

# Tympanocentesis for the Management of Acute Otitis Media in Children

## A Survey of Canadian Pediatricians and Family Physicians

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**Objective:** To evaluate the current knowledge, practice patterns, skills, and attitudes of Canadian pediatricians and family physicians regarding the role of diagnostic tympanocentesis in the management of acute otitis media in children.

**Design:** Survey.

**Setting and Participants:** A self-completion questionnaire was mailed to a random selection of 302 pediatricians and 196 family physicians practicing in hospitals and community settings across Canada in 2002. A second questionnaire was sent to those who did not respond to the first mailing.

**Main Outcome Measures:** The demographic features of respondents and their attitudes, beliefs, and behaviors regarding tympanocentesis for acute otitis media were collected via a 2-page questionnaire consisting of open-ended and multiple-choice questions.

**Results:** The overall response rate was 56%. Only 4% of pediatricians and family physicians surveyed received training in tympanocentesis, and none currently perform the procedure. Higher proportions of those who learned to perform tympanocentesis graduated from medical school before 1970 and received postgraduate training outside of Canada compared with those who did not learn to perform tympanocentesis. Pediatricians were more likely than family physicians to make referrals to otolaryngologists for tympanocentesis for acute otitis media (62% vs 48%;  $P = .04$ ).

**Conclusions:** Few Canadian pediatricians and family physicians in our survey learned to perform tympanocentesis, and none currently perform the procedure. It is not clear whether current practices for tympanocentesis in children with acute otitis media are adequate.

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**A**CUTE OTITIS MEDIA (AOM) is the most common illness for which antibiotic agents are prescribed to children in developed countries.<sup>1,2</sup> Although there is a recent trend for the diagnosis of AOM to be made less often in the United States, the proportion of diagnosed cases that are treated with antibiotics has remained stable at approximately 80% of all diagnosed cases, and in 1998 there were an estimated 13 million office visits for otitis media.<sup>1,3</sup> The management of AOM has been complicated in recent years by the increasing antibiotic resistance of the predominant bacterial pathogens.<sup>4</sup>

The treatment of AOM may be problematic if there is persistence of symptoms in the first 3 days of treatment or early recurrence 10 to 28 days after the start of initial treatment.<sup>5</sup> Such complications after treatment with standard antibiotics in usual doses are more likely in cases of

AOM caused by antibiotic-resistant pathogens.<sup>6-8</sup> In such cases, a change in antibiotic agent is usually necessary. High-dose amoxicillin therapy may fail if the pathogen is a  $\beta$ -lactamase-producing pathogen such as *Haemophilus influenzae*,<sup>9</sup> and the use of  $\beta$ -lactamase-stable drugs such as cefuroxime axetil may fail if the pathogen is penicillin-nonsusceptible *Streptococcus pneumoniae*.<sup>8,10</sup> Administration of high-dose amoxicillin with clavulanic acid is not always an appropriate alternative because of its cost and adverse effects,<sup>11</sup> and newer drugs, such as gatifloxacin, are not accepted as appropriate drugs for routine use in AOM in children but may have a role in the treatment of recurrent or nonresponsive otitis media.<sup>12-14</sup>

Direct sampling of middle ear fluid, using tympanocentesis, for culture and antibiotic susceptibility testing is the most direct way to determine the cause of any case of AOM.<sup>5,15,16</sup> The Drug-resistant

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**Table 1. Demographic Features of Participants**

Feature	Pediatricians (n = 154)	Family Physicians (n = 89)	Total (N = 243)	P Value*
Age, mean, y	48	44	46	.29
Year of medical school graduation, %				
1990 or later	26	35	27	.005*
1970-1989	45	53	49	
1969 or earlier	29	12	24	
Postgraduate training in Canada only, %	84	89	85	.29
Population of current community, %				
<50 000	15	37	21	.001*
50 000 to 250 000	25	15	23	
>250 000	60	48	56	

\*Comparing pediatricians and family physicians and between subcategories (year of graduation and community population).

*Streptococcus pneumoniae* Therapeutic Working Group,<sup>5</sup> convened by the Centers for Disease Control and Prevention, recommends tympanocentesis to assist in the management of complicated cases of AOM, as does the American Academy of Pediatrics Committee on Infectious Diseases.<sup>17,18</sup> Programs to increase the number of resident and practicing pediatricians who can perform tympanocentesis have been conducted.<sup>19-21</sup> However, the overall level of training and understanding in the medical community is unknown regarding the indications for and performance of tympanocentesis.

The objective of this study is to evaluate the current knowledge, practice patterns, skills, and attitudes of Canadian physicians regarding the role of diagnostic tympanocentesis in the management of AOM in children.

## METHODS

A 2-page self-completion questionnaire was developed for pediatricians and family physicians to determine their attitudes, beliefs, and behaviors regarding diagnostic tympanocentesis for AOM in children. The questionnaire included questions about age, current practice setting, and medical training. Other questions were about attitudes and beliefs regarding possible indications for tympanocentesis in the management of AOM in children, including typical AOM, AOM with lack of response 48 to 72 hours after initiation of antibiotic drug treatment or recurrence 10 to 28 days after the start of antibiotic treatment, AOM in the immunocompromised host, and AOM in the neonate.<sup>15,17</sup> There were also questions about whether training to perform tympanocentesis was ever received, how many procedures had been done, and whether the procedure is currently performed. Physicians were also asked whether they make referrals to otolaryngologists for tympanocentesis. The questionnaire was pilot tested on several physicians to ensure face validity and content validity.

Lists of potential participants were obtained from the Royal College of Physicians and Surgeons of Canada (pediatricians) and the Canadian College of Family Physicians (family physicians). The lists were randomly generated from the databases of physicians stated to be in active clinical practice and whose mailing address was in Canada.

The questionnaire was mailed with a cover letter explaining the study, and a postage-paid return envelope was provided. French and English versions of the questionnaire were sent to physicians in the province of Quebec, whereas only an English version was sent to physicians in all other parts of

Canada. A second mailing was sent to all nonrespondents 4 to 8 weeks after the first mailing.

Data from returned questionnaires were entered into a statistical software program (SPSS Macintosh version 11.0.2; SPSS Inc, Chicago, Ill). Continuous variables are summarized as means or medians with ranges and standard deviations. Categorical variables are summarized as proportions. Comparisons among groups were performed using the Pearson  $\chi^2$  statistic for categorical variables and 1-way analysis of variance for continuous variables.

The study was approved by the Alberta Children's Hospital Child Health Scientific Review Committee and the University of Calgary Conjoint Health Research Ethics Board.

## RESULTS

Between January 1 and June 30, 2002, 498 questionnaires were mailed to 302 pediatricians and 196 family physicians. Sixty-three questionnaires were returned because the address was incorrect (n=33) or because recipients considered themselves ineligible (n=30 subspecialists or retired physicians). There were 243 completed questionnaires returned from the total of 435 that were assumed to be received, for an overall response rate of 56%. There was a higher response by pediatricians (61%) compared with family physicians (48%) ( $P=.007$ ).

Demographic features of the participants are summarized in **Table 1**. There were participants from all 10 Canadian provinces and 2 of the 3 territories (excluding Nunavut). Overall, 193 (79%) of 243 participants attended medical school in Canada, and 208 (86%) completed residency training in Canada. A total of 20% of all participants practiced medicine outside of Canada at some point in their careers.

Only 9 (4%) of 240 participants (3 participants did not answer this question) had been trained to perform tympanocentesis: 7 pediatricians and 2 family physicians. Those who had been trained to perform tympanocentesis were older (graduated from medical school before 1970: 67% vs 21%;  $P<.01$  by  $\chi^2$  analysis) and were more likely to have had postgraduate training outside of Canada (44% vs 13%;  $P<.01$  by  $\chi^2$  analysis) compared with those without such training. Of 7 physicians who reported the number of tympanocentesis procedures they had performed, 5 had performed 20 or fewer and 2 had

**Table 2. Beliefs About Indications for Diagnostic Tympanocentesis for the Management of AOM**

Indication	Family Physicians,		P Value*
	Pediatricians, %	Physicians, %	
Never indicated	6	6	.62
AOM	11	8	.57
Unresponsive AOM†	75	71	.35
AOM in immunocompromised hosts	75	57	.02
AOM in neonates	49	34	.02

Abbreviation: AOM, acute otitis media.

\* $\chi^2$  Test.

†Unresponsive 48 to 72 hours after initiation of antibiotic drug therapy or recurrence 10 to 28 days after the start of antibiotic therapy.

performed more than 20. None of these 9 physicians currently perform tympanocentesis.

**Table 2** summarizes the beliefs regarding indications for tympanocentesis in the management of AOM. More pediatricians than family physicians believe that tympanocentesis is indicated in immunocompromised children and neonates. More pediatricians (62%) than family physicians (48%) reported that they make referrals to otolaryngologists to request diagnostic tympanocentesis for children with AOM ( $P = .04$ ).

#### COMMENT

Only 4% of Canadian pediatricians and family physicians who completed the survey have been trained to perform diagnostic tympanocentesis for the management of AOM in children, and none of them currently perform the procedure. Two thirds of this small number of physicians graduated from medical school before 1970, probably reflecting that training to perform this procedure was more common several decades ago. Most participants identified several indications for tympanocentesis. Tympanocentesis was once a common procedure for AOM, but then it became a rarely performed procedure.<sup>16</sup> It provides a means of identifying the pathogen causing AOM and relieves otalgia, but the benefit in clinical cure of AOM is modest.<sup>22</sup> In recent years, tympanocentesis has again become recognized as an important technique in the management of unresponsive AOM, particularly because of increasing antibiotic resistance.<sup>16,17,23</sup> However, most physicians, except otolaryngologists, have not been routinely trained to perform this procedure. In 1998, a news article<sup>24</sup> suggested that only approximately 100 pediatricians in the United States performed tympanocentesis. A recent survey<sup>25</sup> of pediatric residency training program directors in Canada and the United States found that training to perform tympanocentesis was offered by few programs. A recent educational program aimed to teach tympanocentesis to pediatric residents and practicing pediatricians in locations throughout the United States, Greece, Italy, and South Africa. More than 2500 physicians participated.<sup>19-21</sup> Before the course, 97% of American physicians and 90% to 96% of physicians from the other

#### What This Study Adds

As antibiotic resistance increases, AOM becomes more difficult to treat. Tympanocentesis allows sampling of middle ear fluid for pathogen identification and antibiotic sensitivity. Although tympanocentesis has been suggested as a management option for AOM, there are few data regarding who performs the procedure and what pediatricians and family physicians know about the procedure. This study reports the beliefs and practice patterns regarding tympanocentesis in the management of AOM. The procedure is currently not performed by any of the pediatricians and family physicians who participated in the survey. If tympanocentesis is to be performed for AOM, many more physicians may need to learn the procedure.

countries reported that they had never performed tympanocentesis in their offices.<sup>21</sup> Although 22% to 60% of those who completed the course stated that they were likely or highly likely to begin to perform tympanocentesis in their practices, the long-term effect of such courses is unclear. Concern has been expressed about how to maintain the skill with limited practice, about complications of the procedure, and about the time needed to perform the procedure.<sup>26</sup> Other issues to consider in performing tympanocentesis in medical offices include consideration about providing local analgesia, sedation, and physical restraint, as well as equipment needs.<sup>16,23,26</sup> Regardless of concerns about practical considerations, 94% of participants in our survey stated that tympanocentesis was useful in at least some situations related to AOM.

This study has some limitations. The overall response rate was 56%. Thus, the generalizability of our findings may be limited. However, we did receive responses from all across Canada and from physicians of a wide age range. Also, we did not ask pediatricians and family physicians whether they would like to learn to perform tympanocentesis. However, we anticipated that such a question would have been subject to participation bias and so most participants would likely have said "yes," regardless of any concerns they might have about the procedure.

In conclusion, tympanocentesis is an important procedure to assist in the management of AOM, particularly because of antibiotic resistance.<sup>17</sup> Some researchers<sup>15,17-20</sup> have suggested that more primary care physicians should learn to perform the procedure and should be prepared to execute it when indicated. However, it is not clear how practical it is for primary care physicians to learn and perform tympanocentesis.<sup>16,23,26</sup> Further effort is needed to increase the availability of timely and appropriately conducted diagnostic tympanocentesis to assist with the management of AOM in children, regardless of who performs the procedure.

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