Published in final edited form as:

Crit Care Med. 2016 August ; 44(8): 1611–1612. doi:10.1097/CCM.0000000000001771.

Recognition and Appropriate Treatment of the Acute Respiratory Distress Syndrome Remains Unacceptably Low

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MeSH Terms

Adult Respiratory Distress Syndrome; Acute Lung Injury; Quality Improvement; Mechanical Ventilation; Diagnosis

Clinical trials published in 1998 and 2000 convincingly showed mechanical ventilation with low tidal volumes provides a clear mortality benefit to patients with the Acute Respiratory Distress Syndrome (ARDS) [1, 2]. Soon after publication, however, evidence mounted that low tidal volume ventilation (LTVV), a form of lung protective ventilation, was difficult to implement in clinical practice [3, 4]. In this issue of *Critical Care Medicine*, more than fifteen years after these landmark studies were published and after redefinition of ARDS [5], Weiss et. al. provides a contemporary report of low tidal volume ventilation compliance, demonstrating that the vast majority of patients with ARDS still do not receive lung protective tidal volumes while receiving mechanical ventilation [6].

The study examined the electronic health records of one academic and three community hospitals and identified 362 patients meeting the Berlin definition of ARDS. Among this cohort, the authors assessed LTVV compliance, which was defined as the receipt of a tidal volume less than 6.5 mL/kg of predicted body weight at any point during mechanical ventilation. Under this definition, the authors found that only 20% of patients with ARDS received LTVV at any point while receiving mechanical ventilation. Under a looser definition of 8 cc/kg predicted body weight, they found only 54% of ARDS patients received LTVV.

A few aspects of the study's approach should be recognized as one considers the surprisingly low compliance rate reported. The authors performed a retrospective review of electronic health record data to identify ARDS patients and assess LTVV compliance. They developed a protocol for identifying Berlin ARDS criteria, using the clinical notes of

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Conflict of Interest Disclosure: No author's have conflicts of interest to disclose
Dr. Sjoding disclosed that he does not have any potential conflicts of interest.

attending physicians to identify ARDS risk factors and radiographic reports to identify bilateral infiltrates on imaging. Although their approach was carefully designed, and based in part on a previously validated algorithm for identifying ARDS from radiology reports [7], it has not been validated outright. The author's point out that ARDS was documented in the clinical chart among patients they identified with ARDS just 12.4% of the time. Potentially, this could mean the algorithm they used for identifying ARDS was highly inaccurate—an unlikely prospect given its careful design. More likely, it could mean physicians under-recognize ARDS when it is present.

Poor compliance with low tidal volume ventilation (LTVV) has prompted a number of studies to examine barriers preventing universal utilization, citing perceptions of patient contraindications to LTVV by providers, concerns with patient discomfort, and failure to recognize the patients for whom it is indicated [8, 9]. Additional studies examined factors linked to higher compliance with therapy, including the use of a written protocol for LTVV delivery [10], and a closed intensive care unit staffing model [11]. Yet, despite this growing literature, the study by Weiss et al. suggests that very little progress with LTVV compliance has been made.

One approach to spur improvement would be to make LTVV compliance a performance measure tied to hospital reimbursement. There are several reasons why LTVV compliance might be a worthy performance measure for the Center for Medicare and Medicaid Services (CMS) to adopt. First, in contrast to some current CMS performance measures, it has a strong underlying evidence basis and a clear link to patient outcomes [12]. Second, as suggested in the study by Weiss et. al., current LTVV compliance is remarkably low, providing a high ceiling for improvement. Finally, evidence suggests that tidal volumes can be reduced by quality improvement initiatives that utilize audit and feedback [13].

A major barrier to developing an ARDS performance measure, however, is the need for a protocol that reliably identifies a cohort from which to assess LTVV compliance. Similarly, a major barrier to ARDS patient care is the high frequency ARDS is missed or recognized late. The study by Weiss et. al. is not the first to suggest that recognition of ARDS by bedside clinicians is poor. A study at the Mayo clinic in 2009 found that ARDS was documented in the clinical charts by bedside clinicians only 26.5% of the time it was present [7]. Importantly, when ARDS was documented, patients received significantly lower tidal volumes. Low tidal volume ventilation compliance cannot improve without new approaches to help physicians identify ARDS and an ARDS performance measure cannot succeed without a rigorously identified ARDS cohort to evaluate performance.

The paper by Weiss et. al. shows that identification of ARDS using electronic health record data is feasible and, once validated, could serve as model to design a LTVV performance measure. Yet, this approach still requires a careful review of the medical record by trained reviewers, a costly and time-consuming endeavor. It also does not solve the problem of assisting bedside clinicians with ARDS recognition at the point of care. Automated algorithms that scan electronic health record (EHR) systems for patients with ARDS features may be a potential solution. Such systems could perform natural language processing of clinical notes, scan laboratory values and vitals signs, and may provide more

reliable methods for ARDS identification. Although systems that can integrate all the data available in EHRs may still be years away, early efforts suggest that even simple systems that search blood gas values and the text of radiographic reports can be reasonably accurate ARDS screeners [7, 14].

Ultimately, “smart” electronic health record systems could help physicians identify patients as ARDS develops, and identify these patients for performance measurement. Healthcare systems have made major investments in EHRs, which have been touted as a key tool for improving the quality of healthcare. However, some feel these systems have yet to live up to this potential [15]. New approaches are needed to address the problem of inadequate ARDS care, and ARDS recognition systems built into electronic health records may provide a missing link toward improvement.

Acknowledgments

Financial Support: Supported by grants to Dr. Sjoding from the NIH (T32HL007749)

Copyright form disclosures: Dr. Hyzy received support for article research from the National Institutes of Health (NIH). His institution received funding from the NIH (T32HL007749).

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