to treat these emotional disorders. The higher prevalence of mood and anxiety disorder

diagnoses among adolescents hospitalized for pneumonia also raises the question whether adolescents with mood and anxiety disorders may be more likely to become hospitalized for acute medical illnesses, compared with their peers without emotional disorders.

The proportion of pneumonia hospitalizations with an associated complication was 13.1% in our sample,

higher than the 7.5% observed in a 2006 HCUP KID sample of children 0 to 17 years of age excluding several complex chronic conditions.¹⁷ Because our sample included only patients >5 years old who had ≥ 1 comorbid diagnosis in addition to pneumonia, and because patients with underlying conditions and older patients hospitalized for pneumonia are more likely to have complications,²⁵ these selection

TABLE 2 Complications in Pneumonia Hospitalizations Involving Patients With and Without Comorbid Mood or Anxiety Disorders

	Cases per 100 Hospitalizations				
	Number of Cases	No Comorbid Mood or Anxiety Disorder	With Comorbid Mood or Anxiety Disorder	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
School-aged children (5–12 y old) (<i>n</i> = 24 867)					
Any pneumonia complication	2679	10.7	20.3	2.14 (1.47–3.10)	1.80 (1.20–2.71) ^a
Suppurative complication	1613	6.4	10.5	1.70 (1.08–2.67)	1.36 (0.83–2.23) ^a
Respiratory failure	1787	4.4	10.9	2.64 (1.55–4.48)	2.54 (1.21–4.59) ^a
Sepsis	108	0.4	1.0	2.37 (0.58–9.72)	2.23 (0.50–9.79) ^a
Adolescents (13–20 y old) (<i>n</i> = 9927)					
Any pneumonia complication	1862	18.0	25.6	1.56 (1.28–1.90)	1.63 (1.31–2.02) ^b
Suppurative complication	1222	11.9	15.9	1.39 (1.12–1.73)	1.47 (1.16–1.85) ^b
Respiratory failure	668	6.3	11.3	1.90 (1.42–2.54)	2.02 (1.47–2.79) ^b
Sepsis	141	1.3	3.0	2.40 (1.47–3.91)	2.44 (1.44–4.11) ^b

CI, 95 % confidence interval.

^a Adjusted for age, gender, race, urban–rural classification, patient ZIP code income quartile, number of medical diagnoses, intellectual disability, chronic medical conditions, children's hospital, and teaching hospital status.

^b Adjusted for age, gender, race, public insurance, urban–rural classification, number of medical diagnoses, intellectual disability, substance use diagnosis, chronic medical conditions, and teaching hospital status.

criteria resulted in the inclusion of more medically complicated patients and more severe pneumonia cases. Prevalence of sepsis was low in school-aged and adolescent patients hospitalized for pneumonia, which is consistent with previous studies' findings.^{17,26}

We found that the odds of any pneumonia complication were higher in hospitalizations involving both school-aged children and adolescents who had comorbid mood or anxiety disorders. Among adolescents with comorbid mood or anxiety disorders, odds

of all 3 subtypes of pneumonia complications (respiratory failure, suppurative complications, and sepsis) were higher when compared with pneumonia hospitalizations involving patients who had ≥ 1 other comorbid diagnosis. Among school-aged children with comorbid mood or anxiety disorders, only odds of respiratory failure were higher. Mechanisms driving the increase in pneumonia complications among patients with mood and anxiety disorders could include factors in both the prehospital

setting, such as poor adherence to outpatient therapy or delayed presentation to medical care, and factors in the inpatient setting, such as withdrawn behaviors, which may lead to delays in provider recognition of new symptoms or disease progression.

Length of stay was prolonged for patients with comorbid mood and anxiety disorders in both age groups. We hypothesized that medical complications were one factor driving the greater length of stay in patients with comorbid mood and anxiety disorders; however, we found that the presence of

TABLE 3 Mean Length of Stay (d) for Pneumonia Hospitalizations Involving Patients With Comorbid Mood or Anxiety Disorders Compared With Those Without

	No Comorbid Mood or Anxiety Disorder, Mean (SE)	With Comorbid Mood or Anxiety Disorder, Mean (SE)	Adjusted β (95% CI)	<i>P</i> ^a
School-aged children (5–12 y old), (<i>n</i> = 24 867)				
All	3.2 (0.062)	4.9 (0.45)	0.11 (0.02–0.20) ^b	<.001
No complications	2.8 (0.05)	4.2 (0.43)		
With complications	5.7 (0.2)	7.5 (1.4)		
Adolescents (13–20 y old), (<i>n</i> = 9927)				
All	4.2 (0.1)	6.0 (0.55)	0.13 (0.08–0.17) ^c	<.001
No complications	3.6 (0.11)	4.9 (0.40)		
With complications	6.6 (0.23)	9.5 (1.39)		

CI, 95 % confidence interval.

^a From adjusted linear regression model.

^b Adjusted for age, gender, race, urban–rural classification, patient ZIP code income quartile, number of medical diagnoses, intellectual disability, chronic medical conditions, children's hospital, and teaching hospital status.

^c Adjusted for age, gender, race, public insurance, urban–rural classification, number of medical diagnoses, intellectual disability, substance use diagnosis, chronic medical conditions, and teaching hospital status.

pneumonia complications did not modify the association between a comorbid mood or anxiety disorder and prolonged hospital stay. Thus, length of stay was similarly prolonged for all hospitalizations involving a patient who had a pneumonia complication, regardless of whether the patient had a comorbid mood or anxiety disorder. This finding suggests that once patients develop a medical pneumonia complication, they receive similar hospital care regardless of any comorbid mood or anxiety disorder, and that complications are not one of the major mechanisms leading to prolonged hospital stays in patients with comorbid mood and anxiety disorders. Some other potential mechanisms that may drive longer hospital stays in patients with comorbid mood and anxiety disorders include delays in transitioning from intravenous to oral antibiotic therapy, lower patient tolerance of weaning respiratory support, or more care coordination and discharge planning needs.

This study has several limitations. The first is reliance on ICD-9-CM discharge diagnosis codes to identify patients with comorbid mood and anxiety disorders. Perceived irrelevance of mental health conditions to pneumonia hospitalizations may lead to missed documentation of mood and anxiety disorders. However, this omission would bias the results of this study toward the null hypothesis. Second, comorbid mood and anxiety disorders may be more readily identified in patients with longer hospital stays, which could confound the relationship between length of stay and mood and anxiety disorders. We have adjusted for this possibility by including the number of comorbid diagnoses as a covariate in our models. Because the absolute difference in length of hospitalization for patients with and without mood and anxiety disorders is <2 days, we believe large differences in rates of identification and documentation of prevalent mood and anxiety disorders based on length of stay are unlikely. In 2 additional subgroup analyses, 1 limiting the sample to hospitalizations >2 days and a second limiting the sample to hospitalizations <7 days, we found that comorbid mood and anxiety disorders were associated with longer hospital stays,

suggesting that the reported findings are unlikely to be caused by differences in identification rates of mood and anxiety disorders based on hospital length of stay. Finally, because this study was conducted with retrospective cross-sectional data, we cannot exclude the possibility that unmeasured confounders could explain associations between mood and anxiety disorders and medical outcomes.

CONCLUSIONS

In pediatric pneumonia hospitalizations, a comorbid mood or anxiety disorder is associated with higher odds of pneumonia complications and longer hospital stays, after adjustment for relevant clinical, demographic, and hospital factors. We found that a comorbid mood or anxiety disorder was associated with an equivalent increase in length of stay in patients with and without pneumonia complications, suggesting that medical complications are not a mechanism driving increased length of stay in patients with comorbid mood or anxiety disorders.

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