A Time-Motion Study of Inpatient Rounds Using a Family-Centered Rounds Model

abstract

OBJECTIVE: Family-centered rounds (FCR) have become increasingly prevalent in pediatric hospital settings. The objective of our study was to describe time use and discrete events during pediatric inpatient rounds by using a FCR model.

METHODS: We conducted a prospective observational study at Children’s National Medical Center between September 2010 and February 2011. Investigators directly observed rounds on hospitalist and neurology services. Events were timed, and key features were recorded by using a Microsoft Access-based program. Associations with increased time spent during rounds were determined by using regression analyses.

RESULTS: One hundred fifty-nine rounding encounters were observed. Rounds lasted 7.9 minutes on average per patient. An average of 1.3 minutes was spent between patients during rounds. Eighty-six (54%) encounters occurred outside the patient’s room, 3% of the time because of the family’s request. Infectious isolation was associated with rounds occurring outside the patient’s room (P < .0001). Participation of the parent, location of rounds inside or outside the patient’s room, most teaching behaviors, and interruptions were not significantly associated with increased time spent during rounds. Teaching physical examination techniques by allowing multiple trainees to examine the patient was associated with increased rounding time (P = .02).

CONCLUSIONS: The majority of rounds occurred outside the patient’s room, yet rarely at the parent’s request. Patients on infectious isolation were more likely to have rounds occur outside the patient’s room. Neither parental participation nor most teaching behaviors were associated with increased time spent on rounds. These findings will enrich the evidence base needed to establish FCR best practices.

INTRODUCTION

Family-centered rounds (FCR) have been defined as multidisciplinary patient care rounds in which the patient and family share in the medical decision-making as part of the medical team. FCR provide the benefit of including the family in decision-making for their child, improving satisfaction with care and overall communication with the team. FCR also provide the opportunity for the supervising physician to observe trainee professionalism and communication skills with the family and to role model these behaviors at the bedside.

Critics suggest that FCR may impede teaching on rounds, because teaching interactions are observed by the family. Both the learner and the attending physician may be apprehensive about knowledge deficits occurring in the family’s
presence. Families may become frightened or confused by the nature of the discussion. Concerns exist about the efficiency of FCR if parents have multiple questions about the plan of care. Despite these concerns, in 2007, FCR occurred in almost one-half of the pediatric academic settings and in almost one-third of the nonacademic settings surveyed. Those numbers may have increased over time, because it is clear that patients and families prefer bedside rounds. Despite the prevalence of FCR, little information is available describing the moment-to-moment behaviors and events that occur during rounds. The objectives of this study were to (1) identify the participation of members of the health care team during rounds, (2) describe how time is used, (3) determine which factors are associated with an increased length of rounds, and (4) identify which teaching behaviors take place during rounds at our institution, where the primary model of inpatient rounds is FCR.

METHODS
Setting and Study Design
This prospective observational study was conducted between September 2010 and February 2011 at Children’s National Medical Center, a free-standing, urban, academic children’s hospital, with 283 inpatient beds and 14,000 admissions per year. FCR are conducted on almost all medical units. During a 4-month prestudy period, discrete components of rounds were identified and defined. Attending physicians (noninvestigators) were consulted for validation of events, categories, and definitions. A Microsoft Access program was developed to allow simultaneous timing of specific events and components of rounds. The program was then piloted for content validity and usability during rounds.

Families and health care providers were given an information sheet explaining the purpose of the study on the day of each observation. Trained investigators directly observed rounds from start to finish on a convenience sample of weekdays on the hospitalist and neurology services to record events second by second in a time-motion fashion. Both the neurology and hospitalist services have a similar rounding structure with the use of FCR. Data were recorded by using the Microsoft Access–based program. One investigator timed events by using multiple parallel clocks triggered by “on” and “off” buttons on a tablet computer, and another investigator recorded demographic information (Table 1). Data were collected in 2 phases, in the fall (September-October) and in the winter (January-February), to account for seasonal variation in patient census and trainee experience level. During the winter phase, a third investigator documented witnessed teaching behaviors derived from the literature as being effective in the busy clinical setting. To maximize reliability, the roles of the investigators remained consistent for all recorded encounters. Debriefing between these investigators (S.B., J.C., and K.S.) occurred daily, and uncertainties were resolved by discussion. The study was approved by the Institutional Review Board at Children’s National Medical Center.

Outcome Measures
Outcome measures included descriptive analyses of (1) participation of parents and other members of the health care team during rounds, (2) describe how time is used, (3) determine which factors are associated with an increased length of rounds, and (4) identify which teaching behaviors take place during rounds at our institution, where the primary model of inpatient rounds is FCR.
health care team, (2) timing of key events such as rounding time and door-to-door time, (3) interruptions to the team during rounds, (4) factors associated with increased rounding time, and (5) teaching behaviors performed during rounds.

Data Analysis
Data were downloaded from Microsoft Access to Microsoft Excel. Descriptive results were reported as percentages or as means. Multivariate linear and logistic regression analyses with the use of the “R” version 2.10.0 described factors associated with an increased rounding time. Coefficients with 95% confidence intervals are reported. Subgroup analyses compared differences between the neurology and hospitalist services with statistical significance determined by using χ² tests and t tests where appropriate. Odds ratios (ORs) with 95% confidence intervals (CIs) are reported. P values of ≤0.05 were considered significant.

RESULTS
Investigators observed 159 discrete rounding encounters (99 hospitalist and 60 neurology). Each service used a traditional academic model with an attending physician, medical students, and resident physicians. The hospitalist teams had 2 PL-1 residents supervised by a PL-3 resident, whereas, on the neurology team, 2 PL-2 residents were supervised by a fellow. The average length of stay on the hospitalist service during this study was 4.4 days with an average daily census of 14 patients per team in comparison with 3.0 days and an average daily census of 9 patients on the neurology service. (Although the hospitalist service admits general pediatric inpatients, previously healthy children with a single admission diagnosis and anticipated length of stay of 72 hours or less are admitted to a separate non-resident–staffed unit that was not included in this study.) Twelve different attending physicians, ranging from clinical instructors to full professors, were observed. Teaching behaviors were recorded for all 90 patient encounters during the winter phase.

Participants
Parents were present for 72% of observed encounters. Parents were greeted by the team 66% of the time, participated during 81% of encounters, and clarified or corrected information for the team 39% of the time. Fifteen percent of patients in the study were of limited English proficiency, which is consistent with the hospital demographic. An interpreter was present for 65% (11/17) of these encounters. The patient was examined by a physician in 38% of encounters. Neither parental participation during rounds (0.02 ± 0.85 minutes, P = .97), nor the presence of an interpreter (0.03 ± 1.50 minutes, P = .97) was statistically associated with increased rounding time. In addition to the physicians and physician trainees, rounds were attended by nurses (69%), nutritionists (20%), and case managers (18%).

Location
Fifty-four percent (n = 86) of observed encounters occurred outside of the patient’s room. Three percent occurred outside the patient’s room at the family’s request. The remainder was due to the preference of the health care professionals, or reasons that could not be determined by the investigators. Patients on infectious isolation comprised 38% of observations, and 85% of these patients had rounds occur outside of the room. Infectious isolation was associated with rounds occurring outside the room (OR 8.4, 95% CI 3.7–18.6, P < .0001). Location of rounds inside compared with outside the room was not statistically associated with rounding time (0.03 ± 0.71 minutes, P = .94).

Events
On average, rounds for each patient encounter lasted 7.9 minutes (range, 2.0–19.3). The patient presentation took 3.5 minutes (range, 0.7–9.8), the diagnostic discussion 3.6 minutes, and the summary and discussion with the parent 2.2 minutes. (The sum of each component does not equal 7.9 minutes owing to some overlap in the events.) Medical student performance of the patient presentation was associated with increased time spent on the diagnostic discussion (1.14 ± 0.92 minutes, P = .02), but was not associated with overall rounding time (−0.04 ± 0.57 minutes, P = .89). Approximately 0.9 minutes was spent wearing protective barrier equipment for patients on infectious isolation; 1.3 minutes were spent in between patients (termed “door-to-door time”).
care provider during FCR, not directed to the remainder of the team, and not clearly relevant to the patient being discussed. The importance of or reason for the interruptions and interjections, or their effect on distracting the team, was not determined. Overall, these events were observed 574 times during the 159 patient rounding encounters (Table 2). Two hundred twenty-three interjections were directed at the person giving the patient presentation. The attending physician and fellow interjected most frequently, followed by the senior resident, parent, and nurse. Per observed encounter, there was an average of 1.3 (range, 0–16) interjections to the person presenting the patient, 1.2 (range, 0–5) interruptions to the team by pager or phone, and 1.1 (range, 0–5) verbal interruptions to team members other than the person presenting the patient’s case. Verbal interruptions to the team were significantly associated with an increased duration in the time spent on the patient presentation (0.24 ± 0.23 minutes, \( P = .03 \)). However, there was no significant association with either interruptions or interjections and overall rounding time (−0.11 ± 0.20 minutes, \( P = .27 \) for interjections to the presenter, 0.03 ± 0.20 minutes, \( P = .78 \) for verbal interruptions to the team, and 0.09 ± 0.24 minutes, \( P = .46 \) for interruptions by pager or phone).

Teaching behaviors performed by supervising residents and attending physicians during 90 rounding encounters are shown in Table 3. The most common teaching behavior performed by attending physicians was providing generalizable teaching points. The most common teaching behavior performed by supervising residents was providing reinforcement for correct thought processes. Three different types of teaching behaviors (range, 0–10 behaviors) were identified per rounding encounter on average. Controlling for rounding time and location of rounds, there was no significant relationship with teaching and the presence of the parent during rounds (OR 1.08, 95% CI 0.98–1.20, \( P = .14 \)).

With the exception of teaching of the physical examination, other teaching behaviors were not individually or in total associated with increased rounding time (0.02 ± 0.2 minutes, \( P = .83 \)). Physical examination of the patient by multiple trainees occurred in 13% of rounding encounters (20/159) and was associated with an increased rounding time (0.97 ± 0.81 minutes, \( P = .02 \)).

**DISCUSSION**

**Strengths**

Several studies have attempted to characterize the multifaceted culture of inpatient rounds and FCR with the use of quantitative or qualitative methods. Literature exists on FCR practices in the PICU\(^6,9,16\) and NICU.\(^17–19\) However, with the exception of the hematology-oncology field,\(^2\) there are limited published data regarding FCR practices on subspecialty services. Our study used direct observations and objective measurements of the general pediatric and neurology subspecialty services rather than estimates to record events over a period of months. Our methodology permitted identification of multiple simultaneous events with the use of a software program and the presence of up to 3 investigators during rounds. We were able to both characterize teaching during rounds by using specific teaching behaviors and analyze the participation of parents of limited English proficiency.

**Participants**

Although parents were present for nearly three-fourths of the observed

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**TABLE 2** Summary of Interruptions to the Presenter and Other Team Members During Inpatient Rounds

<table>
<thead>
<tr>
<th>Source</th>
<th>To Presenter</th>
<th>Source</th>
<th>To Team Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic interruptions by pager or phone</td>
<td>17</td>
<td>Electronic interruptions by pager or phone</td>
<td>170</td>
</tr>
<tr>
<td>Interjections by team members during patient presentation</td>
<td>206</td>
<td>Verbal interruptions by health care providers</td>
<td>181</td>
</tr>
<tr>
<td>Attending physician</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior resident</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL1 resident</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The source of verbal interruptions to team members could not be determined.
encounters, we were unable to capture 100% parental participation during inpatient rounds. The exchange of information is bidirectional, because parents often have corrections or clarifications for the medical team. It is feasible that more parents would participate if a formal orientation to the FCR process existed. Parents may feel more engaged during rounds if the rate of greeting the parent were improved, because parents are more likely to make meaningful contributions when they feel welcome.3 Despite nurses attending rounds nearly 70% of the time, other multidisciplinary health care providers were not routinely present. Ideally, multiple providers, including a pharmacist and discharge planner, would join the family and physician/nursing team for rounds.20 Of note, parents prefer the bedside nurse to attend rounds.4

### Location

The majority of encounters occurred outside the patient’s room, yet rarely at the request of the parent. It is not clear why rounds were not inside the room for the remainder of the cases. Potential reasons include the following: (1) the need to wear barrier equipment for patients on infectious isolation, (2) fear of waking the family, (3) concern about discussing sensitive topics with parents present, or (4) being unclear if adults in the room were the legal guardians of the patient. Families may become more anxious when witnessing discussions happening outside the patient’s room.1 Rounds in the room provide the team an opportunity for patient assessment, as well as teaching of physical findings. A minority of patients were examined during rounds, supporting findings from Brigham and Woman’s Hospital.21 Teaching of the physical examination, by encouraging multiple trainees to perform the examination, increased rounding time in our study.

### Events

Many studies addressing efficiency on rounds rely on estimates of time rather than on deliberate measurement. Several studies suggest that
FCR may be lengthier than traditional rounds. Our average time for rounds per patient is shorter than in the study by Phipps in the PICU and is consistent with a study of work rounds on a general internal medicine unit. However, the range of our recorded rounding times is striking. Although one may expect this given varying patient complexity, standardization of the patient presentation may be an important area of focus, because the range for patient presentations was between 1 and 10 minutes.

Patients are not always located in geographically adjacent rooms. The average of 1.3 minutes spent in door-to-door time, although consequential for 2 or 3 patients, may be responsible for greater inefficiency when that time is multiplied by the total number of patients. A study of surgical rounds indicated that 18% of the time on rounds was spent traveling between patients.

During preliminary data analysis for the fall study phase, interruptions to the team were associated with an increased rounding time. However, at the completion of the study, the impact of interruptions on rounding time failed to reach statistical significance. One hypothesis is that, although some interruptions distract the team's thought process, other interruptions help focus the discussion, thereby decreasing rounding time. However, the quality of interruptions could not be identified during this study. There are data to suggest that learners find interruptions disruptive to their oral case presentations and that provider communication for patient handoffs may be improved by minimizing interruptions. Rounds may be considered analogous to a handoff in that key information about the patient is discussed to create a shared mental model of the patient.

Most trainees agree to the benefits of communication and family satisfaction as a reason to conduct FCR, but they have concerns about the effect on their learning. In a recent ethnographic study, teaching was found to be impacted, although not prohibited, by contextual factors during bedside rounds. The primary learning reported to occur during FCR or bedside rounds has been described as pertaining to communication skills, physical examination, or bedside manner. In our study, a wide array of additional teaching behaviors by the senior resident and the attending physician occurs during rounds. Specific time spent teaching was not quantified in this study. Apart from teaching of the physical examination, other identified teaching behaviors do not appear to increase overall rounding time and do not appear to be impacted by including the family on rounds at our institution.

Subspecialty Practice

The neurology service was chosen as a comparison group, because it carries a census high enough to warrant a separate team of trainees and conducts FCR in a similar fashion. There do not appear to be significant differences in the rounding practices of the neurology and hospitalist services, other than that rounds occur in the room more frequently and the parent is more often present for rounds on the neurology service.

Limitations

The limitations of our study include data collection in a fast-paced dynamic environment where certain process events overlapped. Indeed, >14,700 data points were collected. The presence of parallel clocks on the Microsoft Access program allowed for capturing of concurrent events, but it is possible that some events were missed. Events such as computerized order entry and retrieval of laboratory or radiologic studies, which are routine practice during rounds at our institution, were not recorded. During door-to-door time, team members engaged in multiple one-to-one conversations or continued debriefing from the previous patient encounter, but the nature of these discussions could not be recorded because of the number of simultaneous conversations and team movement. Observations were made only at a single institution, with key process events based on the rounding practice at our facility. Therefore, the results may not be generalizable to other institutions. However, we collected data during both the fall and the winter to help adjust for seasonal variation in trainee experience and patient census. Our findings may have been influenced by the presence of the study team on rounds. However, the study team did not interact with the health care professionals or families. Rounds were conducted in their typical routine, suggesting that the results are applicable to our daily practice. We did not record the daily patient census during the days that rounds were observed, nor did we observe rounding that occurred on the weekends. We also did not identify patients as having been new or preexisting for the medical team and, therefore, are unable to describe associations with rounding time and day of hospitalization. Specific characteristics about participants (health care team members and patients) were not collected.
CONCLUSIONS

Inpatient rounds at our institution take an average of 8 minutes per patient, occur in the room less than half the time, but do include the parents most of the time. Parents regularly correct or clarify information during FCR, and this participation is not associated with increased rounding time or decreased provision of teaching to trainees. Additional efforts are necessary to further engage families and bedside nurses to actively participate during FCR. Apart from teaching of the physical examination, none of the other identified teaching behaviors are associated with increased rounding time. Minimizing door-to-door time, streamlining patient presentations, and decreasing interruptions may improve rounding efficiency.

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REFERENCES


