

Effect of Contactless Continuous Patient Monitoring in a Medical-Surgical Unit on Intensive Care Unit Transfers: A Controlled Clinical Trial

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Introduction

- ❖ Delayed or suboptimal intervention for inpatients with unexpected clinical deterioration is associated with increased morbidity and mortality.
- ❖ It has been established that patients frequently demonstrate clinical signs of deterioration hours before cardiac arrest or urgent transfers to intensive care units (ICU).
- ❖ The Earlysense™ system (EarlySense LTD) is a contact-less piezoelectric sensor placed under the mattress that provides validated accurate continuous measurement of heart rate and respiration rates.

Objectives

To determine the effects of continuous patient monitoring using the Earlysense contactless monitor in a medical-surgical unit on ICU transfers and ICU length of stay for patients initially admitted to non-ICU units.

Methods

- ❖ The study was a double-controlled group study conducted on the medical-surgical service of a 316 bed urban acute care community hospital.
- ❖ A 9-month prospective intervention period (Nov 09'-July 10') and a 9-month retrospective baseline period (Jan 09'-Sep 09') were compared for primary and secondary outcomes. Monitoring was performed in one unit (study unit) while a similar "sister" unit served as a control unit for the two time periods.
- ❖ Earlysense monitors were implemented in a 33-bed medical-surgical unit including bed side monitors, central nurse station display and pagers for nurses.
- ❖ Patient charts were reviewed by research nurses for co-morbidity, acuity level and study outcomes. Other study variables were collected through the hospital's administrative systems.

Results

- ❖ Overall, 7,643 patients participated in the study, 2,314 of them were monitored using the Earlysense monitor. Demographics and baseline clinical information is presented in **Table 1**.
- ❖ Although no significant change was found in ICU transfers, average length of stay in the ICU and total ICU days for transfers per 1000 patients in the medical-surgical unit has decreased significantly between the baseline to the intervention periods in the study unit and between the control and intervention group (**Table 2 and Figure 1**).
- ❖ Code blue events, a secondary outcome, were found to be significantly lower in the post intervention group compared with the pre (**Table 2**).

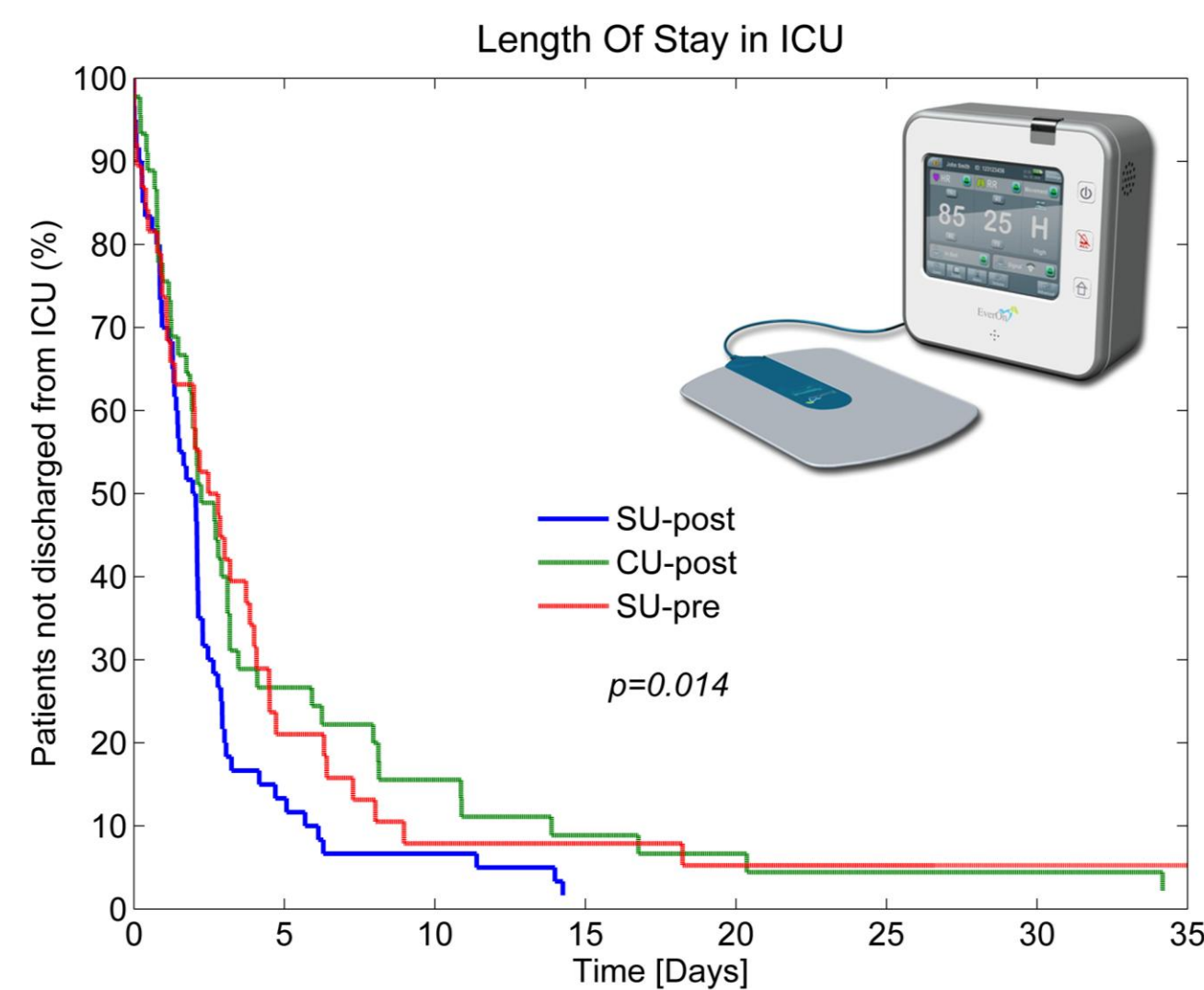


Figure 1: "Survival" plots describing patients stay in the ICU and comparing the study unit after the intervention (blue) to the study unit before (red) and control unit post (green).

	CONTROL UNIT			STUDY UNIT			CU-SU post p value	All Units p value
	Baseline (pre)	Control (post)	p value	Baseline (pre)	Intervention (post)	p value		
Patients n	1,535	2,361		1,433	2,314			
Age (SD)	49.8 (19.6)	49.6 (20.3)	0.76	49.5 (19.6)	49.3 (19.9)	0.73	0.50	0.81
Males %	46.2	45.0	0.57	44.5	48.9	0.04	0.08	0.19
Acuity level*	2.87	2.86	0.36	2.82	2.83	0.70	0.14	0.11
Charlson score	1.81	1.85	0.62	1.84	1.80	0.61	0.50	0.90

Table 1: Demographics and baseline acuity and co-morbidity for the four patient groups. (* acuity level – based on a hospital acuity score, range 1-4)

	CONTROL UNIT			STUDY UNIT			CU-SU post p value	All Units p value
	Baseline (pre)	Control (post)	p value	Baseline (pre)	Intervention (post)	p value		
Med-Surg unit LOS, days	3.80	3.61	0.26	4.00	3.63	0.03	0.91	0.10
ICU								
Transfers / 1000pt	18.89	19.06	1.00	26.52	25.93	0.92	0.12	0.21
Days / 1000pt	32.69	85.36	0.01	120.11	63.44	0.05	0.02	0.014
Avg. LOS, days	1.73	4.48	0.01	4.53	2.45	0.05	0.02	0.014
APACHE II score	13.08	14.06	0.59	15.19	13.38	0.25	0.61	0.65
Code blue events, N	6	5	0.36	9	2	<0.01	0.45	0.02

Table 2: Study outcomes compared between the four study groups. LOS=length of stay; APACHE II= Acute Physiology and Chronic Health Evaluation II (determine the severity of patient upon transfer to ICU and was calculated within the first 24h. Of ICU admission). Highlighted fields mark significantly different results.

Conclusions

- ❖ Continuous monitoring of heart-rate and respiration-rate in a medical-surgical unit was associated with a reduction in total days in the ICU due to patient transfers per 1000 patients with no associated change in number of transfers.
- ❖ We hypothesize that continuous monitoring might result in earlier recognition of patient deterioration and earlier transfer to the ICU, with resulting shorter stay.
- ❖ Although a significant decrease in number of code blue events was noted, small numbers prevent us from reaching conclusions regarding effect on cardiac arrests. Larger scale studies will be needed to address these issues.