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INTRODUCTION

For more than three decades, patients who fail to wean in the critical care setting, becoming dependent on mechanical ventilation, have been transferred to long-term care hospitals for continued attempts at weaning from prolonged mechanical ventilation (PMV). Barlow Respiratory Hospital (BRH) is a 105-bed long-term acute care (LTAC) hospital network that has functioned as a regional weaning center, accepting chronically critically ill (CCI) patients transferred from the ICUs of hospitals in southern California.

Previously, we have reported on the subpopulation of patients with prolonged mechanical ventilation (PMV) and renal insufficiency (1, 2). Herein we report updates to weaning outcomes and 12-month post-discharge survival in patients transferred to Barlow Respiratory Hospital (BRH), a long-term acute care (LTAC) hospital, for weaning from PMV who also received renal replacement therapy (RRT). We also provide a perspective comparison analysis of selected data for three distinct time periods.

METHODS

Data were abstracted by trained personnel from transfer documents and BRH medical records of all adult ventilator-dependent patients receiving invasive mechanical ventilation admitted for weaning. Custom queries were constructed to obtain electronic medical record (EMR) data. Patients with RRT were categorized as: RRT initiated prior to admission to BRH; RRT initiated at BRH. Pre-morbid functional status was determined using the Zubrod Score (0 = Fully active to 4 = Bedridden with no self-care). Zubrod scores of 0-2 were deemed "good" functional status; scores of 3-4 were "poor" functional status. Weaning outcomes were scored at BRH discharge. Social Security Death Index (SSDI) determined post-discharge survival.

RESULTS

Historical comparison data are presented in Table 1. From 1/1/2008–12/31/12, 1,494 patients admitted for weaning were discharged from BRH; 119 (8%) also received RRT (Table 2).

Table 1: Weaning Outcomes and 12-month Post-Discharge Survival in Patients with RRT and PMV: Comparison of Three Time Periods

| Outcomes | 1988-1996 (n=50) | 1997-2000 (n=62) | 2008-2012 (n=119) |
|--------------------------------|------------------|------------------|-------------------|
| RRT on admit / RRT after admit | 40/10 | 57/5 | 67/52 |
| Weaning Outcome: | n (%) | n (%) | n (%) |
| Weaned | 4 (8) | 15 (24) | 43 (36) |
| Vent- dependent | 2 (4) | 3 (5) | 43 (36) |
| Died | 44 (88) | 44 (71) | 33 (28) |
| 12-month post-DC survival | 0% | 11% | 44%* |

*Live discharges through 12/31/2011

Figure 1: Weaning Success Across Time Periods

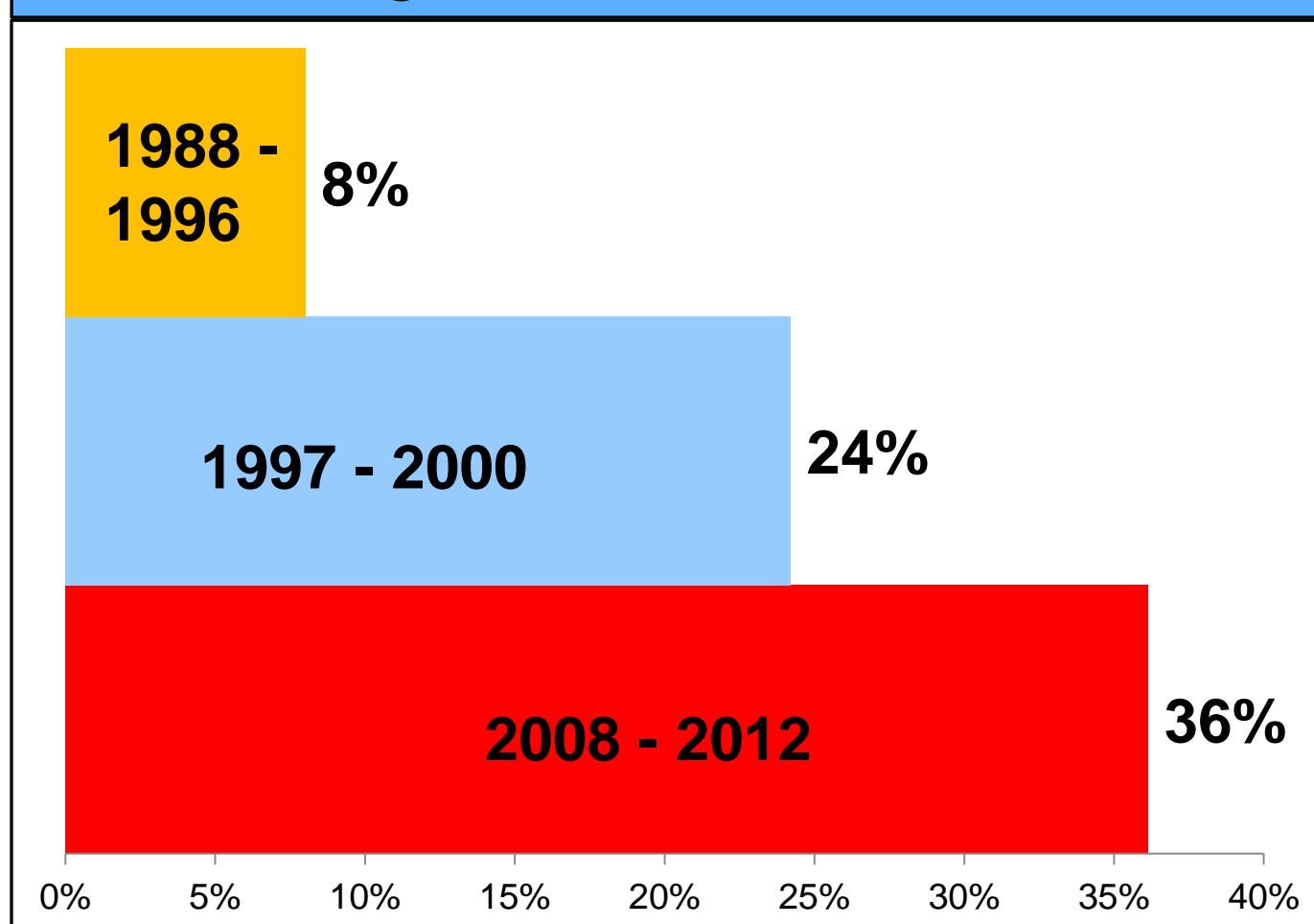
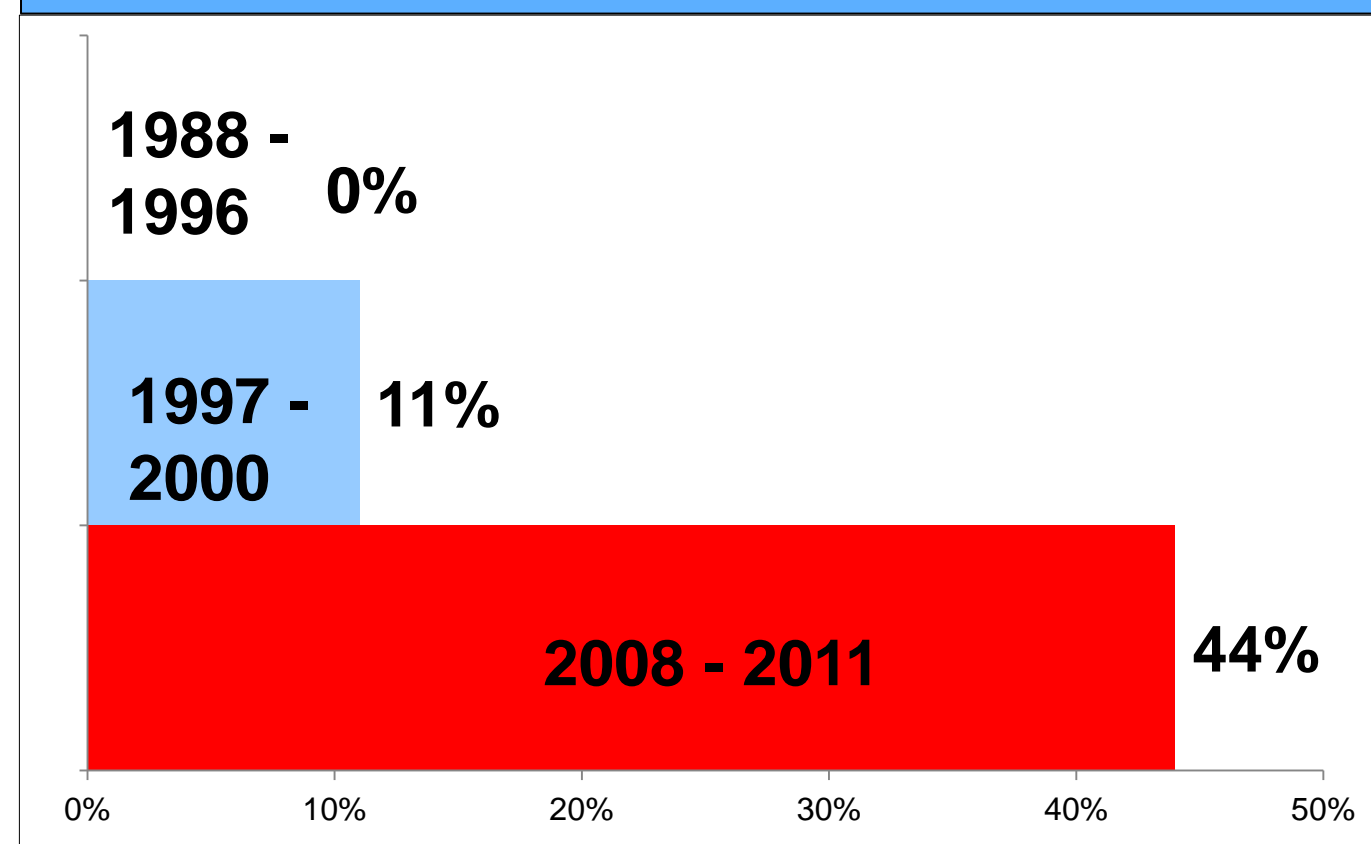


Figure 2: 12-Month Post-DC Survival Across Time Periods



*Live discharges through 12/31/2011

Table 2: Comparison of Admission Characteristics, Weaning Outcomes, Discharge Disposition, and 12-Month Post-Discharge Survival 2008-2012

| Characteristic | RRT initiated prior to BRH Admission n=67 | RRT initiated after BRH Admission n=52 | Patients With no RRT n=1,375 |
|---------------------------------|---|--|------------------------------|
| Age, years | 70 [41 - 92] | 78 [44 - 100] | 73 [19 - 101] |
| Gender, male | 49% | 46% | 48% |
| Payer, Medicare | 66% | 69% | 72% |
| Ethnicity | n(%) | n(%) | n(%) |
| African American | 10 (14.9) | 3 (5.8) | 155 (11.3) |
| Asian/Pacific Islander | 9 (13.4) | 3 (5.8) | 140 (10.2) |
| Caucasian | 25 (37.3) | 28 (53.8) | 761 (55.3) |
| Hispanic | 19 (28.4) | 15 (28.8) | 290 (21.1) |
| Other | 2 (3.0) | 1 (1.9) | 15 (1.1) |
| Missing/Unknown | 2 (3.0) | 2 (3.8) | 14 (1.0) |
| Pre-morbid Location | n(%) | n(%) | % |
| Home | 54 (80.6) | 37 (71.2) | 73.1% |
| ECF | 13 (19.4) | 15 (28.8) | 26.9% |
| Pre-morbid Zubrod | n(%) | n(%) | % |
| "Good" Functional Status | 37 (55.2) | 25 (48.1) | 55.2% |
| "Poor" Functional Status | 30 (44.8) | 27 (51.9) | 44.8% |
| APACHE III@ APS | 63 [41 - 97] | 48 [24 - 84] | 40 [8 - 111] |
| Glasgow Coma Score | 14 [3 - 15] | 12 [3 - 15] | 14 [3 - 15] |
| Lab Values | Mean (SD) | Mean (SD) | Mean (SD) |
| Serum Albumin (g/dl) | 2.7 (.69) | 2.3 (.62) | 2.4 (0.59) |
| Hematocrit (%) | 30.4 (3.5) | 29.5 (3.7) | 31.2 (4.6) |
| BUN (mg/dl) | 57.5 (27.9) | 49.5 (23.8) | 29.5 (20.1) |
| Creatinine (mg/dl) | 3.8 (1.8) | 1.65 (1.25) | 0.83 (0.53) |
| LOS, days | 41 [5 - 327] | 64 [14 - 299] | 35 [1 - 436] |
| Weaning Outcome | n(%) | n(%) | n(%) |
| Weaned | 30 (44.8) | 13 (25.0) | 765 (55.6) |
| Vent Dependent | 27 (40.3) | 16 (30.8) | 473 (34.4) |
| Died | 10 (14.9) | 23 (44.2) | 137 (10.0) |
| Time to Wean, days | n=30 | n=13 | n=765 |
| | 18 [4 - 130] | 62 [7 - 119] | 17 [1 - 275] |
| D/C Disposition | n(%) | n(%) | n(%) |
| Acute | 18 (26.9) | 6 (11.5) | 154 (11.2) |
| ECF | 35 (52.2) | 23 (44.2) | 931 (67.7) |
| Home | 4 (6.0) | | 145 (10.5) |
| AMA/Missing | | | 8 (0.5) |
| Expired | 10 (14.9) | 23 (44.2) | 137 (10.0) |
| Post-Discharge Survival* | 37 live discharges | 17 live discharges | 1,026 live discharges |
| *discharges through 12/31/11 | n(%) | n(%) | n(%) |
| Survival at 6m | 20 (54.1) | 12 (70.6) | 648 (63.2) |
| Survival at 12m | 16 (43.2) | 8 (47.1) | 556 (54.2) |

Table 3: Comparison of Average Costs for Patients Admitted for Weaning from PMV: RRT vs. No RRT

| | On RRT at Admission n=67 | On RRT after Admission n=52 | Not on RRT n=1,375 |
|----------------------|--------------------------|-----------------------------|--------------------|
| Total Cost | \$121,298 | \$220,403 | \$74,591 |
| Dialysis Cost | \$13,563 | \$13,383 | NA |
| Cost per Day | \$2,230 | \$2,442 | \$1,885 |
| Length of Stay, days | 41 [5-327] | 64 [14-299] | 35 [1-436] |

CONCLUSIONS

This is an interesting look at three distinct time period "snapshots" over more than two decades of post-ICU mechanical ventilation at a single facility.

- There is consistent improvement in weaning success over the three time periods.
- The improvement in 12-month post-discharge survival for patients with RRT and PMV over the duration of the VOD is striking.
- The clear differences in weaning outcomes and survival for patients admitted on RRT vs. those with RRT initiated at BRH may help to inform outcomes-based goals of care discussions and treatment decisions at the LTAC hospital.
- Determination of functional status and quality of life post-discharge in the population of patients with RRT and PMV are particularly important challenges.
- The experience and outcomes of this single center study may not be applicable to other centers or the CCI patient population in general.

REFERENCES

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