The Effect of Tele-ICU Innovation on Progressive Care Unit Patient Population

Donna L. Armaignac  
*Baptist Health South Florida*, donnawa@baptisthealth.net

Carlos Valle  
*Baptist Health South Florida*, CarlosValle@baptisthealth.net

Louis Gidel  
*Baptist Health South Florida*, LouisG@baptisthealth.net

Xiaorong Mei  
*Baptist Health South Florida*, xiaorongm@baptisthealth.net

Irfan Zaidi  
*Baptist Health South Florida*, irfan@baptisthealth.net

*See next page for additional authors*

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Citation
Armaignac, Donna L.; Valle, Carlos; Gidel, Louis; Mei, Xiaorong; Zaidi, Irfan; Gross, Leslee; Williams, Lisa-Mae; and Veledar, Emir, "The Effect of Tele-ICU Innovation on Progressive Care Unit Patient Population" (2015). *All Publications*. 651.

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The Effect of Tele-ICU Innovation on Progressive Care Unit (PCU) Patient Population

**Project team:** Donna Armaignac, PhD, CCNS, CCRN; Carlos Valle, DBA, RT; Louis Gidel, PhD, MD, FCCP; Xiaorong Mei, MS IT; Irfan Zaidi, MIT; Leslee Gross, RN MHSA; Lisame Williams MSN, RN; Emir Veledar, PhD, Baptist Health South Florida, Miami, FL.

**OVERVIEW**

**HUMAN WORKFORCE:** The increasing number and severity of critical care patients as the U.S. population ages, and the decreasing supply of critical care physicians available to manage the growing number of ICU patients supports a rationale for Tele-ICU. Additionally, higher acuity patients that were formerly cared for in ICUs are increasingly cared for in PCUs. Tele-ICU has the potential to address this critical care staffing shortage by enabling clinicians to remotely monitor, consult, and care for ICU and PCU patients in multiple and distant locations. By increasing the number of ICU and PCU patients that critical care teams can manage through Tele-innovation effectively extends both the productivity and the reach of the specialists as well as provide PCU status patients a higher level of care.

**QUESTIONS ABOUT RETURN ON INVESTMENT:** Policymakers have had a long-standing interest in knowing under what circumstances improved quality and safety also result in reduced health care costs. ICU quality initiatives in general and the Tele-approach in particular are ripe areas for expanding knowledge of the quality/cost trade-off, not only because the ICU is a core clinical service in virtually all hospitals, but also because ICU and PCU care are large and growing contributors to rising health care spending.

**METHODS**

- Although, Tele-ICU is integrated into 11% of US critical care delivery, Tele-innovation’s advanced monitoring, clinical decision-support functions and cognitive affordances have not been examined in PCU.
- We compared significant well established outcomes and quality measures between PCU Tele-intervention and PCU standard of care, namely:
  - Hospital LOS
  - Mortality
  - APACHE IV severity adjusted mortality
  - MSDRG severity adjusted mortality
- Data about n = 13,421 patients from 6 hospitals (Observational Case Control design) from Jan 2012 – Mar 2015 were analyzed.
  - PCU Tele-intervention n=6374
  - PCU standard of care n=7047
- Inclusion criteria for matched case control was established with the following steps:
  - Examine all census status movements throughout hospital LOS for all patients that were PCU designation any time during their hospital stay
  - Identify 1st PCU status encounter LOS = PCU Index
  - Examine attributes of PCU Index LOS (mean, median, mode)
  - Examine attributes of Tele-intervention LOS during PCU Index LOS
  - Inclusion time was defined as PCU Index = first contiguous PCU census encounter > 24 hours
  - Time thresholds derived from greater than median PCU Index LOS
  - Intervention group inclusion defined as > 24 hours Tele-intervention during PCU Index LOS.

**RESULTS**

- The two groups were fairly balanced. Comparing outcomes in PCU Tele-intervention vs. PCU standard of care, respectfully,
  - The intervention group is older (70+/16 vs. 65+/18, p<0.001).
  - Of the patients who had MSDRG expected mortalities (6359, 7018), expected mortality (6.39% vs. 5.62%, p=0.0025); however, actual mortality direction was reversed and lower (4.65% vs. 5.10%, p=0.2444).
  - Of the patients who had an APACHE IV prediction (5852; 1319), predicted mortality (10.43% vs.17.36%, p<0.000); however, actual mortality is lower (4.41% vs.10.42% vs. p<0.000).
  - PCU Index LOS was shorter (67 hours vs. 93 hours, p<0.001).

**CONCLUSIONS**

In our population, Tele-ICU approach applied in PCU resulted in significantly decreased mortality and much shorter PCU Index LOS. These findings provide evidence of the effectiveness of Tele-innovation and validate the impact on quality and cost in the progressive care setting, providing a rationale for extension of access to Tele-PCU care services across broader hospital populations. Further investigation is needed to examine severity adjusted prediction methods across varying practice settings, disease specific analyses, and intervention specific analysis. The next generation of research must provide clinicians, healthcare administrators, and policy makers with actionable data to guide optimal Tele-innovation configuration tailored to patient type, status, and location.