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Crit Care Clin 23 (2007) 81–96

CRITICAL
CARE
CLINICS

Transforming ICU Culture to Facilitate Early Mobility

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Critically ill respiratory failure patients frequently require mechanical ventilation, have long ICU stays, and account for 3% to 6% of ICU admissions [1]. In North American adult ICUs approximately 40% of patients are ventilated mechanically (some with respiratory failure) during ICU treatment [2]. Patients with prolonged mechanical ventilation use 37% of ICU resources [3,4]. Critical care costs account for approximately 1% of the United States gross national product, or $90 billion [5]. The cost of care for patients requiring long-term mechanical ventilation is a national problem. Although reducing costs is important, it is equally important to improve outcomes in critically ill patients.

Need for culture change

Available literature suggests that interdisciplinary collaboration and a coordinated approach to management improves short-term quality and outcomes while reducing costs [6–11]. Growing interest in reducing costs for patients requiring long-term mechanical ventilation has led to development of different care delivery models, but none have been tested in scientifically rigorous clinical trials [12]. Nonetheless, financial pressures, coupled with increasing expectations from regulators, payers, and consumers are

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0749-0704/07/$ - see front matter
doi:10.1016/j.ccc.2006.11.004 *criticalcare.theclinics.com*

changing health care delivery systems. Integrated, outcomes-oriented systems of care delivery are needed. As such, the authors developed an ICU with a culture of improvement, focusing on reliable implementation of known best practices while improving care. These efforts resulted in the creation of the respiratory ICU (RICU) at LDS Hospital.

ICUs are complex systems. Most ICUs were not planned thoughtfully or derived from outcomes data. Rather they evolved incrementally, and they may be inadequate to support needed changes [13]. According to Langley and colleagues [14], improving system performance involves three important steps.

1. What is the goal to be accomplished? The authors wanted to improve outcomes in critically ill respiratory failure patients, and secondarily, reduce costs.
2. What change can be made that will result in an improvement? The authors thought that management of the entire course of respiratory failure, through their care process model, might achieve these results.
3. What would indicate that a change is an improvement? The authors selected outcome measures to confirm progress. Documenting real change over time may be accomplished efficiently using time series plots. Several time series plots were included to show changes achieved in the RICU. The authors also followed the techniques of Langley and colleagues [14], using the plan-do-study-act rapid improvement cycle.

Development of the respiratory failure care process model

Before the development of their respiratory failure care model, the authors retrospectively reviewed data for all patients treated in the ICU at LDS Hospital from June 1, 1995, through May 31, 1996. Of the 4424 critically ill patients, 112 (2.5%) had respiratory failure. The respiratory failure patients' mean hospital length of stay was greater than 3 weeks, accounting for 29% of ICU patient days and 53% of mechanical ventilation days. Total hospital average cost per case for the group was $121,000 in 1996 United States dollars. These patients were cared for in all four intensive care units at LDS Hospital, and half required prolonged stays in rehabilitation units or extended care facilities. Approximately 40% of the patients who were employed before their illness had not returned to work at 1 year after hospital discharge (C. Jane Wallace, RN, PhD, LDS Hospital, unpublished data, 2000). These data prompted the development of the RICU at LDS Hospital, designed for the express purpose of treating respiratory failure patients. A care process model also was developed using a multidisciplinary, research-based approach designed to prevent pressure ulcers, prolonged immobility, deconditioning, oversedation, stress gastritis, deep venous thrombosis, inadequate nutrition, sleep deprivation, and infectious complications. The authors predicted that

this model would decrease mechanical ventilation days. The care process model differs from traditional care in the following ways:

A care manager with extensive clinical experience is assigned to coordinate care activities for the entire hospital stay.
A multidisciplinary standard care process designed by practicing clinicians guides care in all patients.
Outcomes-oriented data are collected.
Interdisciplinary documentation is used.
Tools to manage the care process were developed.
Longitudinal outcome data are collected.

The authors recognized these changes would require several years to develop and implement.

The clinical team includes an outcomes research manager, clinical care manager (generally an advanced practice registered nurse), physician leader, physicians, nursing, respiratory therapy, physical therapy, occupational therapy, rehabilitation, pharmacy, and dieticians. The clinical care manager and the attending physician, along with other members of the interdisciplinary team, use the care process model to formulate a care plan for each RICU patient. Patients with respiratory failure receive standardized:

Sedation and paralysis administration
Mechanical ventilation orders
Stress ulceration prophylaxis
Deep venous thrombosis prophylaxis
Nutritional support
Maintenance of skin integrity
Physical activity
Treatment of sleep deprivation
Prevention or treatment of infectious complications
Prevention of aspiration

Point-of-care tracking allows the clinical care manager to assure that the care process is used and to document its effectiveness or reasons why it was not used for each patient.

Implementation of the respiratory care process model

To implement the care process model, the authors had to make significant changes in the RICU, which included changes in how the RICU staff worked together. Teamwork and collaboration in the ICU too often is nonexistent between disciplines, or at best is fraught with problems [15,16]. Clemmer and colleagues [17] argue that working together to attain a common purpose is inseparable from change. To effect change, the authors needed cooperation of multiple disciplines, including physicians, nurses, respiratory therapists, physical therapists, and critical care technicians.

During development of the care process model, the authors found many aspects of ICU care that required substantial change. Using a theoretical framework of eight stages of change [18], the authors described the implementation of the care process model in the RICU. Each of the eight stages of change has a corresponding pitfall. The authors encountered significant challenges opposing change in each stage.

Stage 1: establishing a sense of urgency

Early on, an ICU nurse followed patients through the hospital course and recovery phase after transfer from the ICU. After this experience, it became clear that many of the clinical practices initiated early in the course of critical care had long-term side effects that were barriers to recovery. One was the physical deconditioning brought on by illness, heavy sedation, and prolonged bed rest. The identification of barriers to recovery resulted in a sense of urgency to create a process of care that would connect hospital day 1 with the day of discharge, thereby promoting activities that would circumvent complications commonly associated with critical illness.

This perspective was absent in colleagues from traditional ICU backgrounds. The ICU staff caring for patients in the initial phases of respiratory failure had no experience with eventual patient outcomes, such as rehabilitation or nursing home placement, so they could not link early treatment choices with long-term outcomes. Because the RICU was staffed with critical care nurses who did not have a traditional ICU background, they shared the sense of urgency to create a process of care centered on improvement in both short- and long-term outcomes.

Stage 2: creating a powerful guiding coalition

Successful transformation requires a guiding coalition that consists of the unit nurse manager, physician director, and a small number of the most influential people who share a commitment to change. One obstacle to creating a significant guiding coalition was the lack of evidence and/or data supporting activity as an essential part of ICU care. The authors conducted a 1-year pilot study that included early activity in respiratory failure patients on mechanical ventilation, which showed a favorable trend in decreasing ICU length of stay, days on mechanical ventilation, and hospital costs. These results, however, did not change traditional ICU staff practices, requiring creation of a physically detached ICU with a new culture. In this environment, the authors developed a small group of nurses and physicians willing to try a new approach. The authors continued to develop and implement the care process model while they collected data and gained the experience to better articulate a new model of care for respiratory failure patients.

The area of early mobility therapy for ICU patients is conceptually new for hospital administrators and most ICU caregivers alike. There are few published studies to use in defense of staff requirements for early mobility teams. In this light, the authors had limited success in communicating their impetus to change the process of care to hospital administrators. One potential roadblock in their interaction with hospital administrators was the inability of the hospital's accounting system to evaluate revenue in terms of dollars saved by new approaches in the RICU. Furthermore, concentration of the most complex and lengthy cases in a single ICU resulted in a quite a different budget report for the RICU, when viewed from the usual administration metric of ICU cost per case (Fig. 1). The authors argued that reducing length of stay over time, along with a lower than average cost per day of ICU care (Fig. 2) were more fair ways to judge the RICU. Fortunately, the RICU appeared favorable to administration by relieving other hospital ICUs of difficult-to-wean patients, thereby improving ICU patient flow through the hospital. Ultimately, more ICU beds were needed to treat critically ill patients, so the RICU remained open.

Stage 3: creating a vision

Both unit leaders and staff sought a process of care for the entire continuum of care. The authors concentrated on the following related areas:

Reducing oversedation
Increasing early activity
Encouraging sleep to reduce delirium and allow for physical conditioning and weaning from mechanical ventilation
Airway protection in newly extubated patients

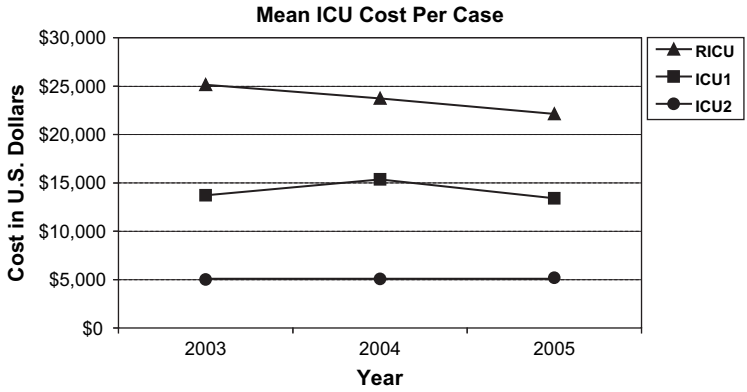

Fig. 1. Mean ICU cost per case for three ICUs, including the RICU, at LDS Hospital over time. Costs are shown in United States dollars not adjusted for inflation.

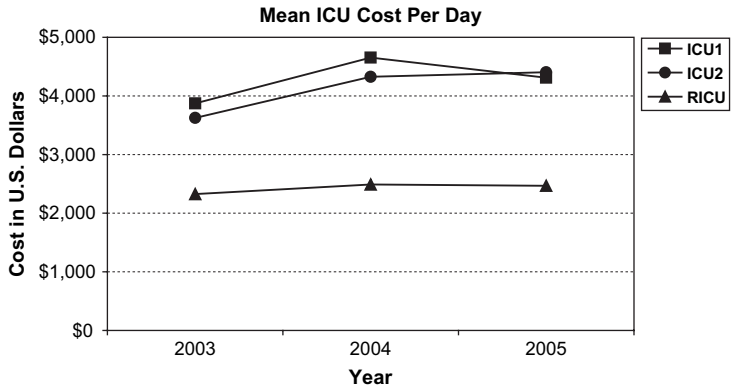

Fig. 2. Mean ICU cost per day for three ICUs, including the RICU, at LDS Hospital over time. Costs are shown in United States dollars not adjusted for inflation.

Initially, the authors held frequent team building meetings where all members of the team contributed to a mission, vision, and value statement. The authors review and revise their mission statement at regular intervals.

Stage 4: communicating the vision

Because the authors desired to change care across the continuum, communicating the process of care in all clinical areas was necessary. The RICU typically does not admit respiratory failure patients from outpatient settings because of lack of 24-hour coverage by residents. Instead, patients are admitted initially to other ICUs. Patients with prolonged respiratory failure subsequently are transferred to the RICU. To provide care across the continuum, early activity and the corresponding processes of care needed to be initiated before transfer to RICU. Hence, the authors needed to communicate the vision to other areas of the hospital and obtain buy-in from clinicians to begin activity early in the ICU course. Educational presentations therefore were made to the other ICUs and acute care areas. Unfortunately, the authors were unable to create support for their process of care in other ICUs.

Stage 5: empowering others to act on the vision

In interactions with the hospital leadership, the RICU team members perceived limited enthusiasm at many levels for the atmosphere of change represented by the RICU. Although the RICU team members sought similar practice changes outside of the RICU, the team was not able to convince management and physicians to require activity as part of clinical care outside of the RICU environment. Individual clinicians are allowed to determine patient care, and the RICU team members perceived a wide variation in the continuum of care outside of the RICU. The authors have removed

this obstacle partially by moving patients to the RICU much earlier in their hospital course. Initially, the average time from hospital admission to RICU admission was 7 to 10 days [19]. Currently the average time to RICU admission is 2 to 3 days.

One obstacle to patient activity in the ICU is coordination of care. Ensuring twice-daily activity for patients, without increasing staffing, required restructuring of patient care. The authors conducted a cross-training course that allowed the staff to share certain tasks. For instance, registered nurses could do a respiratory treatment if the respiratory therapist was busy walking a patient. Physical therapists learned to disconnect arterial lines and flush feeding tubes. Although there is less sharing of these tasks over time, the real advantage of a cross-training program is clear. Staff members learned to be flexible, work well together, and plan their day around the needs of patients.

Another significant obstacle in creation of the RICU culture was finding nurses who agreed with the vision of the care process model. Initially, the authors tried to hire experienced nurses from the other ICUs at LDS Hospital to work in the RICU. With the exception of a few senior ICU nurses involved in the culture change, many potential ICU nurse applicants for the RICU articulated opinions that did not support the early mobilization of sick patients. Commonly, an opinion was expressed that patients should be sedated deeply to facilitate patient comfort and the administration of care. Therefore, the authors hired new ICU nurses and exposed them to the RICU culture from the ground up, rather than try to re-educate established ICU nurses.

Stage 6: planning for and creating short-term wins

RICU team members, many of whom had less than 5 years of clinical experience, received initial short-term wins enthusiastically. An example of one short-term win was to provide the staff data that showed that while the number of admissions to the RICU increased, the number of staff hired also increased. One problem the authors encountered was involving respiratory therapy colleagues in the care process model to teach and provide care for patients. Initially, the RICU team was unable to hire an experienced respiratory therapist who shared the vision for change in care. What the RICU team respiratory therapist lacked in clinical experience, was made up for in enthusiasm and energy. Another short-term win was the selection of this respiratory therapist to serve in the role of shift coordinator. This role required the ability to serve as a resource to the rest of the staff, which generally is reserved for registered nurses. Using this experience, the authors created a cross-training program for respiratory therapists and registered nurses that produced greater efficiency in care delivery and improved knowledge transfer, resulting in stronger staff skills and greater teamwork and collaboration.

A third short-term win was the increased activity in RICU patients, and secondary benefits of activity such as reduced sedation. Participating in activity requires the patient to be neurologically responsive, which in turn requires appropriate administration of sedation. The authors also explored alternative medications for sedation that do not cause respiratory depression or drive the level of consciousness to one that excludes participation in activity.

Stage 7: consolidating improvements and producing still more change

Consolidating improvements to produce more change began to happen quickly once the team reached a level of maturity. An example is the authors' sleep work in critically ill patients. Sleep deprivation and poor sleep quality are common in critically ill patients [20,21]. The authors therefore made recording nighttime sleep duration a priority in all RICU patients.

After adding sleep to their usual computerized nursing charting package, the authors expected that sleep would be charted regularly. This expectation, of course, was not realized. After several rounds of staff education, sleep charting improved to approximately 80% of the time. This was short of the authors' goal of greater than 90% compliance. Therefore, the authors implemented a formal consolidation process, where they tracked noncompliance with sleep charting, providing regular feedback to the staff. The initial measured noncompliance rate for charting sleep in RICU patients in January of 2004 was 14% (Fig. 3). The results of the consolidation effort are seen over the ensuing 24 months, where the authors improved the noncompliance rate to 0% in August of 2005. The subsequent rebound to about

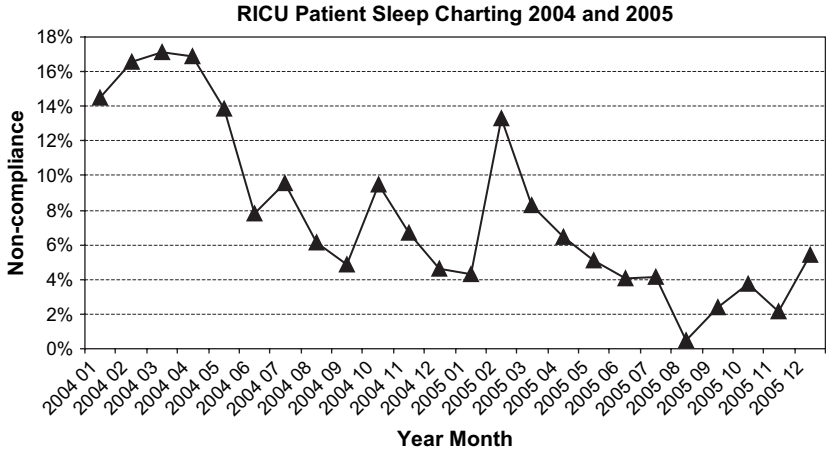

Fig. 3. Noncompliance in nurse charting of patient sleep in the RICU over time, with a goal of greater than 90% compliance. By March of 2005, the authors had greater than 90% compliance in sleep, which remains over time.

5% noncompliance was expected, but could be subjected to further maintenance measures. The 95% compliance rate, however, met the authors' goal of greater than 90% compliance, so they continue to track sleep charting using time series data to determine if further intervention is required. All improvement projects, including early activity, must receive such maintenance if there is to be long-term cultural change.

Stage 8: institutionalizing new approaches

The authors developed and posted a goal grid that allowed the staff to see all the projects currently under way to improve patient care. Each staff member is part of some project; however, all staff often are not aware of all unit projects. Along with the RICU projects, the posted data from outcome measures, so that staff can link projects directly with results. The staff is educated regarding the stepwise process of transformational change and their ability to see the larger picture—how change in care can improve outcomes—is increasing. The changes brought about by the care process model resulted in a RICU staff view of "that's the way we do it here in RICU," so that these new approaches are institutionalized on the local (RICU) level.

At the system level in Intermountain Healthcare, the RICU has become recognized as a leader in developing models of care. Teamwork approaches and the nurse as the central team member also have received system recognition. Nursing research and development projects in the RICU were instrumental in helping LDS Hospital to achieve magnet nursing status. Development of the Intensive Medicine Clinical Program across Intermountain Healthcare has allowed other ICUs to benefit from the lessons learned in the RICU. LDS Hospital's RICU and staff are now, after 7 years, being recognized for their contribution to patient care. The care process model has been linked to improved outcomes for patients (see Measuring effectiveness of the care process). The authors have shared care process protocols, data collection tools, and management strategies to bring about lasting changes. At a more global level, the authors have shared some of their experiences with fellow members of the Institute for Healthcare Improvement's 100K Lives Campaign. They also have presented some of their results in national forums [22,23] and are beginning to publish them in peer-reviewed journals [19]. These successes are shared with staff, fostering pride in collective accomplishments.

Reliability and quality in ICU care delivery

Numerous publications have highlighted problems in the quality and reliability of healthcare. The most important consensus statement comes from the 1999 Institute of Medicine assessment that almost 100,000 patients suffer avoidable death in American hospitals each year [24]. Furthermore,

there is evidence that this situation has not improved much 5 years later [25]. The Institute for Healthcare Improvement (www.ihi.org) has taken a leading role in improving healthcare reliability. Unfortunately, recent reports indicate reliability of performance in accepted healthcare interventions is approximately 55% [26].

In the ICU, reliability of system performance is equally a key concern. Step 7 (Consolidating improvements and producing still more change) and Step 8 (Institutionalizing new approaches) provide a pathway out of—the reliability dilemma. The authors created an ICU dashboard using time series plots of all key ICU processes that allow ICU leadership to verify reliable performance over time. Such an approach ensures that new projects lead to sustained institutional reliability.

Early activity—a case study of successful change in the ICU

Critical illness is associated with poor physical outcomes [1,27,28]. Patients often have persistent weakness with motor and sensory deficits, fatigue, and difficulty with mobilization after prolonged hospitalization [29]. Prolonged immobilization may play a significant role in the neuromuscular abnormalities and complicate the clinical course of most critically ill patients [30]. The authors developed their activity protocol to address problems of prolonged immobilization in patients with respiratory failure.

Early activity protocol

Early activity is begun when the patient achieves initial physiological stabilization and continues through the ICU stay. Initiation of activity is based on neurologic, respiratory, and circulatory criteria. The neurologic criterion to begin activity requires the patient to respond to verbal stimulation (purposeful response). The respiratory criteria are a FiO2 no more than 0.6 and positive end expiratory pressure (PEEP) no more than 10 cm H_2O. The circulatory criteria are the absence of orthostatic hypotension and catecholamine drips. All patients are assessed to determine if they met early activity criteria within 24 hours of RICU admission and daily thereafter. Detailed information regarding the activity protocol is available elsewhere [19].

Each activity requires the physical therapist, respiratory therapist, nurse, and critical care technician to work as a team. Activities begin with sitting on the edge of hospital bed without back support, then sitting in a chair after transfer from the hospital bed, and finally ambulating with and then without assistance using a walker or support from the RICU staff. During ambulation, a physical therapy technician with a wheelchair follows behind the patient in case of sudden fatigue or any adverse event. The goal of the activity protocol is to ambulate more than 100 feet before RICU discharge.

The authors progressively increase the activity level (eg, from sitting in chair to ambulating) in twice-daily physical therapy sessions. If activity is suspended for any reason, activity is re-evaluated daily during team rounds until reinitiated [19].

Measuring effectiveness of the activity protocol

The authors studied the safety and feasibility of activity in the RICU including a total of 1449 activity events. The activity events included 233 (16%) sitting on a bed, 454 (31%) sitting in a chair, and 762 (53%) ambulating [19]. The authors also monitored adverse activity-related events with a frequency of less than 1%, including fall to the knees without injury, feeding tube removal, systolic blood pressure (BP) greater than 200 mm Hg, systolic BP less than 90 mm Hg, and desaturation less than 80%. The adverse events did not lead to extubation, injury, prolonged ICU or hospital stay, or increased costs [19].

On the last full day of RICU stay, the median distance ambulated by survivors was 200 feet (mean 212 ± 178 feet, range 0 to 600 feet). These data include an assigned ambulation distance of zero feet for all patients whose activity level was sitting on a bed or in a chair or no activity. The survivors' activity level on the last day of RICU treatment was: 2.4% had no activity; 4.7% sat on bed; 15.3% sat in a chair; 8.2% ambulated up to 100 feet, and 69.4% ambulated over 100 feet.

Since the implementation of the care process model with the early activity program, the mean RICU and hospital length of stay for respiratory failure patients has declined (Fig. 4). The mean RICU length of stay was 13 days in 2000 and 10 days in 2005. During the same period of time, performance of tracheotomy declined from 29% less than 5%, and weaning failure declined

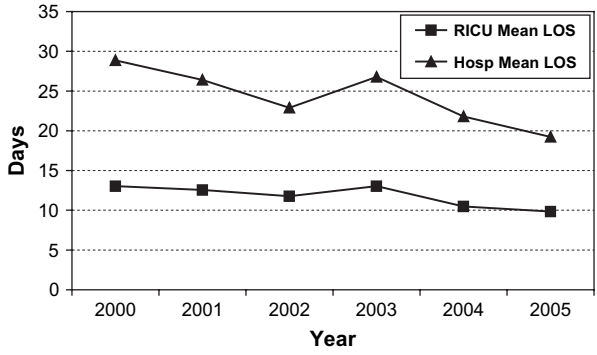

Fig. 4. Mean RICU and hospital length of stay for respiratory failure patients over time. The mean RICU length of stay declined from a mean of 13 days in 2000 to 10 days in 2005, and hospital length of stay declined from a mean of 28 days in 2000 to 24 days in 2005.

from 12% to 3% (Fig. 5). It should be noted that tracheostomy usually is done for weaning failure and not as part of routine care in mechanically ventilated patients. Additional factors may have played a role, but early activity along with sedation and mechanical ventilation management are likely key contributors to this success.

The cost of improvement

One of the key considerations in any improvement process is how the costs of improvement are borne. It is almost always necessary to fund improvements in a budget-neutral manner. If there is no new capital, then one must learn to work smarter, because asking staff to work harder over the long run is not viable. Although many quality improvement processes save money, the insurance companies that pay for health care—rather than the improvement process or the institution—typically realize such savings. This prevents garnering the savings from the improvement processes to self-fund the project or to capture additional funding from the administration.

The changes in care made in the RICU were instituted without new funding. In fact, the RICU operated under a reduced budget over much of its existence, as it was set up initially as a step-down unit, even though it began to function almost immediately as a full-fledged ICU. Following budget reorganization, the RICU's funding per day of ICU care was still lower than the other medical ICUs in the hospital (see Fig. 2).

Even while the authors changed the structure of ICU care and reduced length of stay, they tried to hold ICU costs constant (see Fig. 2). Note that unit costs were constant in terms of cost per day (see Fig. 2), while cost per case decreased (see Fig. 1), as the authors were successful in

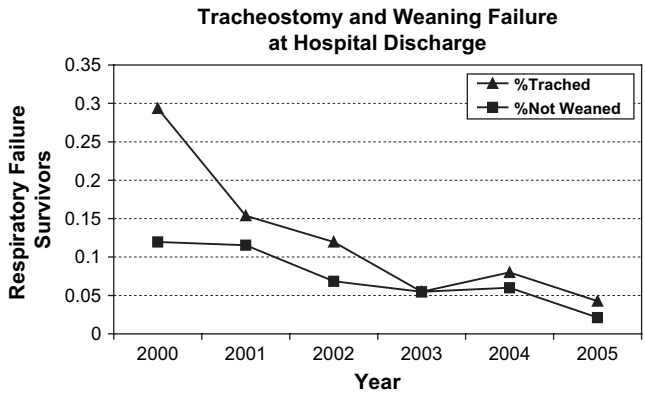

Fig. 5. Declining tracheostomy and weaning failure at hospital discharge over time. Tracheostomy usually is done for weaning failure and not as part of routine care in mechanically ventilated patients.

reducing the RICU length of stay (see Fig. 4). Another factor in determining cost is the degree of patient illness (acuity). One standard metric for acuity is the acute physiologic score (APS), the acute component of an Acute Physiology and Chronic Health Evaluation (APACHE) II score. The RICU APS scores are roughly comparable to the other medical ICUs at LDS Hospital (Fig. 6), so that the lower cost per day of care (see Fig. 2) was not on the basis of less ill patients. These figures show that the authors were able to restructure the RICU, including the changes in activity program, without needing or receiving any additional funding from LDS Hospital administration. These achievements clearly required a dedicated RICU staff.

Improving the respiratory ICU safety and teamwork climate

The climate (culture) of an institution is talked about frequently, yet it is hard to understand fundamentally. Survey tools developed by Sexton and colleagues [15] allow a semiquantitative assessment of healthcare culture. As with cost, the authors wanted to make sure that their improvements were not made at the expense of deteriorating unit culture. The authors' anecdotal experience has been that climate improves when front-line staff is engaged in meaningful projects to improve patient care. Such projects tend to give the sense of ownership, such as "This is how we do things in our ICU…" Fig. 7 compares the RICU safety climate with other ICUs in the Intermountain Healthcare system. Fig. 8 compares the RICU teamwork climate with other ICUs in the Intermountain Healthcare system. The authors do not have baseline data to prove that their scores are the result of improvement activities, but the data do not suggest any cultural problems associated with the improvement environment. The

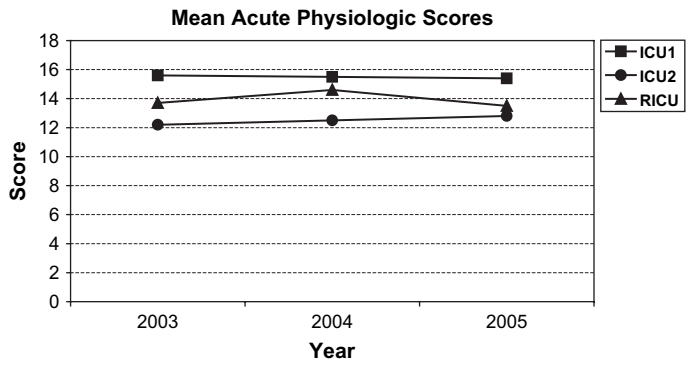

Fig. 6. Mean acute physiologic scores for three ICUs at LDS Hospital. Note that the mean acute physiologic scores for respiratory failure patients in the RICU fall between those in patients treated in LDS Hospital's other medical ICUs.

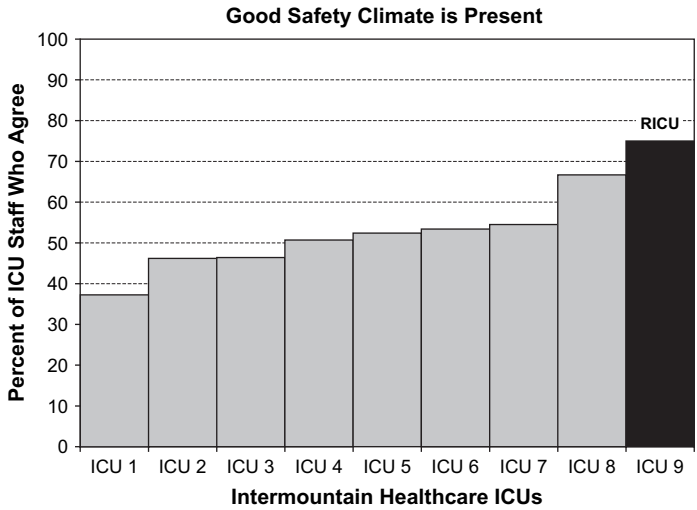

Fig. 7. Survey data regarding the presence of a good safety climate in all ICUs in Intermountain Healthcare. The RICU staff had the highest percentage of staff who indicated there was a good safety climate in the ICU.

survey has been conducted only once (the second survey is underway) so there are only data from one point in time. As has been found in other surveys of ICU culture [31], there remains considerable room for improvement (see Fig. 8).

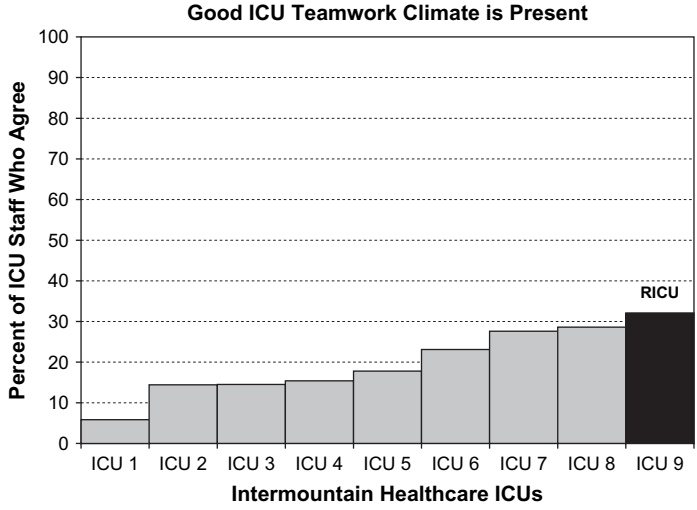

Fig. 8. Survey data regarding the presence of a good teamwork climate in all ICUs in Intermountain Healthcare. The RICU staff had the highest percentage of staff who indicated that there was a good teamwork climate in the ICU.

Summary

ICU culture can be transformed in a way that results in improved and more reliable care, including early mobility, while stabilizing or even decreasing cost. A side benefit of front-line staff involvement in improvement projects has been the simultaneous development of a culture of safety and teamwork.

Acknowledgments

The authors are indebted to Polly Bailey, APRN, and Louise Bezdjian, APRN for their input and for reviewing the manuscript, to Larissa Rodriguez for database support and graphics, and to Nathan Dean, MD, for reviewing the manuscript.

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