

# SEVEN factors predictive of Severe outcomes in INfluenza (SEVIN) tool

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## Introduction

Seasonal influenza continues to be a significant burden on the healthcare industry. In the period 2017 - 2018 the CDC estimated almost 80,000 deaths associated with influenza infection. Many studies have looked at the risk factors associated with hospitalizations and others mortality however, a validated prognostic tool to predict composite adverse outcomes is not yet available.

## Methods

We conducted a retrospective review of the Hospital Corporation of America (HCA) database from January 2016 to December 2018 selecting for patients in South Florida who were admitted for influenza and tested PCR positive. Data analyzed included demographics, comorbidities and routine labs. Adverse outcomes included ICU admission, progression to respiratory failure, septic shock, acute kidney injury, intubation and death. Using logistic regression, the likelihood ratios of the risk factors identified were examined and weighted. Significant risk factors based on their likelihood were scored using a point system. The aim was to identify the seven factors that are more likely associated with adverse outcomes. The tool was created using 90% of the data and validated with 10% of the data set.

**Logistic Regression for Negative Outcomes on test data** (Test Data Area under ROC curve: .775):

SEVIN predictors	Sig.	Exp. (B)	95% C.I. for EXP(B)	
			Lower	Upper
Age 50-59	.000	2.225	1.843	2.685
Age 60-99	.000	2.808	2.380	3.313
COPD	.000	2.204	1.986	2.446
Sleep Apnea	.000	2.040	1.714	2.429
Anemia	.000	2.385	2.060	2.763
MI	.000	7.344	5.417	9.956
CKD	.000	3.087	2.725	3.498
Pneumonia	.000	1.875	1.688	2.082

Predictor	Risk score	
Age (years)	18-34	0
	35-49	2
	50-59	4
	60+	5
COPD	No	0
	Yes	4
Sleep Apnea	No	0
	Yes	4
Anemia	No	0
	Yes	4
MI	No	0
	Yes	10
CKD	No	0
	Yes	6
Pneumonia	No	0
	Yes	3

Scoring Groups (Test Data Area under ROC curve: 0.763)	
0-5 points	19% chance of negative outcome
6-9 points	49% chance of negative outcome
10-16 points	68% chance of negative outcome
17+ points	85% chance of negative outcome

## Results

A total of 10360 patients were included in the data set. The seven most significant factors were age, history of COPD, history of sleep apnea, presence of anemia, acute MI, history of CKD and diagnosis of pneumonia on admission.

## Conclusion

Further analysis is needed to define cut off values for creatine and anemia. Individualized analysis of each adverse outcome needs to be carried out as using such a large composite endpoint can decrease the specificity of the tool. Finally, the tool needs to be further validated on other populations.

## References

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