An Assessment of Pediatric After-hours Telephone Care

A 1-Year Experience

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Background: Pediatric after-hours telephone triage by call center nurses is an important part of pediatric health care provision.

Objectives: To use a computerized database including the after-hours telephone calls for 90% of the pediatricians in Colorado to examine: (1) the epidemiology of after-hours calls during a 1-year period including the volume, seasonality, and timing of after-hours calls, the age of the patients, the presenting complaint, the triage dispositions, and mean rates of calls per pediatrician; (2) the process of care measures at the call center, including waiting times for nurse telephone call-backs, the length of triage calls, and how these factors varied by season; and (3) the frequency and content of calls requesting information but not requiring triage.

Design: Descriptive study.

Setting and Participants: All telephone calls from the After-Hours Telephone Care Program, Denver, Colo, received between June 21, 1999, and June 20, 2000, were retrieved from a computerized database and categorized by age, season, triage disposition, and algorithm.

Main Outcome Measures: The volume, seasonality, timing, age distribution, algorithms used, and triage dispositions of after-hours calls. The reasons for calls requesting information.

Results: During the 1-year period 141922 calls were returned by the call center. Of the total calls, 88% were for a clinical illness; 5%, for information or advice; 5%, for calls in which the parent could not be recontacted; 1%, for duplicate calls, and 1%, for miscellaneous reasons. Listed in rank order for the year, the 10 most common algorithms used for illness calls were vomiting, colds, cough, earache, sore throat, fever, diarrhea, croup, head trauma, and eye infection. Of illness calls, 21% of callers were told to go in for urgent evaluation, 30% were told to contact their primary care physician either the next day or at a later time, 45% were given home care instructions, and 4% were referred to call the on-call physician.

Conclusions: This study describes the epidemiology of after-hours telephone calls regarding children in 90% of the private practices in Colorado. Data provided are useful in guiding the planning of health care provision, providing staffing of after-hours facilities, and planning for the educational training of telephone care staff. They also highlight opportunities for patient education that might decrease unnecessary after-hours calls.


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The objectives of this study were to use a computerized database including the after-hours calls for 90% of pediatricians in Colorado to examine: (1) the epidemiology of after-hours calls during a 1-year period including the volume, seasonality, and timing of after-hours calls, the age of patients, the presenting complaints, the triage dispositions, and mean rates of calls per pediatrician; (2) the process of care measures at the call center, including waiting times for nurse telephone call-backs, the length of triage calls, and how these factors varied by season; and (3) the frequency and content of calls requesting information but not requiring triage. The first 2 objectives were undertaken to obtain data instrumental in planning for the provision of after-hours care and for directing the training of after-hours telephone care providers. The third objective obtained data useful for exploring strategies to reduce unnecessary after-hours calls.

METHODS

DESCRIPTION OF THE AFTER-HOURS TELEPHONE CARE PROGRAM

The After-Hours Telephone Care Program (AHTCP), Denver, Colo, provides after-hours telephone triage to 91% of the Denver pediatricians and 90% of all Colorado pediatricians. The AHTCP is staffed by trained registered nurses who use the Pediatric Triage and Advice System’s computer-based telephone triage algorithms. At the time of the study, the AHTCP employed 11 full-time and 33 part-time nurses.

The AHTCP is open 24 hours a day, 7 days a week, including holidays. It responds to patient calls for practices from 5 PM to 8 AM Monday through Thursday and from 5 PM Friday to 8 AM Monday.

When parents have a problem after hours, they call their primary care physician’s office telephone number. The physician’s answering service records the information and sends a facsimile to the AHTCP, where it is entered into a computerized database. When the AHTCP nurse calls the parent, the nurse determines which triage algorithm to use, based on the most prominent or serious symptom(s), and is guided through a series of questions aimed at identifying conditions that need immediate referral, those that can wait until the next day, and those that can be cared for safely at home. The dispositions in the software program are as follows: (1) call 911, (2) go to the emergency department now, (3) be seen within 4 hours, (4) call your physician within 24 hours, (5) call your physician within 72 hours, or (6) home care instructions. To focus on the most clinically relevant categories, for this study, dispositions were grouped into the following categories: (1) parent was told to call 911 or was told to bring the child in for evaluation immediately or within 4 hours, termed “urgent”; (2) parent was told to contact his or her pediatrician within 24 hours, “next day”; (3) parent was told to contact the primary care physician’s office within 72 hours, “later time”; or (4) patient does not need to be seen and advice for caring for the child at home was given, “home care.”

The nurse can override the recommended triage disposition if the parent insists on speaking with the primary care physician or if the parent insists on a different disposition. This is termed “parent override.” In these cases the algorithm-driven disposition is charted and the parent override disposition is also recorded. It is also possible for the nurse to override a disposition if the parent cannot adequately assess the child, if the parent is unusually concerned about the child, or if the nurse feels that the algorithm-driven disposition may not be best for the situation. This is termed “nurse override.”

All calls are recorded on audiotape and these can be reviewed. Also a record of all questions asked, the recommended disposition, and advice given is automatically stored in the computer database, where it can subsequently be accessed by patient name, date, or time.

DESIGN

All after-hours calls received from June 21, 1999, to June 20, 2000, were retrieved from the computerized database. The volume of calls was calculated and stratified by weekday vs weekend (Saturday 12 AM to Sunday 11:59 PM), time of day and season, age of the patient, algorithm used in triage based on presenting complaint, and triage disposition.

If there is no answer or if the line is busy, the nurse checks the telephone number and tries again 15 minutes later. If there is no answer the second time, the physician’s answering service is notified. If the call is an urgent call and the nurse is unable to get in touch with the family, she calls back in 5 minutes and then, if unable to contact the family, she notifies the physician’s answering service. In cases in which the first call recorded “no contact” but the nurse made contact with the parent on the second attempt, the first no contact entry was not counted as a call. In cases in which the nurse did not reach the parent on either attempt, the first no contact entry was deleted. This was done to get a more accurate representation of the number of calls that the nurse is unable to return. Seasons were defined as follows: summer from June 21st through September 20th, fall from September 21st through December 20th, winter from December 21st through March 20th, and spring from March 21st through June 20th. Triage disposition was the final disposition given by the triage algorithm or, if the nurse overrode this recommendation, the nurse’s override disposition. If a call used multiple triage algorithms, all algorithm symptoms were used to calculate frequencies of topics. However, to avoid counting the same call twice, calls for which multiple algorithms were used were treated as 1 call when stratifying by time, weekend or weekday, season, or age of patient. To calculate the number of calls per pediatrician, the total number of calls was tabulated for all practices that used the call center for all after-hours calls. The total was divided by the number of full-time equivalent pediatricians subscribing to the call center.

To assess the content of calls in which information was sought but no triage occurred, a 1-week sample of all calls for the first week of each season labeled “information only” was retrieved (n=376). Documentation about these calls was reviewed by 1 of us (S.B.) and categorized by the type of information requested by the caller.

MAIN OUTCOME MEASURES

We examined the total volume of after-hours calls, number of calls per pediatrician, seasonal variation in calls, age distribution of patients, and top 10 algorithms used. We also examined a subset of calls within these stratifications that is of particular interest because of its potential for adverse outcomes: cases in which parents were told to call 911. We also examined reasons for calls for information.

DATA ANALYSIS

All after-hours calls returned by the call center over the 1-year period were analyzed. Reason for calls, seasonality, timing of the call, age of the patient, most common triage algorithms used, and dispositions were all calculated as a proportion of total calls.
The χ² test was used to compare the volume of calls per season. The study was approved by the Colorado multiple institution review board.

RESULTS

VOLUMES, SEASONALITY, AND TIMING OF CALLS

A total of 141,922 calls were returned by the call center during the 1-year period. The mean number of after-hours calls handled by the call center per pediatrician was 1,087 calls per year per pediatrician (range, 955-1,520; median, 1,052). Of the total calls 88% were for a clinical illness; 5%, for information or advice; 5%, for calls in which the parent could not be recontacted; 1%, for duplicate calls; and 1%, for miscellaneous reasons (calls for laboratory results, referrals to poison control, and others).

There was significant seasonal variation in the number of calls, as shown in Figure 1. The highest volume of calls was made during the winter (29.4%); the lowest volume of calls were made during the summer (20.1%); call volumes in the fall (24.5%) and spring (26.0%) were roughly equal (P<.001). The call volumes for the lowest-volume summer months were 67% of the call volumes for the highest-volume winter months.

Figure 2 shows the mean number of calls by time of day. Weeknight calls represented 52% of the calls each week, regardless of time of year, and weekend calls accounted for 48% of the calls. During weekdays, 53.9% (95% confidence interval [CI], 53.6-54.2) of the calls were made between 5 and 9 PM, 29.4% (95% CI, 29.0-29.7) between 9 PM and midnight, and 16.8% (95% CI, 16.5-17.1) between midnight and 7 AM. During the weekend, calls were more uniformly distributed, with each hour between 8 AM and 10 PM receiving between 5% and 7% of the total calls. The absolute number of calls after midnight for each night of any given week were similar, although the proportion of after-midnight calls for weeknights was higher than for weekend nights.

AGE, PRESENTING COMPLAINTS, AND TRIAGE DISPOSITIONS

Breakdown of calls by age was as follows: neonates 4%; 1 month to 1 year, 25%; 1 to 3 years, 29%; 3 to 5 years, 13%; 6 to 12 years, 21%; and 12 to 21 years, 8%. The 10 most common algorithms used in triaging clinical calls, which accounted for 45% of all calls, were vomiting (8.4% of total calls), colds (6.0%), cough (5.9%), earache (5.8%), fever (3.8%), sore throat (3.8%), diarrhea (3.4%), croup (3.0%), head trauma (2.6%), and eye infection (2.5%) (listed in rank order for the year). There was little variation in the most commonly used algorithms by season although their rank order changed. The top 10 guidelines used for 911 calls are listed in Table 1.

Of illness calls, 21% of the callers overall were told to come in for urgent evaluation and 1% of these were told to call 911. Thirty percent were told to contact their primary care physician either the next day or at a later time, 45% were given instruction about how to care for their child at home, and 4% were told to call back their primary care physician. Table 2 summarizes the 5 most common algorithms receiving urgent, next day, and home care advice dispositions.
PROCESS OF CARE MEASURES

Mean (SD) call duration per month was 9.6 (0.14) minutes per call. In the summer almost all calls were returned in less than 30 minutes, with 4% of the evening calls and less than 1% of the calls received after midnight being returned in longer than 30 minutes. In contrast, in the winter there were delays in returning calls with 23% of the evening calls and 6% of the calls received after midnight being returned in longer than 30 minutes.

REASONS FOR NONTRIAGED INFORMATION-ONLY CALLS

Information-only calls accounted for 5% of all calls. The most common reasons for information-only calls were as follows: (1) to get medication doses for common over-the-counter cold and fever preparations, (2) to ask if a condition was contagious, (3) to ask if medications could be administered simultaneously, most commonly antibiotics and medications for pain or fever reduction, and (4) to request medication refills.

COMMENT

Despite the financial problems that call centers have encountered in recent years, they remain a major source of after-hours health care provision for children in this country. Although several recent studies have assessed care provided by pediatric call centers, to our knowledge, this study is the first to make use of the wealth of information that is captured by call centers using computerized databases. This study provides data that can be used to guide treatment, policy, and educational issues. In addition, it highlights opportunities for patient education that might decrease unnecessary after-hours calls.

Our data demonstrate trends in the timing and seasonality of after-hours calls that are similar to those reported in several other studies. To our knowledge, the triage algorithms associated with the highest rates of urgent referrals and 911 referrals have not previously been described and this has important implications for training providers who will be performing triage. In addition, to our knowledge, the volume of calls per pediatrician has not been documented previously in a population-based manner. With the increasing numbers of centralized call centers, this information is important for pediatricians who are considering their options for after-hours care.

Our process of care outcomes are similar to recently reported data from other call centers. A survey in 2001 of 32 pediatric call centers across the country showed a mean call duration of 11.3 minutes, with 6 call centers reporting a 9-minute mean call length and 7 call centers reporting a 12-minute mean call time. Similarly, the mean duration in this study was 9.5 minutes. In contrast, previous studies of primary care physicians providing after-hours care showed a mean duration of 3 to 5 minutes per call. Differences in call duration between physicians processing calls based on clinical experience and nurses using protocols may be owing to the physicians’ familiarity with their patients, less complete history taking, or the physician providing less education to parents about their child’s condition. The causes of observed differences in call duration remain unexplored at present.

Previous studies have shown that a high proportion of calls made to pediatric offices during office hours are for routine questions that do not require triage. The results of our study show that many of the calls made after hours are also for questions that are not medically urgent and might be averted if more anticipatory information was provided to the physician’s office or parents were directed to other sources of information available after hours. Of calls requesting information, most of the information requested could easily have been provided to families from other sources. Investing in such alternatives should be especially appealing to physicians who answer their own after-hours calls or who pay out of pocket per call for a call center’s services.

This study has strengths and limitations that need to be considered. The greatest strength of our study is that it takes a total population look at pediatric after-hours call needs, in that 90% of pediatricians in Colorado sign out to our call center. Therefore, it is not subject to the kinds of bias often introduced by analysis of calls from a single practice or institution. Because data are automatically entered into the database at the time of each call, there is also virtually complete capture of the relevant

### Table 2. Top 5 Algorithms Within Each Disposition Category Over a 1-Year Period

<table>
<thead>
<tr>
<th>Disposition (No. of After-hours Calls Received)</th>
<th>Percentage in Disposition Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urgent (19,253)</td>
<td>NA</td>
</tr>
<tr>
<td>Vomiting (15,86)</td>
<td>8.2</td>
</tr>
<tr>
<td>Asthma attack (13,84)</td>
<td>7.2</td>
</tr>
<tr>
<td>Head trauma (981)</td>
<td>5.1</td>
</tr>
<tr>
<td>Croup (726)</td>
<td>3.8</td>
</tr>
<tr>
<td>Next-day evaluation (32,924)</td>
<td>NA</td>
</tr>
<tr>
<td>Earache (6,565)</td>
<td>20.0</td>
</tr>
<tr>
<td>Sore throat (3,01)</td>
<td>11.0</td>
</tr>
<tr>
<td>Cough (2,400)</td>
<td>7.3</td>
</tr>
<tr>
<td>Cold (1,565)</td>
<td>4.8</td>
</tr>
<tr>
<td>Pulling at ear (1,258)</td>
<td>3.8</td>
</tr>
<tr>
<td>Home care (56,773)</td>
<td>NA</td>
</tr>
<tr>
<td>Vomiting (8,420)</td>
<td>14.8</td>
</tr>
<tr>
<td>Colds (6,168)</td>
<td>10.9</td>
</tr>
<tr>
<td>Cough (4,774)</td>
<td>8.4</td>
</tr>
<tr>
<td>Diarrhea (3,455)</td>
<td>6.1</td>
</tr>
<tr>
<td>Fever (3,291)</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not applicable.

*Percentages were calculated by dividing by the number of after-hours calls for each algorithm by the total number of after-hours calls received for the disposition category and they do not sum to 100%.
data. However, although our data are highly reflective of the pediatric population of Colorado, it only reflects care provided at a single call center. One previous study has shown a great deal of similarity between children's hospital-based call centers using the same software for triage in areas such as parental satisfaction and compliance with recommended disposition. However, results regarding prevalence of specific presenting complaints, triage dispositions, and volumes per pediatrician may vary in different parts of the country. In addition, our results may not be generalizable to call centers that do not use pediatric nurses in triaging calls regarding children or that use triage systems that were not developed specifically for pediatric populations.

Understanding the epidemiology and content of after-hours calls provides insight relevant to those who provide the clinical care, those responsible for financial planning regarding this care, and those responsible for educating nurses and physicians who provide this type of care. In addition, because many physicians have the option of choosing if they will manage after-hours care themselves, sign out to a call center, or do a combination of these options, such data are helpful in guiding these individual decisions. This study demonstrates that triage systems with automated data collection have the capability not only of providing complete records of telephone triage transactions that are important for medicolegal purposes but also are relevant data for clinical and policy purposes. Such data are being collected at many call centers throughout the country and should be better used in improving provision of after-hours care and demonstrating unmet needs of families after the physician’s office closes.

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REFERENCES