ARTICLE

Computer-Based Documentation

Effect on Parent and Physician Satisfaction During a Pediatric Health Maintenance Encounter

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Objective: To investigate the impact of a computer-based documentation (CBD) tool on parent and physician satisfaction with a pediatric health maintenance encounter.

Design: The project used a preintervention and postintervention design. The preintervention group visits used paper-based forms for data entry, whereas the postintervention visits used CBD. At the conclusion of each encounter, both the physician and the parent completed a survey that assessed their perceptions of the encounter’s quality.

Setting: Urban hospital-based pediatric teaching clinic.

Participants: Parents and physicians of children 18 months and younger.

Main Outcome Measures: Parent and physician satisfaction with 7 components of a health maintenance encounter (interim history, social history, anticipatory guidance, developmental assessment, physical examination, assessment, and plan).

Results: There was no change in overall parent or physician satisfaction in the areas of communication or physician helpfulness. Physicians using CBD were less likely to agree that they provided clear explanations but were also less likely to agree that they “acted bossy during the visit.” There was no correlation between physician and parent satisfaction or between physician satisfaction and pattern of CBD use. However, there was a strong correlation between physicians’ satisfaction and the extent to which they found CBD helpful (Spearman ρ=0.29, P<.001).

Conclusions: The introduction of CBD into the health maintenance encounter did not affect measured aspects of parent or physician satisfaction; these results support its continued use in that setting.

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NUMEROUS STUDIES1-14 HAVE outlined the potential benefits of using a computer to document a patient encounter. Computer-based documentation (CBD) tools improve access to summaries of the encounter15 and may improve compliance with recommended health maintenance guidelines.1,4,11,16-18 Studies performed in primary care environments have raised concerns about the potential impact of CBD on patient satisfaction,19 patient-physician communication,4,14,20 and the duration of the encounter.21,22 Although early studies23-27 of adult patients demonstrated patient concern about the use of computers, recent studies28-30 have uniformly shown no perceived or measurable decrease in patient satisfaction.

The effect of CBD in a pediatric setting has not been studied and cannot be generalized from adult studies. The first step toward understanding how the use of CBD during health maintenance encounters affects the quality of primary care received is to evaluate how parent and physician satisfaction with the visit is affected by CBD. Therefore, we conducted a study to determine the timing and extent of CBD use and if it affected parent and physician satisfaction with the visit.

METHODS

The study participants used a noncommercial software program developed by one of us (K.B.J.). This program, called Clictate, allows a combination of free-text data input and “point-and-click” input to create a visit summary.31 Clictate displays documentation templates derived from American Academy of Pediatrics health maintenance guidelines for 12 age-specific time frames, ranging from 2 weeks old to adolescence. These templates are reviewed and updated periodically by clinic fac-
ulty. Clictate uses data entry tools found in graphical user interfaces, such as check boxes, radio buttons, text fields, and drop-down list boxes, which generate a text note summary (Figure). Clictate allows clinic physicians, residents, and nurse practitioners to complete the note in any order.

STUDY DESIGN

The study used a preintervention and postintervention design and took place in an urban hospital-based pediatric teaching clinic. The preintervention (control) group consisted of health maintenance visits in the clinic before CBD was implemented, using paper encounter forms (PEFs). The postintervention (CBD) group consisted of parents and physicians who completed health maintenance visits beginning 1 year after the introduction of Clictate. During the CBD phase, physicians were encouraged but not required to use Clictate during the encounter. If they chose not to do so, they generated an encounter summary through computer data entry after the encounter. All clinic physicians were required to use Clictate during the encounter. If they chose not to use Clictate; however, only residents were included in the study. Health maintenance visits were eligible for study inclusion if the patient was 18 months or younger and had not previously been enrolled in the intervention phase of the study.

As a part of a larger study that evaluated parent-physician interaction, each encounter was audiotaped. Length of audiotape was used to determine the duration of the encounter. At the conclusion of the encounter, the physician and parent each completed a questionnaire based on a tool developed by Wisrow et al32 that assessed satisfaction with the encounter. Immediately after the visit, at the end of the clinic interaction, each encounter was audiotaped. Length of audiotape was used to determine the duration of the encounter. The survey asked physicians how they documented each section (not at all, during the visit, immediately after the visit, at the end of the clinic session, or the subsequent day). The survey asked physicians to assess the template’s helpfulness on a 4-point ordinal scale from “no help” to “a great deal of help.”

Data Analysis

This study was designed to assess the effect of CBD on parent and physician satisfaction as measured by our survey instrument. The sample size assumed that a 10% change in satisfaction was clinically meaningful. Assuming 95% power and α = 0.01, we required a sample size of 120 encounters in each group. Results were analyzed using Stata statistical software (StataCorp LP, College Station, Tex).

In initial confirmatory analyses, we compared distributions of satisfaction indices with the Wilcoxon rank sum tests. Comparisons of proportions used Fisher exact or χ² tests. In the multivariate analysis, regression models explored the relationships between satisfaction outcome measures and CBD use, controlling for physician sex and year of training. When comparing parent and physician satisfaction data, we dichotomized the responses to “strongly agree” vs all other responses for the satisfaction questions and “great deal of help” vs all other responses for the helpfulness questions. A logistic regression analysis was then performed to compare the proportion of PEF vs CBD respondents who answered in the highest response category for all survey questions. Because we considered unique parent encounters as the unit of analysis, each physician had multiple encounters. To account for possible within-physician correlations, we used the Huber-White sandwich variance estimators for the logistic regression analysis.34,35

RESULTS

A total of 240 parent-patient dyads were eligible for inclusion in the CBD group. Of these, physicians returned 229 satisfaction surveys (95% of the visits), and parents returned 221 satisfaction surveys (92%). The enrolled visits were uniformly distributed across all ages (through 18 months) at which health maintenance visits occur. The PEF group consisted of 150 parent-patient dyads with 1
set of missing data, leaving 149 PEF dyads suitable for analysis. Compared with the PEF group, the CBD group had significantly more male physicians (38% vs 25%, \( P = .007 \)) and fewer first-year residents (21% vs 44%, \( P = .01 \)).

Forty-three percent of the physicians who returned surveys reported using CBD during the visit for the inter- \( \text{P} \text{erm} \) and social history, and 54% used it for antici- \( \text{p} \text{patory guidance and developmental aspects. However, 74% \ of physicians reported that they documented physical ex- \( \text{amination f} \text{indings, assessment notes, and plans after com-} \text{pleting the encounter. The mean CBD visit length (32 \ minutes; 95% confidence interval [CI], 31-35 minutes) was longer than that for PEF visits (28 minutes; 95% CI, 26-30 minutes; \( P < .001 \)).

Table 1 gives physician perceptions of the documentation templates. The developmental assessment and antici- \( \text{p} \text{patory guidance sections were of “some help” or “a great deal of help” to most physicians, whereas re- \( \text{sponses regarding other sections were mixed. Physi- \( \text{cians’ use of CBD during the patient encounter was cor-} \text{related with the degree of help they thought the template provided (\( P = .32, P < .001 \)).

Parent and physician satisfaction data are given in Table 2 and Table 3. There was no change in mean parent satisfaction with the encounter, although there was a significant increase in the percentage of patients who strongly agreed that they were encouraged by their physi- \( \text{cian to talk about worries (53% in the PEF group vs 64% in the CBD group, \( P = .02 \)). Parent perception of physi- \( \text{cian helpfulness ratings was high, with no difference in the extent to which physicians were perceived as helpful before and after CBD.}

Physician satisfaction was higher among male than female physicians (\( P = .15, P = .003 \)). After controlling for physician year of training and sex, parents in the CBD group were more likely to talk about worries (odds ratio, 4.34; 95% CI, 1.49-12.69) than those in the PEF group; however, there were no other significant effects. Physician and parent satisfaction scores for visits were not related to the degree of continuity between a physician and parent.

Within the CBD group, there was varying use of CBD during the visit. We defined “high-CBD encounters” as encounters in which physicians reported completing documentation either during or between visits (\( n = 120 \)) and “low-CBD encounters” as all other encounters (\( n = 103 \)). Bivariate analysis of parent and physician satisfaction measures between these 2 groups disclosed no significant differences (data not shown).

This study demonstrated that when provided with a CBD tool, most residents chose to use it for some or all parts of health maintenance encounters. Neither parent nor physician satisfaction changed significantly with the introduction of a computer into the encounter. Physicians perceive that they are less “bossy” during encounters, which may be due to changes in communication style integral to CBD or potentially to unmeasured variables. Physicians believed that they were less able to clearly explain issues and plans during a higher proportion of CBD encounters. This perception might have been altered during the CBD period if the use of the technology was affecting the physician’s sense of urgency during the visit or the reception of cues to reassure the physician about the effects of his or her communication with the parent. In either case, we might have expected other components of this scale to be affected, including perceptions about “acting bossy,” which as described herein were less prevalent during the CBD period. An analysis of parent-physician interaction will likely provide objective data to conclude how CBD affects partnering.

This study in pediatrics compares favorably with findings from other studies that examined the effect of computer technology in preventive medicine clinics, \( .\text{9,26 family practice, 30,37,38 and rehabilitation clinics}.\) A consistent pattern is emerging that is more favorable toward computer use in the examination room than was found in older studies\( .\text{25,26 or studies that involved patients who had never had experience with a computer in the examination room. 24,40 The association between exposure to com-\text{puters and satisfaction has been noted by Cruickshank}.\) Unfortunately, the present study did not attempt to correlate parent exposure to computers with satisfaction, which may be an important predictor.

Physicians tend to be more negative about the perceived effects of computers on the quality of patient encounters than are their patients.\( .\text{19,26,27,39 The 2 populations of physicians in this study had a small but significant difference in satisfaction, especially in the area of clearly explaining issues and plans, which suggests some subtle negative effects of CBD on their satisfaction. In previous studies that have examined physicians’ attitudes about computers, physicians have raised concerns about potentially losing eye contact,\text{19,26,27,39 These concerns may affect perceptions about partnership and helpfulness. The extent to which documentation was completed during the encounter was reasonably high for the anticipatory guidance and developmental assessment components of the visit but low for the physical examination, assessment, and plan components. We postulate 3 rea-\text{sons for this difference. First, anticipatory guidance and developmental milestones are difficult to remember. There-\text{fore, Clictate’s age-appropriate templates may have provided an important guideline for many physicians. Sec-}

**Table 1. Physician Perception of the Helpfulness of the Clictate Template During Encounters**

<table>
<thead>
<tr>
<th>Section Surveys (N = 225)</th>
<th>Some or Great Deal of Help</th>
<th>Little Help</th>
<th>No Help or Did Not Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval history (n = 220)</td>
<td>104 (47)</td>
<td>54 (25)</td>
<td>62 (28)</td>
</tr>
<tr>
<td>Social history (n = 221)</td>
<td>78 (35)</td>
<td>57 (26)</td>
<td>86 (39)</td>
</tr>
<tr>
<td>Developmental assessment (n = 225)</td>
<td>188 (84)</td>
<td>19 (8)</td>
<td>18 (8)</td>
</tr>
<tr>
<td>Anticipatory guidance (n = 225)</td>
<td>182 (81)</td>
<td>22 (10)</td>
<td>21 (9)</td>
</tr>
<tr>
<td>Physical examination (n = 223)</td>
<td>126 (56)</td>
<td>29 (13)</td>
<td>68 (31)</td>
</tr>
<tr>
<td>Assessment (n = 222)</td>
<td>107 (48)</td>
<td>54 (24)</td>
<td>61 (28)</td>
</tr>
<tr>
<td>Plan (n = 222)</td>
<td>98 (44)</td>
<td>54 (24)</td>
<td>70 (32)</td>
</tr>
</tbody>
</table>

*Clictate is a noncommercial software program developed by one of the authors (K.B.J.).

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ond, the computers were placed on the desktop between the parent and the physician and could not be moved. Physical examination, assessment, and planning are typically conducted away from the desk, making concurrent documentation difficult. Further research should explore how the use of personal digital assistants or pen-based tablet computers affects the timing of documentation. A third reason for this difference may be the resident’s definition of the encounter, in that residents often leave the examination room to consult with the attending physician before articulating the plan with the patient. It is possible that residents categorize that time as after the patient encounter.

The 2 groups studied in this project had statistically significant differences in both physician sex and year of training. Sex is known to affect patient-physician interactions. Multivariate analyses disclosed a difference in the odds ratio for only 1 question relating to physician partnership, with a more significant difference in the CBD group after controlling for sex and year of training. All other satisfaction measures were unaffected.

The study is limited by our use of a historical control group. This choice may account for the slight difference in physician satisfaction scores between our 2 groups. We are unaware of other changes that may have affected physician satisfaction during the interval encompassed by this study.

### Table 2. Parent Satisfaction With Encounters Using Paper Encounter Forms (PEFs) or Computer-Based Documentation (CBD)

<table>
<thead>
<tr>
<th>Encounters (N = 221)</th>
<th>Mean Score</th>
<th>Percentage Who Strongly Agree</th>
<th>Adjusted OR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PEF Group</td>
<td>CBD Group</td>
<td>PEF Group</td>
<td>CBD Group</td>
</tr>
<tr>
<td>Satisfied with*</td>
<td>4.5</td>
<td>4.6</td>
<td>79.2</td>
<td>78.2</td>
</tr>
<tr>
<td>Attention given by physician</td>
<td>4.6</td>
<td>4.7</td>
<td>80.5</td>
<td>83.6</td>
</tr>
<tr>
<td>Medical care received</td>
<td>4.4</td>
<td>4.6</td>
<td>53.0</td>
<td>64.4</td>
</tr>
<tr>
<td>Encouraged by physician to talk about worries*</td>
<td>4.4</td>
<td>4.3</td>
<td>48.0</td>
<td>44.1</td>
</tr>
<tr>
<td>Able to talk about health problems of interest to them*</td>
<td>4.5</td>
<td>4.6</td>
<td>61.2</td>
<td>62.4</td>
</tr>
<tr>
<td>Had worries or concerns eased by the physician*</td>
<td>4.5</td>
<td>4.5</td>
<td>56.4</td>
<td>56.8</td>
</tr>
<tr>
<td>Was asked for opinion about best way to treat child*</td>
<td>4.6</td>
<td>4.6</td>
<td>65.5</td>
<td>65.2</td>
</tr>
<tr>
<td>Received explanations about physician’s instructions*</td>
<td>3.9</td>
<td>3.9</td>
<td>91.3</td>
<td>91.5</td>
</tr>
<tr>
<td>Medical concerns</td>
<td>3.7</td>
<td>3.8</td>
<td>81.5</td>
<td>83.7</td>
</tr>
<tr>
<td>Feeding and nutrition</td>
<td>3.9</td>
<td>3.9</td>
<td>91.2</td>
<td>90.5</td>
</tr>
<tr>
<td>Safety</td>
<td>3.8</td>
<td>3.8</td>
<td>87.1</td>
<td>90.3</td>
</tr>
<tr>
<td>Behavior</td>
<td>3.6</td>
<td>3.6</td>
<td>82.4</td>
<td>80.9</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio.
*Five-point scale (1 indicating strongly disagree; 5, strongly agree).
†Four-point scale (1 indicating no help; 4, great deal of help).

### Table 3. Physician Satisfaction With Encounters Using Paper Encounter Forms (PEFs) or Computer-Based Documentation (CBD)

<table>
<thead>
<tr>
<th>Surveys (N = 229)</th>
<th>Mean Score</th>
<th>Percentage Who Strongly Agree</th>
<th>Adjusted OR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PEF Group</td>
<td>CBD Group</td>
<td>PEF Group</td>
<td>CBD Group</td>
</tr>
<tr>
<td>Satisfied with*</td>
<td>3.2</td>
<td>3.2</td>
<td>32.4</td>
<td>21.0</td>
</tr>
<tr>
<td>Medical care delivered</td>
<td>5.0</td>
<td>4.8</td>
<td>98.7</td>
<td>95.3</td>
</tr>
<tr>
<td>Attention given to patient and parent</td>
<td>4.7</td>
<td>4.7</td>
<td>93.2</td>
<td>91.9</td>
</tr>
<tr>
<td>Communication with parent</td>
<td>4.7</td>
<td>4.8</td>
<td>92.6</td>
<td>95.7</td>
</tr>
<tr>
<td>Encourage parent to talk about worries*</td>
<td>4.7</td>
<td>4.7</td>
<td>93.3</td>
<td>92.7</td>
</tr>
<tr>
<td>Know the problem the parent wanted to discuss*</td>
<td>4.7</td>
<td>4.7</td>
<td>92.6</td>
<td>92.3</td>
</tr>
<tr>
<td>Can be counted on to relieve worry*</td>
<td>4.0</td>
<td>3.5</td>
<td>73.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Asked for parent’s opinion*</td>
<td>4.8</td>
<td>4.5</td>
<td>96.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Clearly explained issues and plans*</td>
<td>3.2</td>
<td>3.7</td>
<td>79.7</td>
<td>91.4</td>
</tr>
<tr>
<td>Did not act bossy*</td>
<td>3.2</td>
<td>3.2</td>
<td>32.4</td>
<td>26.8</td>
</tr>
<tr>
<td>Medical concerns</td>
<td>3.2</td>
<td>3.2</td>
<td>35.6</td>
<td>32.0</td>
</tr>
<tr>
<td>Feeding and nutrition</td>
<td>3.3</td>
<td>3.2</td>
<td>34.5</td>
<td>27.1</td>
</tr>
<tr>
<td>Growth and development</td>
<td>3.3</td>
<td>3.1</td>
<td>37.7</td>
<td>25.7</td>
</tr>
<tr>
<td>Safety</td>
<td>3.0</td>
<td>2.6</td>
<td>22.3</td>
<td>13.9</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio.
*Five-point scale (1 indicating strongly disagree; 5, strongly agree).
†Four-point scale (1 indicating no help; 4, great deal of help).
study. However, given that the scores of physicians who had CBD available but did not use it during the visit are similar to those of CBD users, the control and intervention groups may not be well matched. Although a randomized controlled method would provide more assurance that the 2 groups were similar, this method is difficult to implement in a busy clinical setting. Another limitation of the study is the high level of satisfaction exhibited by our parents. This high score should not preclude further examination of communication variables may help to explain subtle differences in physician perceptions. Further research is needed to improve the rate at which documentation can be completed during the encounter.

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CONCLUSIONS

We have demonstrated that the adoption of CBD in a primary care pediatric clinic did not significantly affect either parent or physician satisfaction with the encounter. These results support continued use of CBD tools. Deeper examination of communication variables may help to explain subtle differences in physician perceptions. Further research is needed to improve the rate at which documentation can be completed during the encounter.

REFERENCES