

# Acute Otitis Media In Adults: A Report From The International Primary Care Network\*

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**Background:** Of 22 million visits annually to United States physicians for acute otitis media, almost 4 million are by patients 15 years old or older. Yet the clinical spectrum and variables related to recovery have not been reported for adults.

**Method:** Data originated from 3224 primary care patients with acute otitis media, of whom 500 were 15 years old or older, who were enrolled in a prospective study in eight countries. At the initial visit, history, symptoms, physical findings, and treatment were recorded. At a 2-month follow-up visit, changes in treatment and recovery were recorded.

**Results:** Compared with children, adults sought care more quickly after symptom onset; were more likely to have had a tonsillectomy or adenoidectomy; and were more likely to complain of ear pain, decreased hearing, sore throat, and ear discharge. Children were more likely to have a history of recent upper respiratory tract infection, serous otitis media, and ear tubes; symptoms of fever, diarrhea, and vomiting; and tympanic membrane findings of redness, bulging, and ear tubes in place. History of reduced hearing, allergy, prophylactic antibiotics, and tympanic membrane findings characterized as opaque or dull, fluid, draining pus, perforation, and not visualized were equally frequent in both age groups. For adults, neither type nor duration of antibiotic affected outcome. Patients receiving antibiotics had lower rates of recovery than those who did not. The likelihood of a poor outcome increased with an increasing number of past episodes of acute otitis media and with increasing age.

**Conclusion:** Although history and symptoms differ in adults and children, the similarity of tympanic membrane findings is consistent with previous reports of a similar bacterial spectrum in both groups. Recovery is related more to individual patient characteristics and history than to antibiotic therapy. Adults have an increased rate of poor outcome at 2 months compared with children. (J Am Board Fam Pract 1993; 6:333-9.)

Acute otitis media is generally considered a disease of childhood. Yet, of more than 22 million office visits to US physicians for this condition in 1989, 16.6 percent were by patients aged 15 years or older.<sup>1</sup> This relatively common occurrence

contrasts with a paucity of medical literature on acute otitis media in adults.

Studies that compare the clinical spectrum of acute otitis media in adults and children report differences in presenting signs and symptoms.<sup>2,3</sup> These studies, however, did not investigate either recovery rates or the effects of patient characteristics and treatment on outcome. We therefore report data on clinical presentation, antibiotic treatment, and outcomes derived from an international study of patients with acute otitis media.

## Methods

The International Primary Care Network (IPCN) consists of national networks of primary care physicians who collaborate on research and surveillance of health problems in their respective patient populations. A description of the purpose, methods, and policies of IPCN, as well as the

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organization of the otitis media study, has been reported,<sup>4</sup> as has the distribution of symptoms and treatment patterns.<sup>5</sup> Physicians from networks in nine countries (Australia, Belgium, Canada, Great Britain, Israel, the Netherlands, New Zealand, Switzerland, and the United States) were asked to record data on 15 consecutive patients with new episodes of acute otitis media. A new episode was defined as a new infection with or without a history of acute otitis media or chronic serous otitis media. Only cases reported by physicians enrolling 9 or more patients (average 13.6) were included because follow-up data from this group exceeded data from those reporting fewer than 9 patients (84.6 percent versus 66 percent). Patient enrollment extended from February through November 1986.

From a prepared list, physicians checked duration and type of symptoms (ear pain, nasal discharge, fever, diarrhea or vomiting, sore throat, reduced hearing, ear discharge), characteristics of each tympanic membrane (not visualized, opaque or dull, red, fluid behind drum, bulging, retracted, perforated, draining pus, tympanostomy tubes), and certainty of diagnosis (very certain, somewhat certain, somewhat uncertain, very uncertain). In addition, demographic data, the number of attacks of acute otitis media in the preceding 18 months, investigations, and therapy were reported on a standard form. Dutch translations were used by physicians in the Netherlands and by some in Belgium, French by some Belgian and Swiss physicians, and German by the remainder of the Swiss physicians. Those in other countries used English forms.

A 2-month follow-up interval was chosen because more than 85 percent of middle ear effusions clear by 60 days after the onset of acute otitis media.<sup>6</sup> At this time a follow-up form containing six questions was completed by either the patient (mailed questionnaire) or physician, based on telephone contact or repeat examination. The questions elicited information about total number of subsequent visits, follow-up examination by another physician, receipt of ear tubes, changes in medication since the initial visit, hospitalization for the problem presented at the initial visit, and assessment of recovery (yes, no, uncertain). If recovery was not complete, the reasons were described by a checklist as pain, drainage, hearing problem, or other. Using only the other category,

6.5 percent of cases were reported as not completely recovered. Free text descriptions of these other reasons were classified by the investigators as being indicative of ongoing disease (3.3 percent) or an unrelated concern (3.2 percent). Incomplete recovery could have been due to either persistence of middle ear effusion or recurrence of infection.

This report is based on the 3224 patients who were 13 months old or older, including 500 who were 15 years old or older. Canadian participation in the study was of an exploratory nature; the 69 Canadian patients are not included in this report. For analyses regarding the relation of antibiotic treatment at initial visit to outcome, patients for whom follow-up data were lacking (n = 523) and those referred to other physicians at the index visit (n = 180) were excluded (45 had both of these exclusion criteria), resulting in a sample size of 2566, including 386 who were 15 years old or older. More than 96 percent of patients in all countries except the Netherlands (31.2 percent), Belgium (85.1 percent), and Israel (91.4 percent) received antibiotics at the initial visit. Those treated and not treated in different countries could represent heterogeneous groups; however, the sample size of adults was not sufficient for analysis. Analysis of the relation of patient factors to outcome was therefore conducted among the 2186 patients who received antibiotics, including 312 who were 15 years old or older.

**Table 1. Percentage of Adult Patients with Acute Otitis Media by Country, Age, and Sex.**

Sex and Country	1-14 Years	15-24 Years	25-44 Years	45 Years and Older	Total Percent (No.)
<b>Sex*</b>					
Male	87.6	5.2	5.3	1.9	52.6 (1627)
Female	81.2	7.0	8.7	3.1	47.4 (1468)
<b>Country</b>					
Australia	81.9	6.4	8.9	2.9	9.8 (315)
Belgium	77.6	9.6	7.8	5.0	6.8 (219)
Great Britain	85.4	5.3	6.7	2.6	15.7 (507)
Israel	92.6	3.0	3.0	1.5	14.7 (474)
Netherlands	80.8	7.7	8.4	3.1	15.8 (510)
New Zealand	91.9	3.5	3.7	0.9	14.1 (455)
Switzerland	71.8	12.0	11.7	4.4	9.8 (316)
United States	85.8	4.7	7.5	2.1	13.3 (428)
<b>Total</b>	<b>84.4</b>	<b>6.1</b>	<b>6.9</b>	<b>2.6</b>	<b>100.0 (3224)</b>

\*Sex data missing on 129 patients.

**Table 2. Percentage of Patients with Ear Symptoms Waiting from 0 to More Than 3 Days before Index Visit for Acute Otitis Media, by Age.**

Age	Number of Patients	Percent Delaying			P Value
		0-1 Days	2-3 Days	> 3 Days	
13 to 30 months	683	72.0	17.1	10.8	
31 to 60 months	824	87.1	7.8	5.1	
61 to 180 months	1097	94.9	3.6	1.6	
≥ 15 years*	496	95.6	3.0	1.4	< 0.001
Total	3100 <sup>†</sup>	87.9	7.6	4.5	

\*No significant difference within adult age subgroups.

<sup>†</sup>Missing data on 124 patients.

Comparisons of disease and patient variables by age group were assessed by Mantel-Haenszel chi-square and odds ratios. For the tympanic membrane findings, a score of 0 was used if neither membrane was affected, and 1 if one or both sides were affected. Crude and country-adjusted univariate odds ratios were calculated to assess the relation of each demographic, history, symptom, and tympanic membrane variable to outcome at 2 months. Logistic regression was used to calculate the importance of the potential contributors to outcome (those with a univariate relation of  $P < 0.10$ ) among adults receiving antibiotics. Forced entry into a preliminary model of dummy variables confirmed that country was not a confounder, and these variables were not retained in the final model. A significance of 0.10 was required for a variable to enter or remain in the model. No variable other than the one included in the final model reached a significance of  $< 0.25$  for model entry. Analyses used the Statistical Analysis System (SAS).<sup>7</sup>

## Results

The distribution of acute otitis media patients by country, age, and sex is given in Table 1. Those aged 15 to 24 years and 25 to 44 years each made up about 40 percent of adults, with those aged 45 years and older less than 20 percent. Although male patients outnumbered female patients among children (54.5 patients versus 45.5 patients), the reverse was true for adults (42.1 percent versus 58.8 percent).

## Presenting Findings

Few adult patients with acute otitis media delayed seeking treatment following the onset of symptoms. Delay in treatment was inversely related to increasing age with almost 96 percent of adult patients receiving treatment from 0 to 1 day following symptom onset (Table 2). These age-related differences are highly significant ( $P < 0.001$ ).

Patient variables at the initial visit were compared between adults and children (Table 3). Findings more common in adult patients were a history of tonsillectomy or adenoidectomy and symptoms of ear pain, decreased hearing, sore throat, and ear discharge. More common in children were history of upper respiratory tract infection during the preceding week, serous otitis media, and ear tubes; symptoms of fever, diarrhea, or vomiting; and tympanic membrane findings of redness, bulging, and ear tubes in place. Findings of similar frequency were history of reduced hearing (22.3 percent in adults and 22.2 percent in children), allergy (16.8 percent and 17.1 percent), prophylactic antibiotics (3.8 percent and 2.5 percent), and tympanic membrane findings of

**Table 3. Rate (Percentage) of Findings in Adults and in Children with Acute Otitis Media.**

Findings	Adults 15 Years or Older	Children 1 to 14 Years	P Value
<b>Most Frequent in Adults</b>			
<b>History</b>			
Tonsillectomy or adenoidectomy	31.1	9.3	< 0.001
<b>Symptoms</b>			
Ear pain	89.3	80.4	< 0.001
Decreased hearing	63.6	25.5	< 0.001
Sore throat	45.8	23.7	< 0.001
Ear discharge	17.4	14.0	0.05
<b>Most Frequent in Children</b>			
<b>History</b>			
Upper respiratory tract infection during preceding week	67.4	74.7	< 0.001
Serous otitis media	17.2	27.6	< 0.001
Ear tubes	3.4	7.8	< 0.001
<b>Symptoms</b>			
Fever	32.7	55.8	< 0.001
Diarrhea or vomiting	5.8	11.9	< 0.001
<b>Tympanic membrane findings</b>			
Redness	82.0	85.9	0.03
Bulging	28.5	36.4	< 0.001
Ear tubes in place	1.1	2.5	0.05

**Table 4. Percentage of Patients with None to More Than Three Episodes of Acute Otitis Media in the Preceding 18 Months, by Age.**

Age	Number of Patients	Percent with Past Episodes				P Value
		None	0-1	2-3	> 3	
13 to 30 months	670	32.1	15.5	27.2	25.2	
31 to 60 months	776	37.0	21.7	26.0	15.3	
61 to 180 months	1011	47.3	19.6	23.2	9.9	
≥ 15 years*	409	76.5	13.2	7.1	3.2	< 0.001
Total	2866†	45.1	18.3	22.6	14.0	

\*No significant difference within adult age subgroups.

†Missing data on 358.

opaque or dull (47.4 percent and 47.6 percent), fluid behind the tympanic membrane (18.4 percent and 18.2 percent), draining pus (10.4 percent and 10.2 percent), and perforation (6.4 percent and 5.1 percent). In 0.6 percent of adults and 1.4 percent of children, the tympanic membrane was not visualized. The number of past episodes of acute otitis media in the preceding 18 months was inversely related to age ( $P < 0.001$ ) (Table 4).

#### **Factors Related to Outcome**

Increasing age (older than 12 months) was associated with decreasing frequency of recovery from acute otitis media at 2 months, especially in those aged more than 25 years (Table 5). Adults receiving oral antibiotics at the initial visit had lower rates of recovery than those not receiving antibiotics (Table 6). Neither antibiotic type, duration, nor the interaction of type and duration were significantly related to outcome. Female sex and a history of acute otitis media, prophylactic antibiotics, decreased hearing, serous otitis media, and ear discharge were associated with poor outcome in adults (Table 7). The presence or absence of symptoms and tympanic membrane findings had no significant relation to outcome in adults.

Results of the logistic regression indicated that only the history of episodes in the past 18 months was independently predictive of outcome among adults (Table 7). Past episodes appeared more predictive of poor outcome for adults (no past

episodes, 17.4 percent poor outcome; 1 episode, 32.5 percent; 2 or 3 episodes, 52 percent; ≥ 4 episodes, 60 percent) than for children (no past episodes, 10.4 percent poor outcome; 1 episode, 14.3 percent; 2 or 3 episodes, 18.4 percent; ≥ 4 episodes, 26.9 percent); both of these differences were significant ( $P < 0.001$ ).

#### **Discussion**

A comparison of outcomes between adults and children with acute otitis media has not been reported previously. In both groups the number of episodes of acute otitis media during the preceding 18 months is predictive of delayed recovery. It is uncertain why adult patients have a significantly lower rate of recovery at 2 months than do children who are older than 12 months. We have reported previously that those aged 0 to 12 months are also at high risk of poor recovery 2 months after the initial visit (19.2 percent of this age group had not recovered).<sup>5</sup>

A number of studies have reported on the lack of benefit in children from antibiotics, as well as a lack of relation between type of antibiotic or duration of administration with recovery.<sup>5,8,9-11</sup> Our current results suggest a lack of antibiotic effectiveness as assessed clinically at a 2-month follow-up in adults as well. The implications of our data are that individual patient characteristics, such as age, past episodes, serous otitis media, or decreased hearing, are better predictors of the outcome at 2 months following the index visit than is therapy. Although antibiotic therapy can be useful for subgroups of adult patients with characteristics that predict poor outcome, we found no evidence that antibiotic administration benefits the group as a whole.

**Table 5. Relation between Age and Recovery at 2 Months from Acute Otitis Media among Those Treated with Antibiotics.**

Age	Number of Patients	Percent of Patients Who Recovered	P Value
1 to 14 years	1874	84.0	
15 to 24 years	124	80.6	
25 to 44 years	133	75.9	
≥ 45 years	55	61.8	< 0.001
Total	2186	82.8	

**Table 6. Frequency of Recovery among Adults (15 Years or Older) from Acute Otitis Media at 2 Months According to Antibiotic Treatment.**

Treatment	Number of Patients	Percent of Patients Who Recovered	P Value
<b>Antibiotic treatment</b>			
Yes	312	75.3	0.002
No	74	91.9	
<b>Antibiotic type</b>			
Ampicillin group	204	71.6	0.104
Trimethoprim-sulfa	37	83.8	
Other	71	81.7	
<b>Antibiotic duration*</b>			
5 days	94	75.5	0.427
6-7 days	94	72.3	
8-10 days	102	78.4	
Other	15	60.0	

\*Duration data missing for 7 patients.

In our study physicians were instructed to care for patients according to their routine practice. We cannot rule out physician use of patient characteristics when ordering treatment, although the major differences in treatment reflected differences in routine practice among countries rather than among groups based on patient characteristics.<sup>5</sup> Prospective studies that test the efficacy of antibiotic therapy should include sufficient numbers to stratify patient groups by individual predictors of poor outcome.

**Table 7. Patient Factors Related to Outcome at 2 Months among Patients 15 Years or Older Treated with Oral Antibiotics for Acute Otitis Media (n = 312).**

Factors	Percent among Those Recovered	Percent among Those Not Recovered	Odds Ratio	95 Percent Confidence Interval
Past episode	18.8	42.9	3.2	1.79-5.84
History of prophylactic antibiotics	3.0	7.8	2.7	0.89-8.38
History of decreased hearing	20.2	32.5	1.9	1.07-3.38
History of serous otitis media	14.7	24.7	1.9	1.01-3.59
History of ear discharge	14.6	22.4	1.7	0.89-3.22
Female	53.6	64.0	1.5	0.90-2.63
<b>Results of logistic regression analysis incorporating above terms in a model to predict delayed recovery at the 2-month follow-up visit</b>				
<b>Only variable in final model</b>				
Past episode			3.6	2.03-6.35

The 15.6 percent of patients aged 15 years or older in our sample is similar to the 16.6 percent reported from the National Ambulatory Medical Care Survey of 1989.<sup>1</sup> The greater rate of acute otitis media in boys younger than 15 years and in women older than 30 years is also congruent with NAMCS data. The issue of age-related delays in seeking treatment for acute otitis media has not been reported previously. Because children depend on others to get medical care, and because acute respiratory tract infection can reduce parental suspicion of acute otitis media in children early in the illness, this finding is not surprising.

Although acute otitis media is not rare in adults, it occurs more frequently in children, and a decreased frequency in adults of past episodes during the preceding 18 months compared with children is expected. The frequency of historical events related to acute otitis media and symptoms reported for children and adults could differ because of age-related differences in perception and ability to report. Other investigators have reported a similarity in the spectrum of pathogens isolated from middle ear fluid of adults and children. Contrary to early reports, *Haemophilus influenzae* remains a common middle ear pathogen during adulthood.<sup>12-14</sup>

Our data, nevertheless, must be viewed with caution. The data were derived from a sample of patients seeking care from primary care physicians, and generalizations to all patients with acute otitis media might not be warranted. That participating physicians generally were certain of their diagnosis of acute otitis media<sup>5</sup> does not guarantee that all patients actually had this disorder. A reference standard for the diagnosis of acute otitis media does not exist. A panel of experts at a research conference defined acute otitis media as "a clinically identifiable infection of the middle ear with sudden onset and short duration,"<sup>15</sup> but clinicians vary in the relative diagnostic value they place on particular signs and symptoms. A survey of 165 pediatricians revealed 147 different sets of diagnostic criteria; 18 different sets of criteria were used in 26 investigations of acute otitis media,

and in 17 studies none were specified.<sup>16</sup> Even the presence of pathogenic organisms cultured from middle ear fluid obtained by myringotomy is an unreliable indicator because almost 30 percent of specimens obtained from patients with the clinical diagnosis of acute otitis media are sterile.<sup>17</sup> The physicians participating in our study were blinded to the hypotheses, and the data from the study are internally consistent and have high face validity. Finally, outcome reported by patients might not reflect their disease state, although self-assessments of health have been similar to objective findings by physicians.<sup>18</sup>

Our findings indicate that the tympanic membrane findings of acute otitis media are similar in adults and children, in keeping with the similar bacterial spectrum that affects both groups. Their histories of events and symptoms related to acute otitis media are different, possibly because of age-related differences in perception and ability to report. The outcomes at 2 months following the index visits, however, appear worse for adults. Individual patient characteristics are better predictors of outcome than is therapy.

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Jakob Aebersold, Erwin Alder, Rudolf Beerli, Peter Bbend, Lukas Bobny, Ueli Bollag, Daniel Bracher, Ernst Buesser, Rudolf Christen, Claude Derahmand, Martin Escher, Urs Fabrni, Hugo Fluockiger, Markus Gasner, Hansueli Gerber, Béla Iranyi, Kurt Kaspar, Rudolf Koenig, Hausroff Luedrach, Hausjoerg Lang, Peter Ludi, Peter Marko, Hans Maurer, Roland Moeri, Alfred Muggli, Jean-Pierre Mueller, Thomas Mueller, Hans Rufener, Peter Schleuss, Andreas Schmid, Emanuel Singeisen, Andreas Steinmann, Rolf Weber, Juerg Weber, Ulrich Windlinger.

## United States

Stephen Albrecht, John Anderson, Arlis Adolf, Mark Backman, Leonard Banco, David Beaufait, Robert Black, Claire Cifaloglio, Gerald Cahen, Harold R. Chure, C. Leslie Conway, Kevin Costin, Barbara Fisher Coughlin, John Crocker, Val Dean, Donald Evans, Lyle J. Fagnan, Ronald Gagne, William Garrick, Martin Alex Geertsma, John Hickner, Isaac Kleinman, Marie Marrier, James Mellema, Stephen Messimer, Michael Mikkelson, Laura Müller, Peter Molberg, Al J. Mooney, Julie Moore, Lillian Nordin, Mark Parker, Craig Perrinjaquet, J. Michael Pontious, Ralph Rosenberg, Paul Schmitt, Aristotle Sophocles, Terry L. Sullenger, Thomas Syzek, Nicholas Tsoukas, Christopher Verkler, Elizabeth Wise.

\*Deceased