Infants Three Times More Likely to be Admitted to the Hospital Following a Strep Diagnosis Than Children Aged 3 to 5

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Key Findings:

- Despite recommendations not to test or treat strep in patients under age 3, 1-year-olds are tested 8.1% of the time and 2-year-olds are tested 13.7% of the time in encounters with respiratory-related symptoms.
- Strep test positivity rates are lower among younger children with only 3.9% of patients under age 1 testing positive, 7.4% of 1-year-old patients testing positive, and 9.9% of 2-year-olds testing positive compared to 16.4% of patients ages 6 to 8.
- However, those under 1 year of age are 304% more likely to be admitted to the hospital following strep throat compared with children aged 3 to 5, while those who are 1 year old have a 175% increased likelihood and those who are 2 years old have a 58% increased likelihood.
- Children under age 3 treated with antibiotics for strep are up to half as likely to have a hospital admission within 30 days compared with those not treated with an antibiotic.

The Infectious Diseases Society of America (IDSA) does not recommend testing for strep throat in most children younger than 3 years old because strep infection is uncommon, there is not a classic symptom presentation, and severe sequelae are rare.[1] In this study, we examined patterns in testing and treating strep throat among pediatric patients and the impact of treatment on adverse outcomes.

While symptomatic children younger than 3 years are tested for strep throat less often than older children, testing in younger children is not uncommon, as seen in Figure 1. In 2024 so far, those under 1 year of age are tested during 2.7% of visits for upper respiratory symptoms, while those aged 6 to 9 had a testing rate of 29.4%. We saw similar rates of testing for strep in these age groups in all years since 2017.

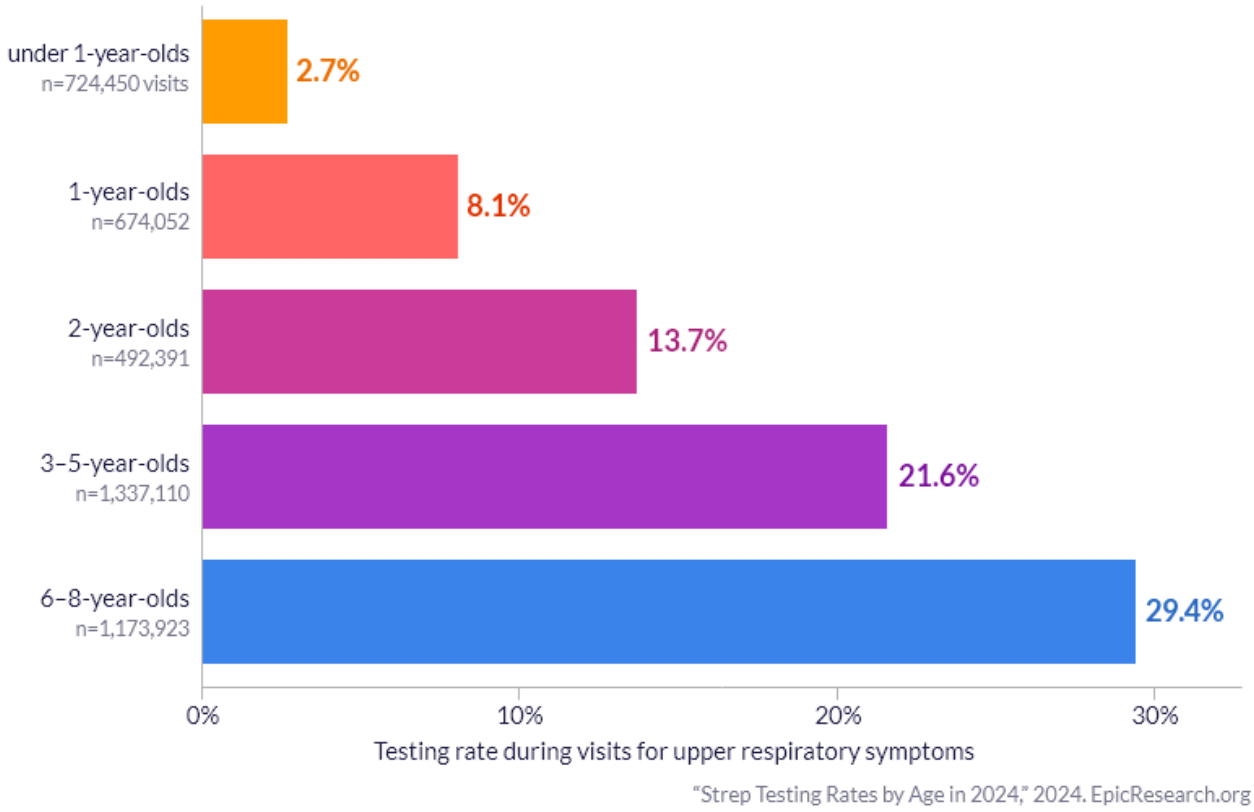

Figure 1. Rate of strep throat testing in 2024 among patients presenting with upper respiratory symptoms, by patient age.

Of patients who were tested for strep throat, younger children tested positive less often than older children. In 2024, we found the following percentages of patients who had a positive test result: 3.9% of those under age 1, 7.4% of those 1 year of age, 9.9% of those 2 years of age, 12.9% of those aged 3 to 5, and 16.4% of those aged 6 to 8, as seen in Figure 2.

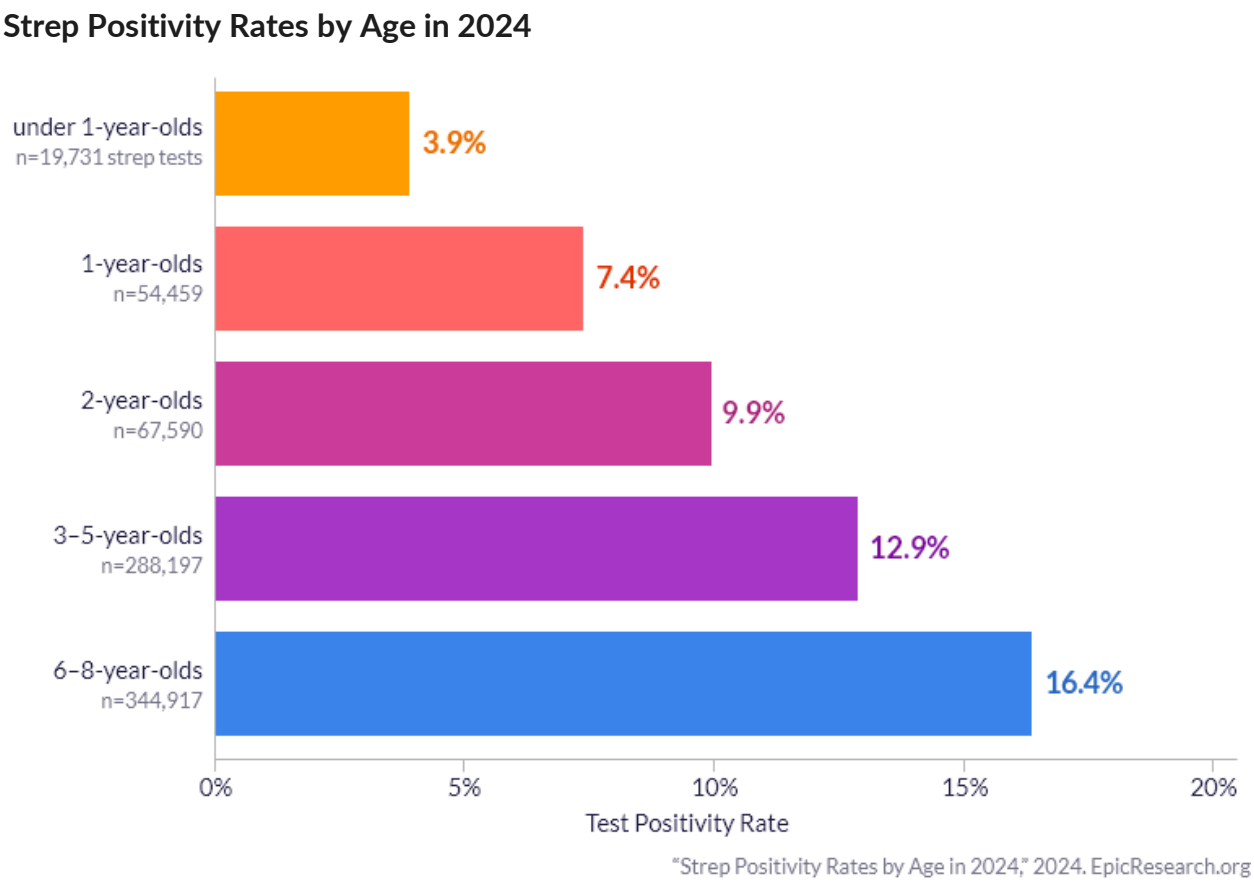

Figure 2. Rate of strep throat positivity in 2024 among patients tested, by patient age.

Despite the the variation in positivity rates, when children had a positive strep test or a strep diagnosis, the treatment rate was high (>90%) among all age groups, including those younger than 3 years. Those under 1 year old had the lowest treatment rate at 90.6%, while age groups older than 2 years had treatment rates around 94%.

To understand the risks from having strep throat among children, we studied the likelihood of all-cause hospital admissions between 1 and 60 days after a positive strep test or diagnosis among patients who had strep throat between January 1, 2017, and April 1, 2024. Patients less than 1 year old were 304% more likely to be hospitalized than those aged 3 to 5, as seen in Figure 3. Those who were 1 year old had a 175% increased likelihood and patients aged 2 had a 58% increased likelihood. A sensitivity analysis of patients with evidence of an upper respiratory symptom yielded similar trends.

Likelihood of Admission After Strep Throat by Age

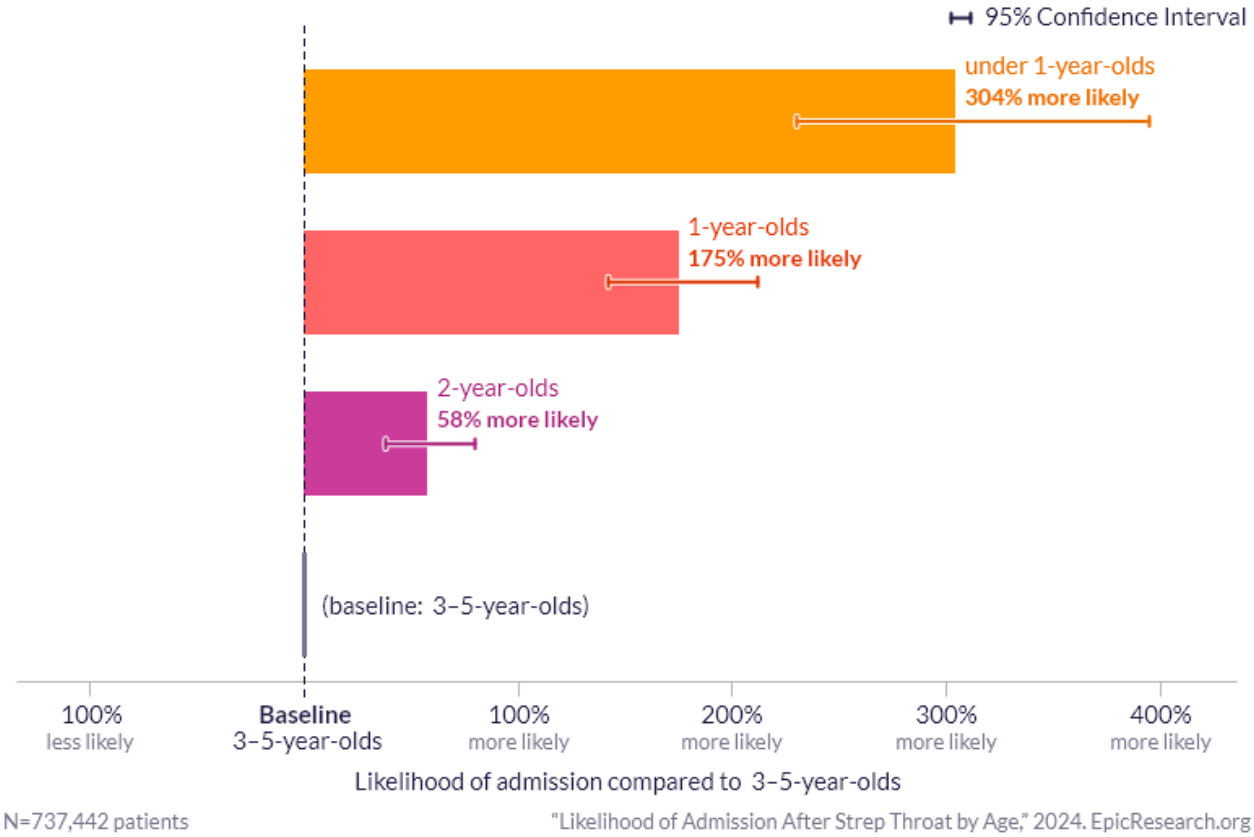

Figure 3. The likelihood of a patient being admitted to the hospital following strep diagnosis or positive test, by patient age.

Additionally, we found that treatment with antibiotics within two days of being diagnosed or testing positive for strep reduced the likelihood of all-cause hospital admission for patients under age 3. Those who were 2 years old had a 55% reduced likelihood of being admitted, those who were 1 year old had a 33% reduced likelihood, and those less than 1 year old had a 38% reduced likelihood, as seen in Figure 4.

Likelihood of Admission After Strep Throat by Antibiotic Prescription and Age

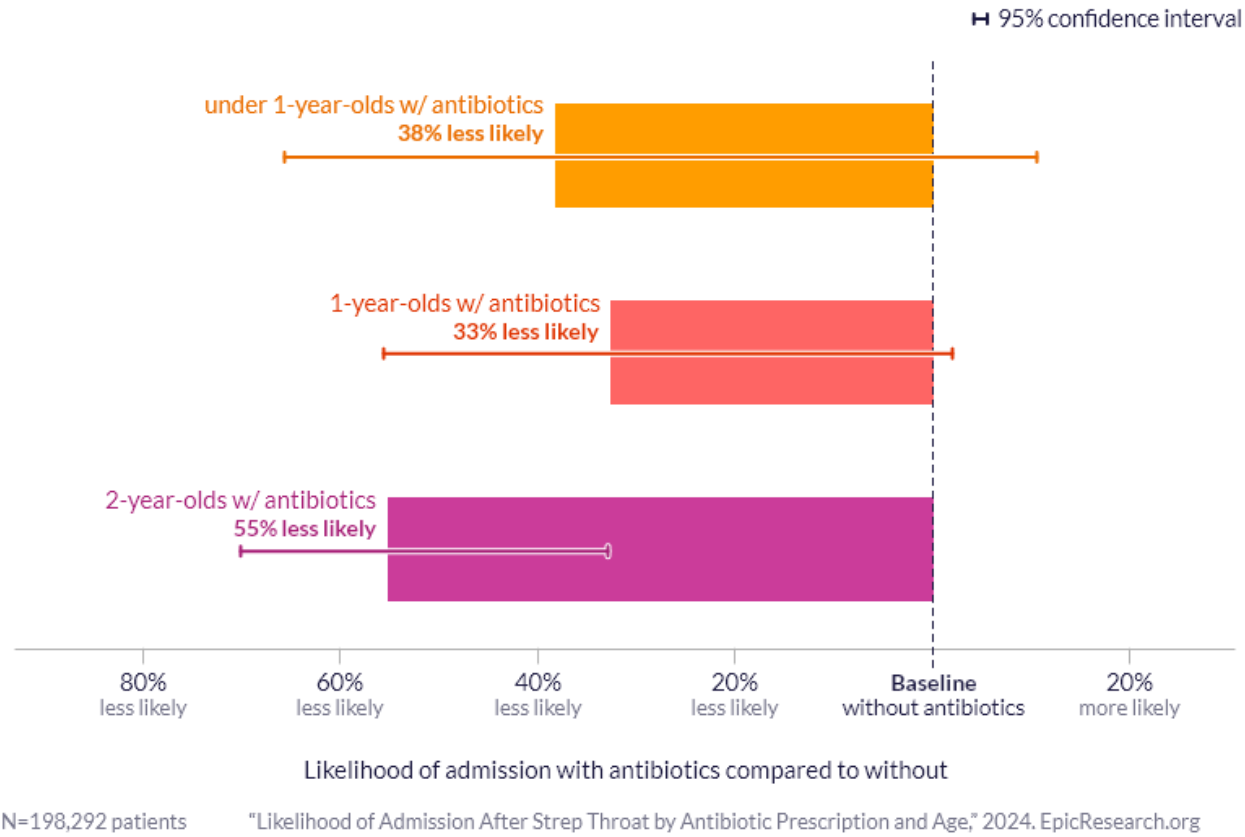

Figure 4. The likelihood of a patient being admitted to the hospital following strep diagnosis or positive test, by antibiotic prescription and age.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 270 million patient records from 1,500 hospitals and more than 35,500 clinics from all 50 states, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

1. Shulman ST, Bisno AL, Clegg HW, et al. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America [published correction appears in Clin Infect Dis. 2014 May;58(10):1496. Dosage error in article text]. Clin Infect Dis. 2012;55(10):e86-e102. doi:10.1093/cid/cis629

Data Definitions

Term	Definition
Study period	1/1/2017 – 4/1/2024
Study population	This study population comprises individual instances of strep infection. A patient may have multiple strep infections during the study. A single infection period is defined as:

	1. A contiguous period of **positive strep tests** and diagnosis of **strep throat** no more than 14 days apart from one and other. 2. The patient is under age 18 at the start of the strep event. 3. The patient has no prior history of: a. **Strep complications** b. **Cancer** c. **Hematological or immune disorders** d. **Chronic respiratory disease** e. **Congenital heart disease** 4. The patient has no recent history (prior two months) of: a. **Other bacterial infections** b. **Antibiotic** usage 5. The patient's final encounter in Cosmos must occur at least 60 days after their study entrance date unless the patient is documented as deceased.
Positive strep test	A lab result with LOINC code 11268-0, 76581-8, 101300-2, 60489-2, 68954-7, 6556-5, 18481-2, 78012-2, 6557-3, 6558-1, 31971-5, 17656-0, 6559-9, 546-2, 68954-7, 6556-5, 547-0, 49610-9, or 5036-9 Lab must have a positive lab impression
Strep throat	A diagnosis with the ICD-10-CM code J02.0, J03.00, or J03.01
Upper respiratory symptoms	A diagnosis with ICD-10-CM code J02, J03, J04, R50, R07.0, or R68.2 or chief complaint of COUGH, URI, NASAL CONGESTION, EAR ACHE, ILLNESS, RASH, FEVER, FEBRILE SEIZURE, SORE THROAT, PHARYNGITIS, LARYNGITIS, ENLARGED TONSILS, or FUSSY
Cancer	A diagnosis with the ICD-10-CM code C*, D0*, D1*, D2*, D3*, or D4*
Hematological or immune disorders	A diagnosis with the ICD-10-CM code D55*, D56*, D57*, D58*, D59*, D6*, D7*, or D8*
Other bacterial infections	A diagnosis with the ICD-10-CM code J01* or H66.0*
Chronic respiratory disease	A diagnosis with the ICD-10-CM code E84*, J41*, J42*, J45*, or J47*
Congenital heart disease	A diagnosis with the ICD-10-CM code Q20*, Q21*, Q22*, Q23*, Q24*, Q25*, Q26*, Q27*, or Q28*
Strep complications	A diagnosis with the ICD-10 code I0*, A48.3*, M00.2*, N00.9*, N05.9*, D89.89*, D89.9*, J03.00*, M72.6*, A40*, G00.2*, J03.01*, J36*, J39.0*, or J38.1*
Antibiotics	A prescription or administration of a medication with a therapeutic class of ANTIBIOTICS, further divided into the following based on pharmaceutical class: • Amoxicillin: PENICILLIN ANTIBIOTICS with the ingredient amoxicillin specified in the simple generic name • Cephalosporins: CEPHALOSPORINS – 5th generation, CEPHALOSPORIN ANTIBIOTICS – 4th generation, CEPHALOSPORIN ANTIBIOTICS – 3rd generation, CEPHALOSPORIN ANTIBIOTICS – 2nd generation, CEPHALOSPORIN ANTIBIOTICS – 1st generation, or CEPHALOSPORIN ANTIBIOTICS – SIDEROPHORE

- Other penicillins: PENICILLIN ANTIBIOTICS excluding amoxicillin antibiotics
- Macrolides: MACROLIDE ANTIBIOTICS
- Lincosamides: LINCOSAMIDE ANTIBIOTICS

Table 1. Strep Testing Rates by Age in 2024

	Cases	Tests	Testing Rate
under 1yo	724,450	19,731	2.7%
1 yo	674,052	54,459	8.1%
2 yo	492,391	67,590	13.7%
3-5 yo	1,337,110	288,197	21.6%
6-8 yo	1,173,923	344,917	29.4%

Table 2. Strep Testing Positivity by Age in 2024

	Cases	Positive	Positivity Rate
under 1yo	724,450	19,731	3.9%
1 yo	674,052	54,459	7.4%
2 yo	492,391	67,590	9.9%
3-5 yo	1,337,110	288,197	12.9%
6-8 yo	1,173,923	344,917	16.4%

Table 3. Likelihood of Admission After Strep Throat by Age

	Odds Ratio	Lower CI	Upper CI
under 1yo	4.04	3.30	4.95
1 yo	2.75	2.42	3.12
2 yo	1.58	1.38	1.80

Table 4. Likelihood of Admission After Strep Throat by Antibiotic Prescription and Age

	Odds Ratio	CI Low	CI High
Had Antibiotics and Under 1yo	0.62	0.34	1.11
Had Antibiotics and 1 yo	0.67	0.44	1.02
Had Antibiotics and 2 yo	0.45	0.30	0.67