Title page

Title: Pediatric Web-based chat services for caregivers of children: A feasibility study

Authors: Anu Kaskinen, MD, PhD; Benjamin Ayeboa-Sallah, MD, MSc; Tiina Teivaanmäki, MD; Elina Wärnhjelm, MD; Liisa Korhonen, MD; Otto Helve, MD, PhD

Affiliations: 1 Pediatric Research Center, Children’s Hospital, University of Helsinki and Helsinki University Hospital, 2 National Institute for Health and Welfare

Corresponding author: Anu Kaskinen, MD, PhD; Contact Address: Pediatric Research Center, University of Helsinki and Helsinki University Hospital, Biomedicum Helsinki 2U, 900290 Helsinki, Finland; E-mail anu.kaskinen@helsinki.fi; Tel. +358 40 5598578; Fax +358 109 471 71 977
Abstract

Background: Pediatric online chat services offer a novel, low-threshold communication channel between caregivers and physicians.

Objectives: Our aim was to evaluate profiles of chat conversations between caregivers and physicians in a Web-based chat service to determine which factors should be taken into account when planning a similar chat service. We also aimed to evaluate the feasibility of a Web-based chat service that helps caregivers with concerns about their child’s health.

Methods: In September 2015, a private health care clinic in the greater Helsinki area initiated a Web-based chat service, accessible via any device with an Internet connection, and open from 9 a.m. to 9 p.m., local time. Four residents in pediatrics served as the physicians responsible for chat consultations with caregivers of children. Between October 2015 and March 2016, 343 consecutive consultations were immediately evaluated by a chat physician. On average, caregivers were followed up by email questionnaire, which 98 caregivers answered a median 11 days [interquartile range (IQR) 7-20] later.

Results: The age of the children whose caregivers contacted the chat service was a median 2.1 years (IQR 0.83-4.69), and 102 (30%) children were less than 1 year old. The majority (119/343, 34.7%) of chat conversations took place from 9 a.m. to noon, and infections were the most common concern in over half of cases (189/343, 55.1%). Chat physicians recommended an in-person appointment with a physician for that same day in 13.7% (47/343) of cases. A physical exam was recommended for that same day more often if the chat concerned infection [36 cases (19%)] compared with other reasons [11 cases (7%), P=.001]. Physicians felt capable of answering caregivers’ questions in nearly three-quarters (229/343, 72.6%) of cases. Whether caregivers had to take their children to see a physician that same day or whether caregivers’ main concern was infection did not associate with whether caregivers considered physicians’ answers helpful or not. However, physicians felt more capable of answering caregivers’ questions when the main concern was infection.

Conclusions: Parental consultations via Web-based chat service often take place before noon and focus on infection-related issues as well as on the health and illness of very young children. These factors should be taken into account when planning or setting up such a service. Based on the high satisfaction with the chat service by both physicians and caregivers, Web-based chat service may be a useful way to help caregivers with concerns about their child’s health or illness.

Keywords: chat service; health information; Internet; online resources; pediatrics; social media; web-based
Background

The availability of health information online and usage of the Internet to research health-related problems have both increased during the last decade and continue to grow [1-3]. In an Austrian study from 2015, more than 90% of caregivers visiting an outpatient clinic with their children reported that they collect health information from the Internet [4]. Furthermore, seeking health information online can reduce unnecessary contact with health care professionals [5].

However, the quality of social media sites as a source of public health information is often variable, opinions are often biased and presented as facts, and it may be difficult to find reliable websites [6-8]. However, social media has shown potential in sharing child health information by perceived experts to caregivers [5,9]. Furthermore, digital communication channels between caregivers and health care professionals may improve family involvement in the health management of children [10]. Although feasibility of various digital communication channels between caregivers and health care professionals has been reported, data on chat-based services are scarce [10-12].

This study aimed to determine the profile of Web-based chat conversations between caregivers and physicians in order to help others to allocate resources in an efficient way when planning a similar service. In addition, this study aimed to determine whether such a chat service is useful to caregivers concerned about child health or illness. Furthermore, we evaluated whether physicians and caregivers considered the Web-based chat service helpful for caregivers and whether further physical medical contact after chatting online was needed. We hypothesized that most chat questions would be infection-focused, as described previously [5], that health information could be delivered to caregivers, and that satisfaction
of the caregivers would be inversely associated with the need for further physical medical contact.

3Methods
4A private health care clinic established a Web-based chat service for caregivers of children in the greater Helsinki area in September 2015. The chat service was based on a Web platform accessible via any device with an Internet connection (Figure 1). The chat service was open from 9 a.m. to 9 p.m. local time, and 4 residents in pediatrics were the physicians responsible for Web-based chat consultations with caregivers of children. The local ethics committee of Helsinki University Hospital approved the study.

Figure 1. Screenshot of the web-based chat service.

Between October 2015 and March 2016, 343 consecutive Web-based consultations were immediately evaluated by the 4 chat physicians and the following data were collected: child’s age, time and length of a chat, the caregiver’s main concern for consultation, need for further physical medical contact, whether the physician felt capable of answering caregiver’s
question, and whether a prescription was given. Since all of the questions did not include sufficient information to set a specific diagnosis, the main concerns were grouped into eight diagnosis groups based on common cases presenting at pediatric outpatient departments. Diagnosis groups were allergy, dermatology, endocrinology or growth problem, gastroenterology, infection, neonatology, neurology, nutrition, and trauma. In addition, an email including a link to a Web-based questionnaire was sent by authors to all caregivers 7-14 days after chat consultation. The questionnaire was answered by 28.6% (98/343) of caregivers a median 11 days [interquartile range (IQR) 7-20] after consultation, and their responses could be matched with physicians’ responses for analyses. The questionnaire was created specifically for this study, and the following data were collected from all the caregivers who answered the questionnaire: need for further physical medical contact, how a chat physician should answer caregiver’s question, and whether the caregiver’s primary source of child health information was the Internet. Both physicians’ and caregivers’ questions were answered on 5-point scale (eg, caregivers and physicians judged whether caregivers’ questions were answered very well, well, not well or poorly, quite poorly, or very poorly). However, the scale was then adjusted to a 2-point scale for studying the factors affecting how chat physicians could answer caregivers’ questions.

Variables on a qualitative scale are presented as n with percentages and compared with chi-square test or Fisher’s exact test, as appropriate. Variables on a continuous scale were assessed for normality visually and by Kolmogorov-Smirnov test, described as mean (SD) or median with IQR, and compared with Student’s t test or Mann-Whitney U test, as appropriate. A P value ≤.05 was considered significant for all statistical analyses. Statistical analyses were performed with SPSS 21.0 (IBM Corp.).
Results

The median age of the children of the caregivers who contacted the chat service was 2.1 years (IQR 0.83-4.69), and 29.7% (102/343) of children were less than 1 year old (Figure 2). In 579.9% (274/343) of cases, a mother contacted the chat service, a father in 18.7% (64/343) of cases, and another caregiver in 1.5% (5/343) of cases. Of chat conversations, 7.6% (26/343) lasted less than 15 minutes, 36.7% (126/343) lasted 15-30 minutes, 26.5% (91/343) lasted 30-845 minutes, and 29.2% (100/343) more than 45 minutes. The majority (119/343, 34.7%) of chat conversations took place from 9 a.m. to noon, 21.6% (74/343) from noon to 3 p.m., 1021.9% (75/343) from 3 p.m. to 6 p.m., and 21.0% (72/343) from 6 p.m. to 9 p.m. The primary source of child health information was the Internet for 57% (56/98) of caregivers.

Figure 2. Age distribution of patients.

Figure 3. The distribution of main concerns leading to chat consultations.
The most common concern for consultation was infection in 55.1% (189/343) of cases (Figure 3). When infection as a concern for consultation was compared with other reasons, no difference was apparent in child’s age, or in length or time of chat conversation ($P > .05$ for both). The chat physician gave a prescription in 20.7% (71/343) of cases, and there was no difference between numbers of prescriptions given after chat conversations concerning infections [44/189 cases (23.2%)] compared with other concerns [27/154 cases (17.5%), $P > .05$].

Chat physicians recommended physical medical contact on that same day in 13.7% (47/343) of cases, later (ie, after that day) in 15.2% (52/343) of cases, and if symptoms would worsen, for nearly half the cases (164/343, 47.8%). Physical medical contact was recommended more often on that same day if the chat conversation concerned infection [36/189 cases (19.0%)] compared with other concerns [11/154 cases (7.1%), $P = .001$]. Whether the child was younger than 12 months or the chat conversation lasted longer than 45 minutes did not associate with whether chat physicians recommended physical medical contact that same day ($P > .05$ for
Of 98 caregivers, 42 (43%) took their children to a physician with respect to their main concern for chat consultation. In 57% (24/42) of these cases, the chat physician had advised physical medical contact that same day or later. A total of 11% (11/98) of caregivers took their children to see a physician that same day, and 8 (73%) of those caregivers were advised to do so by a chat physician.

Physicians felt capable of answering caregivers' question very well or well in nearly three-quarters of cases (249/343, 72.6%). As for caregivers, 93% (91/98) received very good or good answers, and in 90 of these cases, physicians gave a similar assessment. However, 7/98 (7%) cases showed discrepancy, that is, the physician felt capable of answering the caregiver's question very well or well, but the caregiver felt they received a poor answer.

Whether caregivers had to take their children to see a physician that same day, whether the caregiver's main concern was infection, the child was younger than 12 months, or the chat conversation lasted longer than 45 minutes, did not associate with whether caregivers thought the physician answered their question well or poorly (Table 1). However, physicians felt capable of answering caregivers' questions better when the main concern was infection ($P=.02$), and when the chat conversation lasted less than 45 minutes ($P<.001$) (Table 1).
1Table 1. Assessment of chat conversations by caregivers (n=98) and by physicians (N=343).

<table>
<thead>
<tr>
<th></th>
<th>Yes, n (%)</th>
<th>No, n (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregivers thought physician gave a good answer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child &lt;1-year-old</td>
<td>26 (96)</td>
<td>1 (4)</td>
<td>.67</td>
</tr>
<tr>
<td>Child ≥1-year-old</td>
<td>65 (92)</td>
<td>6 (8)</td>
<td></td>
</tr>
<tr>
<td>Infection as a main concern</td>
<td>57 (95)</td>
<td>3 (5)</td>
<td>.43</td>
</tr>
<tr>
<td>Other concern</td>
<td>34 (90)</td>
<td>4 (10)</td>
<td></td>
</tr>
<tr>
<td>Length of chat &gt;45 minutes</td>
<td>26 (90)</td>
<td>3 (10)</td>
<td>.42</td>
</tr>
<tr>
<td>Length of chat ≤45 minutes</td>
<td>65 (94)</td>
<td>4 (6)</td>
<td></td>
</tr>
<tr>
<td>Need to visit a physician that same day</td>
<td>10 (91)</td>
<td>1 (9)</td>
<td>.58</td>
</tr>
<tr>
<td>No need to visit a physician that same day</td>
<td>81 (93)</td>
<td>6 (7)</td>
<td></td>
</tr>
<tr>
<td>Physicians felt capable of giving a good answer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommend physical medical contact for that same day</td>
<td>44 (94)</td>
<td>3 (6)</td>
<td>.47</td>
</tr>
<tr>
<td>Did not recommend physical medical contact for that same day</td>
<td>283 (96)</td>
<td>13 (4)</td>
<td></td>
</tr>
<tr>
<td>Child &lt;1-year-old</td>
<td>95 (93)</td>
<td>7 (7)</td>
<td>.26</td>
</tr>
<tr>
<td>Child ≥1-year-old</td>
<td>232 (96)</td>
<td>9 (4)</td>
<td></td>
</tr>
<tr>
<td>Infection as a main concern</td>
<td>185 (98)</td>
<td>4 (2)</td>
<td>.02</td>
</tr>
<tr>
<td>Other concern</td>
<td>142 (92)</td>
<td>12 (8)</td>
<td></td>
</tr>
<tr>
<td>Length of chat &gt;45 minutes</td>
<td>89 (89)</td>
<td>11 (11)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Length of chat ≤45 minutes</td>
<td>238 (98)</td>
<td>5 (2)</td>
<td></td>
</tr>
</tbody>
</table>

2Discussion

4Principal Findings

5This mainly descriptive study offers new information about Web-based chat services provided to caregivers of children. To our knowledge, this is the first study profiling and assessing the feasibility of Web-based chat services between physicians and caregivers of children [11,12].

6In 2007, half of European people rated the Internet as an important source of health information, preceded only by physical contact with health care professionals [3]. In our study, a decade later, the primary source of child health information was the Internet for more than half of caregivers. In previous studies, nearly all caregivers reported some use of the Internet for their children’s health information, and a fifth of caregivers before attending a pediatric outpatient clinic [4,13,14]. Accordingly, we believe that a Web-based chat service for caregivers of children will become an even more important channel for contacting a pediatrician.
Qualitative profiling of chat conversations between caregivers and physicians is essential to improve chat services and to help others allocate sufficient and focused resources when setting up a similar service. In our study, most chat consultations took place during the morning between 9 a.m. and noon. Half of chat conversations lasted more than 30 minutes, which is consistent with a previous study reporting the median length of a nurse-led direct online chat triage service launched by the United Kingdom National Health Institute (UK NHI) was 30 minutes [12]. Although UK NHI considered online chat conversations too long and therefore too expensive, the patients were satisfied with the chat length [12]. Despite the time-consuming nature, several chat conversations can be managed at the same time when compared with video conference appointments or phone calls. In line with our hypothesis, infections were the most common concern for online chat consultations. Similarly, infections were the most common topic for parental concerns at a child health social media site, which was based on a question-and-answer service produced by a pediatrician [5]. This is logical since infections are a common cause for both ambulatory and emergency pediatrician visits. In our study third of the chat consultations concerned children under 1 year of age, and children under age 5 years comprised a vast majority of the consultations. This is consistent with previous studies showing that the young age of children predisposes caregivers to use the Internet to gather health information [4,14].

In our study, the vast majority of caregivers reported that they received good or very good answers to their questions. Therefore, a Web-based chat service may be a useful way to help caregivers with concerns about their child’s health or illness. However, the proportion of physicians who felt capable of answering caregiver’s question very well or well was somewhat lower. This discrepancy may result mainly from physicians’ self-criticism [15]. Physicians felt capable of answering caregivers’ questions better when the chat consultation
was focused on infection, compared with other concerns. Physicians felt capable of answering caregivers’ questions better also when chat conversation lasted less than 45 minutes. Although the time when awaiting a response may lengthen chat conversations, the length may also reflect the complexity of parental concern. However, parental satisfaction was not linked with the subject of the chat consultation or with the length of chat conversation.

Chat physicians recommended physical medical contact for that same day in only about a tenth of cases, and a comparable portion of caregivers took their children to see a physician that same day. If the chat conversation concerned infection, physical medical contact was recommended in a fifth of the cases. Since the majority of caregivers were not advised to or did not seek further physical consultation at all, some families may have avoided needing physical medical contact thanks to the chat service. However, this study cannot reliably answer the question of whether a Web-based chat consultation can replace physical medical contact. In addition, whether caregivers had to take their children to see a physician that same day was not associated with whether caregivers thought the physicians answered their question well or poorly. Therefore, it is likely that the caregivers may contact Web-based chat services not only to replace a physical consultation, but to gather information [14].

Strengths and Limitations

There are some limitations to our study, the first being the low response rate from parents. Since only a quarter of caregivers completed the questionnaire, it is possible that unsatisfied or highly satisfied parents are overrepresented. However, with a high satisfaction rate, we believe our finding shows a general applicability of a Web-based chat service for health information distribution to caregivers. Second, we relied on parental reporting on the subsequent visits to physicians, therefore using subjective data. However, we believe that caregivers would have taken their children to a physician by the time they answered the
questionnaire and no further appointments were needed with respect to the concern discussed in the chat.

Conclusions
Both caregivers and physicians believed that the concerns of caregivers were well handled and the vast majority of caregivers’ questions could be well answered in a Web-based chat. Thus, Web-based chat service provided for caregivers of children may be a useful way to help caregivers with concerns about their child’s health or illness. However, there are a number of factors that should be taken into account when setting up an online physician-led chat service: physicians should have enough time for chat consultations, especially in morning hours, and physicians should have sufficient knowledge, especially of pediatric infections as well as the health of very young children.

Authors’ Contributions
AK and OH conceptualized and designed the study, collected data, carried out the statistical analyses, drafted the initial manuscript, and reviewed and revised the manuscript. BA carried out the statistical analyses, drafted the initial manuscript, and reviewed and revised the manuscript. EW, LK, and TT conceptualized and designed the study, collected data, and reviewed and revised the manuscript.

Conflicts of Interest
Otto Helve is a shareowner of iHealth Finland Ltd that originally constructed the technical chat platform.

Abbreviations
IQR: interquartile range
References


