Better Etiquette for Effective Paging (B.E.E.P.)—Improving Daily In-hospital Communications in the Pediatric ICU

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INTRODUCTION

Paging is a vital part of hospital care that allows quick contact between physicians and other hospital personnel. There was no structured way to send a page to physicians at our institution. We hypothesized that by standardizing paging format, scheduling laboratory draw times, and using order clean-up sheets, through a bundle of interventions called Better Etiquette for Effective Paging, we would decrease the number of pages received on the pediatric intensive care unit (PICU) resident pager by 15%.

Methods: This project was a quality improvement initiative in a 25-bed multidisciplinary PICU in a tertiary children’s hospital. Baseline data collection was performed in December 2015, categorized by time of day received and type of page. Interventions were paging standards to include relevant information, scheduling laboratory draw times, and order clean-up sheets. We collected postintervention data over 3 years to monitor for sustained change.

Results: The average number of pages decreased from a baseline of 4.71 pages/patient/d in 2015 to 3.70 in 2016 (21% decrease), 3.32 in 2017 (30% decrease), and 2.74 in 2018 (42% decrease). The average PRISM 3 score remained similar in all sets (2.52, 2.50, 2.10, and 2.35). The standardized mortality ratio was not adversely affected by the decrease in pages (0.58, 1.07, 1.19, and 0). Conclusion: Standardizing the format of pages and using scheduled laboratory times with order clean-up sheets has decreased the number of pages/patient/d in the PICU by 42% without adversely affecting patient care. We can continue to improve communication among the patient care team by emphasizing efficient, standardized communication using Better Etiquette for Effective Paging. (Pediatr Qual Saf 2021;6:e423; doi: 10.1097/pq9.0000000000000423; Published online June 23, 2021.)

Abstract

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Better Etiquette for Effective Paging

Phase Five

We surveyed PICU nurses and pediatric residents who rotated through the PICU after implementing BEEP to assess the level of satisfaction with the newly structured paging system.

Interventions

We implemented 3 interventions simultaneously—paging etiquette guidelines, order clean-up sheets, and scheduled laboratory times. Paging etiquette guidelines (Fig. 1A) highlighted the various components of an effective alpha page and the reasons to send an alpha page or an extension page through a HIPAA-compliant paging system. We presented the guidelines to nurses and RTs, who were encouraged to send an alpha page whenever possible to allow providers to prioritize and triage their pages and assess page acuity. A page to a phone extension without any other text was considered an emergency—the provider must call back immediately to ensure proper follow-up. The goal was to maximize alpha paging benefits and allow efficient triage of the numerous pages received on the PICU resident pager. Anyone sending a page was encouraged to be clear, offer appropriate suggestions,
and include relevant information such as the category of the page (STAT, ASAP, Routine, and FYI), patient room number, patient last name and first initial, the message regarding the patient, and sender name with phone extension to call back as needed. We also provided samples of effective pages.

We instituted order clean-up sheets (Fig. 1B) to avoid multiple pages requesting medical record clean-up. It is imperative that all orders on the patient’s chart are up-to-date and reflecting current management to avoid errors, treatment gaps, or duplicate tests. To maintain patient record integrity, we introduced this sheet in the PICU to allow nurses and RTs, who review the patient’s chart and list of orders regularly throughout their shifts, to list orders that are no longer in effect or need to be modified to reflect the patient’s current status. These sheets are filled out by the nurses and RTs and are handed directly to the physician team during the morning and/or evening rounds. The goal with these order clean-up sheets was to minimize nonurgent pages while optimizing patient care.

Implementation of scheduled laboratory times (Fig. 1C) aimed to avoid drawing nonurgent laboratories at random times during the day. Bedside staff (nurses and RTs) must report all abnormal laboratories, so there are many pages for abnormal laboratories at all hours of the day. Scheduled laboratories drawn at specified times of the day were done for patients who received daily or weekly scheduled bloodwork for monitoring clinical status. This ensured providers could expect when they would receive pages regarding abnormal or critical laboratory values. If a patient was critically ill and required urgent results, providers could have laboratories drawn at their discretion and clinical judgment.

Process maps served as a reference and highlighted the paging process before and after these interventions (Fig. 2).
Outcomes
As stated above, we categorized each set of pages by type of page and time received and subsequently compared them. We also calculated the average number of pages per day, pages per patient, and pages per patient per day. Last, we compared the average unit mortality, median PRISM-III score, and SMR among the 4 time periods.

Statistical Analysis
Descriptive statistics are given as mean + SD or median with range for continuous variables, and number with percentages for categorical variables. A one-way ANOVA procedure was performed to assess the change in paging rate between four time points. Post hoc tests were done using Tukey adjustment for multiple comparisons. The Kruskal–Wallis Test procedure was used to test if there is a significant difference in PRISM-III score among the 4 time points. All statistical analyses were performed using IBM SPSS Statistics (Version 26; IBM Corporation 1989, 2019).

RESULTS
Phase One
The preimplementation survey indicated that 64% of the nurses believed that we needed to improve the unstructured paging system. Frustration from the surveyed nurses primarily stemmed from a lack of prompt responses to their pages, especially those considered urgent (critical laboratories, changes in patient’s clinical status, etc.). Ninety-two percent of pediatric residents believed that we needed to improve the paging system. Frustration from the surveyed residents focused on the increased abundance of noncritical pages received, especially in the middle of the night, and encouraged the more efficient use of rounding time to decrease unnecessary pages.

Phase Two
In December 2015, the PICU resident pager received 2,615 pages throughout the month. An average of 20.56 patients was admitted to the PICU per day, resulting in 96.85 pages/d and 4.71 pages per patient per day. The median PRISM 3 score of all PICU patients during that month was 2.00, with a 1% overall mortality and an SMR of 0.58.

During this month, most pages (33%, 863/2,615) occurred between midnight and 7 AM. Most of the pages (39%, 1,016/2,615) were categorized as “Routine,” thereby nonurgent, followed by critical laboratory results (17%, 439/2,615). Residents received 280 pages between 2 AM and 5 AM, usually when most residents rest while on night call (Fig. 3). A PICU physician and PICU nurse categorized 100 of these 2,615 pages to assess interrater reliability and agreed on 92% (92/100) of the categories assigned.

Phases Three and Four
Postimplementation of the BEEP interventions, pages decreased from an average of 4.71 pages per patient per day in 2015 to 3.70 in 2016, 3.32 in 2017, and 2.74 in 2018, an overall reduction of 42% over the 4 periods (P value < 0.001). The median PRISM-III 3 score remained similar in all sets (2.00 in 2015, 0.00 in 2016, 1.50 in 2017, and 2.00 in 2018, P value 0.333). The SMR during each of these periods was 0.58 in 2015, 1.07 in 2016, 1.19 in 2017, and 0 in 2018. See Table 1 for data.

After comparing the categories of pages received before and after implementation of BEEP interventions, we noted that the number of pages received as a phone extension to call back progressively decreased from 435 in 2015 to 143 in 2018 (a 67% decrease), possibly indicating the successful implementation of using phone extensions for genuine emergencies only. We also noted a decrease in nonurgent (FYI and ROUTINE) pages from 1,392 in 2015 to 927 in 2018 (a 33% decrease), and an increase in urgent (ASAP and STAT) pages from 349 in 2015 to 952 in 2018 (a 172% increase), possibly indicating the successful implementation of paging etiquette guidelines.

The average number of pages per patient during rounds was 6.11 in 2015 and 5.38 in 2018 (P value 0.173). During resident educational conferences, the average number of patient pages was 1.89 in 2015 and 2.28 in 2018 (P value 0.434). We had hoped to significantly decrease these 2 time frames to enhance efficient patient care during rounds and optimize resident learning without interruptions. However, the average number of pages received between 2 AM and 5 AM significantly decreased from 10.81 pages per patient per day in 2015 to 5.56 pages per patient per day in 2018, a 49% decrease (P value < 0.001) (Figs. 4 and 5).

Phase Five
The postimplementation survey indicated that 70% of nurses who responded to the survey were either very satisfied or satisfied with the BEEP guidelines. Of the pediatric residents who responded to the survey, 71% preferred to receive BEEP-compliant pages, and 92% believed BEEP is an effective method of paging, primarily because it allowed residents to triage their pages, prioritize their responsibilities, set response time expectations for nurses and RTs, and encouraged more efficient workflow. Ninety-six percent of the residents recommended promoting BEEP in other patient care units, especially in the neonatal ICU (NICU), which is currently under process.

DISCUSSION
To improve our alphanumeric paging system’s efficiency, we instituted 3 specific BEEP interventions in our PICU—paging etiquette guidelines, order clean-up sheets, and scheduled laboratory draws for routine laboratory orders. Implementing the BEEP bundle resulted in an overall 42%
reduction in pages received on the PICU resident pager over 4 years and increased nurse and resident satisfaction. Also, the number of nonurgent pages and phone extension pages decreased over 4 years, likely due to efficient categorizing and increased awareness of the detriment of unnecessary paging. Decreased pages were not associated with increased standardized mortality. This finding is a crucial balancing measure to show that although nurses were paging less, patient safety was not compromised.

Previous studies have demonstrated several challenges with in-hospital communication while abiding by patient privacy laws despite technological advancements. Several different communication methods are used throughout hospitals – alphanumeric paging, mobile phones, smartphones, hands-free communication devices, and task management systems. Paging is known to disrupt patient care, especially without a standardized method. This observation is partially due to challenges in the technological aspects of hospital communication—system delays, lack of integrated tools, unintuitive user interfaces, etc. Traditional paging methods do not always portray urgency, especially when paged to a call-back number. Alphanumeric paging, on the other hand, consists of 1-way or 2-way communication while emphasizing urgency. It has been shown to improve physician satisfaction, is associated with a decreased number of perceived adverse outcomes and delays in care, improves patient care and physician efficiency, minimizes resident learning interruptions, and enhances healthcare personnel time management.

![Graph showing times and categories of pages received before BEEP—December 2015.](image)

**Table 1. Comparison of Pages from December 2015 to December 2018**

|                        | December 2015 | December 2016 | December 2017 | December 2018 |
|------------------------|---------------|---------------|---------------|---------------|
| No. total pages received | 2,615         | 2,491         | 2,333         | 2,023         |
| No. days analyzed      | 27            | 31            | 31            | 31            |
| Average No. patients/d (± SD) | ± 3.17         | ± 2.40         | ± 1.81         | ± 2.06         |
| Average No. pages/d (± SD) | 96.85          | 80.35          | 72.91          | 63.22          |
| Average No. pages/patient/d (± SD) | ± 22.15       | ± 18.63        | ± 21.43        | ± 10.26        |
| Average No. pages/patient from 9 AM to 12 PM (± SD) | ± 0.82       | ± 0.70         | ± 0.97         | ± 0.49         |
| Average No. pages/patient from 12 PM to 1 AM (± SD) | 6.11          | 7.13           | 6.34           | 5.38           |
| Average No. pages/patient from 1 AM to 5 AM (± SD) | ± 2.79        | ± 3.72         | ± 3.44         | ± 2.27         |
| Average No. pages/patient from 5 AM to 9 AM (± SD) | 1.89          | 2.61           | 2.47           | 2.28           |
| Average No. pages/patient from 9 AM to 12 PM (± SD) | ± 1.19        | ± 1.94         | ± 1.85         | ± 1.84         |
| Average No. pages/patient from 12 PM to 1 AM (± SD) | 10.81         | 9.32           | 8.16           | 5.56           |
| Average No. pages/patient from 1 AM to 5 AM (± SD) | ± 3.97        | ± 4.13         | ± 4.06         | ± 2.66         |
| Median PRISM 3 Score (average; minimum; maximum) | 2.00 (3.37; 0; 28) | 0.00 (3.15; 0; 39) | 1.50 (3.86; 0; 42) | 2.00 (3.33; 0; 32) |
| Mortality (%) | 1             | 3             | 3             | 0             |

**Fig. 3.** Times and categories of pages received before BEEP—December 2015.
This study is unique in that it analyzes the pages received in a 25-bed, high acuity pediatric ICU at a tertiary center, requiring efficiency in all communications. Additionally, it combines the results of a survey with prospective pager data. It compares the PRISM-III scores and SMR during each period to ensure that the decrease in pages did not adversely correlate with changes in patient acuity and mortality. We also looked through the hospital’s error reporting system. We did not find any reported communication errors or challenges related to paging during these studied time frames. However, communication failures may be reported elsewhere, such as in root cause analyses, and must be investigated further to ensure patient safety. When combined, all 3 interventions have proven successful in sending efficient and accurate pages while safely minimizing nonurgent pages. Physicians can now triage their pages appropriately and maintain compliance with HIPAA, resulting in improved patient care, patient safety, and physician–nurse/RT relationships.

Although the overall average number of pages decreased significantly by 42% from 2015 to 2018, the average number of pages during rounds only slightly decreased by 12%. The average number of pages during educational conferences increased by 21%. Although this data were not statistically significant, it encourages growth and further education regarding the importance of uninterrupted rounding time and protected resident education time. We can also further improve the education of FYI pages, which do not allow for closed-loop communication among the medical team, potentially affecting patient safety. We need to encourage the required use of “read receipts” available with our current paging system, allowing the sender of the page to receive a notification that the page has been received and read by the receiver.

**Limitations**

We found several limitations throughout the implementation of a new paging strategy. This initiative was a single-center study limited to the pages received by PICU residents. It did not include the pages sent to the fellow physician or attending physician, making the total number of pages received an inaccurate representation of the total number of pages during the months studied. It also excludes other patient care units in the Children’s Hospital, although we have currently implemented BEEP in these units. The primary mode of communication in
these units is also alphanumeric paging. Since our sample size of pages analyzed was almost 10,000 total pages, we expect generalizability to other patient care units and services. Last, the reviewer’s subjective assessment of urgency and nonurgency could bias the categorization of pages.

CONCLUSIONS

Paging is a primary form of communication in many hospitals. Most pages are essential and clinically relevant; however, several other pages should be communicated via other forms in a nonurgent matter or time.

Standardizing the format of pages, labeling pages with a category of urgency, encouraging the use of scheduled laboratory times, and order clean-up sheets have decreased the number of pages per patient per day in the PICU received by 42% without adversely affecting patient care. Other departments in the institution, including the Neonatal ICU and the adult Medical Center, have adopted BEEP guidelines. We can continue to improve communication among the patient care team members by emphasizing efficient communication with our current paging systems.

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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