The Effect of a Continuous Patient Monitoring System on Reducing Falls and Hospitalization in Skilled Nursing Facilities

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Introduction

Background: In the skilled nursing facility, acute changes in condition can result in unplanned hospitalizations for the elderly, often due to falls with injury, or as the result of the onset of an acute medical illness. The introduction of new technological solutions that incorporate continuous vital sign monitoring and surveillance of patient activity in bed can be utilized to improve outcomes among the nursing home population.

Objective: To assess the effects of continuous monitoring in reducing hospitalizations of post-acute care residents in a skilled nursing facility. This was studied using EarlySense™, a contactless patient monitoring system that continuously transmits real-time information on pulse, respiratory rate, and level of activity in bed directly to the nursing staff, and instantly alerts when these values fall outside of pre-set parameters.

Methods

This multi-center study was conducted concurrently at two sites: The Dorot Geriatric Center, a 374-bed facility in Netanya, Israel, and the Hebrew Home for the Aged at Riverdale, an 870-bed skilled nursing facility in Bronx, N.Y.

A six month monitoring period was compared to retrospective baseline controls in a post-orthopedic surgery unit and a nine month comparison to control floors with no monitoring was used to study both before-after and concurrent outcomes, respectively. Data on patients' falls, early diagnosis and treatment at the facility, and rehospitalization rates, were collected. Contactless sensors that monitor patient heart and respiratory rates, and in/out of bed status, were utilized. All data was provided to caregivers on bedside monitors and at the nursing station. Alerts regarding changes in vital signs or bed exit were transmitted to nurses for further assessment and intervention.

Results

We reviewed 833 patient records at Dorot and 773 records at the Hebrew Home. The transfer rate to the hospital decreased by 19% (p=0.06) at Dorot, and the falls rate decreased by 47% (p<0.05) at the Hebrew Home. Similar trends of improved outcomes were observed in other parameters at both settings, though the numbers were too small for statistical significance.

Table 1: Demographics HHAR

	Control	Evaluation (monitored)
Total (no.)	358	415
Men	152 (42.5%)	163 (39.3%)
Women	206 (57.5%)	252 (60.7%)
Age (average)	80.0	80.0

Table 2: Control vs. Evaluation Unit: HHAR Out-Come Results

	Control unit	Evaluation (monitored) Unit	% change
Total No. of patients	358	415	
Fall (%)	52 (14.5%)	32 (7.7%)	-46.9% (p<0.001)
Death (does not include DNR)	3 (0.8%)	2 (0.5%)	-37.5%
Pressure Ulcer	12 (3.4%)	13 (3.1%)	-8.8%
% Transfers to hospital	63 (17.6%)	70* (16.9%)	- 4.0%
hospitalization days / 100 patients	2343	2365	+0.9% (Equivalent to 20 patient hospitalization days)

Table 3: Demographics Dorot Medical Center

	Control	Evaluation (monitored)
Total (no.)	831	562
Men	289 (34.8%)	181 (32.2%)
Women	542 (65.2%)	381 (67.8%)
Age (average)	78	78

Table 4: Control vs. Evaluation Outcome data (Dorot Medical Center)

	Control	Evaluation (Monitored)	% Change
Number of Patients	831	562	
Falls from Bed (%)	15 (1.8%)	7 (1.3%)	-27.8%
Readmission to Hospital (%)	134 (16.1%)	73.(13.0%)	- 19.3% p= 0.06 (normalized per 1000 patients)
Death	2	0	-100%
Length of Stay (days)	23.7	24.2	+ 0.5 day (+ 2.1%)

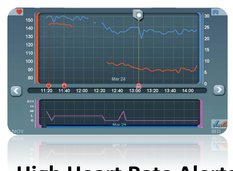
** Out of the 54 patients for whom monitoring data was available; EarlySense monitor provided alerts for 40 (74%) of the patients*

Conclusions

In this multi-center study, the implementation of EarlySense™, a continuous patient monitoring system on the post-acute care units has demonstrated a significant decrease in the total number of falls and a trend towards reduction in the transfer rate to hospitals, thus improving the overall quality of care for the elderly.

Alerts of high HR Leading to Detection of SVT and Dehydration

High Respiration Rate Alerts Leading to Timely Response to Acute abdomen with Colonic Necrosis



High Heart Rate Alerts Leading to Identification of Pain in a Non-Communicative Patient

High Respiration Rate Alerts Leading to Timely Detection of Sepsis and to Transfer to a Hospital

Financial Disclosure: EarlySense™ provided the monitoring systems for this project