

Development Of A New ICD Based Comorbidity Index For Prediction Of 5-Year Survival After Hip Fracture Surgery In 36442 Patients

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INTRODUCTION:

Fragility hip fractures are associated with high postoperative mortality with studies identifying a number known risk factors for mortality prediction. The Charlson Comorbidity Index (CCI)¹ accounts of many risk factors and is commonly used. It is however not calibrated specifically for hip fracture patients and is arguably complex to remember and calculate².

METHODS:

We revalidated the age adjusted CCI and compared it into a newly developed international classification of disease (ICD) derived simplified comorbidity index (ICD-SCI) using a territory wide electronic health database of 41667 consecutive operated hip fractures in patients aged over 50. After exclusion of pathological, contralateral and non-primarily treated fractures, there were 36442 patients included. In all patients, comorbidities were based on the ICD9-CM system defined in previous validation studies³. The primary outcome was their 5-year postoperative survival obtained via electronic healthcare attendance dates and death register dates. Using the cox regression model, ICD derived risk factors were validated and calibrated for CCI and ICD-SCI prediction models.

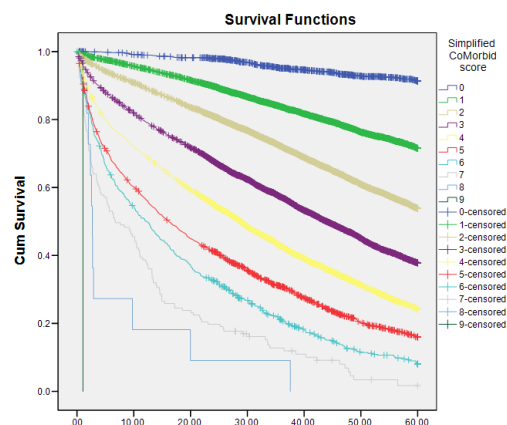
RESULTS:

The ICD-SCI is calculated in a 0 to 9-point scale. Receiver operating characteristics (ROC) statistics showed that the ICD-SCI had superior accuracy compared to CCI in estimating the one, twelve and sixty-month mortality rates respectively. (Area under curve: 0.72 vs 0.67, 0.73 vs 0.71 and 0.71 vs 0.69, $p < 0.0001$).

Table 1 showing calculation of the SCI

Factors contributing to increased mortality in ICD-SCI (0 to 9 points)	p-value
Age >70 (+1)	<0.001
Age >90 (+1)	<0.001
Male Sex (+1)	<0.001
Active or past malignancy (+1)	<0.001
Renal disease* (+1)	<0.001
Liver disease* (+1)	<0.001
Cardiac disease* (+1)	<0.001
Lung disease* (+1)	<0.001
Neuropsychological disease* (+1)	<0.001
ICD9CM specified chronic disease with end organ functional impairment	

Figure 1. Kaplan Meier survival Plot of 36442 patients based on their ICD-SCI. Log Rank test $p < 0.0001$ for ICD-SCI = 0-6 versus 1-7 respectively



DISCUSSIONS:

Factors in the CCI did not always reflect their risk to mortality in hip fracture patients. Malignancy, peptic ulcer disease and connective tissue disease had lower than expected risk to mortality.

CONCLUSION:

Being simplified, the ICD-SCI demonstrated superior prediction performance in fragility hip fracture patients. The ICD-SCI is currently the only scoring system with predictive data of up to 5 years.

REFERENCES:

1. Charlson ME et al, J Chronic Dis. 1987;40(5):373-83.
2. Frost SA et al, Bone. 2013;56(1):23-9.
3. Sundararajan V et al. Medical care 2007;1210-5.