LIMITING THE DISTRACTING EFFECTS OF INTERRUPTIONS IN NURSING CARE

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Interruptions are pervasive in medical settings. The objective of this study was to develop recommendations for dealing with them. We focused on interruptions experienced by the nursing staff at a large Midwestern hospital. We observed workflow in two nursing stations with different layouts at various times of day, and conducted focus groups with nursing personnel. We identified several sources of the interruptions including: other people; auditory messages; shortages of equipment; software flaws; inconvenient location of supplies; layout of the nursing stations; work processes; and staffing levels. Our recommendations were aimed at limiting interruptions, reducing distracting effects, improving the working conditions of medical practitioners, and reducing the possibility of error.

Introduction

The Harvard Medical Practice Study, conducted in the early 1990s, investigated the outcome of more than 30,000 patient cases in 51 randomly selected hospitals in New York State. The results of the study indicated that:

- Adverse events occurred in 3.7 percent of the cases (Brennan, Leape et al., 1991)
- 13.6 percent of the adverse events led to the death of the patient (Leape, Brennan et al.. 1991)

Extrapolation from these results suggests there may be as many as 98,000 deaths each year in the United States that are due to medical error. These findings spurred attempts to reduce medical error and improve patient safety. An important part of this effort has involved applying Human Factors to the investigation of health care systems.

As part of this effort we are conducting a series of Medical Human Factors studies. First, we investigated heparin administration processes at a large Midwestern hospital. In the first quarter following implementation of the recommendations, there was an 11.4% reduction in heparin errors that resulted in increased monitoring or harm to patients on the cardiovascular nursing stations. In the subsequent quarter (4Q2003), there was a 37.8% reduction from pre-implementation baseline data (Harder, Bloomfield et al., in press). Next we investigated procedures used before, during, and after cataract surgery at a second Midwestern medical facility – again there was a reduction in medical errors after our recommendations were implemented (Harder & Bloomfield, 2004).

The study reported here – which is the third in the series – focused on the effect of interruptions on workflow in several nursing stations at a large Midwestern Hospital. Our objective was to develop recommendations aimed at reducing the number distractions and to limit their distracting effects.

Method

We conducted a Human Factors Review of medical practice at a large Midwestern Hospital (with 622 beds). We observed the workflow at two nursing stations that have different layouts – one circular (Station 35), the other with a pod structure (Station 41). The observations were made at several different times during the day – including busy times when shift changes occur (7:30 am to 9:00 am) and when patients are typically discharged (2:00 pm to 4:00 pm), as well as less busy times during the morning (9:30 am to 11:00 am) and evening (8:00 pm to 9:00 pm). Subsequently, we conducted focus groups with nursing personnel from both nursing stations and with personnel from three other nursing stations (Stations 30, 44, and 53). Our analysis of the information gathered from these activities is presented in the sections that follow.

Results

Our analysis indicated that the interruptions experienced by the nursing staff have many sources. We categorized these various sources and then developed recommendations for reducing the number of interruptions and/or limiting their distracting effects. Unfortunately, in some categories there do not appear to be ways of mitigating the effects of interruptions. The categorization of the sources of interruptions and recommendations to deal with them, where possible, are discussed below.

People: Nurses may be interrupted by the many people, including the following: (1) patients; (2) the family and friends of the patients in the station where the nurses work; (3) the family and friends of the patients staying in other stations; (4) physicians; and (5) other medical staff (including nursing assistants, other nurses, student nurses, new-employee nurses, transport personnel, social workers, dietary support, physical therapy, chaplains, etc.). It is difficult to limit interruptions caused by other people without severely limiting the overall effectiveness of the hospital.

Auditory messages: Nurses may be interrupted by: (1) telephones; (2) alarms; (3) announcements made on the public address system. While these sources of interruption cannot be eliminated, the effect of interruptions produced by telephone calls could be reduced by providing more mobile phones for the medical personnel. Nurses who already use mobile phones indicated that they were very convenient. A major advantage for nurses is that they only receive messages intended for them. Because of this dedicated use, other nurses are not distracted by phone calls that are not directed to them. Mobile phones also help to empower the patients. From the point of view of the nurses, this is good when the patient needs urgent medical attention, but may be problematic if the patient has a trivial request. Unfortunately, the mobile phones that are currently used by some nurses are bulky.

We *recommended* that smaller mobile phones be acquired and given to all nurses in the nursing stations. At shift changes, the phones would be transferred from the outgoing nurse to the oncoming nurse.

Shortage of equipment: Nurses reported that there was a shortage of the following: (1) pulse oximeters and thermometers; (2) computers; and (3) printers.

Because there are occasions when pulse oximeters and thermometers are being used by others, sometimes nurses must wait before they can use them – this shortage interrupts workflow and causes time delays.

Similarly, because there are too few computers, the nurses may have to wait to access a computer – causing an interruption in their workflow.

Because of the lack of printers, nurses may have to walk a long distance to retrieve print-outs and, sometimes when they get to the printer, their print out may be lost. One nurse told us that she always prints two copies of everything to help to ensure that at

least one copy will be at the printer when she arrives to pick it up. In addition, on at least one nursing station (Station 30) lab reports are printed at 4:00 am – the printing takes approximately 45 minutes. This exclusive use of the printer makes it impossible for nurses to print out urgent work-related documents (e.g., heparin protocols) during that time frame.

We made the following *recommendations*: (1) there should be a pulse oximeter and thermometer in each patient's room; (2) more computers should be provided for the nurses; and (3) more printers should be provided – particularly on Station 30.

Software Programming Flaws: When the computer-user interface for the administration of heparin is being used, we learned that after the nurse clicks the print button, the information on the monitor disappears. Sometimes, this creates a major problem when the printer is blocked for an extended period of time by another print job – because the nurse can neither access the heparin information on the monitor nor see a print-out.

We *recommended* that: (1) the software used in the heparin administration process should be reprogrammed so that the heparin information remains on the screen after the print job has been ordered; and (2) more printers should be provided.

Inconvenient location of supplies: The inconvenient location of supplies (cup dispensers, laundry supplies) can interrupt the workflow of the nurses. We learned that in at least one nursing station the patient rooms do not have cup dispensers. Workflow is disrupted when a nurse must take the time to locate a cup somewhere else in the station when patients request water.

Laundry supplies are not stored in patient rooms. When it is necessary for a nurse to change a patient's linens there would be a smaller disruption to efficient workflow if laundry supplies were stored in patient rooms.

We *recommended* that: (1) cup dispensers should be installed in the patient's bathrooms; and (2) laundry supplies should be stored in each patient's room.

Layout of the nursing station: The layout of the nursing stations impacts workflow. The circular layout facilitates communication between the medical personnel. However, it should be recognized that one person's communication can be another's interruption – we observed medical staff talking loudly across the space to each other. Also, at times the circular layout can be chaotic – we observed occasions when the central desk space and terminal area were so crowded with physicians that there was no room for nurses to work.

In contrast, with the pod layout the activity is decentralized activity and less chaotic. However, the pod fingers are so narrow that patient transport is difficult when nurses or physicians are seated at workstations outside the patient rooms. And patient transportation is more difficult if there is equipment parked in the pod finger. With the pod layout, nurses are able to see patients easily, but there are drawbacks. For example, on one nursing station (Station 30) there are no alcoves in which medications can be accessed for administration. Currently, the Pyxis is in a busy hallway. The nurses would like to have a dedicated medication room to prepare medications.

It is difficult to deal with layout issues, and as discussed above there are advantages and disadvantages with both layouts that we observed. We *recommended* that a dedicated medication room be planned for future pod layouts.

Specific space issue: During reconstruction of the hospital's parking ramp, one nursing station (Station 30) on the hospital's second floor has become a surrogate reception area for the entire hospital. Routinely, the medical staff on Station 30 are interrupted and asked to give directions to other areas in the hospital.

We *recommended* that, during the reconstruction of the parking lot, a large easily visible sign should be positioned so that visitors to the hospital will be informed that the hospital's reception area is on the first floor. Another alternative – the addition of a receptionist to Station 30 – would compound space issues in an already crowded station. [We include this because it is important to anticipate the unintended consequences of system changes.]

Work process issues: We learned that sometimes patients are scheduled to be admitted or discharged during shift changes. Workload is high during the period surrounding shift changes. The scheduling of admissions and discharges during this time can result in delays in patient care. Nurses may have to wait until well past the end of the shift to discharge their patients.

We *recommended* that, if possible, patient admissions and discharges should not be scheduled during shift changes. We also *recommended* that a variation of a procedure currently used on one nursing station (Station 30) could be considered for other nursing stations. On Station 30 reports are tape recorded by the outgoing staff prior to the arrival of the oncoming staff. When each oncoming nurse arrives, he or she listens to the report of the nurse they are replacing. Then, he or she consults with outgoing staff if any clarification is necessary. We recommended that a variation of the tape recording process be adopted: In this variation a separate verbal computer recording would be made by an outgoing nurse for each of his or her patients. Then when oncoming nurses arrive, they would click on the computerized recording for their assigned patients, in their preferred order. As with the tape recorded process, the nurse would consult with outgoing staff if anything required clarification. We believe this will help to facilitate a more efficient transition between outgoing and oncoming staff at shift changes.

Limited staffing levels: Interruptions to patient care can occur because of the limited staff available on some nursing stations (e.g., Station 35).

We *recommended* that, if possible, more nurses and/or nursing assistants be assigned to nursing stations with staffing shortages.

Summary

In this study, we focused on the distracting effects of interruptions. While interruptions are so pervasive that they cannot be eliminated from medical practice, it may be possible to manage their distracting effects. We conducted a Human Factors Review of medical practice at a large Midwestern Hospital. We observed the workflow on two nursing stations with different layouts – one circular, the other with a pod structure. The observations were made at several different times during the day – including the busy times when shift changes occur and when patients are discharged. Subsequently, we conducted focus groups with nursing personnel from these and other nursing stations. We identified several sources of interruptions, including – (1) people (patients and their families and friends, physicians and other health professionals); (2) auditory messages (from phones, alarms, and public address announcements); (3) shortage of equipment (e.g., pulse oximeters, thermometers, computers, and printers); (4) software programming flaws; (5) inconvenient location of supplies; (6) layout of the nursing stations; (7) work processes; and (8) staffing levels. Our recommendations were aimed at limiting interruptions, reducing distracting effects, improving the working conditions of medical practitioners, and reducing the possibility of error.

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