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**Citation**
Lokhandwala, S, B Escobar, A Chahin, N Mccague, M Ghassemi, M Feng, and LA Celi. 2015. "Risk factors for death in chronic critical illness." Intensive Care Medicine Experimental 3 (Suppl 1): A449. doi:10.1186/2197-425X-3-S1-A449. http://dx.doi.org/10.1186/2197-425X-3-S1-A449.

**Published Version**
doi:10.1186/2197-425X-3-S1-A449

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Lokhandwala et al. Intensive Care Medicine Experimental 2015, 3(Suppl 1):A449
http://www.icm-experimental.com/content/3/S1/A449

Intensive Care Medicine Experimental
a SpringerOpen Journal

POSTER PRESENTATION Open Access

# Risk factors for death in chronic critical illness

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*From* ESICM LIVES 2015
Berlin, Germany. 3-7 October 2015

## Introduction

As early recognition, resuscitation and technological advancement in the treatment of critically ill patients have improved, efforts to understand patient outcomes after an acute period of illness are being undertaken. While it has been noted that one-year mortality among survivors of critical illness is extremely high, awareness is increasing regarding patients who, despite survival, remain "chronically critically ill". This is important considering that patients who have short-term survival after ICU discharge have poor quality of life leading to death.

## Objectives

To determine among a cohort of ICU patients who survived >30 days factors that are associated with survival less than one year.

## Methods

We conducted a longitudinal, single center, retrospective cohort study of patients admitted to an intensive care unit at Beth Israel Deaconess Medical Center using the MIMIC database. Patients were included if they survived greater than 30 days post discharge and excluded if they were known to have advanced cancer. The 1-year survivors and non-survivors were compared using the Wilcoxon rank sum test for continuous variables, and the Fisher's exact test for categorical variables. All significant variables were included in the multivariable logistic regression model to predict 1-year survival in the study cohort.

## Results

17,478 patients met the inclusion criteria and were included in the study. 15,449 (88.39%) survived greater than 365 days, whereas 2,029 (11.61%) did not. Variables associated with decreased one-year survival include: age, hospital length of stay, number of hospital admissions post ICU discharge, duration of mechanical ventilation and vasopressor use, a diagnosis of sepsis, history of congestive heart failure (CHF), end-stage renal disease (ESRD), dementia, cirrhosis, cerebro-vascular accident (CVA), chronic obstructive pulmonary disease (COPD), and the need for renal replacement therapy (RRT) or tracheostomy. These results were true for both univariate and multivariate analysis. The following interaction terms were found to be significant: Age*cirrhosis, Age*-COPD, Difference in SOFA $day_3$-$day_1$*sepsis, duration of mechanical ventilation*duration of vasopressor use, duration of mechanical ventilation*cirrhosis, duration of mechanical ventilation*tracheostomy, duration of vasopressor use*cirrhosis, duration of vasopressor use*tracheostomy, ESRD*CHF, RRT*HTN, RRT*sepsis.

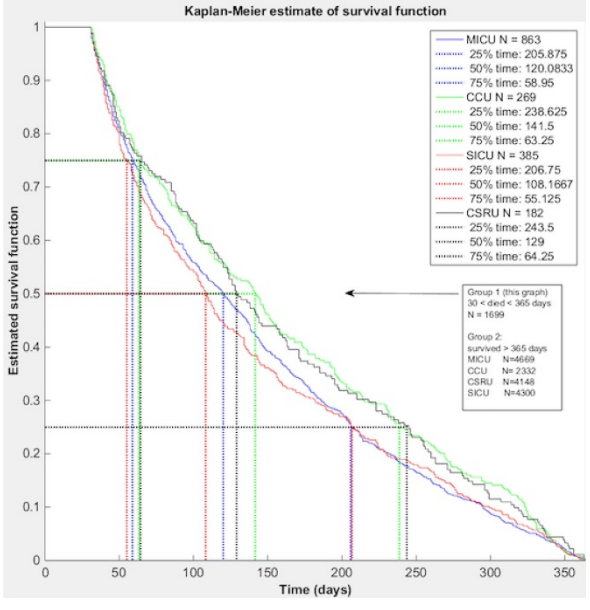


**Figure 1** Survival analysis based on type of ICU.

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**Table 1. Comparison based on length of survival**

| | 30<Survival<365 n = 2029 (11.61%) | Survival>365 n = 15449 (88.39%) | P-value | | 30<Survival<365 n = 2029 (11.61%) | Survival>365 n = 15449 (88.39%) | P-value |
|---|---|---|---|---|---|---|---|
| **Age, years** | 72.63+14.19 | 59.83+17.75 | 0.000 | **Hypertension** | 1014 (49.98) | 7774 (50.32) | 0.776 |
| **Congestive Heart Failure** | 927 (45.69) | 3478 (22.51) | 0.000 | **Diabetes** | 572 (28.19) | 3663 (23.71) | 0.132 |
| **Dementia** | 190 (9.36) | 446 (2.89) | 0.000 | **ICU LOS, days** | 2.86 [4.76] | 1.99[2.48] | 0.000 |
| **Cirrhosis** | 157 (7.74) | 739 (4.78) | 0.000 | **Post-discharge Hospital Admissions** | 1.21+0.58 | 1.06+0.28 | 0.000 |
| **Cerebrovascular Accident** | 303 (14.93) | 1720 (11.13) | 0.000 | **SOFA Day 3-Day 1** | 1.65 | 1.25 | 0.000 |
| **COPD** | 554 (27.3) | 2575 (16.67) | 0.000 | **Duration of Mechanical Ventilation, days** | 3.73 [12.34] | 0.84 [2.29] | 0.000 |
| **ESRD** | 65 (3.2) | 132 (0.85) | 0.000 | **Duration of Vasopressor Use, days** | 1.48 [5.19] | 0.77 [1.5] | 0.000 |
| **Obesity** | 252 (12.42) | 3135 (20.29) | 0.000 | **Renal Replacement Therapy** | 147 (8.03) | 275 (1.99) | 0.000 |
| **Sepsis** | 925 (45.59) | 2904 (18.8) | 0.000 | **Acute Kidney Injury** | 366 (18.26) | 950 (6.33) | 0.000 |

## Conclusions

Among critically patients who survive greater than 30 days post discharge, many survive for greater than one year. Factors associated with decreased one-year survival include age, length of stay, number of post-discharge admissions, and numerous co-morbid conditions.

## Grant Acknowledgment

The Laboratory of Computational Physiology receives research funding from the National Institute of Health through Grant R01 EB001659 and Philips.

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Published: 1 October 2015

doi:10.1186/2197-425X-3-S1-A449
**Cite this article as:** Lokhandwala *et al.*: Risk factors for death in chronic critical illness. *Intensive Care Medicine Experimental* 2015 **3**(Suppl 1):A449.

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