Alphanumeric Paging: A Potential Source of Problems in Patient Care and Communication

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PURPOSE: In recent years, the use of numeric paging in many medical centers has been largely replaced by 1-way alphanumeric paging. There is currently no research studying the potential for alphanumeric paging to lead to problems in communication. The purpose of this article is to determine whether the use of alphanumeric pagers may lead to potential problems in patient care and/or communication.

METHODS: Alphanumeric pages sent to residents on 3 surgical services at the Medical College of Virginia Hospital were collected over a 3-month period. The pages were classified according to reason for the page, amount of information provided, and follow-up required.

RESULTS: A total of 52,384 alphanumeric pages were sent to residents on the surgical services over a 3-month period. There were 1037 pages (2.0% of total) that contained patient laboratory results. 11,844 pages (22.6% of total) contained a callback number with no sender information and 6198 (11.8% of total) contained a callback number and sender information. Trauma pages totaled 10,312 (19.7% of total). There were 2636 pages (5.0% of total) that contained identifying information, potentially violating HIPAA regulations.

CONCLUSIONS: The authors have observed a significant number of occurrences in which alphanumeric pages lack sufficient information, do not indicate the urgency of the page, and still require immediate callback by residents. This potentially interrupts patient care and educational activities. (J Surg 68:447-451. © 2011 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: 1-way communication, paging, surgery, errors

COMPETENCIES: Systems-Based Practice, Interpersonal and Communication Skills, Patient Care, Professionalism

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INTRODUCTION

Until the last several years, numeric paging has been the main route of communication between physicians and the rest of the care providing team. The advent of alphanumeric paging in which comprehensive information can be transferred has allowed 1-way communication to take place. One-way communication is defined as communication in which information is always transferred in only 1 preassigned direction. By relaying information through an alphanumeric page, nurses no longer have to wait for physicians to return their pages. Furthermore, studies have shown that the implementation of an alphanumeric paging system has decreased disruptions to patient care, educational activities, and physician workflow.[1-3] Without having to respond via telephone call to each numeric page, physicians can triage pages according to their content and perceived urgency, and they can discriminate between those pages that require immediate attention and those that do not. Conversely, senders of the message are able to relay information without needing to wait at a particular telephone terminal for a callback to do so. Such ability to judge the urgency of messages received and reduce the wait time for pages to be returned has increased satisfaction among both physicians and the nursing staff.[1]

In an environment of increasing focus on reducing medical errors and improving quality of care, it has been suggested that alphanumeric paging can serve as a solution to the interruptions and distractions that are caused by frequent paging of residents. Often work inefficiencies and disruptions to patient care have been attributed to the behavior of frequent numeric paging.[2] By making it possible for receivers of the page to judge the urgency of the message, residents can respond after they have completed important tasks necessary for safe patient care, thus reducing medical errors.

It is now becoming a standard that 1-way alphanumeric paging is the method of choice for communication among attending physicians, residents, and ancillary staff. At the authors' teaching hospital, alphanumeric paging is the main route of telecommunication to the attending physicians and residents. Although there have been advantages gained since the transition from numeric paging, it has also been noted that potentially

problematic incidents have occurred using 1-way communication.[4] These incidents have created potential errors in communication between the team members providing care. For example, a nurse will relay a message regarding abnormal vital signs, but the resident may be in the operating room or another area of the building where the message cannot be received; in another scenario, the resident is occupied and cannot answer immediately and, thus, cannot let the sender know the information has been received, leaving the sender uncertain whether the message has been relayed.

It is hypothesized that although there are significant advantages to using 1-way alphanumeric paging over numeric paging, there is still potential for inefficient communication, compromised patient safety, and suboptimal patient care. Additionally, how alphanumeric paging is used in daily workflows may restrict the purported advantages of this method. There are no reports that have addressed this topic.[5,6]

METHODS

Study Setting

This study was carried out in an academic medical center, the Medical College of Virginia Hospital (779-bed tertiary-care referral center), in Richmond. In this hospital, alphanumeric paging is the official system of communication to all residents. Alphanumeric messages are sent by 3 methods: (1) calling Telepage operators, (2) using the intranet-based Telepage system, or (3) directly paging through the telephone. Residents are not provided mobile phones and must use hospital phone terminals to return pages.

Subject Population

All alphanumeric messages sent to residents on the General Surgery, Trauma Surgery, and Surgical ICU services were obtained over a 3-month period, from July to September 2008, after Institutional Review Board (IRB) approval. The subject population included surgery residents as well as residents of other specialties rotating through the surgical services during this 3-month period. Messages were obtained from the hospital paging system, Telepage. All identifying information, including names and pager numbers, was removed from the dataset. Telepage operators were not involved as investigators in the study and were used only to obtain the alphanumeric pages.

Alphanumeric messages collected over the 3-month period included those sent by attending physicians, residents, nursing staff, and other hospital ancillary staff on both the surgical and nonsurgical services. The information used for evaluation included only the content of the message. The messages were then evaluated according to reason for the page, omission of pertinent return contact information, whether information in the message could potentially violate the Health Insurance Portability and Accountability Act of 1996 (HIPAA) regulations, the follow-up action required for the message, or whether there was a potential disruption in workflow if the message was not received by the resident.

Category of Pages

Pages were divided into 11 categories depending on their content. Categories include (1) callback number, in which only a phone number is provided; (2) callback name and number, in which the sender includes his or her name and phone number; (3) trauma call, which is a mass page sent to all residents listed as being on the Trauma service at that time; (4) team update, which includes resident-to-resident pages regarding work specific to their care teams; (5) change in patient status, in which nurses page residents regarding changes in patient condition; (6) notification of test result, which includes pages sent to residents by the laboratory or imaging centers or nurses regarding new test results; (7) consult request, by which residents are notified of new consults from other care teams; (8) request for medication orders, by which nurses request residents to write orders for patients; (9) request for paperwork, in which the sender requires the resident to fill out necessary documents in order for patient care to be provided; (10) nonpatient care-related, which include personal messages sent between residents; and (11) other, which include error messages, unclear text pages with no discernable messages, and request for callback or information from an outside number. Messages were not categorized according to sender or receiver. No pages were excluded from the study.

RESULTS

Summary Data

A total of 52,384 alphanumeric pages were sent to residents on the surgical services over a 3-month period (Table 1 and Fig. 1). Messages that contained a callback number with no sender identification totaled 11,844 (22.61% of the total). Messages that contained a callback number and sender name totaled 6198 (11.83% of the total). There were 1037 alphanumeric messages (1.98% of the total) that contained patient laboratory results and required resident follow-up. Overall, 1273 pages (2.43% of the total) included information regarding changes in a patient's status and required resident follow-up. There were 249 instances (0.5% of the total) in which residents were paged regarding consult requests and 411 pages (0.8% of the total) sent requesting the resident to place an order (ie, medication and test). A total of 1803 pages (3.44% of the total) relayed information regarding educational activities and team updates (ie, educational conferences and patient sign-offs). Trauma pages sent by Telepage operators to the Trauma Surgery team totaled 10,312 (19.69% of the total). There were 2636 pages (5.03% of the total) that contained patient identifying information and could potentially violate HIPAA regulations. There were 124 messages (0.2% of the total) of a personal nature with no relation to patient care. There were 18,966 pages (36.21% of

the total) that did not fall in the above-mentioned categories. These pages included error messages, unclear text messages with no discernable purpose, and pages sent from outside numbers requesting information or a callback.

DISCUSSION

Alphanumeric pagers have recently been rising in popularity as a result of their convenience in relaying messages. However, they have many potential downfalls, with the most obvious being errors in communication either from unclear text or failure of direct person-to-person communication. It was hypothesized that alphanumeric paging is not the most efficient way to relay messages and can lead to communication problems resulting in errors in patient management.

Potential for Errors in Patient Care

Roughly 1.98% of all pages sent to residents during the 3-month period included information about patients' tests or laboratory results. Although this avenue of providing information allows the resident to learn of results earlier than waiting to call the laboratory or test center and potentially making repeated phone calls to receive information, there is a possibility that the message is not received. This can lead to delays in patient care and medical errors.[7]

The content of 2.43% of pages indicates a change or an update in a patient's status. Similarly, a small proportion of pages to residents was sent by other residents requesting consult evaluations on patients. The inability of the sender to receive delivery confirmation of the page can lead the sender to wonder if receipt of the page occurred, create wait times for response from the resident regarding appropriate action, and lead to suboptimal patient care. It is also possible that the resident does not receive the page, is unaware of changes in the patient's status, and is unable to respond adequately (ie, write a prescription or examine the patient), thus potentially creating a situation in which suboptimal patient care is provided.[8]

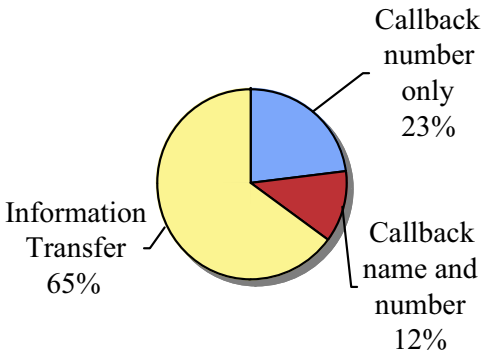

FIGURE 1. Content of alphanumeric pages.

Use as Numeric Paging

Although alphanumeric pagers can display both numbers and text, it was found that more than 23% of messages sent to residents included only a callback number. Another 12% of all messages sent to residents included only a callback number and the sender's name. Both types of pages do not provide information regarding the urgency of the page and can be considered a numeric page that necessitates an immediate callback, thereby creating disruption in patient care or educational activities. It is possible that this method of paging the resident is used to encourage immediate callback, even if the reasons for the call are not urgent. Furthermore, it is unclear whether the purpose of the page was to relay important patient information. It is possible for the resident to not receive the page containing pertinent information or respond immediately, potentially resulting in suboptimal patient care.

In total, there were 20,652 pages (39.42% of total) that have a potential in resulting in patient harm if the message is not

TABLE 1. Categories of Alphanumeric Pages

Content of Page	Number (%)	Example
Callback number	11,884 (22.61)	x81234
Callback name and number	6198 (11.84)	[Resident]x81234
Trauma call	10,312 (19.69)	22222 Echo ETA 5 minutes
Team update	1803 (3.44)	8 a.m. rounds on Main Hospital 9. have vitals ready
Change in patient status	1273 (2.43)	possible tension pneumothorax on CT patient status post VATS
Notification of test result	1037 (1.98)	Ultrasound done on Patient X. free fluid present, not there yesterday
Consult request	249 (0.48%)	please call team 1 regarding a consult on patient × with port-a-cath swelling and erythema
Request for medication order	411 (0.78%)	Patient X—can he have a PO dose of Benadryl® for sleep?
Request for paperwork	127 (0.24%)	when you have time, please consent Patient X for toe amputation
Nonpatient care-related	124 (0.24%)	food in the team room when you are done with rounds
Other	18,966 (36.21)	includes error messages, unclear text pages, request for callback and/or information from an outside number example: 804-555-1212 home health regarding orders for patient × dob 1/1/2001 seen with [Resident]
Total	52,384 (100)	

relayed adequately. These include pages containing only a callback number and/or name, consult requests, changes in patient status, test result updates, and request for medication orders.

HIPAA Violations

It was found that patient identifying information, including patient name and/or patient medical record number, was relayed in a significant number of pages, creating a potential source of HIPAA violations. HIPAA regulates the use and disclosure of patient information, establishing a set of standards to protect certain health information. In particular, the HIPAA Privacy Rule permits the disclosure of personal health information needed for patient care and other important purposes, whereas the Security Rule mandates that a series of safeguards are used to ensure the confidentiality of electronic protected health information. This includes security of the transfer of patient information through the use of alphanumeric paging. Because alphanumeric paging in the hospital is through the use of a secure and encrypted server, the mere transfer of patient identification and information through paging does not itself violate the HIPAA Privacy Rule. However, there are anecdotal reports of an increasing incidence of residents having pages automatically forwarded to their personal mobile devices in an effort to reduce the number of telecommunication devices they carry. Unless each personal mobile device has been modified by the hospital telecommunications team to ensure a secure transfer of information, it is possible that sending alphanumeric pages with patient information can violate HIPAA regulations.

Limited Workstations

Because sending an alphanumeric page still requires calling Telepage operators or using the intranet-based Telepage system, senders of a message must still find a phone or computer workstation to do so. Furthermore, senders who expect a callback must remain in close proximity to a telephone terminal.

Effective communication between providers in the hospital is essential to providing safe and optimal medical care. Previous studies have purported that transitioning from a numeric paging system to adopting an alphanumeric paging system has increased satisfaction among providers, decreased disruptions in workflow, improved the means of communication in the hospital, and improved patient care and patient safety. However, this study shows there are still errors in communication that could potentially negate the advantages in adopting and using a 1-way alphanumeric paging system. In particular, the area of biggest concern that has the most significant impact on patient care is the fact that the sender is not informed of whether the intended recipient has received the page in a timely manner. Without immediate receipt confirmation, there is potential for incomplete or no transfer of important patient care information, possibly resulting in patient harm.

Consequently, there is significant value in improving how 1-way alphanumeric paging is used. For example, intern training before the start of the year as well as nursing orientation can include modules on what type of information should be relayed through alphanumeric paging and what may be better transferred through direct person-to-person communication. In particular, calling consult requests or relaying urgent changes in patient status should be done through direct communication instead of relaying information through 1-way alphanumeric paging.

There are limitations to this study. For example, evaluation of the types of pages sent was limited only to residents on 3 surgery services within a 3-month period. It is possible that an evaluation of a longer period may reveal slightly different paging behaviors. Additionally, no pages to other residents, attending physicians, or ancillary staff of other medical services were evaluated, thereby creating a potential selection bias. However, the goal of this study was to obtain a simple snapshot of the potential errors in communication that may be caused by the use of 1-way communication via an alphanumeric paging system. Potential effects and errors on other hospital service lines need to be investigated separately. There was also no data available regarding the prevalence of residents forwarding pages to their personal devices; consequently, potential HIPAA violations cannot be objectively quantified. Finally, because a paging log was not collected from residents that included events resulting from each page, data regarding what happened after each page was sent could not be determined (ie, if the page was received in a timely manner and if the patient information was relayed appropriately).

CONCLUSIONS

There is currently a shift in the way communication is handled between resident and hospital staff, with an increasing number of hospitals investigating the possibility of transitioning to more direct communication via 2-way pagers and the use of mobile phones for each provider. There is currently no data comparing satisfaction among care providers, efficiencies in workflow, and prevalence of medical errors when using 1-way alphanumeric paging versus 2-way communication methods. Based on this experience in how 1-way alphanumeric paging is used, it seems there is an opportunity to improve the efficiency of communication further between hospital staff and residents, potentially reducing medical errors and disruptions to patient care and physician workflow. Future studies should explore any potential advantage 2-way communication has over the current standard of 1-way alphanumeric paging.

REFERENCES

1. Nguyen TC, Battat A, Longhurst C, Peng PD, Curet MJ. Alphanumeric paging in an academic hospital setting. *Am J Surg*. 2006;191:561-565.
2. Volpp KG, Grande D. Residents' suggestions for reducing errors in teaching hospitals. *N Engl J Med*. 2003;348:851-855.

3. Wong BM, Quan S, Shadowitz S, Etchells E. Implementation and evaluation of an alpha-numeric paging system on a resident inpatient teaching service. *J Hosp Med*. 2009; 4:e34-e40.

4. Sutcliffe KM, Lewton E, Rosenthal MM. Communication failures: an insidious contributor to medical mishaps. *Acad Med*. 2004;79:186-194.

5. Saboor S, Ammenwerth E. Developing a taxonomy of communication errors in heterogeneous information systems. *Organizing Committee of MIE 2008*. Amsterdam, the Netherlands: IOS Press; 2008.

6. Guerrero AF, Nunez LB, Thompson JC, et al. Alphanumeric paging in an academic military hospital setting. *Mil Med*. 2009;174:85.

7. Poon EG, Kuperman GJ, Fiskio J, Bates DW. Real-time notification of laboratory data requested by users through alphanumeric pagers. *J Am Med Inform Assoc*. 2002;9:217-222.

8. Haroon M, Yasin F, Eckel R, Walker F. Perceptions and attitudes of hospital staff toward paging system and the use of mobile phones. *Int J Technol Assess Health Care*. 2010;26: 377-381.