

# Patient Safety Tip of the Week

## March 6, 2018 Nurse Workload and Mortality

There have been numerous studies linking poor nurse:patient ratios with adverse patient outcomes. A study by Aiken and colleagues found that each additional patient per nurse was associated with a 7% increase in the likelihood of dying within 30 days of admission and a 7% increase in the odds of failure-to-rescue ([Aiken 2002](#)).

California was the first state to mandate nurse:patient ratios and multiple other states have also already mandated or are considering mandating nurse:patient ratios. But the issue is more complex than simple nurse:patient ratios. Those ratios do not take into account actual nurse workload nor do they take into account the fatigue factor that may accompany long work shifts or forced overtime. One factor that comes into play in those conditions is the concept of “missed nursing care” or “care left undone” (see our Patient Safety Tips of the Week for November 26, 2013 “[Missed Care: New Opportunities?](#)” and May 9, 2017 “[Missed Nursing Care and Mortality Risk](#)”).

In our July 11, 2017 Patient Safety Tip of the Week “[The 12-Hour Shift Takes More Hits](#)” we discussed a study by Ball and colleagues ([Ball 2017a](#)), using survey data from the RN4CAST study to correlate measures of nurse-reported quality with shift duration. They found the rate of “care left undone” was 1.13 times higher for nurses working  $\geq 12$  hours. A previous study by Ball ([Ball 2017b](#)) showed that a 10% increase in the amount of care left undone by nurses was associated with a 16% increase in mortality.

The two studies by Ball and colleagues focus on nurse staffing levels and fatigue as big issues leading to care left undone and its potential effects on patient care. But another issue that we have discussed, primarily in our columns on “the weekend effect”, has to do with nurse workload. We often see circumstances where a nurse:patient ratio is reasonable, yet the workload placed on nurses leads to care left undone.

Patient acuity and case mix, of course, are primary factors contributing to nurse workload. There are a number of tools used to factor patient acuity into nurse workload estimates. These have been used primarily in intensive care unit settings. But factors other than patient acuity also contribute to nurse workload.

A recent retrospective analysis of adult patients admitted to two multi-disciplinary Intensive Care Units in Hong Kong showed that exposing critically ill patients to high workload/staffing ratios is associated with a substantial reduction in the odds of survival ([Lee 2017](#)). Data required to calculate TISS-76 (Therapeutic Intervention Scoring System), Acute Physiology and Chronic Health Evaluation III (APACHE III) and the average number of bedside nurses working on each day were collected on almost 900

patients over a 5-month period. TISS-76 uses 76 possible interventions to quantify nursing workload

They found that survival to hospital discharge was more likely to occur when the maximum workload-to-nurse ratio was low and that death was more likely to occur when the ratio was high. Moreover, exposure to as little as one day of high workload/staffing ratios was associated with a substantially increased risk of death in critically ill patients.

Results of the Lee study suggest that staffing should be based on workload, not just patient numbers, and that “making do” with fewer nurses even for a short time or temporary increases in ICU capacity without a corresponding increase in staffing may adversely affect patient outcome.

Of course, extrapolation of the ICU experience described by Lee et al. to other settings is not possible. The measures of nurse workload in the TISS-76 may not be applicable to the med/surg or pediatric wards, ob/gyn or rehab settings, etc. And it’s not known whether the type of additional activities we’ve described in “the weekend effect” that increase nurse workload would have the same impact as those in an ICU.

But the overall implication is clearcut: nurse staffing considerations must take into account not only the nurse:patient ratio but also a measure of nurse workload.

In our many previous columns on the weekend effect or after-hours effect we have pointed out how hospitals differ during these more vulnerable times. Staffing patterns (both in terms of volume and experience) are the most obvious difference but there are many others as well. We’ve often said the use of the simple nurse:patient staffing ratio on weekends may be misleading. That is because there is often a significant difference in nurse workload on weekends. We’ve described the tremendous increase in nurse responsibilities on weekends due to lack of other staff (no clerical staff, delayed imaging, physicians not on site) that add additional responsibilities to their jobs. Our December 15, 2009 Patient Safety Tip of the Week “[The Weekend Effect](#)” discussed how adding non-clinical administrative tasks to already overburdened nursing staff on weekends may be detrimental to patient care. Just do rounds on one of your med/surg floors or ICU’s on a weekend. You’ll see nurses answering phones all day long, causing interruptions in some attention-critical nursing activities. Calls from radiology and the lab that might go directly to physicians now often go first to the nurse on the floor, who then has to try to track down the physician. They end up filing lab and radiology reports or faxing medication orders down to pharmacy, activities often done by clerical staff during daytime hours. Even in those facilities that have CPOE, nurses off-hours often end up entering those orders into the computer because the physicians are off-site and are phoning in verbal orders. You’ll also see nurses giving directions to the increased numbers of visitors typically seen on weekends. They may even end up doing some housekeeping chores and delivering food trays. All of these interruptions and distractions obviously interfere with nurses’ ability to attend to their clinically important tasks (see our Patient Safety Tips of the Week for August 25, 2009 “[Interruptions, Distractions, Inattention...Oops!](#)” and May 4, 2010 “[More on the Impact of Interruptions](#)”). We thus

think that simply addressing nurse:patient staffing ratios without addressing nurse workload issues may be short-sighted.

Few attempts to predict nurse workload have taken into account factors beyond patient acuity. One study in Singapore ([Hoi 2010](#)) did take into account other factors and developed a nursing workload intensity measurement system (WIMS). In addition to patient diagnoses, WIMS incorporated nursing diagnoses and nursing time spent on direct patient care and time spent on indirect patient care. They found that patient dependency measurements were not correlated with nursing time. The authors concluded that workload predictions should de-link patient dependency with acuity status as both do not correlate, as evidenced by this study.

A protocol for more accurately measuring nurse workload has been proposed in the Netherlands ([van den Oetelaar 2016](#)). The researchers expanded upon a framework for nurse workload management that had been developed in the Netherlands, called the NZI methodology, which consisted of the following items:

1. A checklist of nine patient characteristics that lead to a classification of light, moderate, heavy and intensive care;
2. Time study of nurses' activities, registering time spent on direct and indirect patient care, unit-related tasks and other tasks;
3. Estimate of allocated nursing resources;
4. Questionnaire of perceived workload and perceived quality of work.

These data are combined to estimate and validate the workload of nurses.

But several disadvantages of that methodology led to modification by the new researchers. The proposal uses a new list of patient characteristics expected to influence care time. It also more specifically determines the required nurse resources, differentiating for levels of education and experience. Finally, it also uses a validated questionnaire to determine nurses' perceived workload. They choose to measure five dimensions of perceived workload: work pace (time pressure), amount of work, emotional load, physical load and mental load, as experienced by nurses.

### **Identifying relevant patient characteristics**

Rather than classifying patients in categories of intensity of care, the researchers sought to directly **predict care time** of patient characteristics. Focus will be on finding patient characteristics that are expected to cause additional care time, on top of "baseline" care time that all patients get.

### **Time study nursing staff**

A random sample of the activities of nurses is a useful and cost-effective methodology to explore work-related activities and provide broad insight into the way nurses spend their working hours, and to what extent their work is directly patient-related. The time study would utilize trained observers but might incorporate some self-reporting when certain

activities (such as cognitive activities) cannot be directly observed. From the time study, time spent on non-patient-related activities can also be estimated.

### **Estimating required care time**

Results of the patient characteristic checklist will be combined with work sampling results. Data will be analyzed from the perspective of the nurse (How do they spend their time?) and the perspective of the patient (How much time is spent on caring for patients?). This is designed to answer questions such as: Does care time increase when certain characteristics apply? Also, what is the baseline care time for a patient when none of the characteristics apply?

### **Estimating allocated care time**

Allocated care time can be calculated by simply counting the number of nurses in a shift and multiplying this amount by the shift hours. However, that ignores staff skill and experience mix. Therefore, it is necessary to introduce nurse education levels and level of expertise into the workload equation.

### **Estimating nurses' workload**

An estimate of nurses' workload can be made by dividing the estimate of allocated care time by the estimate of required care time. Patient type profiles for all admitted patients in a shift can be added up to get to the total required care time for patient-related activities for that shift and added to an estimate for time spent on non-patient-related activities per shift to determine the total estimated required nursing time. Allocated nursing time is then determined by counting the number of nurses on duty and multiplying this by the shift time. This will be performed for each type of nurse on duty (registered, student, etc).

### **Measuring perceived nurses' workload**

Job demands and resources will be assessed with shortened scales of the validated Questionnaire on the Experience and Evaluation of Work (QEEW).

### **Validation**

The workload management method will be validated by comparing the estimated nurses' workload to the workload as it was perceived by the nurses on duty.

There are a host of factors that contribute to nursing care left undone and ultimately to adverse patient outcomes. Nurse:patient ratio is a major factor, but nurse fatigue contributes and nurse workload is likely a major factor. Workload is not simply a function of patient acuity and we need to take into account all the other factors that impact a nurse's time. We are pleased to see that ongoing studies are beginning to look at

those factors so we can appropriately address ways to ensure our nurses are able to safely address the needs of our patients.

**Some of our other columns on missed nursing care/care left undone:**

November 26, 2013 [“Missed Care: New Opportunities?”](#)  
May 9, 2017 [“Missed Nursing Care and Mortality Risk”](#)).

**Some of our other columns on the role of fatigue in Patient Safety:**

November 9, 2010 [“12-Hour Nursing Shifts and Patient Safety”](#)  
April 26, 2011 [“Sleeping Air Traffic Controllers: What About Healthcare?”](#)  
February 2011 [“Update on 12-hour Nursing Shifts”](#)  
September 2011 [“Shiftwork and Patient Safety](#)  
November 2011 [“Restricted Housestaff Work Hours and Patient Handoffs”](#)  
January 2012 [“Joint Commission Sentinel Event Alert: Healthcare Worker Fatigue and Patient Safety](#)  
January 3, 2012 [“Unintended Consequences of Restricted Housestaff Hours”](#)  
June 2012 [“June 2012 Surgeon Fatigue”](#)  
November 2012 [“The Mid-Day Nap”](#)  
November 13, 2012 [“The 12-Hour Nursing Shift: More Downsides”](#)  
July 29, 2014 [“The 12-Hour Nursing Shift: Debate Continues”](#)  
October 2014 [“Another Rap on the 12-Hour Nursing Shift”](#)  
December 2, 2014 [“ANA Position Statement on Nurse Fatigue”](#)  
August 2015 [“Surgical Resident Duty Reform and Postoperative Outcomes”](#)  
September 2015 [“Surgery Previous Night Does Not Impact Attending Surgeon Next Day”](#)  
September 29, 2015 [“More on the 12-Hour Nursing Shift”](#)  
September 6, 2016 [“Napping Debate Rekindled”](#)  
April 18, 2017 [“Alarm Response and Nurse Shift Duration”](#)  
July 11, 2017 [“The 12-Hour Shift Takes More Hits”](#)

**Our previous columns on the 12-hour nursing shift:**

November 9, 2010 [“12-Hour Nursing Shifts and Patient Safety”](#)  
February 2011 [“Update on 12-hour Nursing Shifts”](#)  
November 13, 2012 [“The 12-Hour Nursing Shift: More Downsides”](#)  
July 29, 2014 [“The 12-Hour Nursing Shift: Debate Continues”](#)  
October 2014 [“Another Rap on the 12-Hour Nursing Shift”](#)  
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July 11, 2017 [“The 12-Hour Shift Takes More Hits”](#)

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