Incremental B-Type Natriuretic Peptide Reduction During Heart Failure Hospitalizations

ASSOCIATION WITH LOWER 30-DAY READMISSION AND 30-DAY MORTALITY AMONG PATIENTS WITH SERIAL ASSAYS

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BACKGROUND

Using B-type natriuretic peptide (BNP) during a heart failure (HF) hospitalization to ascertain diagnosis and prognosis has strong evidence:

- Results from the Breathing Not Properly study, showed that BNP accurately diagnosed HF in patients presenting to the ED with dyspnea, with a sensitivity of 90% and specificity of 76% at a cutoff of 100 pg/mL

- The PREVEND study (Prevention of Vascular and Renal End Stage Disease), evaluated a total of 13 biomarkers for their value in the prediction of new-onset HF; BNP and NT-proBNP had the strongest predictive value

- Each 100-pg/mL increase in BNP was associated with a 35% increase in the relative risk of death

- Results from the ADHERE (Acute Decompensated Heart Failure National Registry) registry showed a linear relationship between admission BNP quartiles and in-hospital mortality; 1.9% mortality rate for patients in the lowest quartile compared to 6% mortality rate for those in the highest quartile

Despite all these results and some data that supports the use of serial measurements of BNP its use with serial measurements has not been stablished. Our aim was to examine the relationship between changes in BNP levels during a HF hospitalization and 30-day readmission and 30-day mortality

METHODS

Data from patients discharged from any Intermountain hospital with a primary HF diagnosis between Jan 2014 and May 2017 were analyzed. A subset of data was formed with patients with serial measurements of BNP. Admission and discharge BNP values were evaluated and stratified. The primary endpoints were 30-day readmission and 30-day mortality.

Relative change from discharge and admission BNP was calculated and stratified as follows:
- No reduction
- 1% - <25% Reduction
- 25% - <50% Reduction
- 50% - <75% Reduction
- >= 75% Reduction

Ascertainment of the endpoints included data from our electronic medical record and reviewing discharge notes, clinic follow-up visit notes, and 30-day follow up call notes

Data were analyzed using Stata 12 statistical software (College Station, TX StataCorp LP).

LIMITATIONS

Because patients can be readmitted to outside intermountain hospitals, readmissions can be under ascertained. Similarly, mortality data not available through our EMR or the State of Utah Vital Records could contribute to the under estimation of the mortality rate.

RESULTS

6887 consecutive patients were discharged with a primary diagnosis of HF. The overall readmission and mortality rates were 16.1% and 8.6% respectively. 19.1% of the patients has serial measurements of BNP.

The average baseline BNP was 1256.8 ± 1079.7 and the average discharge BNP was 1004.3 ± 1029.1.

Patients who had a relative reduction in BNP had a 30% lower 30-day readmission rate when compared to those without a BNP reduction (16.1% vs. 21.2%; OR 0.70, 95% CI 0.51 − 0.96, p = 0.029). Similarly, patients who had a relative reduction in BNP had a 54% lower 30-day mortality rate when compared to those without a BNP reduction (7.1% vs. 12.8%; OR 0.46, 95% CI 0.30 − 0.69, p < 0.000).
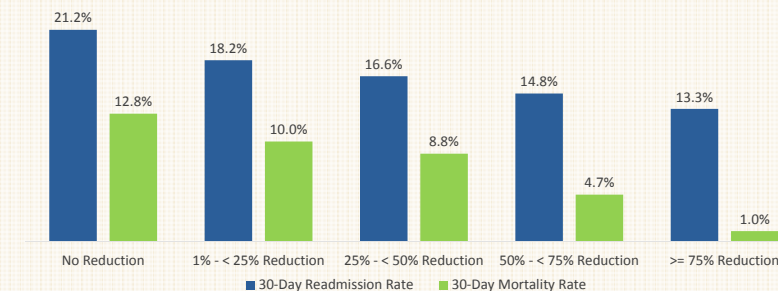
A favorable reduction in readmission and mortality rates was observed at different relative reduction in BNP levels. Figure 2 shows this incremental association

Figure 1: Patients who attained a reduction in BNP over their HF hospitalization had improved outcomes with reductions in 30-day readmission and 30-day mortality rates

Readmission Rate = 21.2%

Mortality Rate = 12.8%

Readmission Rate = 16.1%

Mortality Rate = 7.1%
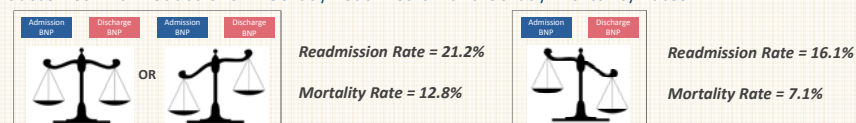
After adjusting for baseline BNP and age, patients who had a relative reduction in BNP had a 30% lower 30-day readmission rate when compared to those without a BNP reduction (OR 0.70, 95% CI 0.51 − 0.96, p = 0.029). Similarly, patients who had a relative reduction in BNP had a 54% lower 30-day mortality rate when compared to those without a BNP reduction (OR 0.46, 95% CI 0.30 − 0.69, p < 0.000).

Figure 2: Incremental Reduction in Readmission and Mortality Rates Associated with Relative Reductions in BNP Among Hear Failure Patients

	No Reduction	1% - < 25% Reduction	25% - < 50% Reduction	50% - < 75% Reduction	>= 75% Reduction
30-Day Readmission Rate	21.2%	18.2%	16.6%	14.8%	13.3%
30-Day Mortality Rate	12.8%	10.0%	8.8%	4.7%	1.0%

CONCLUSIONS

Our results suggest that patients who attained a reduction in BNP over their HF hospitalization had improved outcomes with reductions in 30-day readmission and 30-day mortality rates. These data suggested that perhaps serial measurements of BNP in hospitalized HF patients could become a surrogate of more favorable outcomes. Further research is needed to understand which interventions caused the drop in BNP, which patients responded, and to stablish a reduction target. Lastly, patients without a reduced BNP may be eligible for advanced heart failure therapies or this lack of BNP reduction may prompt screening for end of life care.

No Conflicts of interest to disclose