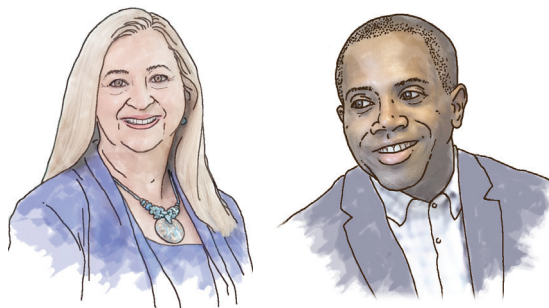


Editorial

SHELF LIFE OF CRITICAL CARE KNOWLEDGE

By Cindy L. Munro, PhD, RN, ANP, and Aluko A. Hope, MD, MSCE



Critical care units today are more technologically complex and provide care for patients with higher acuity than when they were envisioned more than 50 years ago. New diseases, such as COVID-19, present new challenges. As critical care moves forward, there will be instances where previous evidence will no longer apply to evolving or new situations. In order to deliver the best care to patients, in these instances prior knowledge must be examined and new evidence built. However, providing optimal care requires that we bring *all* appropriate available evidence to bear in clinical decision-making.

In use of the scientific literature, there is a tendency to view more recent evidence as more reliable and to discount the value of older work. Clinicians and authors are often directed to use current literature as a basis for decision-making, and teachers may admonish students to limit references to works from the past 5 years. It is indeed important to incorporate recent and current references in one's clinical problem-solving. However, incorporation of new knowledge should not come at the expense of attention to less recently discovered wisdom.

The shelf life of knowledge is variable and may be compared to the shelf life of foods. Some is highly perishable, and some less so. We would argue that some knowledge endures despite its publication date. A recent *AJCC* editorial¹ about critical judgment was grounded in the 17th century work of Francis Bacon;

in that case, ideas about critical judgment from 400 years ago still ring true with respect to practices of scientific peer review today.

A short-sighted view of clinical history is problematic for at least 3 reasons. First, if we constrain our view to only recent evidence, we risk discarding valid information that may remain relevant to patient care. Second, those who published work preceding our own deserve credit for what they did. And third, those who forget the past are at risk of repeating it. Particularly in research, those who are ignorant of prior work are at risk of rediscovering existing knowledge or reiterating unfruitful investigations, at the expense of building on existing foundations to generate new and useful knowledge.

As an example, prone positioning has garnered much attention in the COVID-19 pandemic. A PubMed search of "COVID-19 and prone position" in mid-February yielded 382 articles published since the onset of the pandemic. Given coverage in the general press about prone positioning in COVID-19, one might be led to believe that prone positioning is a novel approach to patient care, only recently "discovered" as a last-ditch, untested rescue therapy for COVID-19. However, evidence for prone positioning in patients receiving mechanical ventilation dates back more than 45 years.

Studies of prone positioning in adult patients with acute respiratory distress syndrome (ARDS) date to 1976, when Margaret Piehl, a nurse, and Robert Brown, a physician, published data about the effects of "extreme" positions on lung function in 5 patients who were placed in CircOlectric beds

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(a highly innovative bed technology at the time).² All 5 patients were receiving mechanical ventilation and had ARDS, and all 5 experienced improvements in PaO₂ when turned from supine to prone. Other positive effects were noted, including more effective removal of respiratory secretions. Piehl and Brown also noted “enthusiastic acceptance of this technique by the nursing staff in the intensive care unit,”^{2(p14)} which they attributed both to improved patient outcomes and to potential improvements in nursing care made possible by the new technology of the CircOlectric bed. (Incidentally, the Piehl and Brown paper was published in the first year that AJCC coeditor Cindy Munro was a nurse, and she cared for many patients in CircOlectric beds!). Examination of prone positioning in 14 intubated newborns followed in 1979,³ demonstrating that PaO₂, dynamic lung compliance, and tidal volume were all better when infants were positioned prone rather than supine. Despite early enthusiasm for prone positioning reported by Piehl and Brown,² their report did not result in widespread practice changes nor did it immediately spark interest in further research.

The next wave of interest in prone positioning for patients with ARDS began in the late 1990s. Kathleen Vollman, a nurse, designed and tested a prone positioning device to improve nursing implementation of prone positioning.⁴ Other studies in small numbers of patients with ARDS pointed to prone positioning as a useful treatment.^{5,6} A study of preterm infants in 2002⁷ showed results similar to the results of the 1979 study³ of infants receiving mechanical ventilation. Nursing considerations and guidelines for implementing prone positioning were published.⁸⁻¹¹ By 2009, enough randomized controlled trials of prone positioning had been conducted to warrant a meta-analysis,¹² with 1271 participants enrolled among 4 trials. Overall mortality did not differ significantly between prone and supine patients, but there was a trend toward lower mortality in the most severely ill patients who were placed prone. There were also trends toward higher risk of pressure injuries and endotracheal tube complications in the patients who were randomized to prone position.

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Lingering uncertainties about effects of prone positioning were addressed in 2013 by a large clinical trial (N=466) of prone positioning on mortality in severe ARDS.¹³ Among the group who were randomized to 16 hours per day of prone positioning beginning early in the intensive care unit stay, both 28-day and 90-day mortality were significantly lower than in the group that remained supine. Although the incidence of pressure injury was higher in the group of prone-positioned patients, the researchers pointed out that this higher incidence could be associated with the higher survival rates in patients who received prone positioning and were alive to be assessed for pressure injury at follow-up.¹⁴ Thus, the benefit of survival outweighed the risk of pressure injury, and the risk for pressure injury requires enhanced surveillance and prevention, not abandonment of prone positioning.

All of the studies of prone positioning just described were published more than 5 years ago. Should they be stricken from our knowledge about the treatment of ARDS? We do not believe so. Taken as a whole, the previous studies of prone positioning in adults with ARDS receiving mechanical ventilation have provided a useful framework for improving patient outcomes.

The evidence in favor of prone positioning for patients with ARDS who are receiving mechanical ventilation has provided a springboard for research about prone positioning of patients with COVID-19, including expansion of use of prone positioning in nonintubated patients^{15,16} and those who are not yet critically ill as a measure to reduce deterioration and risk of intubation. If use of prone positioning can delay intubation, or avoid intubation entirely, there are benefits both for patients and for the pandemic-burdened critical care system.

It is important to be a critical consumer of evidence, regardless of its publication date. The passage of time neither guarantees nor invalidates knowledge. Publication date should not be the sole consideration in applying or discarding evidence. To expand our search for evidence beyond a set date range to include older studies does not imply that all knowledge remains useful indefinitely. An aspect of clinical knowledge may indeed exceed its shelf life, becoming obsolete as conditions change or newer evidence supplants it. Knowledge is often reexamined, as it should be, and questions thought to be settled may be upended as a result. Clinical practice is replete with examples of protocols and procedures that were thought to be best practice but were later abandoned as ineffective or harmful.

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New research provides novel insights and nuanced understanding that may confirm, alter, or overturn prior understanding. Seasoned clinicians are masters of retaining “long shelf life” knowledge and integrating it with new information. Playing on an old adage, we suggest that to create best evidence for practice is to “create new knowledge but keep the (still valid) old. One is silver, the other gold.”

The statements and opinions contained in this editorial are solely those of the coeditors in chief.

FINANCIAL DISCLOSURES

None reported.

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