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Palliative care and hospital readmissions in patients with advanced heart failure: Insights from the PAL-HF trial

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Patients with end-stage heart failure (HF) have a significant symptom burden that is often managed in the hospital despite most patients' preferences to minimize readmissions. The PAL-HF trial intervention improved quality of life (QOL) compared to usual care in advanced HF patients.¹ Whether a palliative care intervention can reduce the burden of readmissions in advanced HF patients has not been well characterized.²

In the setting of clinical trials, all-cause and HF-specific hospitalizations are routinely assessed as a time to first event. This approach does not capture the total burden of hospitalizations, as HF patients commonly experience recurrent hospitalizations.³ Although the PAL-HF intervention did not reduce time to first HF hospitalization,¹ we hypothesized that the multidisciplinary intervention would address the complexities of multimorbidity and subsequently reduce total hospitalization burden and improve "days alive and out of the hospital" (DAOH) in these patients. Thus, the primary aim of the present work was to explore the total burden of hospitalizations and not just time to first event.

The PAL-HF trial design and primary outcomes have been previously published ([ClinicalTrials.gov](https://clinicaltrials.gov) Identifier:).^{1,4} In brief, PAL-HF was a single-center, randomized controlled trial of a multidisciplinary palliative care intervention compared to usual care in 150 patients with advanced HF (n = 75 per study arm). The primary end points were QOL measurements via the Kansas City Cardiomyopathy Questionnaire and the Functional Assessment of Chronic Illness Therapy with Palliative Care Subscale assessed at 6 months. Secondary end points included hospitalizations and mortality. Causes of hospitalizations were blindly adjudicated by a clinical event committee. The intervention resulted in greater improvements in Kansas City Cardiomyopathy Questionnaire and Functional Assessment of Chronic Illness Therapy with Palliative Care Subscale compared to usual care with similar rates of mortality and hospitalization. PAL-HF was funded by the National Institute of Nursing Research (R01NR013428).

In the present analysis, we evaluated the total burden of all-cause, cardiovascular (CV), and HF-specific readmissions and DAOH with the palliative care intervention compared to usual care over the 6-month study period. To account for the potential bias due to censored and incomplete data (eg, due to withdrawal of consent or loss-to-follow up), we used the inverse probability weighted estimators of Bang and Tsiatis to model the hospitalization data over 6

months. The authors are solely responsible for the design and conduct of this study, all study analyses, the drafting and editing of the paper, and its final contents.

In PAL-HF, the median age was 72 (62-80) years, 47% were female, 41% were black, 48% had ischemic etiology, and 55% had an ejection fraction $\geq 40\%$. Overall, 43 (28.7%) patients died and 73 (48.7%) were readmitted during the 6-month follow-up period, without a significant between-group difference by treatment assignment (both $P > .05$). Ninety three patients (62%) had the full 6-month follow-up. Fifty-seven (38%) did not have complete follow-up through 6 months because of death ($n = 43$), withdrawal ($n = 13$), and loss to follow up ($n = 1$). The Table presents readmission data and DAOH by treatment arm. Total readmissions were similar in the intervention group compared with the usual care (61 vs 69 readmissions, respectively), with similar estimated DAOH in both groups (133 vs 136 days, respectively). When evaluating the mean differences in number of hospitalizations per 100 patients over a 6-month period by treatment arm, there were no statistically significant differences between groups (84 vs 94 readmissions per 100 patients in the intervention vs usual care groups; $P = .59$). There were numerically fewer non-CV readmissions with the PAL-HF intervention, but this difference was not statistically significant (15 vs 28 readmissions per 100 patients; $P = .13$); these observations should be viewed as hypothesis-generating and in need of replication in a larger study. Specifically, there was a nonsignificant decrease of approximately 50% in non-CV hospitalizations in the intervention group relative to the usual care group. To detect a difference of >10 hospitalizations per 100 patients in non-CV hospitalizations at the $P < .05$ level with 80% power, a sample size of approximately 800 patients (400 in each arm) would be required.

A multidisciplinary, palliative care intervention that improved QOL resulted in a similar number of total readmissions and similar DAOH compared to usual care. Although these data did not support our hypothesis that palliative care would reduce the total burden of hospitalization, these findings have several important implications. First, readmissions in general are associated with worse QOL over time for patients.⁵ However, despite similarly high rates of readmission in both of the PAL-HF study groups, the intervention resulted in significant improvements in QOL. Second, these findings provide hypothesis-generating data regarding cause-specific readmissions with palliative care. Whereas CV-specific hospitalizations may not be altered by the intervention in patients with advanced HF, palliative care may be able to reduce non-CV hospitalizations by improving the holistic management of these individuals in outpatient and home settings. Further work is needed to examine whether this intervention can be generalized to the broader population of advanced HF patients to optimize strategies that improve patients' QOL.

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References

1. Rogers JG, Patel CB, Mentz RJ, et al. Palliative care in heart failure: the PAL-HF randomized, controlled clinical trial. *J Am Coll Cardiol* 2017;70:331–41. [PubMed: 28705314]
2. Kavalieratos D, Gelfman LP, Tycon LE, et al. Palliative care in heart failure: rationale, evidence, and future priorities. *J Am Coll Cardiol* 2017;70:1919–30. [PubMed: 28982506]
3. Rogers JK, McMurray JJ, Pocock SJ, et al. Eplerenone in patients with systolic heart failure and mild symptoms: analysis of repeat hospitalizations. *Circulation* 2012;126:2317–23. [PubMed: 23042980]
4. Mentz RJ, Tulskey JA, Granger BB, et al. The palliative care in heart failure trial: rationale and design. *Am Heart J* 2014;168:645–651.e1. [PubMed: 25440791]
5. Lewis EF, Li Y, Pfeffer MA, et al. Impact of cardiovascular events on change in quality of life and utilities in patients after myocardial infarction: a VALIANT study(valsartan in acute myocardial infarction). *JACC Heart Fail* 2014;2:159–65. [PubMed: 24720924]

Hospital readmissions and DAOH at 6 months by treatment group (reference = usual care)

Table.

	PAL-HF intervention (n = 75)	Usual care (n = 75)	Mean difference (CIs)* by treatment arm	P value
All-cause readmissions				
Total readmissions	61	69		
Patients with 1 readmission	35 (46.7%)	38 (50.7%)		
Patients with 2 readmissions	19 (25.3%)	18 (24.0%)		
Estimated* number of hospitalizations (mean, 95% CI) per 100 patients followed for 6 m	84 (60-107)	94(64-125)	-10 (-49 to 28)	.59
Estimated* DAOH (mean, 95% CI), days over 6 m, per patient CV readmissions	133 (119-147)	136(123-150)	-3 (-23 to 16)	.72
Total admissions				
Patients with 1	50	47		
Patients with 2	32 (42.7%)	27 (36.0%)		
Estimated* number of hospitalizations (mean, 95% CI) per 100 patients followed for 6 m	15 (20.0%)	12 (16.0%)		
Estimated* DAOH for CV (mean, 95% CI), days over 6 m, per patient Heart failure readmissions	69 (49-90)	65 (39-92)	+4 (-30 to 38)	.82
Estimated* DAOH for CV (mean, 95% CI), days over 6 m, per patient Heart failure readmissions	134(120-148)	139(126-152)	-5 (-25 to 14)	.59
Total readmissions				
Patients with 1	36	35		
Patients with 2	23 (30.7%)	22 (29.3%)		
Estimated number of hospitalizations (mean, 95% CI) per 100 patients followed for 6 m	12 (16.0%)	7 (9.3%)		
Estimated* DAOH for HF (mean, 95% CI), days over 6 m, per patient Non-CV readmissions	51 (33-71)	48 (26-71)	+3 (-26 to 33)	.82
Estimated* DAOH for HF (mean, 95% CI), days over 6 m, per patient Non-CV readmissions	135(120-149)	141 (128-154)	-6 (-26 to 13)	.52
Total admissions				
Patients with 1	11	22		
Patients with 2	3 (4.0%)	11 (14.7%)		
Estimated* number of hospitalizations (mean, 95% CI) per 100 patients followed for 6 m	4 (5.3%)	6 (8.0%)		
Estimated* DAOH for non-CV (mean, 95% CI), days over 6 m, per patient	15 (3-26)	28 (14-43)	-14 (-33 to 4)	.13
Estimated* DAOH for non-CV (mean, 95% CI), days over 6 m, per patient	142(128-155)	144(130-158)	-2 (-22 to 17)	.83

* The inverse probability weighted estimators of Bang and Tsiatis are applied to account for the potential bias due to censored and incomplete data.