



## Exhausted workforce increases the risk of errors

If you work in healthcare, then you've experienced it: that mind-numbing, body-draining fatigue that makes it difficult or impossible to stay focused on the task at hand or to remain vigilant toward patient safety. Perhaps you can relate to the following all-too-typical scenarios:

*A nurse who, after a busy 12-hour day, is required to stay another 4 hours to assist in the care of a patient who has unexpectedly developed serious complications; the nurse then returns early the next morning for another scheduled 12-hour shift.*

*A nurse who, fighting to stay awake at 5:30 am, 11.5 hours after the beginning of his shift, is now required to prepare several complex emergency IV admixtures for an influx of trauma patients, keeping him onsite for 2 additional hours.*

*An on-call nurse anesthetist who, after working 9 hours in the OR, is called back to the hospital to assist with an emergency surgical procedure that lasts into the night, only to return to the hospital the following morning for another 8 hours in the OR.*

Long work hours and the fatigue that results represent a serious threat to patient safety. The detrimental effects of fatigue on performance (see Table) are well documented.<sup>1-3</sup> In fact, prolonged wakefulness can degrade performance, leaving a healthcare provider with the equivalent of a blood alcohol concentration of 0.1%, which is above the legal limit for driving in

most states.<sup>4</sup> When fatigued, performance is also quite variable. One moment it's good, and the next moment perceptions of reality begin to disengage during microsleeps.<sup>5</sup>

Microsleeps are intermittent lapses in consciousness that last seconds to a few minutes. They are caused by the physiological drive to sleep and occur with the eyes open and without the knowledge of the individual.<sup>5</sup> Microsleeps impair performance, often leading to errors due to missed information, or even loss of situational awareness. In one study, a videotaped, sleep-deprived anesthesiologist exhibited behaviors indicative of microsleeps during 30% of a 4-hour case!<sup>6</sup>

Other industries have taken action to defend against the effects of fatigue. Yet the healthcare industry in general has largely disregarded the problem, especially with the ongoing shortages of nurses and other licensed practitioners. The 2003 report, *Keeping Patients Safe: Transforming the Work Environment of Nurses*, recommends that nurses work no more than 12 hours a day and 60 hours per week, in any combination of scheduled shifts, or mandatory or voluntary overtime.<sup>7</sup> However, more needs to be done. See **checkitout** for suggestions to reduce fatigue in the workplace.<sup>8</sup>

References may be found at: [www.ismp.org/NursingArticles/2005\\_12\\_01.htm](http://www.ismp.org/NursingArticles/2005_12_01.htm).

**Table. Effects of Fatigue<sup>1-3</sup>**

- Slowed reaction time
- Reduced accuracy
- Inability to recall
- Reduced motivation
- Irritability or hostility
- Impaired communication
- Short-term memory lapses
- Inability to deal with the unexpected
- Lapses of attention and inability to stay focused
- Omissions and neglect of non-essential activities
- Indifference and loss of empathy
- Reduced hand-eye coordination
- Compromised problem solving and decision-making
- Diminished ability to recognize significant but subtle changes in a patient's health
- Decreased energy for successful completion of required tasks

### checkitout! ✓✓✓✓

Consider the following suggestions to reduce fatigue in the workplace.<sup>8</sup>

✓ **Scheduling.** Analyze current staffing patterns, looking at the minimum off-duty time, consecutive work periods, and rest/recovery opportunities. Establish work schedules with off-duty requirements (intended for rest), limitations on hours worked each day and week, and time limitations for specific, potentially fatiguing physical and mental tasks within each work day. Provide sufficient coverage to ensure breaks are possible. Disruptions in circadian rhythms (light/dark or sleep/wake cycles) can also result in fatigue. Whenever possible, recognize the circadian rhythm principles when designing work schedules.

✓ **Routine breaks.** Take periodic rest and meal breaks; a 15-30 minute break away from the work area decreases the effects of sleep deprivation. If unable to take breaks, report the inadequacy to supervisors.

✓ **Education.** Learn more about the science of sleep, risks associated with fatigue and circadian rhythm disturbances, and approaches to optimize performance.

✓ **Light therapy.** Application of higher levels of ambient light (general background lighting) has helped reduce the effects of disrupted circadian rhythm for night-shift workers.

✓ **Use evidence-based safety practices.** While not a replacement for well-rested staff, the use of proven safety practices (e.g., independent double-checks) and technologies (e.g., computerized order entry/documentation, bar coding, "smart" pumps) may help overcome some of the errors caused by impairment from fatigue.

## Concentrated morphine oral solution

Eliminating access to concentrated electrolytes in patient care units has been a Joint Commission requirement since 2001. Such products have caused countless deaths when mistaken for other products and administered IV. Other concentrated medications pose a similar danger, particularly concentrated morphine oral solution. This drug is available in various concentrations, primarily labeled (and listed in drug references) in mg/mL or mg/5 mL. When the more concentrated form of morphine (labeled as 100 mg/5 mL or 20 mg/mL) is available in patient care units, it can be confused with the conventional concentrations (20 mg/5 mL or 10 mg/5 mL), leading to potentially fatal overdoses.

Some physicians have prescribed this medication in mL instead of mg, which has also contributed to errors if an unintended concentration is administered. In other cases, nurses have given the patient the prescribed mg dose in mL (e.g., 5 mL instead of 5 mg). This error is compounded by mistakenly using the more concentrated solution if it's available as floor stock. In one such case, a 91-year-old man being treated for a mild heart attack was accidentally given a 100 mg dose of **ROXANOL** (concentrated morphine solution) instead of 5 mg as prescribed, likely contributing to his death. The nurse had given the patient 5 mL of the more concentrated form of morphine, Roxanol 20 mg/mL (100 mg), instead of 5 mg. Some patients may need the more concentrated form of morphine to treat chronic pain. Thus, it's unrealistic to assume that this drug can be fully eliminated from floor stock. However, its availability can be limited, and its use can be safeguarded, as suggested below:

- ✓ **Limit access.** Avoid stocking concentrated morphine solution in patient units when possible, including the ED, as the drug is used primarily to treat chronic pain. Storage in automated dispensing cabinets (ADCs) alone will not prevent errors—the wrong strength could be stocked or removed. Have pharmacy dispense the drug when ordered for patients with severe chronic pain. Return unused supplies to the pharmacy after patient discharge.
- ✓ **Affix reminders.** Ask pharmacy to affix warning labels to bottles of concentrated morphine solution dispensed to patient care units. Include similar alerts on ADC screens. If possible, ask pharmacy to list the concentration in mg/mL, not mg/5 mL. (It's easier to differentiate 4 mg/mL from 20 mg/mL; harder to differentiate 20 mg/mL from 20 mg/5 mL).
- ✓ **Differentiate.** Ask pharmacy to dispense concentrated morphine solution in unit-dose oral syringes or dropper bottles (available from manufacturers) to help differentiate the concentrated solution from the conventional solution.
- ✓ **Segregate.** Secure and separate the concentrated solution from the conventional solution if both products are temporarily available in patient care units.
- ✓ **Don't accept incomplete orders.** Clarify all orders for liquid medications prescribed in mL rather than metric weight (mg, mcg, g).

### Has this **happened** to you? Keypad "double bounce"

We recently heard about several unusual errors that led to overly rapid infusions via IV pumps. In each case, the infusion pump inadvertently registered the same number twice while programming the rate, and the duplicate number on the screen was not recognized. One nurse programmed 36 mL per hour but the pump registered 366. Another nurse had pressed the "4" key once while programming "42" mL/hour for a TPN infusion for a CHF patient; the pump delivered 442 mL/hour. When the error was discovered, the patient's blood glucose was 564 mg/dL and her potassium level was 6.8 mEq/L. The resulting severe acidosis led to the patient's death. All nurses involved in these errors emphasized that they had not pressed the key twice. The problem seems to happen rarely but ISMP, FDA, ECRI (a safety agency for medical devices), and pump manufacturers need to better understand these errors. Please let us know if you've experienced a similar situation that you'd be willing to share in confidence (send an email to [ismpinfo@ismp.org](mailto:ismpinfo@ismp.org)). Thank you!

## safetywire

**⚡ Painful Mix-Up.** An ED patient who needed suturing of a laceration was accidentally injected locally with **SHUR-CLENS** (20% poloxamer 188), a wound-cleansing agent, instead of **XYLOCAINE MPF 1%** (lidocaine). The suture kit contained a plastic ampul of Xylocaine, which was pulled out and placed next to the similar-looking plastic ampul of Shur-Cleans on the bedside stand. While the ampuls are different sizes, both are small, making it difficult to distinguish the two. The Xylocaine



Xylocaine (L) and Shur-Cleans (R)

ampul is labeled using very small black lettering and the Shur-Cleans label is embossed without color into the clear plastic. The

patient complained of burning during and after the injection as well as during the suturing, at which point the error was discovered. Talk to your pharmacists about stocking Xylocaine in single-use vials (smallest volume needed, 10 mL or less) in your ED and procedure kits used in the hospital to prevent this type of mix-up. Affixing auxiliary warning labels may not be the best error-prevention strategy because inks and glues might leach through the plastic into the medication. (Effects of leaching are not fully known, but when associated with respiratory medications packaged in plastic ampuls, it can confound the diagnosis of an asthma attack.)

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## Special Recognition...

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