

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

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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.

PURPOSE



- 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**
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OBSERVATIONAL CASE CONTROL DESIGN

Sample

Data from
13,421 patients

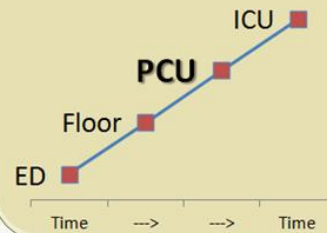
6 hospitals

Jan 2012 – Mar 2015

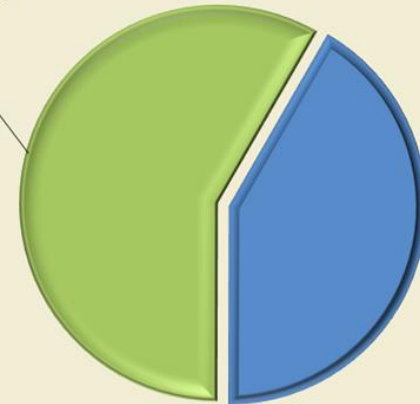
- PCU standard of care control $n = 7047$
- PCU standard of care + tele-intervention $n = 6374$

Primary PCU

PCU BEFORE ICU



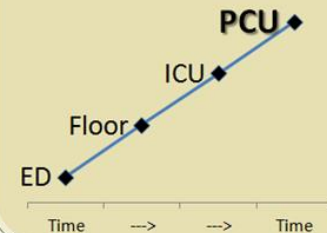
PCU
Standard of
Care
6251
58.29%



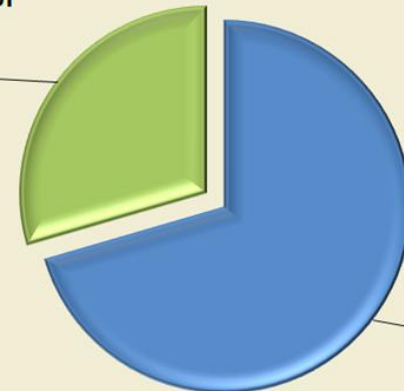
Tele-
Intervention
4473
41.71%

Secondary PCU

ICU BEFORE PCU



PCU
Standard of
Care
796
29.51%



Tele-
Intervention
1901
70.49%

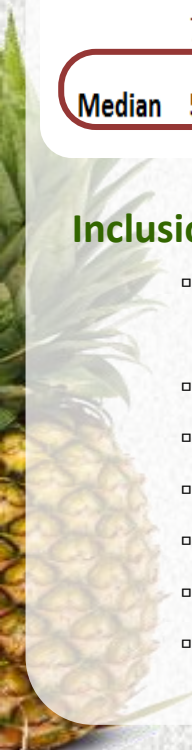
Inclusion criteria for matched case control



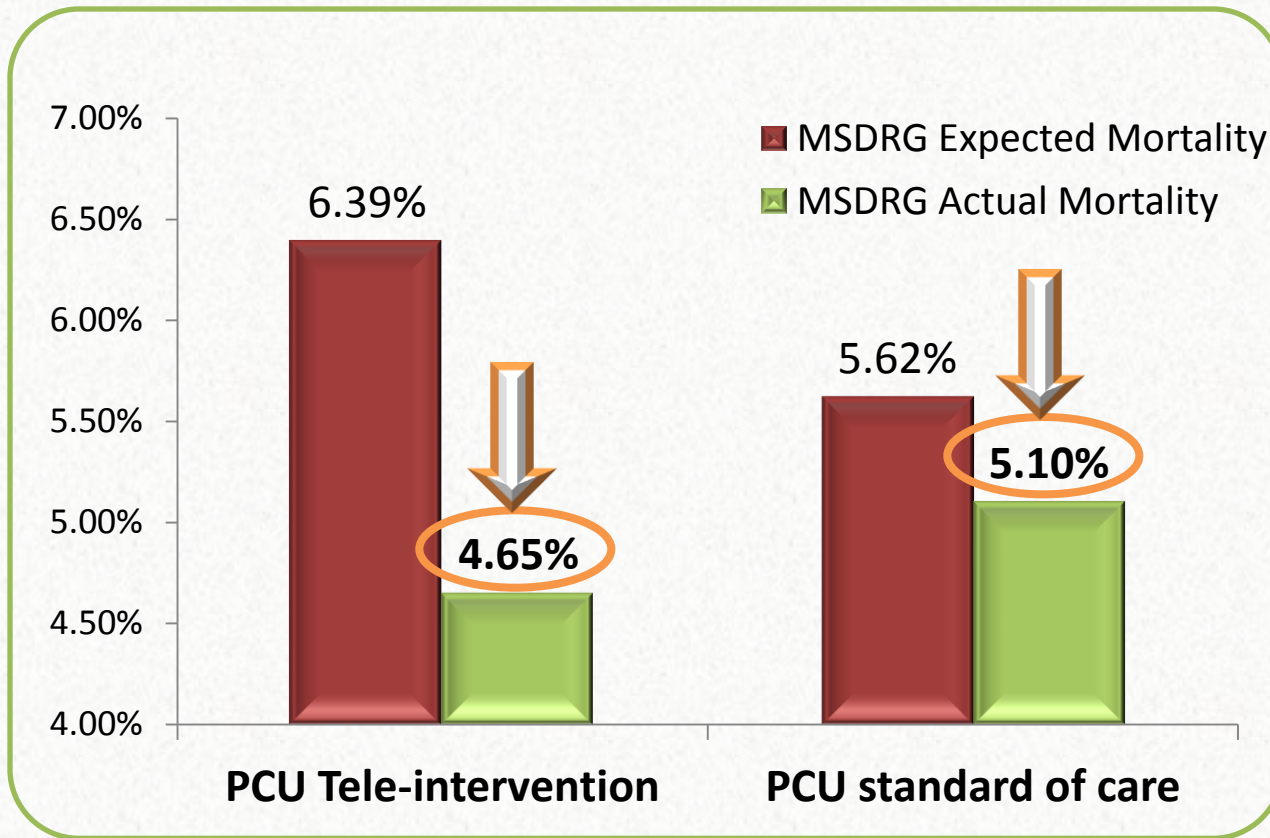
	Monitored in eCare		Monitored in eCare		Monitored in eCare		Monitored in eCare	
	Time in PCU		Time in PCU		Time in PCU		Time in PCU	
	Time in PCU (Hours)	Time monitored in eCare	Time in PCU (Hours)	Time monitored in eCare	Time in PCU (Hours)	Time monitored in eCare	Time in PCU (Hours)	Time monitored in eCare
75.00%	69:10:00	24:23:00	72:01:15	57:19:45	44:05:30	44:05:30	54:53:00	48:42:30
Median 50.00%	34:08:00	8:17:00	43:45:00	32:29:00	22:54:00	22:54:00	29:06:00	25:26:00

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.



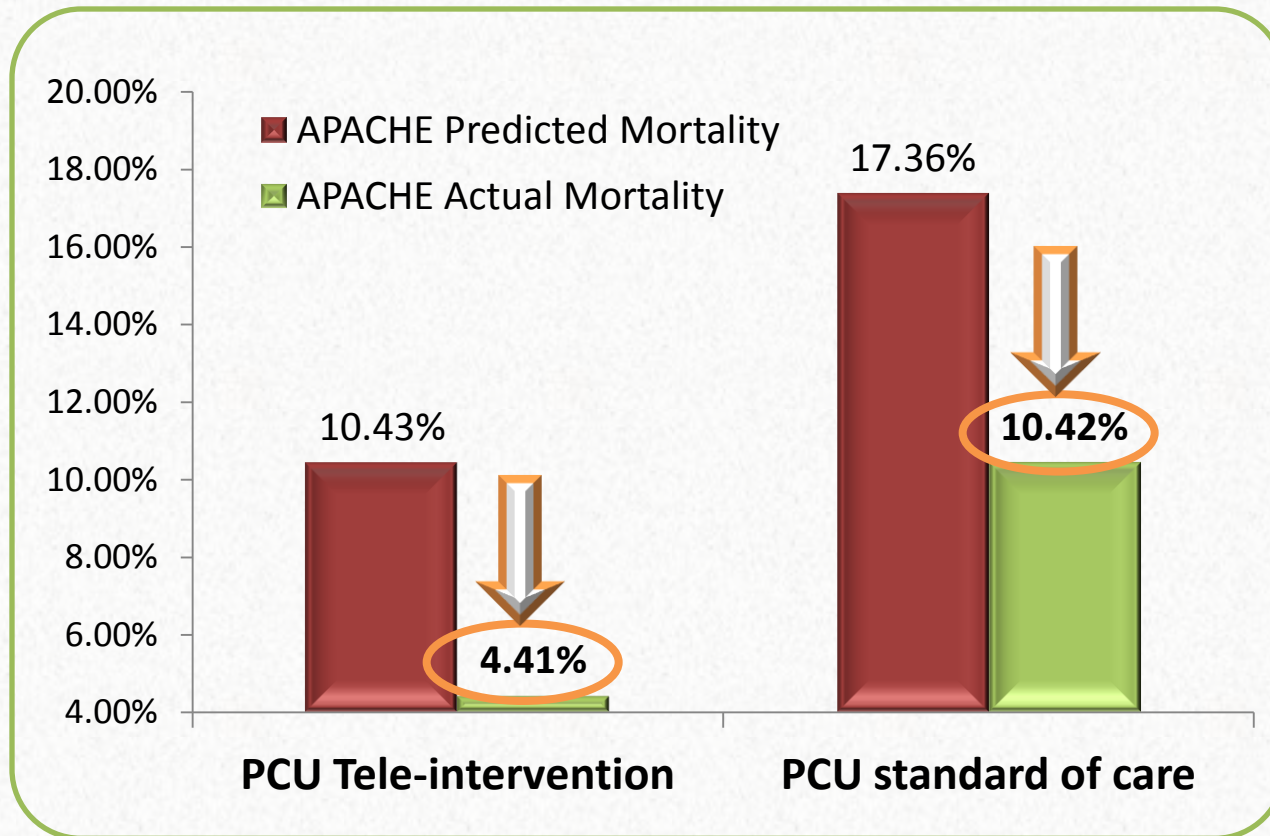
MSDRG Expected vs. Actual Mortality



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%, $p=0.2444$).



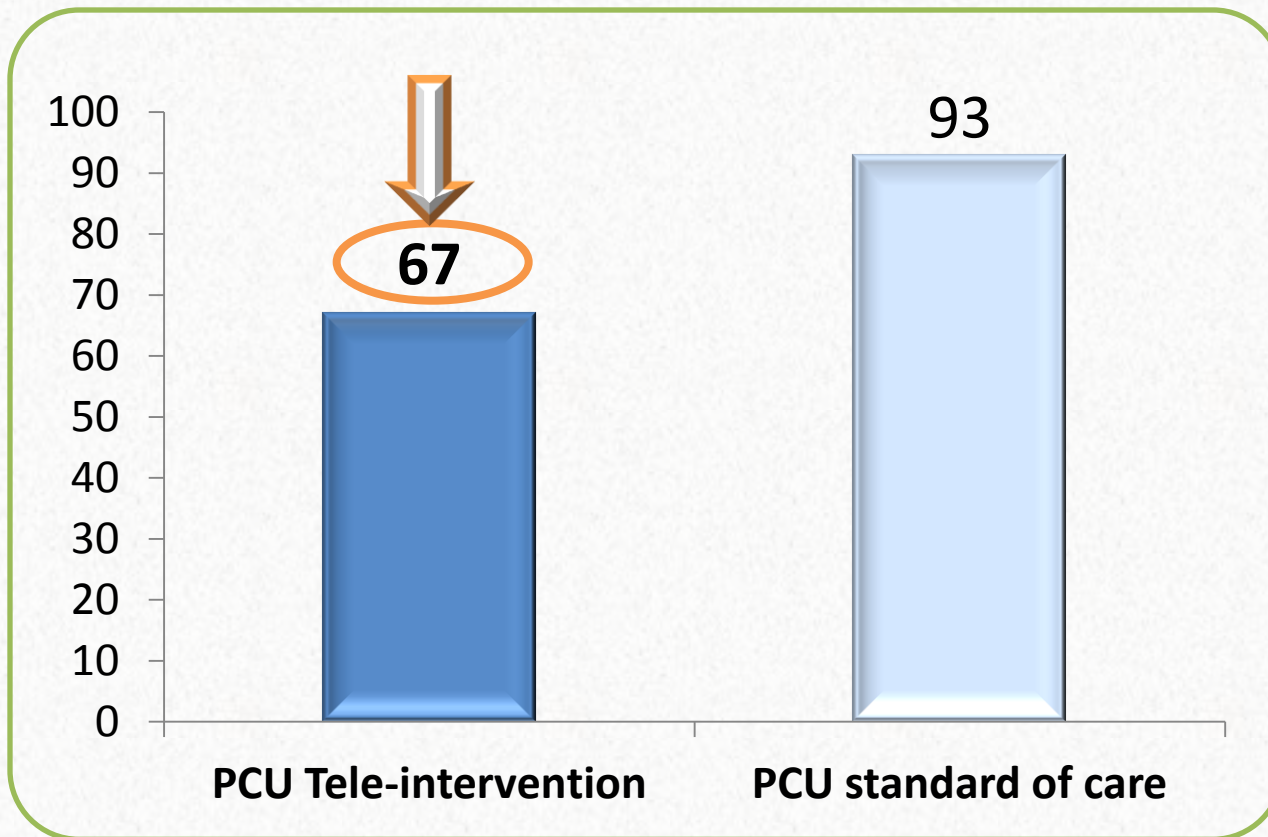
APACHE Predicted vs. Actual Mortality



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 (in Hours)



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.**
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