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

Philips Users Group Dallas, Oct 5-7, 2016

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BACKGROUND

HUMAN WORKFORCE:
• Increasing number and severity of critical care patients.
• Decreased supply of critical care specialist.
• Higher acuity patients that were formerly cared for in ICUs are increasingly cared for in PCUs.
• Tele-ICU has the potential to provide PCU status patients a higher level of care.

QUESTIONS ABOUT RETURN ON INVESTMENT:
• 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.
• Although, Tele-ICU is integrated in up to 13 % of US critical care delivery with reported positive impacts, 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
**OBSERVATIONAL CASE CONTROL DESIGN**

**Sample**
Data from 13,421 patients
6 hospitals
Jan 2012 – Mar 2015
- PCU standard of care control $n = 7047$
- PCU standard of care + tele-intervention $n = 6374$

**Primary PCU**
- PCU before ICU
- PCU standard of care
  - 6251 (58.29%)
- Tele-Intervention
  - 4473 (41.71%)

**Secondary PCU**
- ICU before PCU
- PCU standard of care
  - 796 (29.51%)
- Tele-Intervention
  - 1901 (70.49%)
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.
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).

Note: the intervention group is older (70+/−16 vs. 65+/−18, p<0.001);
Conclusions

• Tele-ICU approach resulted in significantly decreased mortality with two different severity adjustment methods and much shorter PCU Index LOS.

• These findings provide:
  - Evidence of the effectiveness of tele-innovation
  - Validate the impact on quality and cost in the progressive care setting
  - Rationale for extension of tele-ICU care services to more PCUs
RECOMMENDATIONS

Further investigation to examine:

- Severity adjusted prediction methods across varying practice settings.
- Disease specific analyses.
- 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.
References


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