Appendix 1:
An Annotated Bibliography pertaining to Safe Staffing of Respiratory Care Practitioners


The restricted content at this website mentions that, while California is the only state to have enacted nurse-to-patient ratio legislation to date, legislative activity elsewhere in the U.S. suggests that other states may soon enter the fray. The Massachusetts Nurses’ Association has been lobbying for such ratios since 1995, and a national mandatory nurse-ratios bill has been introduced in the U.S. Congress.


This document is one of a host of Guidelines created by the American Association for Respiratory Care (AARC), the national voluntary professional organization for respiratory care practitioners (RCPs). It is a detailed, authoritative, comprehensive, and highly granular description of the approach to patients managed with long-term ventilation in the home.


In this web-log (“blog”) entry, the implementation of instrumentation which furnished continuous, real-time readouts of patients’ oxygen saturation and end-tidal carbon dioxide tension was shown to drastically reduce the incidence of emergent calls to the Rapid Response Team at White Memorial Medical Center in Los Angeles, California. The monitoring is managed entirely by the Respiatory Care Department at White Memorial, under the leadership of Richard Kenny, RRT, the Director of Respiratory Care Services.


This AARC Position Statement was revised in July of 2014. It formally recommends that personnel who apply mechanical ventilation to patients prior to the arrival of those patients in the hospital receive competency training at regular intervals so that they can demonstrate their mastery of the requisite skill set.
AARC Uniform Reporting Manual, 5th Edition, Dallas, TX, Daedalus Publishers, 2013. This resource can be purchased from Daedalus, a wholly-owned subsidiary of the AARC. It lists the results of time-and-motion studies conducted in over one hundred medical centers throughout the United States, wherein time allocations for various respiratory care procedures were determined, generating supremely reliable statistics (mean, Standard Deviation, etc.) for the full gamut of services provided by the typical RC department. This Fifth Edition updated materials that had appeared in the previous edition. Specifically, the current edition contains data pertaining to institutions in addition to Acute-Care hospitals, which render this version of the URM especially valuable to those who are interested in the full spectrum of care venues within which RCPs administer care to respiratory patients.


This paper provides guidance and considerations in the application of the AARC Position Statement: “Best Practices in Respiratory Care Productivity and Staffing” adopted by the AARC Board of Directors in July, 2012.


This White Paper provides guidance for best practices for the safe initiation and management of mechanical ventilation. It helps define the competency, training, and the interdisciplinary approach necessary for patient safety and improved outcomes.


The pertinent portion, Section 70405(d), of these voluminous regulations reads: “Sufficient respiratory therapists and/or respiratory therapy technicians to provide support for resuscitation and maintenance of the mechanical ventilators in a ratio of 1:4 or fewer on each shift.

Eleven trials that included 1971 patients met the inclusion criteria. The geometric mean of the total duration of mechanical ventilation in the protocolized weaning group was, on average, reduced by 25% compared with the usual care group (N = 10 trials, 95% CI 9% to 39%, P = 0.006); weaning duration was reduced by 78% (N = 6 trials, 95% CI 31% to 93%, P = 0.009); and ICU LOS by 10% (N = 8 trials, 95% CI 2% to 19%, P = 0.02). However, there was significant heterogeneity among studies for total duration of mechanical ventilation (I(2) = 76%, P < 0.01) and weaning duration (I(2) = 97%, P < 0.01), which could not be explained by subgroup analyses based on type of unit or type of approach.


The authors sought to investigate the effects of weaning protocols on the total duration of mechanical ventilation, mortality, adverse events, quality of life, weaning duration, and length of stay in the intensive care unit and hospital. There was evidence of a reduction in the duration of mechanical ventilation, weaning, and stay in the intensive care unit when standardized weaning protocols were used, but there was significant heterogeneity among the (eleven) studies, and an insufficient number of studies to investigate the source of this heterogeneity.


The authors of this paper make a startling statement: “Even though the most effective CME [Continuing Medical Education] techniques have been proven, use of least-effective ones predominate.” The authors provide meta-analyses of peer-reviewed monographs dealing with physician education.

Chatburn RL. Report: Staffing of Respiratory Care Practitioners in the ICU (White Paper dated March 2, 2016) Staffing of RCPs in the ICU

In this brief (four-page) document, Robert Chatburn, former Director of the Respiratory Care Department at Rainbow Babies’ & Children’s Hospital in Cleveland, Ohio, and an acknowledged authority on the day-to-day operation of a Respiratory Care Department, provides the results of a survey that he conducted. The survey specifically examined “best practices” pertaining to safe staffing ratios for RCPs in ICUs.
Chatburn RL, El-Khatib M, Mireles-Cabodevila E. A taxonomy for mechanical ventilation: 10 fundamental maxims. *Respir Care* 2014; 59(11):1747-1763

This full-text monograph furnishes a standardized taxonomy of terms that enables clinicians to unambiguously describe the parameters that govern the manner by which mechanical breaths are initiated and delivered to patients interfaced to such machines. It succeeds in clarifying the details of ventilator function and abolishing the confusion introduced into this area by a plethora of proprietary terms.


Studies performed prior to the publication of this paper suggested that basing assignments on average work load led to periods of unachievable work rate, resulting in missed treatments and staff dissatisfaction. Respiratory Care managers have only limited ability to reduce peaks in work rate, but staggering treatment times is effective. Fair assignment of work should differentiate scheduled from unscheduled work.


This report summarizes findings of a study performed in 232 acute-care hospitals in California. It confirms impressive reductions in the incidence of pneumonia observed among patients admitted to medical/surgical and coronary units referable to increases in baseline RN staffing and increases in RN-to-patient ratios triggered by flex staffing during periods of high acuity.


The authors of this paper contend that senior resident physicians are not being supplied with essential evidence-based elements of the information that they need to provide effective care for mechanically ventilated patients. Those who peruse this paper might be led to think that this monograph describes a dangerous situation, but, to the extent that Intensive Care Unit Teams incorporate RCPs as well as physicians and nurses, the claims of the authors don’t necessarily imply the existence of a dangerous situation.

Intensive care unit costs are highest during the first two days of admission, stabilizing at a lower level thereafter. Mechanical ventilation is associated with significantly higher daily costs for patients receiving treatment in the intensive care unit throughout their entire intensive care unit stay. The mean incremental cost of mechanical ventilation in intensive care unit patients was $1,522 per day. Interventions that result in reduced intensive care unit length of stay and/or duration of mechanical ventilation could lead to substantial reductions in total inpatient cost.


In the current debate over health care reform, many observers are proposing new delivery structures to move U.S. health care away from fragmentation, poor performance, and dysfunction toward accountability for high-value care. Ideally, these new structures would promote clear accountability for both improving quality and controlling costs and would encourage health care professionals to organize themselves into teams working on behalf of patients. For such structures to be sustainable, however, the payment system must reward professionals for the quality and efficiency of services, rather than the quantity.


This Issue Brief describes the methodology used by the Center for Medicare and Medicaid Services (CMS) in determining reimbursement schedules for physicians.


These researchers found that the costs of ICU and non-ICU respiratory care for patients with COPD are higher than the costs of care for other mechanically ventilated patients. Although the increased cost of bronchodilators and oximetry in these patients may serve as target areas for reductions in respiratory care costs, it may also be true that these modalities of therapy and management are necessary, and need to be used with even greater intensity to achieve better outcomes.

The author of this editorial, a recognized authority on RC department staffing, describes the advantages of employing “work rate” as a metric that lends itself to the widespread deployment of computerized electronic medical record (EMR) systems. He persuasively argues that the careful linking of work rate to the EMR can generate staffing levels that are, at one and the same time, safer for patients and more rewarding for bedside RCPs.


These authors assert that educational meetings (a common activity whereby physicians learn of new developments in their practice), when taken alone, are not likely to be effective in altering complex behaviors. But they go on to claim that certain methodologies, implemented by clinical educators, can substantially improve educational effectiveness. These techniques include auditing, systematic provision of feedback, and focusing on outcomes likely to be perceived as serious.


These researchers sought to identify and standardize the core clinical knowledge required to care for mechanically ventilated patients. They describe a consensus that core competencies among resident physicians requires a broad range of knowledge application and skill.


In this abstract, the authors, who manage a Respiratory Care Department in an 800-bed medical center in North Carolina, document the cost savings that their department achieved by employing Relative Value Units (RVUs) as the metric of choice for staffing their department. The implementation of this strategy elicited far safer staffing levels for RCPs in their institution. In addition, the savings that were realized in salary expenses alone was $247,953 in one fiscal year. Their methodology was so successful that it was subsequently adopted by other clinical departments (Neurodiagnostic Lab, Pulmonary Rehabilitation, Inpatient Dialysis, and Sleep Disorder Center) in their hospital.

In this abstract, the authors, who are employed by Mission Health System in Asheville, North Carolina, demonstrate how the metrics used by various proprietary consulting companies correlate very poorly with Relative Value Units for: Total Patient Days; Total Inpatient Days; Average Daily Census; Non-billable Procedures; and Adjusted Discharges per Patient Day, with Correlation Coefficients ranging between 0.002 and 0.61. They recommend that Relative Value Units (RVUs) be adopted as the exclusive metric by state licensing boards to ensure that staffing levels are adequate for the safe delivery of services.


This portrait of patients’ experiences in U.S. hospitals offers insights into areas that need improvement, suggests that the same characteristics of hospitals that lead to high nurse-staffing levels may be associated with better experiences for patients, and offers evidence that hospitals can provide both a high quality of clinical care and a good experience for the patient.


Analysis of 2005 data from HQA national reporting system shows that performance varies among hospitals and across indicators. Given this variation and small differences based on hospitals' characteristics, performance reporting will probably need to include numerous clinical conditions from a broad range of hospitals.


Although treatments for respiratory disorders continue to improve, more people died of COPD in 2011 in the United States than succumbed to diabetes and breast cancer combined. This White Paper concludes that voices of medical providers are crucial in keeping the physician-patient relationship at the forefront.
Interactive Annotated Bibliography: Safe Staffing


This author, who is considered by many to be the single foremost spokesman for the respiratory care profession, contends that the competencies of the respiratory therapist specific to mechanical ventilation will markedly increase over the ensuing decade. He further asserts that the entry level of education of the RCP of the future must be set at the baccalaureate level.


In this study, a computer-aided methodology for integrating the budgeting, staffing, and labor productivity systems of Ancillary Services using Respiratory Therapy as an example is presented. The data needed, staffing computations and schedules, and productivity analysis are presented and discussed. A summary of the predicted savings and other benefits for the application hospital are presented, with comparisons to their then-current productivity systems.


Marin Kollef, who is a widely respected intensivist, opines that protocols that are jointly developed by physicians and RCPs can be uniquely effective in improving outcomes and ensuring safety among mechanically ventilated patients.


The Affordable Care Act signed into law by President Obama, with its value-based purchasing program, is designed to link payment to quality processes and outcomes. Treatment of critically ill patients represents nearly 1% of the gross domestic product, and 25% of a typical hospital budget. Data suggest that high-intensity staffing patterns in the intensive care unit (ICU) are associated with cost savings and improved outcomes. This study evaluates the literature investigating the cost-effectiveness and clinical outcomes of high-intensity ICU physician staffing as recommended by The Leapfrog Group (a consortium of companies that purchase health care for their employees), and identifies ways to overcome barriers to nationwide implementation of these standards. Hospitals that have implemented the Leapfrog initiative have demonstrated reductions in mortality and length of stay and increased cost savings. High-intensity staffing models appear to be an immediate cost-effective way for hospitals to meet the challenges of health care reform.

In this paper, the authors provide a unified data set of key demographic information obtained from the three professional bodies guiding the development of the respiratory care profession: the American Association for Respiratory Care (AARC); the National Board for Respiratory Care (NBRC); and the Committee on Accreditation of Respiratory Care Education (CoARC). They demonstrate that, although mandatory overtime is a common practice in Respiratory Care Departments, it is not overwhelmingly utilized in comparison to other bedside caregivers (most notably, Registered Nurses).


This study extends prior research by clarifying features of hospitals and providers associated with use of respiratory care protocols. The authors claim that validation in future hypothesis-testing samples will further advance this knowledge.


The deficits identified in this paper pertaining to adherence to recommended processes for basic care pose serious threats to the health of the American public. Strategies to reduce these deficits in care are warranted. Some of those strategies are described in this paper.


This analysis found that Medicare beneficiaries treated by respiratory therapists had better outcomes and incurred lower costs than those not treated by RCPs. A multivariate analysis and subsequent analyses further showed that these findings were true regardless of age or sex, the presence of comorbidities, or the incidence of stroke.

Evidence from an increasing number of studies has shown an association between the level of in-hospital staffing by registered nurses (RNs) and patient mortality, adverse patient outcomes, and other quality measures. Quality measures that are related to nurse staffing have been adopted by the National Quality Forum, the Agency for Healthcare Research and Quality (AHRQ), and the Joint Commission. In this study, the authors examined the association between mortality and day-to-day, shift-to-shift variations in staffing at the unit level in a single institution that has lower-than-expected mortality and high average nurse staffing levels, and has been recognized for high quality by the Dartmouth Atlas, rankings in U.S. News and World Report, and Magnet hospital designation.


From 1991 to 2001, there were important expansions in the scope of respiratory care practice by the Cleveland Clinic’s Section of Respiratory Care, while the volume of respiratory care services delivered per year increased 1.96-fold (from 339,600 to 665,921 services/yr). The number of respiratory therapy consults performed yearly, beginning in 1992 when the service was first implemented, rose to over 10,000/yr by 2001. At the same time, the cost of respiratory therapy services delivered per patient decreased by 4.2%. Regarding staffing trends, the number of full-time-equivalent employees increased by 50% (from 65 to 97.5). However, the percent turnover rate among respiratory therapists decreased by 2.3-fold (from 11.5% to 5%). In the face of these trends, the hospital mortality rate for patients with diagnosis-related group 088 (high users of respiratory care services) decreased by 53%, and the length of hospital stay for all patients receiving respiratory treatments decreased by 30%.


The authors serve as educators at the highly-regarded School of Allied Health Professions, University of Alabama at Birmingham, Birmingham, AL. They were able to document that, during the 1989-1991 time period, hospitals with higher staffing intensities for both respiratory therapists and respiratory therapy technicians had better outcomes for their Medicare inpatients being treated for COPD.

These investigators implemented a straightforward disease management program at five Veterans Administration medical centers, enrolling 743 COPD patients over a one-year period. They observed a reduced rate of hospitalizations for cardiac/pulmonary conditions other than COPD (by 49%), hospitalizations for all causes (by 28%), and Emergency Department visits for all causes (by 27%). The P-value for each of these reductions was < 0.05.


The authors created a factor analysis yielding a five-factor structure. Several questions in the "not in patient's best interest" category scored the highest moral distress, including disagreements with surrogate decision makers and providing futile care. Higher scores were also found with questions regarding the perception of unsafe staffing and passively or actively participating in deception. None of the demographic variables predicted career dissatisfaction or job turnover. However, the perception of unsafe staffing was found to be a significant factor in predicting career dissatisfaction and job turnover.


This press release documents that an increase in coverage (by physicians, pharmacists and RCPs) of the University of Maryland’s Medical Intensive Care Unit elicited a rise in survival and enabled patients to be weaned from ventilator support earlier than had previously been observed.


Respiratory Care Department directors are now becoming experts in staffing models that are unique to services provided through allied health professionals. The basic human resource management tenets of “attract”, “retain”, and “motivate” remain at the core of management focus. However, time standards, volumes, staffing variables, and flexible budgets are the current twists added to the litany of labor management terms. Optimizing resource consumption and establishing measurable patient outcomes to justify staff use will also be part of the manager’s challenges related to health care delivery in the twenty-first century.

Over twenty percent of Michigan nurses reported knowledge of a patient dying as a consequence of understaffing, according to a survey conducted in March, 2016 by the Anderson Robbins Research firm of Boston, Massachusetts and commissioned by the Michigan Nurses’ Association.