Behavior-Based Safety

Improvement opportunities in hospital safety

By Don Nielsen and John Austin

FEW WORKPLACES ARE AS COMPLEX as hospitals. Not only do hospitals provide a multitude of patient care services, they also require many support services. Hospitals in the U.S. employ more than four million workers—or about 3.4 percent of the total U.S. workforce (USDoL). These workers are exposed to a wide range of potential safety hazards in direct patient care departments and support services departments. The annual rate of injury among hospital workers is 7.7 per 100 full-time employees (BLS). The leading causes of injury in these settings are overextension, falls, contact with objects, exposure to harmful solutions and environmental hazards.

Many hospitals have developed general (and in some cases specific) guidelines for preventing accidents and injuries, but these guidelines typically do not require employees to demonstrate mastery of safe behavior. Behavioral approaches to safety have shown substantial improvement of specific safe behaviors in various settings, but few behavior-based research studies have been conducted in hospital facilities; this suggests an opportunity for additional investigation and application. This article identifies potential causes of injuries and offers some suggestions for reducing injuries using behavioral approaches.

The Hospital Setting

Hospital medical staff provide patient care around the clock. Their services range from emergency procedures to scheduled activities, from fairly routine tasks to complex procedures. Some patients display difficult and even combative behaviors, which can hinder the provision of these services. Further complicating the picture are severe staff shortages being reported by hospitals nationwide.

Examination of hospital safety history reveals several national efforts to address hospital employee safety and health problems. In 1958, a report by the American Medical Assn. and American Hospital Assn. identified the basic elements of occupational health for hospital workers (AMA). In addition, the groups reported that hospitals should serve as examples of job safety. In June 1972, NIOSH completed a survey of health programs and services for hospital workers. The survey identified three key deficiencies in U.S. hospitals.

1) Only half of the hospitals had regular employee safety and health education programs.

2) Only 39 percent had employee immunization programs for infectious disease control.

3) Only 18 percent of the hospitals trained employees about potential hazards and at-risk activities [NIOSH(b)].

Currently, protection of hospital workers is accomplished through a hodgepodge of approaches. Hospitals are regulated or accredited by various local, state and federal government agencies such as local zoning boards, state health departments, state licensing boards, Joint Commission on Accreditation of Healthcare Organizations, American Osteopathic Assn., OSHA, U.S. Nuclear Regulatory Commission, Food and Drug Administration and Federal Aviation Administration. As a result, no single set of safety and health regulations is applied to hospitals and their employees [NIOSH(a)]. Some mandatory standards, such as the Needle Stick Safety and Prevention Act, require hospitals to identify and make use of safer medical devices (Pugliese and Bartley 30). However, hospital employee safety programs have primarily been developed using information from NIOSH and the Centers for Disease Control and Prevention [CDC(a); (b)].

Patient care involves a broad spectrum of services—delivered by various departments—designed to maximize a patient's health and recovery. These departments include surgery, intensive care, acute care, nursing, radiology and laboratory. Potential hazards to workers in these areas include radiation exposure, needlesticks, and exposure to chemicals and hazardous bodily fluids.

Hospital support services include

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Table 1

Incident Rate per 100 FTEs

Event	Hospital Rate
Overextension	1.25
Slip/Trip/Fall	0.50
Contact with Objects	0.39
Harmful Substances/Environments	0.15

Source: BLS.

maintenance, housekeeping and food services. Workers in these departments face exposure to solvents, mechanical malfunctions, steam burns and electrical hazards. Housekeeping employees are exposed to various solvents and disinfectants that may result in rashes or irritation. They are also exposed to hepatitis and other diseases from hypodermic needles that have not been properly discarded. Food service workers face potential cuts from sharp kitchen objects, burns from hot surfaces and falls on slippery floors. All hospital workers face common risks and hazards such as strain and overextension, slips, trips and falls, potential contact with used needles and exposure to hazardous bodily fluids.

The annual rate of injury among hospital workers is 7.7 per 100 full-time employees (FTEs) (BLS). The leading causes of injury are overextension (often resulting in back injury), slips/trips/falls, contact with objects, exposure to harmful solutions and environmental hazards such as exposure to contagious diseases. Table 1 displays the incidence rate per 100 equivalent FTEs for these leading causes (BLS). Treatment typically ranges from minor first aid to major medical treatment with possible chronic disabling conditions or even death.

Typical hospital safety programs feature several elements: 1) enlistment of administrative support; 2) hazard identification; 3) periodic inspection and monitoring of safety and industrial hygiene; 4) informal interviews of workers; and 5) environmental evaluation [NIOSH(a)]. Administrative support helps ensure that all departments are involved in safety. Hazards are identified via walkthrough inspections and from information gleaned from MSDS. Periodic inspection and monitoring is generally conducted by the many regulatory agencies that oversee hospitals. Informal interviews of workers and environmental evaluations usually focus on problems once they have occurred.

The types and rates of occurrence of hospital worker injuries have been identified at the national level through the collection of work-related injuries and illnesses data for OSHA. As a result, hospitals have developed guidelines to prevent accidents and injuries. However, based on the authors' experience in more than one hospital, safety training for hospital workers often involves a "show and go" approach—that is, workers are shown an appropriate method to complete a specific task, with the expectation that they will continue to execute the task in that manner when unsupervised. Typically, these training programs do not require employees to demonstrate mastery of the specific task being trained.

Training (called performance-based instruction) is most effective when carried out in three phases: guided observation, guided practice and demonstration of mastery (Brethower and Smalley). Guided observation uses examples or demonstrations that show why something is done, what is accomplished and how. Through guided practice, learners practice processes that produce specific results and receive feedback while they do so. Demonstration of mastery requires employees to show that they can perform these tasks and generate the products/services accomplished by their work. Instead of using all three steps, hospital training programs typically include only one step—guided observation. In the authors' experience, this often entails only discussion of or modeling how to accomplish a task.

Hospital workers are similar to workers in other settings in that many likely engage in at-risk behavior in part because such behavior may be easier and may save time. In general, risk taking is rarely punished and is often rewarded with convenience (Geller 115). Hospital safety programs, like those in other work settings, typically focus on the outcomes of unsafe practices rather than on safe practices. Other efforts have focused on identifying factors that correlate with occupational safety, such as personality characteristics assumed to be associated with injury (Grindle, et al 29-68). As a result, it is difficult to pinpoint the specific behaviors needed to improve safety and reduce injuries in these settings. Therefore, hospitals need to develop safe environments and nurture safe worker behavior rather than merely respond to injuries. Many hospitals need a safety process that focuses on the safe behavior of hospital employees, requires employees to demonstrate mastery of safe behavior and helps maintain safe behavior.

Behavioral Approaches to Safety Improvement

Studies conducted using a behavioral approach to safety—applying the principles of applied behavior analysis—have reported improvement of specific safe behaviors and reduced injury occurrence. In a meta-analysis of 73 applications in varying industries, one study reported a 20 to 25 percent year-over-year decrease in injuries for the first five years after implementing a behavioral approach to safety (Krause, et al 1-18). A literature review by Sulzer-Azaroff and Austin found that 32 of 33 behavioral safety studies resulted in substantial decreases in injury rates (21).

In a classic example of the behavioral approach to occupational safety, behaviorally defined and reinforced safe practices resulted in occupational injury reduction (Komaki, et al 434-445). This investigation

provided workers with information and practice on how to discriminate between particular safe and unsafe behavior related to injury, graphs depicting results of the safe behavior and verbal feedback from supervisors. These activities resulted in a substantial and immediate increase in safe behavior. When the behavioral program was discontinued, safety behavior returned to preintervention levels.

A behavioral approach to safety has been used in various other occupational settings as well: with roofing crews (Austin, et al 49-75); in a paper mill (Fellner and Sulzer-Azaroff 3-24); in a soft drink bottling facility (Williams and Geller 135-142); with delivery drivers (Ludwig and Geller 253-261); in an electronics components facility (Streff, et al 3-14); in an open-pit mine (Fox, et al 215-224); in a residential facility for persons with developmental disabilities (Alavosius and Sulzer-Azaroff 151-162); and in a hospital emergency room (DeVries, et al 705-711).

A review of the literature revealed that few behavior-based research studies have been conducted in hospitals. A handful of studies have been completed in healthcare-related settings (e.g., Babcock, et al; DeVries, et al; Geller, et al; Mayer, et al). Because of the limited research in this area, this appears to be an opportunity for additional investigation and application. Using a behavioral approach to increase safe behaviors and reduce injury among hospital workers would likely enhance the quality of life for these workers. It would also likely result in fewer lost workdays and would save time and money—both for workers and the hospitals that employ them.

Areas of Opportunity

To improve hospital safety, practitioners must focus on behaviors that lead to the common injuries incurred by hospital workers—overextension, slips, needlesticks and contact with bodily fluids.

Overextension

Within the category of overextension, back strain is the most frequently reported injury and accounts for approximately half of all reported injuries and illnesses in the healthcare industry (BLS). Back injury causes include a) task performance by a worker who is unfit or unaccustomed to the task; b) postural stress; and c) work that approaches the limit of a worker's strengths [NIOSH(a)]. Specific causes among hospital workers include assisting or lifting patients, raising or lowering beds, lifting or moving heavy objects, and pushing or pulling carts. NIOSH recommends that programs designed to prevent back injury contain the following elements:

- use of mechanical devices to lift patients;
- use of wheels and other devices to move heavy equipment;
- adequate staffing to prevent workers from lifting heavy patients or equipment alone;
- education and close supervision to ensure proper lifting or moving [NIOSH(a)].

Hospital workers also need to gain competency in specific safe behaviors. Providing employees with written instructions alone generally results in short-lived improvements (Shook, et al 206-215). Therefore, building behavioral competency in addition to providing information to employees is critical.

Individualized feedback has been used to build behavioral competency among healthcare workers (Alavosius and Sulzer-Azaroff 151-162). That study was designed to establish safe behaviors associated with patient transfer or positioning. Participants first received instructions on how to execute the behaviors properly, then received either densely scheduled (many times each day) or intermittently scheduled (a couple of times each week) feedback about their lifting performance. Under both schedules, feedback continued until participants had demonstrated mastery of the behavior. Dense feedback allowed participants to master the target behavior within two or three workdays. Those who received intermittent feedback took longer to demonstrate mastery. However, both approaches resulted in similar patterns of behavior change maintenance.

Typically, safety training programs for hospital workers use a "show and go" approach and do not require employees to demonstrate mastery of the specific task being trained.

Practitioners interested in improving proper lifting, patient transfer and/or positioning could use techniques similar to those used in the Alavosius and Sulzer-Azaroff study. Practitioners could:

1) Identify and create a checklist of observable actions that must occur, including an explanation of why they need to occur for employees to avoid overextension and/or back injuries.

2) Observe (or have employees self-monitor) and accurately record these actions during actual work activities.

3) Make sure employees understand and can demonstrate the safe actions specified on the checklist, then deliver frequent supportive and guidance feedback to employees immediately after they complete work activities.

Many organizations will benefit from training employees to conduct observation and feedback sessions with coworkers. Clearly, delivering feedback involves an elaborate set of skills and this fact should not be ignored. However, how to deliver effective feedback is beyond the scope of this article.

Slips, Trips & Falls

Slips, trips and falls in hospital settings are generally the result of hazards such as wet floors, stairway and hallway obstructions, or faulty ladders. This category is the second-leading cause of injury among hospital workers. Preventive measures might include housekeeping procedures to keep floors dry, keep halls and stairways clear, provide good lighting in halls and stairways, and use ladders properly [NIOSH(a)]. Practitioners seeking to remedy slips, trips and falls would, for example:

1) Identify and create a checklist of safe environmental conditions that would reduce or eliminate slips, trips and falls.

Although at the global level the behavioral solutions discussed appear the same, at the implementation level, each intervention must be customized.

2) Observe (or have employees self-monitor) and accurately record these conditions in all work areas.

3) Make sure workers and supervisors understand and can produce the safe working conditions specified on the checklist, then deliver frequent feedback to employees and supervisors immediately after they establish safe working conditions.

Systems support is one issue to address when considering these conditions. Before behavior can change, the relevant equipment, processes and other systems must be in place to enable safe behavior. Expecting people to behave safely when appropriate systems are not in place could produce frustration and failure.

Needlesticks

Needlesticks generally affect direct care and housekeeping employees. Reports suggest that healthcare workers suffer between 600,000 and 800,000 needlestick injuries each year in the U.S. (Baran 66). Hospital workers incur about 30 needlesticks per 100 hospital beds per year (EPINet). Needlesticks generally occur as a result of uncapped needles during preadministration, puncture during patient administration or puncture during needle disposal. Approximately 38 percent of needlesticks occur during use and 42 percent occur after use and before disposal [CDC(a) 21-25]. Engineering controls have been the primary method of minimizing employee exposure to these injuries (Pugliese and Bartley 26). Engineering approaches eliminate the use of needles where alternatives are available and have resulted in the use of safer needle devices as well [NIOSH(c)].

A behavioral approach would target the safe use and disposal of needles. Practitioners interested in addressing this area could:

1) Create a checklist of observable actions that must occur for the safe handling of needles during preadministration, recapping, passing and transferring needles, needle disposal and use of safety equipment where appropriate.

2) Observe (or have employees self-monitor) and accurately record these actions during actual work activities.

3) Make sure employees understand and can demonstrate the safe actions specified on the checklist, then deliver frequent supportive and guidance feedback to employees immediately after they complete work activities.

Contact with Bodily Fluids

Contact with potentially dangerous bodily fluids is generally the result of contact with blood and blood products, other bodily fluids or tissue. Potential consequences of contact with contaminated bodily fluids include exposure to hepatitis C virus, human immunodeficiency virus and hepatitis B virus [NIOSH(a); (c)]. In 1983, CDC identified a set of universal precautions. Revised in 1987, these standard precautions serve as guidelines to help healthcare workers avoid contact with potentially dangerous bodily fluids [CDC(b)].

Hospitals typically have specific programs that identify three categories of potential exposure: 1) tasks that involve exposure to blood, bodily fluids or tissues; 2) tasks that involve no exposure to blood, bodily fluids or tissue, but may require performing unplanned category one tasks; and 3) tasks that involve no exposure to blood, bodily fluids or tissue and category one tasks are not a condition of employment [NIOSH(a); (c)]. Efforts to reduce exposure in this area focus on educating healthcare workers about the danger of contact and the proper use of PPE. Specific PPE use is generally tailored to the task at hand. For example, protection for category one tasks would include the use of appropriate gloves; for situations where splashes may occur, protective eyewear or faceshields would be worn.

A behavioral study used a feedback intervention to increase glove wearing by nurses in a hospital emergency department (DeVries, et al 705-711). Using a multiple baseline design to evaluate the effects across four participants, a substantial increase in glove wearing was observed for situations in which contact with fluids was probable. The potentially hazardous situations were cleaning instruments, cleaning a laceration, giving an injection, phlebotomy, inserting a catheter, and obtaining or transporting specimens. Staff nurses received individual feedback to inform them of the percentage of contact opportunities in which they wore gloves.

In a similar study, a feedback intervention was implemented to increase the frequency of nurses giving feedback to nursing assistants about increasing glove use to avoid contact with bodily fluids in a head-injury treatment center (Babcock, et al 621-627). The authors reported an increase in both the feedback provided to nursing assistants and in glove use by these employees. Practitioners wishing to use similar techniques could:

1) Identify and create a checklist of observable actions that must occur for employees to avoid contact with potentially harmful body fluids.

2) Observe (or have employees self-monitor) and accurately record these actions during actual work activities.

3) Make sure employees understand and can demonstrate the safe actions specified on the checklist, then deliver frequent supportive and guidance feedback to employees immediately after they complete work activities.

Customize at the Implementation Level

Although these behavioral solutions to common injuries in hospitals may look the same, in reality each situation is different. Certainly, each of these safety efforts would incorporate data collection, feedback and praise. However, in each case, the practitioner will be monitoring different activities. Thus, although the solutions at the global level appear the same, at the implementation level, each safety intervention must

be customized. Exactly which behaviors are measured, how often and the logistics of that measurement will differ dramatically in each case. Acceptable formats for feedback, posting of feedback and frequency of feedback will vary based on work characteristics. Furthermore, how employees talk to each other when delivering praise will differ in each work culture and, therefore, must be customized in each setting.

Conclusion

The complex nature of hospitals, the numerous services provided, and the many and varied behaviors exhibited provide many opportunities for future research and practice. Four important categories have been identified, but future work should not be limited to these four areas.

In *Performance Management*, Daniels identified methods to manage employee behavior. These include defining and measuring current performance, developing specific interventions and evaluating the impact on performance. Defining and measuring safe behavior and demonstration of mastery through training and practice of and feedback about safe behavior have been key procedures in many successful solutions to date. For example, occupational injuries were reduced when information and verbal feedback were provided to employees in a food manufacturing setting (Komaki, et al 434-445). Individual feedback was used to establish competency of healthcare workers in patient transfer or positioning (Alavosius and Sulzer-Azaroff). Exposure to potentially hazardous bodily fluids was reduced by providing individual feedback to staff nurses (DeVries, et al 705-711).

These few examples illustrate how training, practice and feedback can be used to improve organizational effectiveness and reduce injuries. Future hospital-based studies should also identify the critical elements of feedback and other behavior-change solutions that best establish and maintain safe behaviors. The results will be beneficial to both hospital workers and the institutions that employ them. ■

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