

Inappropriate use of antibiotics in croup at three types of hospital

Paul Pianosi,* MD
William Feldman,* MD, FRCPC
Mark G. Robson,† MD
David McGillivray,‡ MD, FRCPC

Despite recent suggestions that bacterial infection is an increasingly important cause of serious croup, most authorities still consider croup a viral disease in which antibiotic therapy is unnecessary. To assess the frequency of antibiotic use in croup among children in hospital, we reviewed the records at three types of hospital in Ontario. Children with evidence of a concurrent infection that might be bacterial were considered to have received antibiotics appropriately. Whereas only 6% of cases at a university-affiliated children's hospital were inappropriately treated with antibiotics, the proportions at a small rural community hospital staffed by general practitioners and a general hospital staffed by both pediatricians and general practitioners in a medium-sized city were 63% and 38%. Possible reasons for these differences are discussed.

Malgré quelques récentes indications d'un rôle grandissant des infections bactériennes dans les laryngites graves, la plupart des sommités regardent encore le faux-croup comme une maladie virale où l'antibiothérapie n'est pas nécessaire. On étudie sur dossiers la fréquence d'une antibiothérapie du faux-croup chez l'enfant dans trois genres d'hôpitaux en Ontario. En mettant de côté les cas où il y avait lieu de croire à une infection concomitante de cause peut-être bactérienne, on trouve une antibiothérapie intempestive chez seulement 6% des malades d'un hôpital d'enfants affilié à une université mais chez 63% de ceux d'un petit hôpital rural desservi par des omnipraticiens et 38% de ceux d'un hôpital général desservi par des pédiatres et des omnipraticiens dans une ville d'importance moyenne. On épilogue sur les causes de ces différences.

From *the Children's Hospital of Eastern Ontario, †Arnprior and District Memorial Hospital, Arnprior, Ont., and ‡Peterborough Civic Hospital, Peterborough, Ont.

Reprint requests to: Dr. William Feldman, Children's Hospital of Eastern Ontario, 401 Smyth Rd., Ottawa, Ont. K1H 8L1

Croup is a well known childhood illness caused almost exclusively by viruses,¹⁻³ even though some recent reports suggest bacteria as an infrequent cause.⁴⁻⁹ Nevertheless, the practice of prescribing antibiotics is common in primary care, probably because of the unfounded belief that croup may progress into a more severe illness with acute upper airway obstruction if antibiotics are withheld.

A younger member of a group of physicians serving a rural community noted an unusually high frequency of prescribing antibiotics for croup. At his request we calculated the frequency of inappropriate antibiotic use in croup at the general hospital, staffed by general practitioners, serving that community and compared it with the frequency at a tertiary care children's hospital and a hospital in a medium-sized city that was staffed by both general and pediatric practitioners.

Methods

Of the charts for all children admitted to the Children's Hospital of Eastern Ontario (CHEO), Ottawa, between April 1981 and March 1982 those recording a discharge diagnosis of croup or laryngotracheobronchitis were reviewed. The diagnosis had to be based on a history of barking cough and stridor of sudden onset, plus the radiologic finding of subglottic narrowing and a normal epiglottic shadow when x-ray films of the neck had been made; when epiglottitis had been suspected the diagnosis had been made by direct laryngoscopy. Tracheal aspirates had been obtained at the time of insertion of the endotracheal tube in patients who required intubation.

Similarly, the charts for patients with croup who had been discharged between October 1971 and September 1981 from the Arnprior and District Memorial Hospital, a rural community hospital in Ontario, were reviewed. Here the diagnosis was based on the presence of a febrile upper respiratory tract illness with barking cough and

stridor that had improved with the use of cool, humidified air or oxygen.

Finally, the charts for patients with croup who had been admitted between March 1981 and February 1983 to the Peterborough Civic Hospital, a general hospital in a medium-sized Ontario city, were reviewed. Here the diagnosis was based on the presence of a croupy cough, stridor and signs of respiratory difficulty of sudden onset.

At the three centres the use of antibiotics in croup was tabulated from the charts. In each instance of antibiotic use it was noted whether any concurrent and possibly bacterial infection, such as otitis media, tonsillitis, bronchitis or pneumonia, had been suspected. Although these infections are often viral, the use of antibiotics was considered appropriate in such cases; in all other cases the use of antibiotics was considered inappropriate. Differences in the rates of use were tested for statistical significance by chi-square analysis.

Table I—Characteristics of children with croup in three types of hospital

Characteristic	Type of hospital		
	University-affiliated children's	Rural community	Urban general
Average age (mo)	23	23	31
Duration of hospital stay			
Mean (d)	3.5	4	3.3
Extremes	1, 10	1, 13	1, 9

Table II—Antibiotic use in the cases of croup

Antibiotic use	Type of hospital; no. (and %) of cases			
	University-affiliated children's (n = 269)	Rural community (n = 70)	Urban general (n = 148)	Total (n = 487)
Appropriate	60 (22)	7 (10)	34 (23)	101 (21)
Otitis media	45	1	21	67
Pneumonia	9	3	10	22
Tonsillitis/pharyngitis/bronchitis	6	3	3	12
Inappropriate (no concurrent and possibly bacterial infection)	17	44	56	117
None	192	19	58	269

Table III—Antibiotic use in the 112 cases of croup at the urban general hospital without presumed bacterial infection or treatment by an otolaryngologist

Antibiotic use	Category and age of physician; no. (and %) of cases			
	General practitioner		Pediatrician	
	≤ 40 yr (n = 46)	> 40 yr (n = 8)	≤ 40 yr (n = 31)	> 40 yr (n = 27)
No	22 (48)	2 (25)	25 (81)	8 (30)
Yes	24 (52)	6 (75)	6 (19)	19 (70)

Results

Although the three hospitals were different in terms of type of population served and level of care provided, the mean age of the patients with croup, and the mean and extremes of the duration of their hospital stay were similar (Table I). None of the cases were fatal. The proportion of cases inappropriately treated with antibiotics varied greatly between the three hospitals, from 6% at CHEO through 38% at the urban general hospital to 63% at the rural community hospital (Table II); the overall rate of use of antibiotics in croup was significantly lower ($p < 0.001$) at CHEO (29%) than at the other two hospitals (61% and 73% respectively).

At CHEO four children underwent intubation

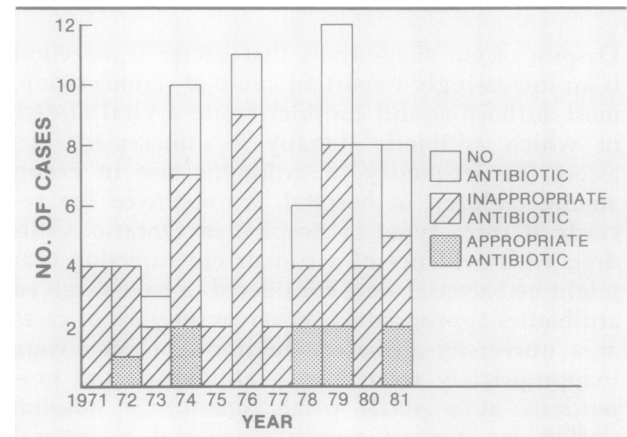


Fig. 1—Use of antibiotics in croup at a rural community hospital in Ontario.

because of epiglottitis, and two of them received antibiotics: one had pneumonia, and the tracheal aspirate of the other yielded a light growth of *Staphylococcus aureus* on culture. Intubation was not continued beyond 24 hours. At the other two hospitals none of the children with croup underwent intubation.

Fig. 1 shows the annual number of cases of croup at the rural community hospital for which antibiotic prescriptions — inappropriate or appropriate — were written.

Of the cases of croup at the urban general hospital there was no presumption of bacterial infection in 114. After exclusion of the two cases treated by an otolaryngologist, this group of cases was subdivided according to the attending physician's training (general practice v. pediatrics) and age (40 years or less v. over 40). Antibiotics were far less often prescribed in the cases managed by younger pediatricians (Table III), the rate being 19% as compared with, for example, 52% for younger general practitioners ($p = 0.008$).

Discussion

The use of antibiotics in croup appears to be not only common but also unnecessary: the much lower overall rate of use at CHEO was not associated with a greater morbidity, as judged from the frequency of concurrent airway infections and the mean duration of the stay at each hospital. In addition, the rate of intubation at CHEO was only 1.5%, and none of the children at that hospital who were not treated with antibiotics had complicating bacterial infections during their stay. The low rates of intubation and the absence of any deaths at the three hospitals suggest that other conditions were not mistakenly diagnosed as croup. Each hospital used a scoring system to assess the severity of the cases; however, since the score was not always found in the chart, we could not quantitate the severity of the cases at each centre. The reason for the difference in the frequency of otitis media is not clear; since the diagnostic criteria were not standardized we could not assess whether this condition was overdiagnosed or underdiagnosed in a given centre.

These findings serve to emphasize that croup is generally a self-limited illness, infrequently requiring antibiotic therapy or intubation. A 1983 report concluded that intubation was required in over 10% of cases of croup in Winnipeg because of the re-emergence of bacterial tracheitis; the authors noted that the rate of intubation in croup at Toronto's Hospital for Sick Children had increased from 1.1% or 2.1% in 1976-78 to 5.9% by 1979.⁵ However, in late 1979 there was an epidemic of severe viral croup, and none of the children who underwent intubation for croup that year at the Hospital for Sick Children were thought to have bacterial tracheitis, even though bacteria were cultured from tracheal secretions in some cases; by

1980-81 the rate of intubation in croup at that hospital had returned to the 1976-78 levels.¹⁰ Similarly, the experience at CHEO does not suggest that bacterial tracheitis is a significant cause of croup.

For many years we have known that croup is a viral illness and therefore does not require antibiotic therapy. Then why do practitioners ignore this fact and prescribe antibiotics unnecessarily? Our study has provided a clue. At the urban general hospital younger pediatricians were least likely to treat croup with antibiotics; they may be more familiar with viral croup and therefore feel comfortable in treating it appropriately, knowing that the constant supervision of these patients in hospital will allow quick intervention should complications arise. Perhaps older physicians fear the bacterial croup of a few decades ago or prescribe antibiotics to cover the possibility of a concurrent undetected bacterial infection. Each time a child recovers uneventfully from a viral illness after receiving antibiotics, parents (and perhaps some physicians) are encouraged to believe in a causal relation. However, the cost of this inappropriate treatment, in terms of adverse drug reactions, altered host-flora relationships and dollars, is real.

Although our study dealt only with patients in hospital, it is safe to conclude that antibiotics are unnecessary in uncomplicated croup in ambulatory patients. Denny and colleagues¹¹ have clearly shown that croup in this patient population is a viral disease; therefore, it should be treated as such.

We thank Carol Serediuk, Carol Sherwood and Corinne Hodgson for their assistance in the preparation of this manuscript and Dr. Pierre H. Beaudry for his advice.

References

1. Barker GA: Current management of croup and epiglottitis. *Pediatr Clin North Am* 1979; 26: 565-579
2. Levison H, Tabachnik E, Newth CJ: Wheezing in infancy, croup, and epiglottitis. *Curr Probl Pediatr* 1982; 12: 1-65
3. Cherry JD: Croup. In Feigin RD, Cherry JD (eds): *Textbook of Pediatric Infectious Diseases*, vol 1, Saunders, Philadelphia, 1981: 146-155
4. Sofer S, Chernick V: Increased need for tracheal intubation for croup in relation to bacterial tracheitis. *Can Med Assoc J* 1983; 128: 160-161
5. Sofer S, Duncan P, Chernick V: Bacterial tracheitis — an old disease rediscovered. *Clin Pediatr (Phila)* 1983; 22: 407-411
6. Jones R, Santos J, Overall J: Bacterial tracheitis. *JAMA* 1979; 242: 721-725
7. Liston S, Gehrz R, Jarvis C: Bacterial tracheitis. *Arch Otolaryngol* 1981; 107: 561-564
8. Liston S, Gehrz R, Leighton CS et al: Bacterial tracheitis. *Am J Dis Child* 1983; 137: 764-767
9. Henry RL, Mellis CM, Benjamin B: Pseudomembranous croup. *Arch Dis Child* 1983; 58: 180-183
10. Isles AF, Newth CJL: Increased need for tracheal intubation for croup in relation to bacterial tracheitis [C]. *Can Med Assoc J* 1983; 129: 532
11. Denny FW, Murphy TF, Clyde WA Jr et al: Croup: an 11-year study in a pediatric practice. *Pediatrics* 1983; 71: 871-876