RESEARCH ARTICLE

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Validation of "Get With the Guidelines" Risk Score (GWTG) to Predict the In-hospital Mortality among the Patients Admitted with Congestive Cardiac Failure

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Abstract

Background and Aim: Heart failure (HF) is a leading cause of cardiovascular morbidity and mortality. Prognostic models such as the Get With the Guidelines-HF (GWTG-HF) score are validated for predicting in-hospital mortality, but data from critically ill populations in South India are limited. To validate the predictive accuracy of the GWTG-HF score for hospital mortality in acute decompensated HF (ADHF) cases managed in a tertiary intensive care unit (ICU).

Materials and Methods: In this prospective observational study, 67 adults admitted with HF over three months were enrolled. Patients with chronic kidney disease, thyroid disorders, valvular heart disease, pulmonary arterial hypertension, or pregnancy were excluded. Clinical, laboratory, and hemodynamic data were collected, and GWTG-HF scores were calculated at admission. Patients were stratified into low (0-33), moderate (34-50), and high (>50) risk groups. Outcomes included in-hospital mortality and ICU stay. Statistical tests included analysis of variance, Kruskal-Wallis, chi-square/Fisher's exact, and receiver operating characteristic (ROC) curve analysis.

Results: Of 67 patients, 61 (91%) survived and 6 (9%) died. Mortality increased across risk groups: 0% in low, 9.3% in moderate, and 28.6% in high ($P = 0.012$). Non-survivors had higher mean GWTG-HF scores (47.7±7 vs. 38.4±8.1; $P = 0.013$) and lower sodium levels (128±4 vs. 134.6±6.3 mmol/L; $P = 0.007$). ROC analysis showed good discrimination (area under the curve: 0.754). At a cut-off ≤47, sensitivity was 66.7%, specificity 85.2%, and negative predictive value 96.3%. ICU stay was longer in higher-risk groups ($P = 0.041$).

Conclusion: The GWTG-HF score demonstrated good predictive performance for in-hospital mortality in ICU patients with ADHF. Its strong negative predictive value supports its use for identifying low-risk patients, while incorporating biomarkers such as N-terminal pro-brain natriuretic peptide may enhance prognostic accuracy.

Keywords: ADHF, GWTG-HF score, mortality, risk stratification, cardiac failure, heart failure

INTRODUCTION

Heart failure (HF), arising from structural and functional cardiac abnormalities, represents the final stage of most heart diseases and contributes substantially to cardiovascular illness and death. Although there has been progress in diagnosis and management of HF there is sparse satisfactory information regarding outcomes of HF.[1] Many clinical scores have been derived and validated for in-hospital survival, but

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their applicability in real world population has been seldom evaluated.[2] Get With the Guidelines-HF (GWTG-HF) score is one of the scores to evaluate outcomes of HF. Other scores include, the acute decompensated HF (ADHF) national registry, OPTIMIZE-HF outcome of a prospective trial of IV milrinone for exacerbates of chronic HF, enhanced feedback for effective cardiac treatment.

Although hospitalizations for HF have surged, standardized models for risk assessment in ADHF admissions are still lacking. Medical decision-making may benefit from the use of clinical risk prediction technologies. A patient who is thought to be at a lesser risk might be treated with less extensive therapies and monitoring on a hospital ward or telemetry unit, whereas a patient who is believed to be at a higher risk might need more severe care in an intensive care unit (ICU) or coronary care unit.

The analysis sought to validate a straightforward risk assessment tool for hospital mortality in ADHF patients that can be integrated into everyday practice.

Aim

Validate GWTG-HF score for its predictability of outcome in congestive HF patients, admitted in ICU in a South Indian tertiary care center.

METHODS

A prospective observation study was conducted in a tertiary care center in South India. Over a period of three months 67 patients admitted with congestive HF were studied and followed up for their outcomes in the hospital.

All patients (more than 18 years) getting admitted with diagnosis of congestive cardiac failure were included in the study. Pregnant women, patients with chronic kidney disease, thyroid disorders HF due to organic valvular disease or due to pulmonary arterial hypertension were not included in the study.

The routine investigations like complete blood count, renal function test, 12-lead electrocardiogram, 2D echocardiography, N-terminal pro-brain natriuretic peptide (NT-proBNP) were done as per routine standard of care. The GWTG score was determined for each patient upon admission. A patient's score was calculated by adding the points assigned to each predictor's value. The score values range from 0 to 100. Participants were categorized into three groups (low, moderate, high) according to the GWTG-HF risk score.

Based on previous clinical studies,[3-7] availability of data on the time of presentation the following data was collected: -demographic details (age, gender), clinical data (pulse rate, blood pressure), diagnosis, comorbidities [diabetes mellitus, hypertension, chronic obstructive pulmonary disease (COPD), hypothyroidism], laboratory parameters were recorded. All the patients were followed up till their stay in hospital. patient outcome, number of days in ICU and GWTG-HF score

The protocol received approval from the Institutional Ethics Committee of Ramaiah Medical College (ref. no: MSRMC/EC/SP03/122022, reg. no: ECR/215/Inst/KA/2013/RR22) on 15 December 2022 for three months, with all activities conducted in line with committee guidelines.

ClinicalTrials registry: Not applicable.

GWTG-HF Score

GWTG-HF risk score has 7 predictor variables. These variables are age, heart rate, systolic blood pressure (SBP), sodium, race, COPD and blood urea nitrogen (BUN). Every predictor variable has been assigned points according to their values within various ranges as illustrated in Table 1.[4] A total score is generated by adding points from each variable.

Statistical Analysis

The study was stratified into three groups based on the GWTG-HF risk score: low (0-33), moderate (34-50), and high (>50), as presented in Table 2. Continuous variables including age, SBP, BUN, and heart rate were summarized as mean ± standard deviation (SD). Categorical variables such as COPD prevalence and Black race were expressed as percentages.

Laboratory parameters—including white blood cell count, red blood cell count, hemoglobin, haematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and MCH concentration (MCHC)—were reported as mean ± SD. ICU stay duration was expressed as median with interquartile range (IQR) due to its non-normal distribution. Additional metrics such as number of deaths, predicted mortality (based on GWTG-HF score), and observed mortality rates were also tabulated.

Comparisons across the three risk groups were performed using one-way analysis of variance for normally distributed continuous variables, Kruskal-Wallis test for non-normally distributed variables (e.g., ICU stay, NT-proBNP), and chi-square or Fisher's exact test for categorical variables. Corresponding *P*-values are provided in Table 1 to indicate statistical significance.

Baseline patient data were analyzed with descriptive statistics. Continuous measures were expressed as mean ± SD or median (IQR) and compared between discharged and in-hospital deaths using ttests or Mann-Whitney U tests. Categorical variables were presented as counts and percentages, with chisquare or Fisher's exact tests applied where appropriate. A *P*-value below 0.05 was considered significant.

Receiver operating characteristic (ROC) curve analysis was employed to assess the discriminative performance of the GWTG-HF risk score in predicting in-hospital mortality among patients admitted to the ICU with HF. The ROC curve plots sensitivity (true positive rate) against 1- specificity (false positive rate) across a range of threshold values.

The area under the curve (AUC) was calculated[8] as a measure of the model's overall accuracy. Multiple cut-off values were assessed, and the optimal threshold was determined using the Youden's index (J = sensitivity + specificity - 1), which identifies the point on the ROC curve that maximizes the combined sensitivity and specificity. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were reported for the selected cut-off.

RESULTS

Patients were stratified into three groups according to the GWTG-HF risk score: low (0-33; n=17), moderate (34-50; n=43), and high (>50; n=7) as shown in Table 2. A clear stepwise increase in mortality was observed across groups. No deaths occurred in the low-risk group, compared with 4 deaths (9.3%) in the moderate group and 2 deaths (28.6%) in the high-risk group (*P* = 0.012, Fisher's exact test). The observed mortality rates corresponded well with the predicted mortality estimates (<1%, 1-5%, and 5-10% for the low, moderate, and high groups, respectively).

Length of ICU stay also differed significantly between groups, with median stays of 5.5 days (range 2-16), 8.75 days (range

Table 1. GWTG-HF score

Systolic BP	Points	BUN	Points	Sodium	Points	Age	Points
50-59	28	≤9	0	≤130	4	≤19	0
60-69	26	10-19	2	131	3	20-29	3
70-79	24	20-29	4	132	3	30-39	6
80-89	23	30-39	6	133	3	40-49	8
90-99	21	40-49	8	134	2	50-59	11
100-109	19	50-59	9	135	2	60-69	14
110-119	17	60-69	11	136	2	70-79	17
120-129	15	70-79	13	137	1	80-89	19
130-139	13	80-89	15	138	1	90-99	22
140-149	11	90-99	17	≥139	0	100-109	25
150-159	9	100-109	19			≥110	28
160-169	8	110-119	21				
170-179	6	120-129	23				
180-189	4	130-139	25				
190-199	2	140-149	27				
≥200	0	≥150	28				
Heart rate	**Points**	**Black race**	**Points**	**COPD**	**Points**	**Total score**	**Probability of death**
						0-33	<1%
						34-50	1-5%
≤79	0	Yes	0	Yes	2	51-57	>5-10%
80-84	1					58-61	>10-15%
85-89	3					62-65	>15-20%
90-94	4	No	3	No	0	66-70	>20-30%
95-99	5					71-74	>30-40%
100-104	6					75-78	>40-50%
≥105	8					≥79	>50%

The range of scores reflects the probability of mortality as indicated in the Table 1

GWTG-HF: Get With the Guidelines-heart failure, BUN: Blood urea nitrogen, COPD: Chronic obstructive pulmonary disease, BP: Blood pressure

2-60), and 8 days (range 2-21) for the low-, moderate-, and high-risk groups, respectively (P = 0.041).

Baseline characteristics varied substantially across risk categories. Patients in the moderate and high-risk groups were older (72.1±9.2 and 74.4±11.7 years, respectively) compared with the low-risk group (58.1±15.3 years; P < 0.001). SBP decreased significantly with higher risk strata (150.2±28.1 mmHg in low vs. 129.4±20.3 mmHg in moderate and 100.0±12.6 mmHg in high-risk groups; P < 0.001).

Markers of renal dysfunction and cardiac stress showed strong associations with risk category. BUN levels were markedly elevated in the high-risk group (48.1±35.2 mg/dL) compared with the low (17.1±5.9 mg/dL) and moderate groups (17.9±10.0 mg/dL; P < 0.001). Similarly, NT-proBNP concentrations were highest in the high-risk category (16.820±10.920 pg/mL) compared with the moderate (5.059±6.370 pg/mL) and low-risk groups (9.122±9.360 pg/mL; P < 0.001).

In contrast, hematological indices—including white blood cell count, red blood cell count, hemoglobin, hematocrit, MCV, MCH, and MCHC—did not differ significantly across the three groups (P > 0.05 for all). However, the prevalence of COPD increased with higher risk category (5.9% in low, 11.6% in moderate, and 28.6% in high; P = 0.031). No patients identified as Black in this cohort.

Among the 67 patients included, 61 (91%) were discharged and 6 (9%) died during hospitalization. Age, gender, diagnosis, and key comorbidities did not differ between groups (P > 0.05), and hemodynamic parameters such as blood pressure and heart rate were also comparable (Table 3).

However, serum sodium levels were significantly lower in patients who died compared with those discharged (128±4 vs. 134.6±6.3 mmol/L, P = 0.007). In addition, the mean GWTG-HF risk score was higher among patients with outcome of death (47.7±7 vs. 38.4±8.1, P = 0.013). Although not statistically significant, non-survivors had a numerically longer hospital stay (median 18.5 vs. 4.5 days, P = 0.117) and higher BUN and NT-proBNP values.

Overall, these findings suggest that lower sodium levels and higher GWTG-HF risk scores were strongly associated with in-hospital mortality, while other clinical, hemodynamic, and laboratory variables did not show significant differences.

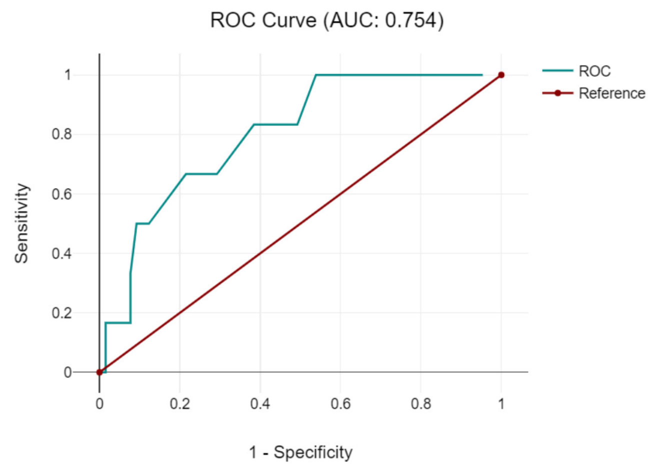
The discriminative ability of the GWTG-HF risk score for predicting in-hospital mortality was evaluated using ROC curve analysis. Graph 1 given below shows AUC was 0.754 [95% confidence interval (CI): 0.58-0.93], indicating good overall discrimination. At an optimal cut-off value of ≤47, the model achieved a sensitivity of 66.7% and a specificity of 85.2%. The corresponding PPV was 30.8%, while the NPV was notably high

Table 2. Patient outcomes and biomarkers across low, moderate, and high risk score groups

Parameter	Low score (0-33)	Moderate score (34-50)	High score (>50)	*P*-value
Number of patients	17	43	7	-
Deaths (n)	0	4	2	0.012 (Fisher's exact)
Mortality rate (%)	0%	9.3%	28.6%	0.012 (Fisher's exact)
Predicted mortality	<1%	1-5%	5-10%	-
ICU stay (days)	5.5 (2-16)	8.75 (2-60)	8 (2-21)	0.041 (Kruskal-Wallis)
Age (years)	58.1±15.3	72.1±9.2	74.4±11.7	<0.001 (ANOVA)
Systolic BP (mmHg)	150.2±28.1	129.4±20.3	100.0±12.6	<0.001 (ANOVA)
Heart rate (bpm)	89.6±13.3	90.0±20.1	92.0±24.1	0.331 (ANOVA)
BUN (mg/dL)	17.1±5.9	17.9±10.0	48.1±35.2	<0.001 (ANOVA)
NT-proBNP (pg/mL)	9.122± 9.360	5.059±6.370	16.820±10.920	<0.001 (Kruskal-Wallis)
WBC (cells/µL)	9.891±3.160	10.957±5.620	9.956±3.050	0.56
RBC (millions/µL)	4.29±0.63	4.30±0.66	4.52±0.72	0.58
Hemoglobin (g/dL)	11.49±2.04	11.79±1.79	11.91±2.54	0.78
Hematocrit (%)	37.1±6.3	36.7±6.8	37.6±7.1	0.82
MCV (fL)	87.1±10.4	87.3±11.9	88.6±9.8	0.66
MCH (pg)	26.6±4.8	27.6±3.2	28.1±3.9	0.49
MCHC (g/dL)	30.9±1.3	31.2±2.9	31.6±2.1	0.62
COPD prevalence (%)	5.9%	11.6%	28.6%	0.031 (chi-square)
Black race (%)	0%	0%	0%	-

ICU: Intensive care unit, BUN: Blood urea nitrogen, NT-proBNP: N-terminal pro-brain natriuretic peptide, WBC: White blood cell, RBC: Red blood cell, MCV: Mean corpuscular volume, MCH: Mean corpuscular hemoglobin, MCHC: MCH concentration, COPD: Chronic obstructive pulmonary disease, ANOVA: Analysis of variance, BP: Blood pressure at 96.3% as shown in Table 4, supporting the score's strength in ruling out adverse outcomes. Overall, the model's performance was graded as good.

Logistic regression analysis was performed to assess independent predictors of inhospital mortality. In univariable analysis, hyponatremia and COPD appeared associated with adverse outcomes, while other variables including SBP, BUN, age, and heart rate were not significant. However, after adjustment in the multivariable model, none of the predictors retained statistical significance. The GWTG-HF score showed a directional trend toward increased risk (odds ratio: 1.46, 95% CI 0.80-5.87, P = 0.438), but with wide CIs reflecting limited sample size. Notably, no patients with COPD died, producing an apparent protective effect in univariable regression; this represents complete separation, a statistical artifact of small samples, rather than a true protective role. Overall, these findings suggest that while the GWTG-HF score captures relevant prognostic information, its independent predictive value in this cohort was modest (Table 5).



Graph 1. ROC curve demonstrating discriminative ability of the GWTG-HF score (AUC: 0.754)

ROC: Receiver operating characteristic, AUC: Area under the curve, GWTG-HF: Get With the Guidelines-heart failure

Table 3. Comparison of baseline characteristics and clinical parameters of patients with outcome of discharge and death

Characteristic	Total (n=67)	Discharged (n=61)	Dead (n=6)	*P*-value (dead vs. discharged)
Age (years)	69.4±12.7	69.3±13.2	71.7±12.3	0.66
Gender (male)	36 (53.7%)	34 (54.1%)	2 (50%)	1.00
Gender (female)	31 (46.3%)	27 (45.9%)	4 (50%)	1.00
Diagnosis: ADHF	50 (74.6)	46 (75.4%)	4 (66.7%)	0.65
Diagnosis: ACS	17 (32.8%)	15 (24.5%)	2 (33.3%)	0.63
Hypertension	51 (76.1%)	46 (75.4%)	5 (83.3%)	1.00
Diabetes mellitus	50 (74.6%)	44 (72.1%)	6 (100%)	0.32
Hypothyroidism	9 (13.4%)	9 (14.7%)	0 (0%)	0.57
COPD	9 (13.4%)	9 (14.7%)	0 (0%)	0.57
Black race	0	0	0	-
Systolic BP (mmHg)	132±26.3	134.3±26.5	119.3±18.1	0.10
Diastolic BP (mmHg)	78.1±13.3	78.3±13.3	80.7±15.4	0.72
Heart rate (bpm)	89±20.4	89±20.1	91.7±39.6	0.87
Sodium (mmol/L)	134.1±6.4	134.6±6.3	128±4	0.007
BUN (mg/dL)	20.3±11.3	20±16.3	27.3±26	0.25
NT-proBNP (pg/mL)	6242.5±7402.6	6242.5±7402.6	8001.8±10462.4	0.64
GWTG score	39.6±8.5	38.4±8.1	47.7±7	0.013
Length of stay (days)	5 (4)	4.5 (3)	18.5 (24.5)	0.117

ADHF: Acute decompensated heart failure, ACS: Acute coronary syndrome, COPD: Chronic obstructive pulmonary disease, BUN: Blood urea nitrogen, NT-proBNP: N-terminal pro-brain natriuretic peptide, GWTG: Get With the Guidelines, BP: Blood pressure

Table 4. Performance characteristics of the GWTG score

Parameter	AUC	Cut-off	Sensitivity	Specificity	PPV	NPV	Performance grade
GWTG score	0.754	≤47	0.667	0.852	0.308	0.963	Good

GWTG: Get With the Guidelines, AUC: Area under curve, PPV: Positive predictive value, NPV: Negative predictive value

Table 5. Univariable and multivariable logistic regression analysis for predictors of inhospital mortality

Variable	Univariable OR (95% CI)	*P*-value	Multivariable OR (95% CI)	*P*-value
SP	0.974 (0.93-1.00)	0.134	1.035 (0.76-1.29)	0.787
BUN	1.017 (0.88-1.07)	0.800	0.899 (0.46-1.07)	0.626
Sodium	0.828 (0.67-0.91)	0.019	0.809 (0.28-1.16)	0.510
Age	1.016 (0.95-1.11)	0.683	0.902 (0.56-1.22)	0.617
Heart rate	1.003 (0.95-1.08)	0.941	0.960 (0.79-1.23)	0.727
COPD	0.001 (0.00-0.01)	<0.001	0.417 (0.18-1.00)	0.063
GWTG score	1.134 (1.04-1.36)	0.701	1.458 (0.80-5.87)	0.438

BUN: Blood urea nitrogen, COPD: Chronic obstructive pulmonary disease, GWTG: Get With the Guidelines OR: Odds ratio, CI: Confidence interval

DISCUSSION

This study evaluated the prognostic utility of the GWTG-HF risk score in a cohort of ICU-admitted patients with ADHF. The findings underscore the relevance of this clinical tool in stratifying in-hospital mortality risk, while also highlighting potential limitations in high-acuity settings.

The GWTG-HF score estimates hospital mortality risk in HF patients, particularly in ICU settings, based on seven parameters: age, SBP, BUN, sodium, heart rate, race, and COPD status (Figure 1).

Patients with chronic kidney disease, valvular heart disease, pulmonary hypertension, and thyroid disorders were excluded because these conditions independently alter key prognostic variables such as BUN, sodium, and hemodynamic status, which could have confounded the score's predictive accuracy. However, their exclusion also limits external validity, as these comorbidities are common in real-world HF populations and may affect generalizability of our findings.

Among these, SBP, BUN, and age contribute more heavily to the final score, reflecting their stronger association with adverse outcomes. Specifically, lower SBP, elevated BUN, and advanced age have been consistently linked to increased mortality risk in HF populations. This scoring model offers a practical framework for early risk stratification and targeted clinical decision-making in critically ill patients. While SBP is widely recognized as a strong predictor of HF outcomes due to its correlation with cardiac output and perfusion status,[9] our findings revealed that several high-risk patients (GWTG-HF score >50) survived despite low SBP values. Their elevated risk scores were primarily driven by low SBP and/or high BUN, yet these patients did not experience mortality during ICU admission. This discrepancy suggests that while SBP heavily influences the score, its isolated predictive strength may vary depending on patient context and compensatory factors.

Conversely, some patients in the moderate-risk group who died had higher sodium levels than expected. Although hyponatremia is a well-established marker of poor prognosis

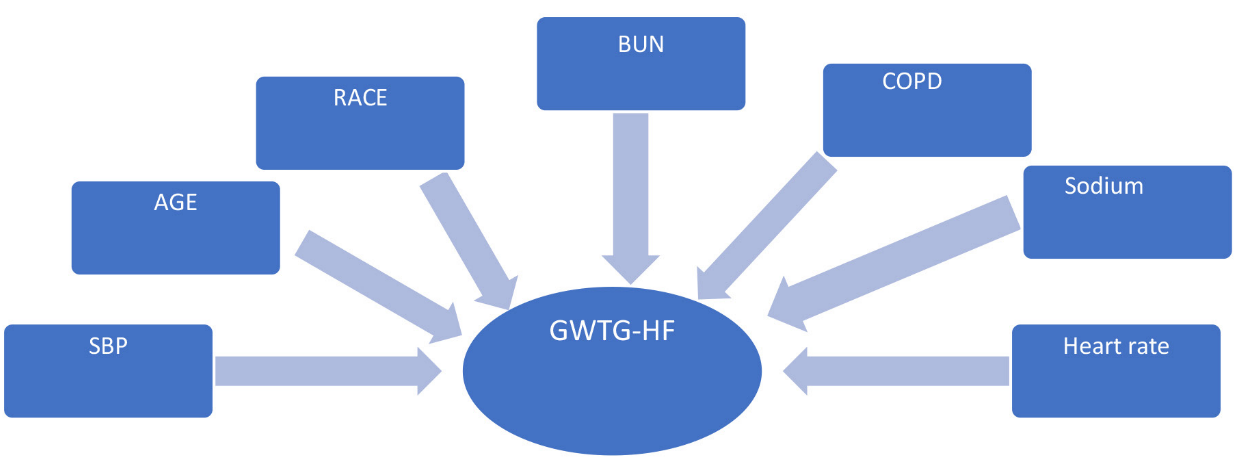


Figure 1. Parameters of GWTG-HF risk score

GWTG-HF: Get With the Guidelines-heart failure, SBP: Systolic blood pressure, BUN: Blood urea nitrogen, COPD: Chronic obstructive pulmonary disease in HF,[10,11] the GWTG-HF model assigns relatively low weight to serum sodium. This may partially explain why certain high-sodium patients were under classified despite adverse outcomes, implying that sodium may warrant greater emphasis in future iterations of risk models.

The role of heart rate as a predictor remains debated across HF risk models. While some studies support its prognostic relevance,[5,12,13] others report minimal impact on mortality prediction.[3,14] Our dataset reflects only a modest variation in heart rate across risk categories, underscoring the ongoing need for consensus regarding its integration into standardized scoring systems.

A key observation was that 9% of patients succumbed during their ICU stay, with mortality disproportionately affecting postmenopausal females and patients with significant comorbidity burdens—100% had diabetes mellitus and 83.3% had hypertension. These findings align with existing literature linking metabolic syndrome with adverse HF outcomes.

Risk stratification using the GWTG-HF score revealed clear clinical and biochemical gradients across low, moderate, and high-risk groups. Lower-risk patients exhibited higher SBP and serum sodium, with lower BUN and heart rate, reflecting preserved hemodynamic and renal function. In contrast, high-risk patients demonstrated classic markers of decompensation—hypotension, hyponatremia, elevated BUN, and tachycardia, as well as higher COPD prevalence—corroborating the score's clinical validity.

The score's performance was further evaluated through outcome comparison. While low-risk patients had excellent alignment between predicted and observed mortality (0%), the moderate and high-risk groups experienced higher-than-predicted mortality, indicating a tendency toward risk underestimation in sicker patients. This suggests that the GWTG-HF score, while broadly useful, may require local recalibration or enhancement to maintain accuracy in critically ill patients.

However, multivariable regression did not confirm independent associations for the GWTG-HF score or its individual components, reflecting collinearity and the limited number of deaths in this cohort. Notably, sodium and COPD did not retain predictive value after adjustment, and the absence of deaths among COPD patients produced a statistical artifact in univariable analysis. These shortcomings highlight the constraints of small sample size and event rates, which limit the stability of regression estimates. Overall, the findings suggest that while the GWTG-HF score captures relevant prognostic information and performs well in ruling out adverse outcomes, its independent predictive value in critically ill populations remains modest. Larger, multicenter studies are needed to validate and recalibrate the score.

Haematological data added another dimension, pointing to progressive anaemia and altered red cell indices in higher-risk groups. These findings reinforce the concept of systemic compromise as HF advances. Moreover, NT-proBNP was markedly elevated in patients who died (mean ~8001.8 pg/mL), highlighting its potential as a complementary biomarker for short-term prognostication.

Our data revealed markedly elevated NT-proBNP levels (~8001.8 pg/mL) in non-survivors, suggesting its potential as an adjunctive biomarker. Recent studies have validated NT-proBNP's prognostic value in both acute and chronic HF settings. For instance, Nguyen et al.[15] identified NT-proBNP ≥1858 pg/mL as an independent predictor of 90-day mortality and rehospitalization in HFrEF patients. Similarly, Ali et al.[16] demonstrated a 5-4 fold increase in ICU admission or death risk with NT-proBNP >1826 pg/mL. These findings support the integration of NT-proBNP into existing risk models to improve predictive accuracy.

Study Limitations

This study has several limitations. It was a single-centre study with a small sample size and only six deaths, limiting statistical reliability of ROC estimates, cut-off optimization, and predictive values. The exclusive focus on ICU-admitted patients introduces severity bias, while exclusion of patients with chronic kidney disease, valvular heart disease, pulmonary hypertension, or thyroid disorders further narrows generalizability. These comorbidities are common contributors to ADHF and their exclusion may bias the cohort toward less complicated cases. Outcomes were restricted to in-hospital mortality, without long-term follow-up. The cut-off value of ≤47 was identified post hoc and should be interpreted as exploratory. Aggressive ICU interventions (e.g., vasopressors, mechanical ventilation, renal replacement therapy) may have confounded associations between admission scores and outcomes, underscoring the need for local recalibration of the GWTG-HF score in high-acuity settings. Additionally, underrepresentation of certain predictors, such as black race and COPD, restricted assessment of their true impact. Although NT-proBNP levels were collected and found to be prognostically relevant, they were not integrated into the GWTG-HF model. Future multicenter studies with larger cohorts, longer follow-up, and recalibration for ICU populations are needed to refine the score and enhance its predictive accuracy.

CONCLUSION

In ICU patients with ADHF, the GWTG-HF score reliably predicts hospital mortality and is especially useful for identifying lowrisk cases. Refinement with additional biomarkers such as NT-proBNP may improve predictive accuracy in high-acuity settings.

Ethics

Ethics Committee Approval: The protocol received approval from the Institutional Ethics Committee of Ramaiah Medical College (ref. no: MSRMC/EC/SP03/122022, reg. no: ECR/215/Inst/KA/2013/RR22) on 15 December 2022.

Informed Consent: Written informed consent was obtained from all participants prior to enrollment.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Y.R., A.K., A.H., M.A.S., M.S., Concept: Y.R., A.K., M.A.S., Design: Y.R., A.K., M.A.S., Data Collection or Processing: Y.R., A.H., M.S., Analysis or Interpretation: Y.R., A.K., M.S., Literature Search: Y.R., A.K., M.S., Writing: Y.R., A.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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