

Is Perception Reality? Nurses' Expectations of Smart Pump-EHR Interoperability

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Background

Smart pump-EHR interoperability can offer significant benefits including improved patient safety, enhanced nursing efficiencies and increased charge capture.¹ Interoperability, however, requires significant change to clinical workflows, and this impact on the nursing experience has not been well documented. This study explored the perceptions of ICU and MedSurg (MS) nurses throughout a smart pump-EHR implementation.

¹Bartos D, Vitoux RR, Schuster C, Curtin CR. Outcomes from a smart infusion pump and electronic health record integration: Improved patient safety, nursing efficiency and return on investment. *J Inform Nurs.* 2022;7(3):13-19.

Method

Non-randomized, exploratory data collection study at a 172-bed acute care hospital in upstate New York. ICU (n=81) & MS nurses (n=139) completed a 30-item survey (5 demographic items) on interoperability expectations, programming confidence and estimated programming time during 4 study periods: 1 month pre- and 1-, 4-, & 6-months post-implementation. Data for each period were compared using an analysis of variance (ANOVA).

Lessons Learned

- ❖ Set realistic expectations of interoperability & impact on workflows
- ❖ Consider different clinical environments, room layout, technology placement
- ❖ Continue training after go-live with sustained engagement of unit super users
- ❖ Consider impact of 3rd party interface on workflow & documentation
- ❖ Establish measurable goals and a process for tracking & reporting performance

Conclusion

This study illustrated the change in interoperability perceptions over time. Nurses started with very high expectations, leaving little room for improvement and when it came to incorporating interoperability into clinical practice, expectations were reduced. ICU room layout (e.g. having pumps and computer on opposite sides of the bed) impacted time & efficiency and underscored the need to adapt workflows to each clinical unit. Even though time/efficiency expectations decreased, nurses thought integration improved safety and was easy to learn. While programming time improved, programming confidence did not, suggesting the need for continued support long after implementation.

The organization's nurse informaticist is critical to help drive change, manage expectations and measure performance, enlisting super users to address workflow issues in real-time and build confidence. Interoperability is a dynamic, continuous quality improvement project that requires constant vigilance, ongoing support, and a plan for sustaining success.

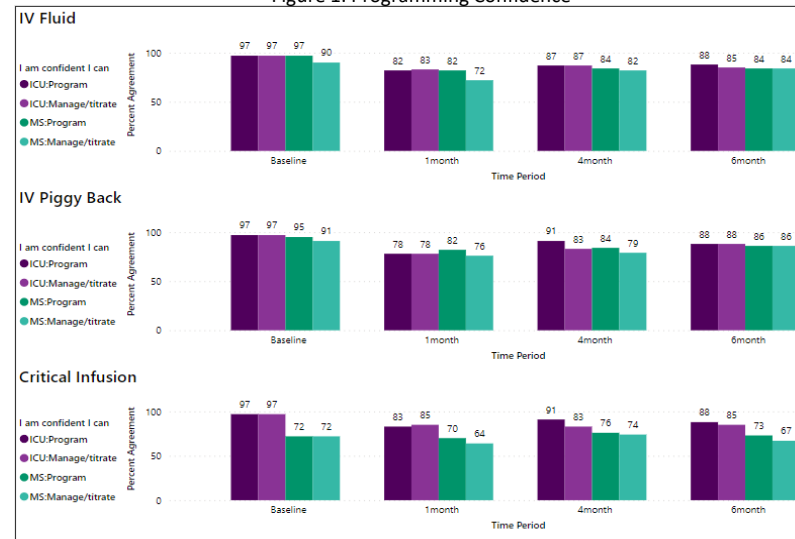
Results

Table 1: Interoperability Expectations	ICU Baseline (Mean±SD)	1month (Mean±SD)	4month (Mean±SD)	6month (Mean±SD)	p-Value	MS Baseline (Mean±SD)	1month (Mean±SD)	4month (Mean±SD)	6month (Mean±SD)	p-Value
Accomplish programming quicker	5.6±1.2	2.8±1.5	2.7±1.4	2.9±1.5	<.001	5.5±1.3	4.2±1.7	4.7±1.6	4.6±1.6	<.001
Improve quality of patient care	5.8±1.2	3.7±1.8	3.4±1.6	3.8±1.6	<.001	5.7±1.1	4.9±1.3	4.9±1.6	4.7±1.4	<.001
Improve safety of patient care	6.0±1.2	4.6±1.5	4.3±1.7	4.4±1.6	<.001	6.0±1.2	5.6±1.4	5.6±1.5	5.4±1.6	0.054
Increase effectiveness in caring for patient	5.7±1.3	3.3±1.6	3.2±1.7	3.4±1.7	<.001	5.6±1.3	4.8±1.5	4.8±1.4	4.5±1.5	<.001
Made documentation easier	5.6±1.3	2.9±1.6	2.7±1.6	3.1±1.8	<.001	5.6±1.3	4.6±1.6	4.9±1.7	4.7±1.7	<.001
Decrease time spent on documentation	5.5±1.4	2.7±1.7	2.2±1.2	2.8±1.7	<.001	5.6±1.4	4.2±1.8	4.3±1.8	4.3±1.9	<.001
Easy to learn	5.6±1.2	4.8±1.5	4.8±1.3	5.0±1.5	0.040	5.4±1.2	5.0±1.6	5.2±1.5	5.2±1.4	0.368
Reduce programming steps	5.4±1.4	2.7±1.7	2.4±1.5	2.9±1.7	<.001	5.3±1.5	4.0±1.9	4.5±1.7	4.4±1.9	<.001
Reduce need to manually enter info	5.8±1.2	4.1±1.4	3.6±1.8	3.9±1.8	<.001	5.8±1.3	5.1±1.7	5.1±1.8	4.8±1.8	0.003
Reduce time to program	5.6±1.5	2.9±1.8	2.5±1.3	2.8±1.6	<.001	5.5±1.5	4.3±1.6	4.5±1.7	4.3±1.8	<.001
Made interdisciplinary communication easier	5.6±1.3	4.0±1.4	3.4±1.5	3.6±1.7	<.001	5.7±1.2	4.5±1.3	4.6±1.1	4.7±1.2	<.001
Allow more time for other care activities	5.4±1.4	2.7±1.6	2.4±1.2	2.9±1.5	<.001	5.3±1.4	4.1±1.4	4.4±1.4	4.1±1.4	<.001
Help improve DL compliance	5.8±1.1	4.4±1.7	4.5±1.6	4.2±1.7	<.001	5.9±1.2	5.1±1.5	5.2±1.5	5.2±1.6	0.008
Decrease medication events	5.8±1.3	4.3±1.5	4.1±1.5	4.2±1.7	<.001	5.8±1.1	5.0±1.5	5.2±1.4	5.1±1.5	0.003
Align well with work flow	5.7±1.4	2.8±1.6	2.7±1.5	2.9±1.6	<.001	5.7±1.2	4.3±1.5	4.6±1.5	4.5±1.7	<.001
Function as expected	5.5±1.3	3.5±1.6	2.4±1.5	3.2±1.6	<.001	5.6±1.3	4.5±1.7	4.5±1.6	4.3±1.7	<.001

At baseline, interoperability expectations (Table 1) were very high for both groups (ICU mean = 90.2/112, MS mean = 90.0/112) and decreased (p<.001) at subsequent study periods. All nurses agreed that interoperability improved patient safety and was easy to use (green highlights). The most pronounced unmet expectations related to time & efficiency (purple highlights), more so for ICU nurses (e.g., decreased time spent on documentation and more time for patient care.)

Programming confidence (Figure 1) dropped post-integration for both groups (p>.05) and while there were some improvements at 4 months, they remained lower than baseline at 6 months.

Figure 1: Programming Confidence



Estimated programming time (Figure 2) improved at 4 months for both groups. The percentage of ICU nurses that estimated they could program a primary (IV fluid) in less than 30 seconds increased from 55% at baseline to 64%, secondary (IV piggyback) from 45% to 55%, and critical drip from 31% to 50%. The percentage of MS nurses that estimated they could program a primary infusion in less than 30 seconds increased from 46% at baseline to 51%, secondary from 44% to 53%, and critical drip from 13% to 24%.

Figure 2: Estimated Programming Time

