H Cleveland Clinic

Background

• Early Progressive Mobilization Programs in Medical ICUs have been reported to achieve significant cost savings, which are attributed to reductions in ICU and hospital length of stay (LOS) and a reduction in mechanical ventilation days.

Purpose

- To Determine the level of reduction and significance of an Early Progressive Mobility Program on three administrative and cost saving outcomes
- LOS in number of neuro ICU days and hospital days
- Mechanical ventilator use in percent of patients requiring mechanical ventilation and days requiring ventilator support
- Cost impact including direct, indirect and total cost

Methods

Prospective, pre-post comparative design, with IRB approval

Setting and Sample

- Quaternary care medical center in Northeast Ohio
- 22-bed Neurological Intensive Care Unit (standard equipment included TotalCare^R bed systems)
- Patients received usual care (pre) and Early Progressive Mobility Program (post)
- All admissions included in analysis Intervention
 - Mobility protocol algorithm provides criteria for mobility initiation, progression, and discontinuation
 - The protocol included 4 mobility milestones, beginning in bed through ambulation utilizing ICU bed features.
- Portable lift & bed features or lift team used to facilitate mobility Outcomes and Data Collection
 - Mechanical ventilation: ventilator use, and number of days on ventilator; by electronic medical record review
 - Cost: direct, indirect and total hospital costs; by administrative database data pull

Data Analysis

- Categorical factors are described using frequencies and percentages and were compared between groups using logistic regression models with generalized estimating equations (GEEs) to account for potential correlation among unit stays by the same patient
- Cost outcomes were positively skewed, so group comparisons were made using gamma regression models with GEEs
- Data management and analyses were performed using SAS software (SAS Institute Inc.; version 9.2; Cary, NC)

Impact of Early Mobilization on Mechanical Ventilation and Cost in Neurological ICU Kate E. Klein, ACNP-BC, CCRN; James F. Bena, MS; Nancy M. Albert, PhD, CCNS, CCRN, FCCM Cleveland Clinic, Cleveland, Ohio

Results

- 637 NICU patients; 260 pre and 377 post -intervention
- No differences between groups in demographic factors comorbid conditions, or acuity (APACHE III scores)
- Compared to pre-EPMP, 2 patient factors differed in the post-EPMP group. More patients prior to admission used walking aid and had more walking barriers in the post-EPMP group. **Table 1**

Table 1. Patient Characteristics

$\frac{\text{Pre-EPMP}}{\text{N} = 260}$	Post-EPMP N = 377	<i>P</i> -Value
62.7 (16.1)	61.3 (16.7)	0.36
168 (64.6)	274 (72.7)	0.15
129 (49.6)	189 (50.1)	0.63
2.6 (2.2)	2.6 (2.3)	0.76
59.2	55.0	0.23
129 (49.6) 100 (38.5) 31 (11.9)	192 (50.9) 142 (37.7) 43 (11.4)	0.075
34 (13.1)	21 (5.6)	0.006
10 (3.9)	42 (11.1)	< 0.001
10 (3.8)	20 (5.3)	0.38
	N = 260 62.7 (16.1) 168 (64.6) 129 (49.6) 2.6 (2.2) 59.2 129 (49.6) 100 (38.5) 31 (11.9) 34 (13.1) 10 (3.9)	N = 260N = 377 $62.7 (16.1)$ $61.3 (16.7)$ $168 (64.6)$ $274 (72.7)$ $129 (49.6)$ $189 (50.1)$ $2.6 (2.2)$ $2.6 (2.3)$ 59.2 55.0 $129 (49.6)$ $192 (50.9)$ $100 (38.5)$ $142 (37.7)$ $31 (11.9)$ $43 (11.4)$ $34 (13.1)$ $21 (5.6)$ $10 (3.9)$ $42 (11.1)$

APACHE, Acute Physiology and Chronic Health Evaluation; CCI, Charlson Comorbidity Index

Clinical Outcomes: LOS and Mechanical Ventilation

• Hospital and Neuro ICU LOS days were reduced; **Figure 1**

- Mechanical ventilation/patient was reduced; Figure 2
- Ventilator days/patient were reduced; **Figure 3**

Figure 1. Length of Stay

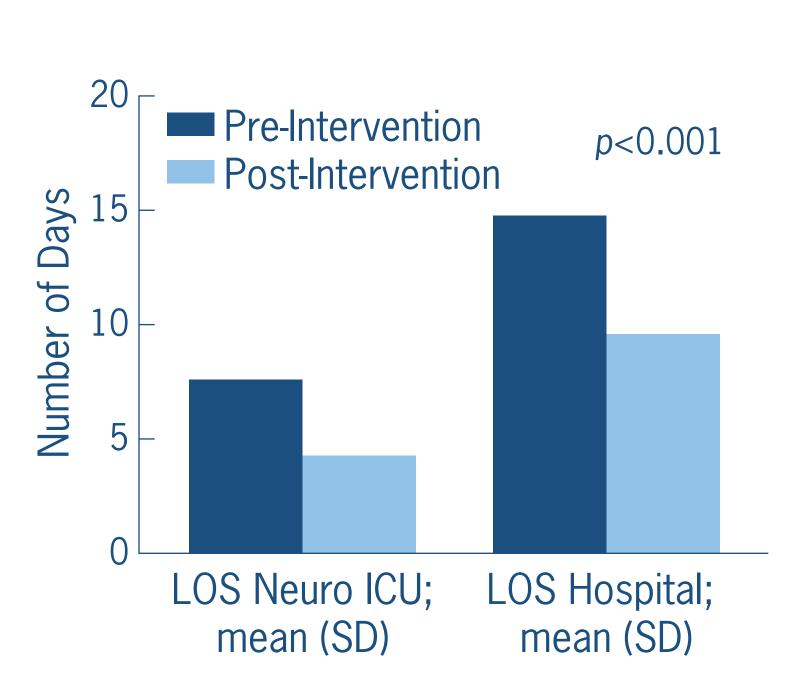


Figure 3. Mechanical Ventilator Days

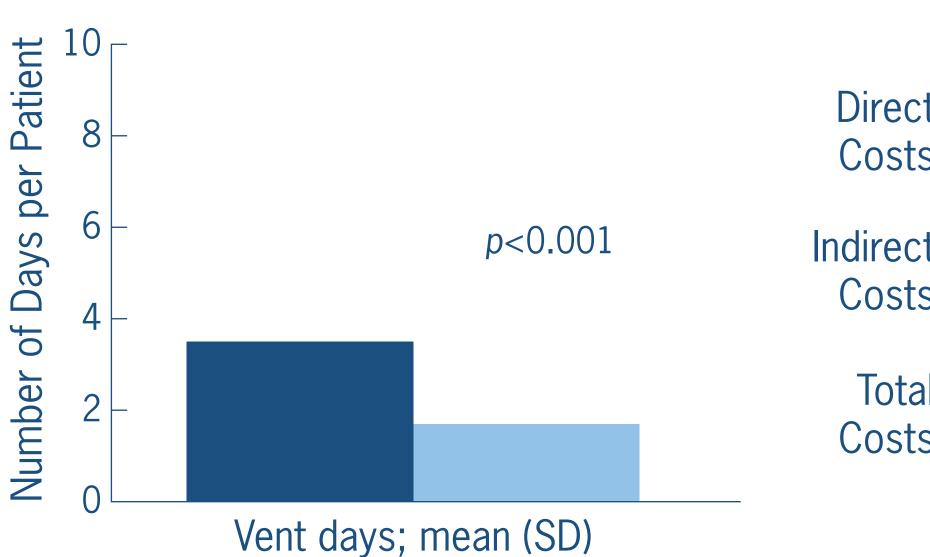


Figure 2. Mechanical Ventilator Use

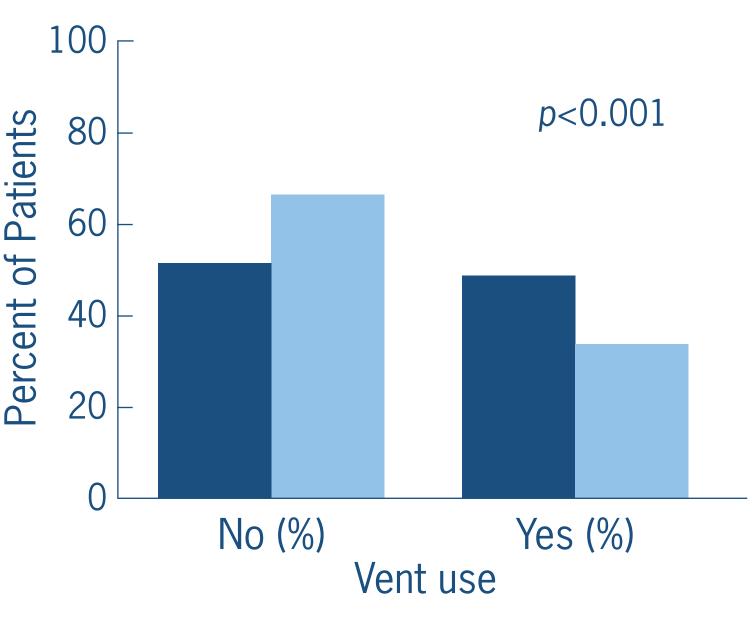
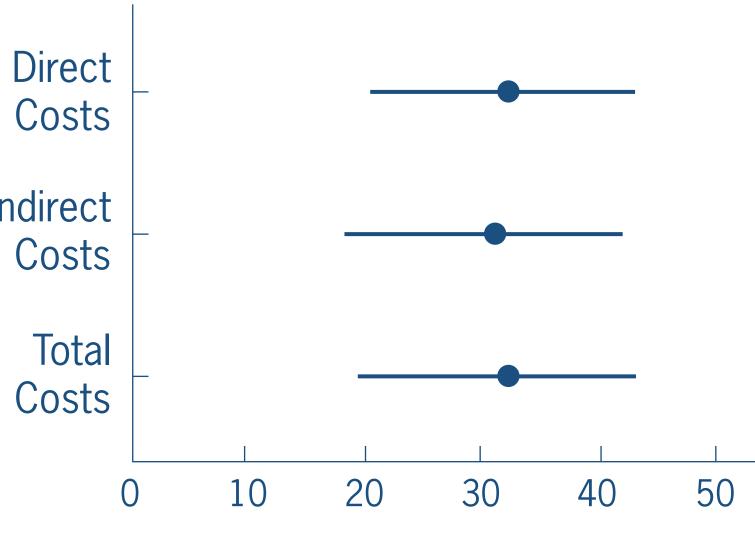


Figure 4. Cost Impact

Post-EPMP Rediction in cost (%)



Clinical Outcomes after Adjusting for Significant Ba Characteristics (walking aids and walking barriers)

 Ventilator use and ventilator days remained significantly after implementation of an early mobility algorithm; Tak

Table 2. Adjusted Clinical Outcomes

	Unadjusted Model		Adjusted M	Adjusted Model	
Factor	Mean (SEM)	P-Value	Mean (SEM)	P-Value	
APACHE III Pre-EPMP Post-EPMP	59.0(1.76) 55.6 (1.61)	0.16	59.0 (2.64) 58.7 (2.54)	0.90	
Neuro ICU Length of Stay Pre-EPMP Post-EPMP	7.60 (0.59) 4.28 (2.25)	< 0.001	7.37 (0.68) 4.75 (0.64)		
Hospital Length of Stay Pre-EPMP Post-EPMP	14.76 (0.99) 9.58 (0.44)	< 0.001	15.16 (0.96) 10.21 (1.04)	< 0.001	
	OR (95% CI)	P-Value	OR (95% CI)	P-Value	
Ventilator Use Pre-EPMP Post-EPMP	1.00 0.54 (0.38, 0.76)	< 0.001	1.00 0.54 (0.38, 0.76)	<0.001	
	Mean (SEM)	P-Value	Mean (SEM)		
Ventilator Days Pre-EPMP Post-EPMP	3.50 (0.37) 1.74 (0.20)		3.30 (0.44) 0.98 (0.41)	< 0.001	

Early Progressive Mobility – Financial Impact

- Of 637 cases, cost analysis included 605 unique hospitalizations (pre, n=243 and post, n=362); 32 patients had multiple Neuro ICU stays
- Overall cost and attributing factors including length of stay and mechanical ventilator therapy were reduced after implementation of an EPMP

Table 3. Cost Impact

Pre-EPMP	Post-EPMP	Reduction
Neuro ICU Length of Stay in 7.37 (0.68)	Days Therapy [mean (SEN 4.75 (0.64)	И)] 36%
Hospital Length of Stay in Da 15.16 (0.96)	ays [mean (SEM)] 10.21 (1.04)	33%
Patients Requiring Mechanica 1.00	al Ventilator Therapy [OR 0.54 (0.38. 0.76)	(95% CI)] 46%
Mechanical Ventilator in Days 3.32 (0.44)		70%
Cost Reduction Post-Early Pr NA	rogressive Mobility Progra Direct / Indirect 30% / 29%	nm Total 30%

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P.	-Value
<	0.001
<	0.001
<	0.001
<	0.001
<	0.001

Limitations

- Single center study with a pre-post design Data collected over a period of 1 year
- Other factors could have affected mechanical ventilation and cost outcomes
- Data collected by medical record review and administrative databases, missing or incorrectly imputed data could have affected data collection and analysis

Conclusions

- Implementation of a NICU EPMP reduced overall hospital costs by 30%
- This may have been driven by an ICU LOS decrease of 36%, Ventilator Use decrease of 46%, and a reduction in ventilator days of 70%
- Neuro ICU teams must develop sustainable EPMP
- Cost savings can be used to purchase safe patient handling equipment to improve both nurse and patient safety during transfer from bed to chair and to aid in walking

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