PREDICE score as a predictor of 90 days mortality in patients with heart failure

D P S Purba\(^1\) and R Hasan\(^1\)

\(^1\)Cardiology Division, Department of Internal Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia.
\^Corresponding author: refli_hasan@yahoo.co.id

Abstract. Hospitalization in chronic heart failure patients associated with high mortality and morbidity rate. The 90 days post-discharge period following hospitalization in heart failure patients is known as the vulnerable phase, it carries the high risk of poor outcomes. Identification of high-risk individuals by using prognostic evaluation was intended to do a closer follow up and more intensive to decreasing the morbidity and mortality rate of heart failure. To determine whether PREDICE score could predict mortality within 90 days in patients with heart failure, an observational cohort study in patients with heart failure who were hospitalized due to worsening chronic heart failure. Patients were in following-up for up to 90 days after initial evaluation with the primary endpoint is death. We found a difference of the significant statistical between PREDICE score in survival and mortality group (p=0.001) of 84% (95% CI : 60.9% - 97.4%). In conclusion, PREDICE score has a good ability to predict mortality within 90 days in patients with heart failure.

1. Introduction
Heart failure is a complex clinical syndrome that results from structural or functional disturbances, from ventricular filling or blood pumping through the heart. Heart failure may associate with a wide spectrum of left ventricular abnormalities, which can range from normal left ventricular size and preserved ejection fraction to severe dilatation with or without significant ejection fraction reduction.[1,2]

The high rates of re-hospitalization and mortality in the early post-treatment period are also related to the transition phase regarding treatment. The changing pattern of hospitalization into outpatient care involves changes, regarding doctors monitoring, changes in the dietary modification, demand for physical activity and stress coming from their families and environment. So early post-treatment periods a vulnerable phase in patients with heart failure.[3,4]

There are various models to helping predict outcomes in hospitalized heart failure patients aimed to facilitate the decision-making process and assisting at the risk stratification for immediate treatment and a secondary preventive. Based on the discourse then made a model that includes an evaluation of the ability to perform daily activities in assessing the prognosis in patients with heart failure. The PREDICE score knows as the prognostic assessment tool.

2. Methods
All subjects agreed in writing the approval of informed consent. The data collection includes name, age, medical record number, gender, address, telephone number and all clinical data related to this...
research. Researchers took all subjects that met the study criteria.

Assessed PREDICE score: Age: <50 years: 0 point, 50-59 years: 1 point, 60-69 years: 2 points 70-79 years: 3 points ≥ 80 years: 5 points. Plasma creatinine clearance: <77: 9 points, 77-100: 7 points, 100-150: 6 points, > 200: 0 point. Diagnosis of pathophysiology: Systolic: 3 points, Diastolic: 0 point, Sodium serum <135: 3 points, 135-145: 0 point, > 145: 3 points; Evaluate the presence/absence of daily activities of patients within 24 hours of admission by using the Barthel index. If we find dependency in doing daily activities: 2 points, if not: 0 point.

Furthermore, patients were in following-up for 90 days from the initial examination. Patient condition information is obtained based on a direct meeting with the patients, or by communicating via telephone with patients or their families.

Statistical analysis: Normality test was performed using Shapiro-walk test. For observing the difference in the mean variables between survival and mortality groups, the independent T-test was used if it was a normal distribution and if otherwise used the Mann Whitney test. To see the comparative relationship between independent variables that are categorical use chi-square test. Results p <0.05 were considered significant and used the SPSS v.20 program.

3. Results
This research was conducted in the inpatient room of Internal Medicine of Haji Adam Malik Hospital Medan, starting March 2016 with a total sample of 34 people who have fulfilled the inclusion. All subjects were then followed up for 90 days from the initial examination. The total number of study subjects was 34 people, 16 subjects died during the follow-up period of 90 days.

Table 1. Characteristics of subjects.

|                          | Total (n = 34) | Mortality (n = 16) | Survival (n = 18) | P     |
|--------------------------|---------------|-------------------|------------------|-------|
| Demographics             |               |                   |                  |       |
| Gender Male              | 15 (44.1)     | 7 (43.8)          | 8 (44.4)         | 0.968 |
| Female                   | 19 (55.9)     | 9 (56.3)          | 10 (555.6)       |       |
| Age. average, year       | 58.94(13.78)  | 65.63 (12.28)     | 53 (12.5)        | 0.006 |
| NYHA Classification      |               |                   |                  |       |
| Class III                | 21 (61.8)     | 8 (38.1)          | 13 (61.9)        |       |
| Class IV                 | 13 (38.2)     | 8 (61.5)          | 5 (38.5)         | 0.183 |
| Daily Activity Dependency, n (%) | 34 (100)     | 16 (100)          | 18 (100)         | -     |
| Laboratory               |               |                   |                  |       |
| Sodium (mEq / L)         | 132.44 (8.97) | 131.18 (8.23)     | 133.55 (9.67)    | 0.094 |
| Potassium (mEq /L)       | 4.08 (0.74)   | 4.27 (0.73)       | 3.92 (0.74)      | 0.160 |
| Creatinine clearance (ml /min) | 63.07 (44.86) | 56.18 (22.96)   | 69.19 (57.93)    | 0.459 |
| Diagnosis of Pathophysiology. | 15 (44.1)     | 9 (56.3)          | 6 (33.3)         |       |
| Systolic dysfunction, n (%) | 19 (55.9)     | 7 (43.8)          | 12 (66.7)        | 0.179 |
| Diastolic dysfunction    |               |                   |                  |       |
| Predice score            | 14.82 (3.84)  | 17.06 (2.76)      | 12.83 (3.60)     | 0.001 |

The subjects were female dominant in both study groups. 9 peoples (56.3%) in the survival group and 10 peoples (55.6%) in the mortality group. Based on functional capacity, the majority of patients enter the group with the functional capacity of NYHA III. Mean age was significantly different in the subjects who mortality compared to the survival subjects (p <0.05).

All subjects in this study have a dependence on daily activities. On laboratory tests showed no difference in mean laboratory parameters between subjects experiencing mortality 90 days and
survival subjects (p> 0.05). Subjects with systolic dysfunction were more common in the mortality group than in the survival group.

With Mann-Whitney test obtained p-value<0.05 it can be a conclusion that there was a significant difference between PREDICE score of mortality group and PREDICE score of survival group. (Table 1)

Figure 1. Differences in PREDICE score between survival and mortality groups within 90 days.

Figure 2 shows a boxplot graph of the difference in the value of the PREDICE score of the survival subject group and the mortality groups within 90 days. The median value of PREDICE score in the group of mortality was higher than the survival group of subjects. Statistically significant differences were between these two groups (p = 0.001).

Relationship of PREDICE Score with 90 Days-Mortality in Heart Failure Patients
With the statistical test using chi-square test, it was found the relationship between PREDICE score and 90 days mortality in hospitalized patients with heart failure (p = 0.015).

| 90 Days-Mortality | Yes | No | Total | p |
|-------------------|-----|----|-------|---|
| Predice-score     |     |    |       |   |
| <15               | 4 (75) | 12(25) | 16 |   |
| >15               | 12(66.7) | 6(33.3) | 18 | 0.015 |

4. Discussion
In this study with a total of 34 subjects, there was a significant mean age difference between the mortality subjects (65.63 ± 12.28) and the survival group (53 ± 12.5), p <0.05. The mortality group in this study had characteristics of older age. This result is in line with a study by Gheorghidae et al who obtained subjects who experienced an incident of early mortality and rehospitalization had age characteristics with mean age 68.2 ± 13 years compared with the non-group of 65.2 ± 12.0 in the survival group (p <0.001).[5]
Age is the most factor determining the condition of individual cardiovascular health. Aging is associated with a progressive decrease in some physiological processes, leading to an increased risk of illness as well as complications.[6] Also, due to aging, there is an overall decline in anatomical and functional structures due to degeneration. Frailty and comorbid disease are characteristic of this age group and contribute to unexpected events at the care and post-care.[7] Studies by Gustafson et al. found increased age-related independence with both short- and long-term mortality Patients with heart failure who are hospitalized. Each 10-year-old increase in heart failure patients aged ≤60 years results in a significantly increased risk of death within 30 days (Relative risk (RR) 1.23 (1.04-1.47, P = 0.02)) and risk of death within ten years (RR 1.55 (1.50-1.61, P <0.001).[8]

From the results of serum creatinine clearance and sodium levels, there was no difference in mean of creatinine clearance and sodium levels between subjects who died within 90 days and living subjects (p> 0.05). These findings differ from previous studies by Camara et al. Who found differences in mean blood sodium levels, lower creatinine clearance in the deceased group and these conditions associated with a poorer prognosis.[9-10]

In this study, all subjects have a dependence on daily activities. Studies by Dunlay et al. found that difficulty in daily activity is common in patients with heart failure and is progressive over time and the difficulty of daily activity is a marker of poor prognosis in patients with heart failure. Mortality increased with increasing difficulty in daily activity, with a hazard ratio of death was 1.49% (95% CI, 1.22 - 1.82) in the group with moderate functional disability and hazard ratio 2.26 (95% CI, 1.79 - 2.86) in the group with severe disability.[10-11]

Systolic dysfunction was found more frequently in the mortality group (56.3% vs 33.3%). These findings are consistent with research by Camara et al. Found that systolic dysfunction is more prevalent in the group of mortality subjects (36.8% vs. 22.16%).[9-12]

From this study shows there is a difference in the value of PREDICE Score between groups of mortality and survival subjects. The mean of the subject group who died within 90 days was 17.06 (2.76) while the mean PREDICE Score on the survival subject within 90 days was 12.83 (3.60). And with the statistical test using chi-square test, it was found a relationship between PREDICE score and 90 days mortality in patients with heart failure. These findings are not comparable to previous studies because of the 90-day PREDICE score and 90-day mortality in patients with heart failure as yet.

Limitations of this study include: 1) The number of samples is small so that the possibility cannot yet reflect the actual results regarding the relationship of the variables assessed in this study to 90-days death in patients with heart failure. 2) Do not analyze the number of previous hospitalization history. 3) No assessment of the patient's lifestyle, medication adherence and the possibility of any other comorbid that exacerbates the patient's post-care condition.

5. Conclusion
From the results of this study can be concluded:
1. PREDICE score can be a predictor of 90-day mortality in patients with heart failure.
2. PREDICE score has a good sensitivity and specificity in predicting 90-day mortality in patients with heart failure
3. There was a relationship between PREDICE score and 90 days mortality in patients with inpatient heart failure

References
[1] Aung N, Ling H Z, Cheng A S, et al. 2013 Expansion of the red cell distribution width and evolving iron deficiency as predictors of poor outcome in chronic heart failure Int. J. Cardiol. 168 1997–2002
[2] Panggabean M 2014 Gagal jantung PD UI edisi VI bab 18 pp 1132-5
[3] Mann D and Chakinala M 2015 Heart failure: pathophysiology and diagnosis Harrison’s principle of internal medicine 19th edition pp 1500-6
[4] Greene S, Fonarow G, Vaduganathan M, Khan S, Butler J and Gheorgiade M 2015 The vulnerable phase after hospitalization for heart failure *Nat. Rev. Cardiol.* 14 1-10

[5] Metra M, Gheorghiade M, Bono R and Dei Cas L 2010 Post discharge assessment after a heart failure hospitalization: the next step forward *Circulation* 122 1782-5

[6] Gheorghiade M, Pang P, Ambrosi A, Lan G, Schmidt P, Fillipato G, et al. 2002 A comprehensive, longitudinal description of the in-hospital and post-discharge clinical, laboratory, and neurohormonal course of patients with heart failure who die or are rehospitalized within 90 days: analysis from the EVEREST trial *Heart Fail. Clin.* 17 485–509

[7] Lakatta E and Levy D 2003 Arterial, and cardiac aging: major shareholders in cardiovascular disease enterprises, part I: aging arteries: a “set up” for vascular disease *Circulation* 107 139–46

[8] North B and Sinclair D 2012 The intersection between aging and cardiovascular disease *Circ. Res.* 110 1097-108

[9] Strait J and Lakatta E 2012 Aging associated cardiovascular changes and their relation to heart failure *Heart Fail. Clin.* 8(1) 143–64

[10] Camara A, Vales J, Tapia P, Esteban E, Fernandez del Pozo S, Sandubete E, et al. 2012 Role of biological and nonbiological factors in congestive heart failure mortality: PREDICE Score: A clinical prediction rule *Cardiol. J.* 19 578–85

[11] Brophy J M, Dagenais G R, McSherry F, Williford W and Yusuf S A 2004 Multivariate model for predicting mortality in patients with heart failure and systolic dysfunction *Am. J. Med.* 116 300–4

[12] Filippatos T and Elisaf M 2013 Hyponatremia in patients with heart failure *World J. Cardiol.* 5(9) 317-28

[13] Rozzini R, Sabatini T, Cassinadri A, Boffelli S, Ferri M and Piera B P 2005 Relationship between functional loss before hospital admission and mortality in elderly persons with medical illness *J. Gerontol.: Med. Sci.* 60A 1180–3