Acute Care and Antibiotic Seeking for Upper Respiratory Tract Infections for Children in Day Care

Parental Knowledge and Day Care Center Policies

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Background: Children who attend day care are high consumers of antibiotics. Studies suggest that physicians prescribe unnecessary antibiotics for upper respiratory tract infections (URIs) for children who attend day care on the basis of perceived pressure from parents and/or day care centers.

Objective: To determine both parental and day care-center level predictors of acute care and antibiotic seeking for children who attend day care.

Methods: We conducted a day care center–based cross-sectional survey of parents and day care center staff. Two hundred eleven parents of children attending 36 day care centers in Massachusetts completed a survey. Day care center staff completed a separate survey addressing their day care center's policies for ill children.

Results: Few parents reported day care staff pressure to seek care from a physician (3.9%) or antibiotics (1.9%). In multivariate models, higher parental knowledge about URIs was related to decreased acute care seeking for 3 upper respiratory symptoms (clear rhinorrhea, green rhinorrhea, and cough) in the absence of fever (odds ratios and 95% confidence intervals: 0.45 [0.31-0.65], 0.66 [0.52-0.85], and 0.57 [0.45-0.72], respectively). Parent-reported acute care seeking was not related to a day care center's polices for exclusion or physician clearance for these illnesses. Similar results were also found for the parental belief that antibiotics expedite return to day care for these symptoms.

Conclusion: Although it has been suggested that inappropriate day care center policies for exclusion motivate parental acute care and antibiotic seeking, this study suggests that parental knowledge is a more important predictor of these reported behaviors than are day care center policies.

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IN THE past decade, increasing rates of bacterial resistance to antibiotics have become a major national health concern.1-3 The rapid increase in drug-resistant Streptococcus pneumoniae is of particular concern in pediatrics, where pneumococci are the leading cause of bacterial meningitis, pneumonia, bacteremia, and otitis media.6 The causes of antimicrobial resistance are multifactorial; however, antibiotic overuse is likely a major contributor.7-10

Recent studies of family physician and pediatrician practice patterns indicate that antibiotics are frequently prescribed unnecessarily for children with colds and other viral upper respiratory tract infections (URIs).31,32 Physicians relate numerous sources of pressure to prescribe unnecessary antibiotics, including perceived or stated parental expectation for antibiotics19-21 and a parental desire to expedite return to work and day care.19,21

The possibility that day care attendance contributes to parental antibiotic-seeking behavior is important to investigate for several reasons. First, the population of children in out-of-home child care settings has increased dramatically during the past 3 decades.22 Approximately 30% of children younger than 5 years are cared for by a nonrelative in organized child care settings at least part of the time.23 Day care attendance has been found to be a risk factor for many infections, including nonspecific URI.24-27 Furthermore, studies have shown that children who attend day care receive more antibiotics than children cared for at home.7,30-33 Day care attendance has also been found to be a specific risk factor for carriage28 and spread29 of drug-resistant S pneumoniae.

Although this literature documents increased use of antibiotics for children in day care, no studies have carefully assessed the relative contributions made by parental beliefs vs day care center beliefs and actions.
Specifically, little is known about how day care center policies influence parental acute care and antibiotic-seeking behaviors. The objectives of this study were to (1) describe URI and antibiotic knowledge, and beliefs about day care polices regarding URIs, and (2) identify both parent and day care center predictors that might contribute to parental acute care and antibiotic seeking for children in day care.

METHODS

STUDY DESIGN

We conducted a cross-sectional study based in randomly selected day care centers in Massachusetts. Day care center directors and lead teachers completed a day care staff survey. Parents in the participating day care centers completed a separate parent survey.

STUDY SAMPLE

Day care centers were randomly selected for participation from a list of all licensed centers in the state of Massachusetts provided by the Department of Public Health. Center selection was limited to centers with a listed capacity of between 5 and 75 children. Median household income level of the day care center’s community was taken from 1990 census data. By means of a random number generator, 40 centers each were chosen from communities with median household income above and below the statewide median household income level in 1990. In January 2001, these 80 centers were sent a recruitment letter describing the study, a day care center demographics form, and a consent form, with a follow-up telephone call in 7 to 10 days. Eligible centers had (1) a director who was reached by telephone and able to consent on behalf of the center, (2) a capacity of 5 to 75 children, and (3) children enrolled who were younger than 48 months. The centers that agreed to participate returned a consent form signed by the director. Centers that were not eligible or refused to participate were asked to complete and return the day care center demographics form in a self-addressed postage-paid envelope.

This study was reviewed and approved by the institutional review board of The Children’s Hospital, Boston.

DATA COLLECTION AND SOURCES

Centers that agreed to participate were mailed day care staff surveys for the director and lead teachers. Surveys were returned directly to project staff in a self-addressed postage-paid envelope. A second set of surveys with a reminder was mailed 6 weeks later for the director and/or any lead teacher who had not responded.

One parent survey was distributed by day care center staff to the parent of each child between the ages of 6 and 48 months, as reported by the director. Parents returned the survey directly to project staff in a self-addressed postage-paid envelope. Six weeks later, the day care director distributed to all parents a reminder letter with a small thank-you token for the child to all parents.

DEPENDENT VARIABLES

Both outcome variables were derived from the parent survey. The primary outcome was reported acute care seeking for the following upper respiratory symptoms in the absence of fever and with normal activity level: clear runny nose, green runny nose, and cough. Those whose response was that they always–almost always or sometimes sought acute care were grouped as acute caretakers, and those who responded never–almost never were grouped as nonseekers. The secondary outcome was the belief that antibiotics expedite return to day care for the same 3 symptoms. Those who responded that obtaining antibiotics would always–almost always or usually expedite return to day care were compared with those who responded never–almost never.

INDEPENDENT VARIABLES

Day Care Variables

Day care center exclusion and physician clearance policies for clear runny nose, green runny nose, and cough without difficulty breathing (all without fever) were taken from the day care center director’s survey responses. Current American Academy of Pediatrics/American Public Health Association Guidelines for Out-of-Home Child Care Programs do not recommend exclusion or physician clearance for any of these upper respiratory symptoms. Thus, day care centers who reported these practices always–almost always or sometimes were classified as inappropriately excluding and requiring clearance for these symptons in the absence of other signs of illness.

Day care center enforcement of rules for exclusion of ill children was derived from the day care center survey for that center. Centers reported applying their rules (1) strictly in all situations, (2) as a general guide, or (3) not at all. These were collapsed into 2 groups: strict enforcement (response 1) or non–strict enforcement (response 2 or 3).

For all day care variables, if the director did not return a survey, data from the lead teachers’ survey were used. If there were discrepancies among lead teachers for any of these covariates (2 occasions), data for that covariate were designated missing.

Parent Variables

Knowledge. The parent survey contained 11 questions addressing parental knowledge and beliefs regarding cause of URIs and antibiotic indications for specific URIs. Responses for antibiotic indications were judged to be correct or incorrect on the basis of the current American Academy of Pediatrics and Centers for Disease Control and Prevention’s principles of judicious use of antimicrobial agents for pediatric URIs.

Cronbach’s alpha was calculated to determine the internal consistency of these 11 items. Six of the 11 survey items had the highest internal consistency (Cronbach’s α = 0.68). These 6 items were used to calculate a knowledge score, with each correct response contributing 1 point to the score.

Attitudes and Beliefs About Day Care Center. Items addressing parents’ understanding of their day care center’s policies included knowing rules for (1) exclusion when their child is ill and (2) requirements for readmission after an illness. Parents were also asked to report whether they expected their day care center to exclude, require physician clearance, and/or require an antibiotic before return to day care for 3 specific upper respiratory symptoms without fever. The parent survey also contained 2 items addressing perceived pressure from day care staff to (1) see a physician and (2) obtain antibiotics.

Demographics. Respondents’ highest level of education attained was dichotomized into less than completion of college vs completion of college or greater. Five household annual income levels were dichotomized into 2 groups, which were less than $60,000 and greater than or equal to $60,000.

STATISTICAL ANALYSES

All statistical analyses were performed with SAS version 8.1 software (SAS Institute Inc, Cary, NC). For bivariate analyses, SEs
and significance tests are presented for normally distributed continuous data after adjusting for clustering within day care centers by means of linear regression models. For tests of proportions, generalized estimating equations were used to allow adjustment for clustering by day care center.38,39

Predictors that were significant (P < .10) in bivariate analyses were evaluated for inclusion in multiple logistic regression models. A forward selection procedure was used given the expected high degree of collinearity among covariates. Once models were finalized, SEs and tests of significance were adjusted for clustering by day care center by means of generalized estimating equations.36,39

Of the original 80 centers selected, 43 agreed to participate, 17 were not eligible, and 20 refused. Of the 37 centers that were ineligible or refused, 29 (78%) returned day care center demographics forms. There were no significant differences among centers that did and did not participate with respect to median household income level of their communities (23 [54%] of 43 centers vs 17 [46%] of 37 from communities below median, respectively), number of children enrolled in the center (median, 21-40 children in both groups), or the director’s years of experience in child care (median, >10 years in both groups). Seven of the centers that initially agreed to participate dropped out of the study before distributing the parent survey. Six centers dropped out because of competing needs for documentation from parents, and 1 because of the director’s medical leave of absence. These 7 centers were not different from the 36 that distributed the parent surveys with respect to median household income level of their communities (4 [57%] of 7 centers vs 19 [53%] of 36 from communities below median, respectively), number of children enrolled in the center (median, 21-40 children in both groups), or the director’s years of experience in child care (median, >10 years in both groups).

There were a total of 398 parents with 1 or more children between the ages of 6 and 48 months in the 36 day care centers that distributed parent surveys. There were 129 directors and lead teachers in these centers. Eighty-five directors and lead teachers (65.9%) and 211 parents (53.0%) returned completed surveys. Almost all surveys were completed by the child’s mother (95.6%). Most parents were well educated, with 59.7% having received at least a college degree. Of the parents, 57.8% came from households with total household income greater than $60000.

Overall, 22.2% and 19.3% of parents incorrectly believed that most colds and flu illnesses are caused by bacteria and get better faster with antibiotics, respectively (Table 1). Common misconceptions included the belief that antibiotics are needed for green rhinorrhea (72.8% incorrect) and bronchitis (88.2% incorrect).

The overall frequency of day care director–reported exclusion and physician clearance practices are presented in Figure 1. Day care centers reported at least sometimes excluding children for green rhinorrhea (75%) and cough without difficulty breathing (88%), and requiring a physician visit for these 2 symptoms (65% and 73%, respectively). Figure 2 shows the percentage of parents who expected their day care center to exclude, require a physician visit, or require an antibiotic before return if their child had a specific upper respiratory symptom. Very few parents expected that their child would be excluded from their day care center for a clear runny nose or a cough without difficulty breathing. Many believed, however, that their child would be excluded for a green runny nose (36.5%) and would require an antibiotic before being readmitted for this symptom (13.5%). A day care center’s actual exclusion policy for a given URI, as reported by the day care center director, did not influence the proportion of parents who believed their child would be excluded for that URI. Very few parents felt pressured by day care staff to see a physician (3.9%) or obtain an antibiotic (1.9%) when their child is ill.

In multivariate logistic regression models, parent knowledge score was a significant independent predictor of acute care seeking for all 3 symptoms (Table 2, top). An increase of 1 knowledge score point was associated with a significant decrease in the likelihood of parental acute care seeking for afebrile clear rhinorrhea (odds ratio [OR], 0.45; 95% confidence interval [CI], 0.31-0.65), green rhinorrhea (OR, 0.66; 95% CI, 0.52-0.85), and cough (OR, 0.57; 95% CI, 0.45-0.72).

Multivariate logistic regression models assessing adjusted predictors of the parental belief that obtaining an antibiotic expedites return to day care for 3 symptoms are presented in Table 2, bottom. Parental knowledge score was significantly related to this misconception for all 3 symptoms, with adjusted ORs as follows: clear rhino-
norrhea (OR, 0.46; 95% CI, 0.34-0.61), green rhinorrhea (OR, 0.65; 95% CI, 0.52-0.83), and cough (OR, 0.49; 95% CI, 0.38-0.64).

In both multivariate models, neither parent-perceived pressure to see a physician nor to obtain antibiotics was significantly related to acute care seeking after adjusting for knowledge score and/or demographic covariates. In addition, day care center exclusion and physician clearance policies were not related to acute care seeking, or to the misconception that antibiotics expedite return to day care, for upper respiratory symptoms. A day care center’s enforcement of rules for the exclusion of ill children (strictly vs as a general guide) was also not related to these parent-reported practices and beliefs.

The mechanisms driving high antibiotic prescribing rates among children who attend day care are complex. In this study, we focused on the relationship between day care center policies and parental acute care and antibiotic-seeking behaviors. This is the first study, to our knowledge, to examine how day care center policies influence parent-reported acute care and antibiotic-seeking behaviors. We found that day care policies were not related to parental report of these behaviors. Instead, parental acute care and

**COMMENT**
antibiotic-seeking behaviors were related to common misconceptions about URIs and antibiotic indications.

While 8 key knowledge items were answered correctly by the majority of parents (>50%), several widespread misconceptions were found. Particularly prevalent were misconceptions about the need for antibiotics for green rhinorrhea and cough. This finding is consistent with recent studies of more general parent populations, which found that large proportions of parents believe antibiotics are useful for colds and cough.40-42 Knowledge about URIs and antibiotics was the single most consistent predictor of both reported acute care seeking and the misconception that antibiotics would expedite return to day care for 3 specific symptoms.

In this study, we found that a large proportion of parents believed that antibiotics would expedite return to day care for 3 upper respiratory symptoms without fever. In focus group discussions with parents, Barden et al21 found that parents believed antibiotics would help their child return to day care sooner. In a separate study, parents of children in day care were more likely to expect that an antibiotic would be prescribed for a cough.53 It is not clear whether these findings relate to day care–level policies and pressure, or parents’ misunderstanding of antibiotic indications and the natural course of viral URIs. In our study, less than 2.0% of parents believed they were explicitly pressured by their day care center to obtain antibiotics for their child. Furthermore, in multivariate models, a day care center’s exclusion and physician clearance practices, strictness with which rules for exclusion of ill children are applied, and parent-reported pressure to obtain antibiotics were not related to the parental belief that antibiotics expedite return to day care. Only parent demographic covariates and knowledge about URIs and antibiotics were related to the belief that antibiotics expedite return to day care for 3 symptoms.

Day care center attendance may also contribute to acute care visits and antibiotic prescribing through parental misunderstanding of center policies that are, in fact, appropriate. Thus, parents who believe that day care will exclude their child, or not allow readmittance without physician clearance, may be more likely to seek care even if they do not believe it is necessary. The potential for such misunderstanding is supported by our finding that large proportions of parents expected their child to be excluded, referred to a physician, or required to have an antibiotic to return to day care for 3 upper respiratory symptoms. Furthermore, among parents who expected their child to be excluded for these symptoms, approximately equal numbers came from day care centers that did and did not exclude for them.

Another mechanism through which day care attendance may contribute to increased antibiotic exposure is increased incidence of infectious diseases for which antibiotics are indicated.28,44-46 Children who attend day care also experience more nonspecific URIs than their peers who are cared for at home.24,25,27-29 Thus, children who attend day care may receive more antibiotics simply because of an increased incidence of URIs in conjunction with known rates of physician overprescribing for these infections.11,14-16,19,21 Day care attendance may further influence overprescribing, above these baseline rates. In focus group discussions, physicians have reported that day care attendance contributes to antibiotic overprescribing through encouraging of antibiotic use by day care centers, and parental desire for a “quick fix.”21 Our study suggests, however, that pressure from day care staff may be a less important factor contributing to parental demand than previously thought. Parental demand may be related to previous experiences with the health care system, and physician overprescribing may reinforce parent misconceptions about antibiotic indications for URIs. We found that a much greater proportion of parents believe that antibiotics are useful for green rhinorrhea vs clear (72.8% vs 11.6%, respectively), and for bronchitis vs loose cough (88.2% vs 49.8%, respectively). These beliefs mirror patterns of overprescribing by physicians.19,23 In one study, parental expectation for an antibiotic was associated with an increased likelihood of a diagnosis of bronchitis.93 A recent survey addressing physician prescribing for acute purulent rhinitis found that 61% would immediately prescribe antibiotics for an infant with scant green nasal discharge present for 1 day.94 That percentage increased to 95% if the mother worked more than 20 hours per week and the infant attended day care.

There are several limitations to this study that should be addressed. First, day care directors who agreed to participate on behalf of the day care center may differ from those who refused. On the basis of the demographic data we collected, however, there were no significant differences between directors or centers that agreed and those that did not agree to participate. In addition, 7 directors dropped out of the study after receiving study forms. Again, there were no differences between directors or centers that agreed to complete the study and those that were lost to follow-up. If present, these 2 biases would have caused underestimation of the relationship between inappropriate day care policies and parent acute care and antibiotic seeking. In addition, directors may have underreported inappropriate exclusion and physician clearance practices, such that they would be more in line with current American Academy of Pediatrics/American Public Health Association guidelines. Although directors may report appropriate exclusion policies, in practice, these policies are unlikely to be exercised with great rigidity. Directors, in consultation with parents, may decide a child who is mildly ill would be more comfortable cared for at home. In addition, we did not ask parents about chronic illnesses such as asthma that may be important mediating covariates guiding decisions to seek care. Finally, this study population was very well educated and came from a high income strata, limiting the generalizability of these results. In addition, the generalizability is limited to acute care and antibiotic seeking specifically for URIs and not other infections.

In summary, this study suggests that parent level predictors such as education level attained, median household income, and, most consistently, knowledge regarding URIs and antibiotic indications are related to acute care and antibiotic seeking for 3 upper respiratory symptoms. Day care–level covariates, including policies for exclusion and physician clearance for these symptoms, and how strictly policies for ill children are applied, were not related to parent-reported acute care and antibiotic seeking. Although parental demand for antibiotics for chil-
While there is a perception that parents seek treatment and antibiotics for their children’s URIs so that they can return to day care, little is known about actual day care policies and parental beliefs about these policies. A survey of day care centers showed that respiratory symptoms can lead to exclusion from care. However, parental misconceptions about the cause of URIs and the need for antibiotics were much more related to acute care and antibiotic seeking than were day care center policies.

REFERENCES


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