2-17-2020

Death in ICU is a Death in Hospital - Mode of Intensivist model delivery and In-hospital Mortality

Chintan Bhatt
Baptist Health South Florida, ChintanB@baptisthealth.net

02.17.2020

Death in ICU is a Death in Hospital Mode of Intensivist model delivery and In-hospital Mortality

Chintan Bhatt MBBS, MPH

Armaignac D, Rojas L, Valle Ca et al. Research Snapshot Theater: Quality And Patient Safety VII 1359: Exploring mortality of tele-intensivist delivery model with and without 24/7 bedside intensivists. *Critical Care Medicine.*2020;48:34. Supl1
doi:10.1097/01.ccm.0000618768.07027.72.CCM

Society of Critical Care Medicine
The Intensive Care Professionals

Baptist Health South Florida

Critical Care Congress
#CCC49

FIU
Robert Stempel College of Public Health & Social Work

Disclosure

No conflict of interest to disclose

Disclaimer

The author(s) of the presentation appearing in front of you is/are solely responsible for the content thereof; The research snapshot presentation shall not constitute or be deemed to constitute any representation by the Baptist Heath South Florida or Florida International University or any organization the data presented therein are correct or sufficient to support the conclusions reached or that the experiment design or methodology is adequate.

Background

Leapfrog group's standard of critical care recommendation

- 24/7 coverage of a board certified intensivist in all ICUs (Leapfrog Factsheet: ICU physician staffing)

Amendment: Intensivist providing critical care by Telemedicine- will satisfy the guideline recommended by the leapfrog group if implemented properly

In, 2015, American Hospital Association Annual Survey suggests of all acute care hospitals (2814) only 50% had intensivists., however 75% of ICU bed had intensivist coverage. (Crit Care Med. 2019;47(4):517-525)

Gap

Current literature comparing patient outcomes with

- Intensivist with no intensivist (*JAMA*. 2002;288(17):2151–2162) (*Crit Care Med*. 2013;41(10):2253–2274)
- Intensivist with other specialist like hospitalists (J. Hosp. Med. 2012 March;7(3):183-189)
- Daytime versus Nighttime intensivist (N Engl J Med 2012; 367(10):971–972),(Crit Care Med. 2015 43(11):2275-82) (N Engl J Med. 2013;368(23):2201–2209)
- Alternative to Intensivist in different type of ICU(open versus closed) (Curr Opin in Anaes 2019 32(2):123–128

Role of Tele-ICU

- Evidence of consistent quality and efficiency outcomes (Crit Care Med. 2016 Feb;44(2):265-74)
- Lowering the cost of patient care (Mil Med. 2017;182(5):e1702-e1707)
- Tele-ICU beds account for 11% of total ICU beds in US (Arch Intern Med 2011; 171:498-506)

Currently there are no outcomes research on critical care provided by 24/7 Bedside Intensivist versus Tele-Intensivist.

Objective of the study

To assess mortality(ICU & Hospital) and examine the difference between 24/7 Bedside Intensivist versus Tele-Intensivist critical care delivery models using conventional and innovative statistical methods.

Study Setting

12 ICUs from 5 hospitals were selected from a non teaching, not for profit, health system in south Florida from Oct 2016- June 2019.

19519 cases discharged from ICU between Oct 2016- June 2019 meet the inclusion criteria were selected for the study.

Study Design

Quasiexperimental observational study design using Health System's EHR data between Oct 2016-June 2019.

Dependent Variable: In-ICU Mortality(ICU Mortality), In-Hospital Mortality (hospital mortality)

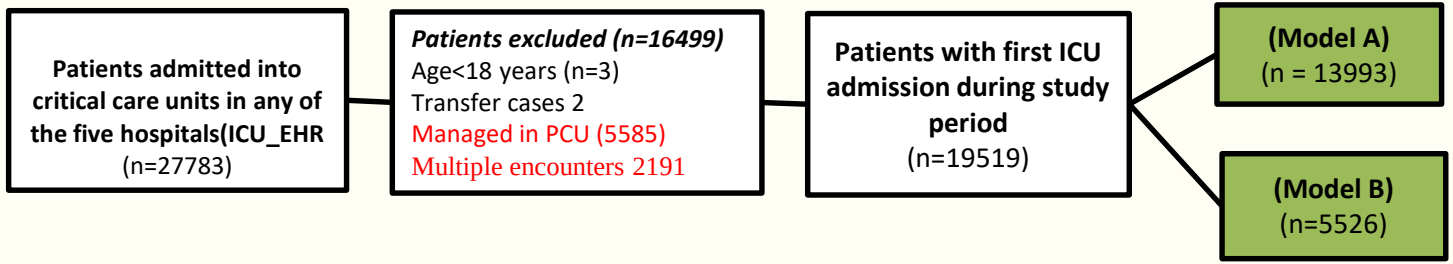
Independent Variable:
Model A: 24/7 Bedside Intensivist with standard of care in ICU, universal to health system model

Model B: Only standard of care
Standard of Care: Heath system has converted all ICU beds as Tele- Critical care bed, housing a Tele-ICU hub with a 24/7 in house tele-intensivist with a support staff of tele-nurses. The consultation is based on on demand services.

Prognostic Risk score: used APACHE IVa predicted ICU mortality and Predicted Hospital mortality

Covariates: Case Mix index, APACHEI Va Admitting diagnosis, Gender, Age, Race/ethnicity, ED level of acuity, discharge disposition. Annualized ICU volume, Annualized hospital volume, Pre-ICU-Los, Post-ICU discharge LOS, Mechanical ventilation, Age in increasing splices

Flowchart & Analytic plan



Innovative Approach

Step 1. Direct Risk Standardization with CaseMix Adjustment using complex models

Step 2: Multilevel Multivariate Generalized Linear Regression with Generalized estimating equation

Step 3: Sensitivity analysis Priori- study hypothesis testing

Patient Characteristics of two CCModels

Characteristics		OVERALL	CCD MODEL A	CCD MODEL B	Difference¥
Number of patients	N	19519	13993(71.7%)	5526(28.3%)	
Age	Mean(95% CI)	67.28 (66.24-67.88)	67.66 (67.37-67.94)	66.34 (65.84-66.84)	<0.001
	IQR (25 %-75%)	57-81	57-81	54-82	
Gender	Female	9620(49.3%)	6713(49.3%)[a]	2907(49.3%)[a]	0.987
	Male	9899(50.5%)	7280(50.7%)[a]	2619(50.7%)[a]	
Race/ethnicity	White	4013(20.6%)	2929(19.6%)$_a$	1084(20.6%)$_a$	<0..001
	Black	1937(9.9%)	1414(10.1%)$_a$	523(9.5%)$_a$	
	Hispanic	10905(56.3%)	7874(54.8%)$_a$	3031(55.9%)$_a$	
	Other	2664(12.7%)	1776(16.1%)$_a$	88816.1%)$_b$	
APS	Mean(SE)	41.82(0.15)	42.66(0.18)[a]	39.68(0.28)[a]	<0.001
APACHE IVa Score	Mean(SE)	55.19(0.17)	56.19(0.20)[a]	52.65(0.31)[a]	<0.001
APACHE IVa Predicted ICU Mortality	Mean	0.125(0.001)	0.133(0.001)	0.105(0.001)	<0.001
	Median	0.062	0.066	0.054	<0.001
	Interquartile Range	0.123	0.135	0.100	<0.001
APACHE IVa Predicted Hospital Mortality	Mean	0.125 (0.001)	0.133 (0.001)	0.105 (0.001)	<0.001
	Median	0.062	0.066	0.054	<0.001
	Interquartile Range	0.123	0.135	0.1	<0.001
APACHE IVa Diagnosis	Non-operative	12282(62.9%)	7900(56.5%)	4382(79.3%)	<0.001
	Operative	7233(37.1%)	6089(43.55)	1144(20.7%)	
APACHE system diagnosis	Cardiovascular	5179(26.5%)	3703(26.5)[a]	1476(26.7%)[a]	<0.001
	Sepsis	3013(15.4%)	2172(15.5%)[a]	841(15.2%)[a]	
	Respiratory	2789(14.3%)	1976(14.1%)[a]	813(14.7%)a	
	Neurologic	2613(13.4%)	1871(13.4%)[a]	742(13.4%)a	
	Digestive	1573(26.5%)	1136(26.7%)[a]	437(26.5%)a	
	Metabolic	999(5%)	725(5.1%)[a]	274(5%)a	
Prior admission Emergency Department Visit	Yes	17079(87.5%)	11757(84%)	5322(96%)	<0.001
ICU admission ≤24hrs of Hospital Admission	Number cases (%)	13482(69.1%)	9247(66.1%)	4235(76.6%)	<0.001
Pre-ICU-LOS	Mean (SE) days	1.91(0.05)	2.20 (0.71)	1.12 (0.05)	<0.001
Mechanical Ventilator	(%)	5191(26.6%)	4154(29.6%)	1037(18.7%)	
	Mean (SE) days	3.76 (0.069)	3.71(0.078)	3.98(0.142)	0.107

Society of Critical Care Medicine
The Intensive Care Professionals

Summary of Results

Outcomes	Total N	Model A N (%)	Model B N (%)	Difference 95% CI	Odds Ratio (95% CI)	P value
	N=19519	13993	5526			
Mortality€						
ICU Mortality [a]	19519	671 (4.8%)	169 (3.1%)	1.73% (1.16-2.31)	1.673 (1.25-2.23)	<0.0001
Hospital Mortality [b]	19519	1762 (12.6%)	445(8.1%)	5.09% (4.17-6.09)	1.355 (1.17-1.56)	<0.0001
Length of stay-days LS Mean¶						
ICU- LOS [e]	19519	3.1407 (3.0621-3.219)	2.588 (2.4817-2.6946)	0.5525 (0.4413-0.6638)		<0.0001
Hospital-LOS [f]	19519	9.056 (8.89-9.221)	7.31 (7.09-7.54)	1.73 (1.503-1.974)		<0.0001
Cost- US $ LS mean¶						
Total Cost/case [g]	19391	$39434 (38468-40400)	$37933 (36530-39335)	$1501 (-70, 3072)		0.06
Fixed Cost /Case [h]	19391	20905 (20418, 21391)	$20061 (19354, 20767)	$844 (52,1635)		0.03
Variable Cost/ Case [i]	19015	$18529 (18028, 19029)	$17872 (17145, 18599)	$657 (-157, 1471)		0.11

Models [a-i] are adjusted for APACHE Predicted Hospital Mortality, Hospital Mortality Risk Quartiles, APACHE Score, CaseMixIndex, Gender, Race and Ethnic groups, Age grouped in restricted order linear splines, annual Hospital volume. Confidence interval takes into account clustering at model level

Sensitivity analysis

	Specific Patient Group	N	Model A 24/7 bedside Intensivist model			Model B Tele-Intensivist Model			Interaction Term
ICU Mortality									
			N(total) %	OR(95%CI)	P value	N(total)%	OR(95%CI)	P value	P Value
1	ICU Admission within 24 hours of Hospital Admission	13584	430 (9310) 4.6%	1.41(1.21-1.65)	<0.0001	125 (4265) 2.9%	0.88(0.84-0.92)	<0.0001	<0.001
2	Receiving Active Treatment 33 active treatment in ICU J Crit Care 2010;25:205-213	12603	631 (9335) 6.8%	1.36(1.07-1.74)	<0.0001	156 (3268) 4.8%	0.57(0.43-0.76)	<0.0001	<0.001
3	Night Time ICU Admission (7pm-7am)	10749	364 (7715) 4.7%	1.56(1.17-2.09)	0.002	99 (3034) 3.3%	0.58(0.42-0.82)	0.001	0.025
4	Mechanical Ventilation within 24 hours of Hospital Admission [d]	3070	313 (2295) 13.6%	1.20(0.88-1.626)	0.234	96 (679) 12.4%	0.83(0.62-1.13)	0.241	0.38
5	Sepsis- admitting physician diagnosis	2343	103 (1583) 6.1%	2.29(1.27-4.15)	0.006	20 (657) 3%	0.44(0.24-0.78)	0.003	<0.001
6	Highest third of Acute Physiology Scores	4936	510 (3697) 13.8%	1.32(1.04-1.71)	0.02	132 (1107) 10.7%	0.75(0.58-0.95)	0.021	0.001
7	Direct ICU admission	497	29 (352) 8.2%	1.16(0.41-3.32)	0.77	10 (145) 6.9%	0.85(0.30-2.43)	0.77	0.56

Conclusion

- ICU Mortality was reported higher in Model A vs Model B, Overall Hospital Mortality was higher in Model A Vs B
- Nonacademic, not for profit ,Multicenter, single health system's study findings cannot be generalized to the whole teleICU population so research studies using multisystem data, utilizing randomizatized control trial is recommended,
- Tele-intensivist model is an intensivist model of care should be included as best practices

Thank you

Questions

Let the discussion be continued. ....

SEE Y'ALL NEXT YEAR

Society of Critical Care Medicine
The Intensive Care Professionals

Critical Care Congress
#CCC49