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Pulmonary Artery Pressures During Cardiopulmonary Exercise Testing Using Cardiomems

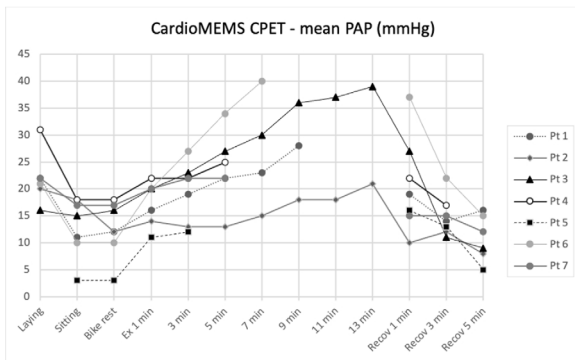
P. Kennel, H. Lumish, C. Lee, S. Alishetti, E. Lin, A. Kirtane, G. Sayer, N. Uriel and K. Axsom. Columbia University Medical Center, New York, NY.

Purpose: Continuous pulmonary artery (PA) pressure monitoring has proven its value in reducing heart failure and all-cause hospitalizations. Invasive hemodynamic testing has shown that exercise in HFREF leads to a steep increase in PA pressures and this steep rise is independently associated with reduced peak VO₂. PA pressure response during exercise is likely more closely related to outcomes than resting hemodynamics in HF. The significance and potentially prognostic value of measuring PA pressures during CPET testing in AHF patients is currently unknown. In this feasibility-study we describe PA pressure curves during CPET in a cohort of advanced HF patients.

Methods: 7 advanced HF patients (Etiology: 4 NICM, 3 ICM; age 61 ± 12y; EF 28 ± 15%; 86% on beta blocker) with CardioMEMS device underwent standard stationary bike - CPET. PA pressures were measured at rest, every 2 minutes during exercise and during recovery.

Results: Max VO₂ was 13.3±5.2 ml/kg/min; average duration of exercise was 8:56 min. Mean resting PA pressure was 12.5±5.2 mmHg. Mean peak PA pressure was 26.7±10 mmHg. Mean PA pressures increased on average by 2.5-fold (± 1.14) (Figure 1). The slope of mPAP rise was 3.33±2.1. mPAP uniformly returned to baseline values within 3 minutes of recovery. Pt. 3 was admitted 1 week after CPET testing with subacute worsening HF symptoms and underwent OHT, all other patients continue to follow at the centralized HF program at our institution.

Conclusion: PAP assessment using CardioMEMS is feasible during CPET. mPAP rose sharply during exercise. In HF patients with invasive PA pressure monitor devices, exercise PAP assessment may be a valuable tool to assess for functional capacity with possibly prognostic significance.



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Acceptability of Mobile Directly Observed Therapy for Immunosuppression Medication Adherence in Adolescent Heart Transplant Recipients

D. Gupta,¹ S.A. Clifford,² G. Skivington,³ A. Kimbro,⁴ J.S. Rackley,⁴ E.S. Martin,⁴ B.A. Pietra,¹ F.J. Fricker,¹ and M.O. Killian.³ ¹Congenital Heart Center, Department of Pediatrics, University of Florida, Gainesville, FL; ²College of Nursing, University of Florida, Gainesville, FL; ³College of Social Work, Florida State University, Tallahassee, FL; and the ⁴Pediatric Heart Failure and Transplant, University of Florida, Gainesville, FL.

Purpose: Non-adherence with immunosuppressant medications is a significant challenge for pediatric transplant patients and is an important predictor of poor post-transplant outcomes. The risk of non-adherence in adolescents is 40-60% and few interventions are available.

Methods: Using a mobile video directly observed therapy (mDOT) application by emocha Health Inc. we conducted a 12-week intervention. Inclusion criteria: age 11-21 years, ≥6 months post-transplant, medically stable, and demonstrating low medication adherence [medication level variability index score (MLVI) >2.0 and/or clinical concern of medication non-adherence from transplant team]. A phone interview was performed at 3 weeks to assess patient acceptability of the mDOT application and intervention. The 3-week participant acceptability intervention interview included the Post Study System Usability Questionnaire (PSSUQ) to assess usability of and experience with the mDOT application with responses ranging from “1=strongly agree” to “5=strongly disagree”.

Results: 14 patients were approached, 4 (28.6%) consented but did not begin the program, and 2 (14.3%) completed 3 weeks before dropping out. Patients who completed the intervention were more likely to be younger, white, and have lower MLVI values 6 months prior to participation. Socio-economic status as measured by insurance type (Medicaid vs. private) was not a predictor of dropout. Overall, the 8 patients completing the 12-week mDOT program ranged from 12-21 years, majority were female (5, 62.5%), had mean MLVI scores of 2.54±0.65. The 3-week feasibility interview demonstrated high overall user satisfaction. Responses on the PSSUQ items yielded consistent responses (Table 1).

Conclusion: Adolescents and their parents reported positive perceptions of the mDOT application, with high levels of acceptability, and engagement early in the intervention. Further research is required to assess ongoing acceptability and benefit.

Table 1: Post Study System Usability Questionnaire Items

PSSUQ Questions	M (SD)	Mode	Range
The system has all the functions and capabilities I expect it to have	1.50 (1.07)	1	1-4
Overall, I am satisfied with the system	1.25 (0.46)	1	1-2
Overall, I am satisfied with how easy it is to use this system	1.13 (0.35)	1	1-2
It was simple to use this system	1.13 (0.35)	1	1-2
I could effectively complete the tasks and scenarios using this system	1.25 (0.46)	1	1-2
I was able to complete the tasks and scenarios using this system	1.00 (0.00)	1	1-1
I was able to efficiently complete the tasks and scenarios using this system	1.00 (0.00)	1	1-1
I felt comfortable using this system	1.13 (0.35)	1	1-2
It was easy to learn to use this system	1.25 (0.46)	1	1-2
The interface of this system was pleasant	1.50 (1.07)	1	1-4
I liked using the interface of this system	1.63 (0.92)	1	1-3
The organization of information on the system screens was clear	1.13 (0.35)	1	1-2
The system gave error messages that clearly told me how to fix problems	2.00 (1.20)	1.5	1-4
Whenever I made a mistake using the system, I could recover easily and quickly	1.88 (1.13)	1.5	1-4
The information provided with this system (online help, documentation) was clear	1.00 (0.00)	1	1-1
It was easy to find the information I needed	1.00 (0.00)	1	1-1
The information provided for the system was easy to understand	1.00 (0.00)	1	1-1
The information was effective in helping me complete the tasks and scenarios	1.13 (0.35)	1	1-2

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Pharmacist Expansion to Tele-Health Visits in Heart Transplant Clinic

E. Supko, J.E. Clark, C.G. Rogers Marks and G. Waldman. Massachusetts General Hospital, Boston, MA.

Purpose: During the COVID-19 pandemic, inpatient cardiothoracic transplant pharmacists expanded clinical services to include remote telehealth visits to increase patient access to pharmacy services and streamline visits for providers. Pharmacist visit activities included adherence and medication access assessments, adverse effect assessment and management, chart reviews, and medication reconciliation.

Methods: A single center retrospective chart review of 80 heart transplant recipients transplanted between January 2020 and December 2020 was completed. From July 2020 - March 2021, pharmacists called patients within the first year of transplant prior to scheduled provider clinic visits. Patients were not called if they had been called within the prior 4 weeks. Activities from clinic visits before and after pharmacist involvement were compared at 1 month, 3 months, 6 months, and 12 months post-transplant. The goal of this analysis was to describe the number and types of interventions made by the pharmacist.

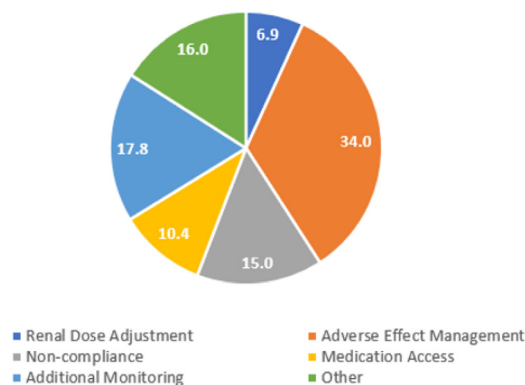
Results: A total of 100 patients and 272 clinic visits were analyzed, baseline clinical characteristics did not differ in the two cohorts. Pharmacists performed 233 tele-health visits which resulted in 394 interventions from July 2020 - March 2021, summarized in Figure 1. The most common interventions included adverse effect management (34%) and renal dose adjustment (17.8%). An analysis of outpatient visits before and after pharmacist involvement found no significant difference in reported adherence, appropriate renal dosing of medications or reported neurotoxicity (Table 1).

Conclusion: Close to 400 interventions were made by our transplant pharmacy team through tele-health visits over a period of 8 months. Use of pre-visit pharmacist tele-health assessments allowed for expansion of clinical pharmacy services while facilitating more focused provider clinic visits. more consistency in clinic may yield improved post-pharmacist outcomes, though further analysis is warranted.

Table 1

Baseline Characteristics			
	Pre-Pharmacist N=60	Post-Pharmacist N=40	P value
Age, years	54.6 +/- 12.6	55.7 +/- 11.7	0.66
Race, n (%)			0.3
Caucasian	48 (80)	34 (85)	
African American	5 (8)	4 (10)	
Asian American	0 (0)	1 (2.5)	
Hispanic/Latino(a)	7 (11.7)	1 (2.5)	
Male, n (%)	45 (75)	27 (67.5)	0.42
Transplant Indication, n (%)			0.2
Ischemic Cardiomyopathy	18 (30)	14 (35)	
Non-Ischemic Cardiomyopathy	33 (55)	18 (45)	
Congenital	1 (1.7)	2 (5)	
Re-transplantation	3 (5)	1 (2.5)	
Other	5 (8.3)	5 (12.5)	
Visit Analysis			
	Pre-Pharmacist Visits (n = 179)	Post - Pharmacist Visits (n = 72)	P value
Visits with reported non-adherence, n (%)	11 (6.1)	3 (4.2)	0.58
Inappropriate renal dosing of medications, n (%)			0.58
Overdosing, n (%)	14 (7.8)	4 (5.6)	
Underdosing, n (%)	12 (85.7)	4 (100)	
Underdosing, n (%)	2 (14.3)	0 (0)	
Neurotoxicity noted, n (%)	28 (15.6)	15 (20.8)	0.28
Conversion to tacrolimus extended release	6 (3)	4 (6)	0.33

Intervention Category Percentages



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Post-Heart Transplant Employment: Rates, Predictors, and Interventions

M. Casciato University of Toronto, Toronto, ON, Canada.

Purpose: Heart transplantation (HT) extends survival and improves quality of life, permitting patients to regain a more active role in society. The ISHLT reports that approximately 70% of adult HT recipients can engage

in their daily activities without limitation, however, overall rates of employment remain less than 40% between three and five-years post-HT. The purpose of this study is to describe rates, predictors, and interventions of employment in HT recipients based on the available literature.

Methods: We conducted a systematic literature search of four electronic databases in May 2021 using a combination of key terms including “organ transplantation”, “return to work”, “employment”, and “social integration.” Eligible studies on post-HT social reintegration, specifically employment, were selected by three independent reviewers.

Results: A total of 4,360 title and abstracts were generated. The literature search and reference lists of relevant articles identified twenty-two papers on post-HT employment rates, nineteen papers on predictors of employment post-HT, and two papers on interventions for social reintegration in HT recipients. Employment was defined as paid part-time or full-time work. Post-HT employment rates were highly variable and ranged from 21% to 73% at 1 year post-transplant. The most frequently reported predictors of post-HT employment were younger age at time of HT, pre-HT employment, higher education, and positive self-perception of workability. Successful Interventions in increasing employment rates and social reintegration included both physical and psychosocial rehabilitation programs reported in a case study and cross-sectional study.

Conclusion: Our review of the available literature has demonstrated variability in post-HT employment rates and some patient characteristics associated with post-HT employment. However, only a small number of interventions have specifically targeted the HT population. We proposed an approach to developing an intervention that is patient informed and requires multidisciplinary methods to identify patients at high risk of unemployment post-transplant, is sustainable outside of the transplant centre, and is patient partnered to ensure feasibility and practicality.

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Trends in Emergency Department Use and Hospital Mortality Among Heart Transplant Recipients in the United States

L. Holzhauser,¹ N. Reza,¹ J. Edwards,² E.Y. Birati,³ A. Owens,¹ R. McLean,¹ K. Maeda,² M. O'Connor,² J.W. Rossano,² H. Katcoff,² and J.B. Edelson.² ¹Cardiology, Advanced Heart Failure and Transplantation, University of Pennsylvania, Philadelphia, PA; ²Children's Hospital of Philadelphia, Philadelphia, PA; and the ³University of Pennsylvania, Philadelphia, PA.

Purpose: Annual heart transplant (HT) volume and post-HT outpatient care needs have increased over the last decade. However, contemporary data on the characteristics and outcomes of HT-related emergency department (ED) visits are limited.

Methods: Retrospective analysis of 177,450 HT patient ED visits from the 2009-2018 Nationwide Emergency Department Sample. HT recipients, primary diagnoses (PD) and comorbidities (CM) associated with ED visits were identified via ICD-9/10 codes. Multivariable logistic regression was used to predict outcomes of hospital admission and death.

Results: HT volumes and HT-related ED visits increased during the observed period (Fig. A). Median age was 61 years (IQR 46,69); 70% male. CM burden was high: 38% diabetes, 42% hypertension, and 31% > 2 CM. Infectious complications were the most common PD (24%) whereas cardiac PD represented 10% of encounters. 48% of ED visits led to hospital admissions, but overall mortality was low (1.6%). Median length of stay was 3 days (IQR 1.6,5.9), with overall charge \$13,304 (IQR 3,868; 37,422). Those aged ≥ 65 years had a significantly higher odds of admission (OR 2.14, 95% CI 1.97,2.33) and death (OR 2.06, 95% CI 1.61,2.62; both p<0.001). The number of CM increased odds of admission (OR 2.16, 95% CI 1.97,2.37; p<0.001) but not death (Fig. B). The highest risk of admission was seen with renal PD (OR 4.05, 95% CI 3.6,4.57) followed by infection and stroke. In contrast, HT recipients presenting with cardiac PD had the highest odds of death (OR 11.6, 95% CI 9.09,14.85; both p<0.001) (Fig. C).

Conclusion: The burden of HT-related ED visits increased from 2009-2018 and was characterized by a high admission rate but low in-ED and hospital mortality, suggesting an opportunity to improve pre-hospital care. Older patients and those presenting with cardiac PD had the highest risk of death. The observed contrast between predictors of admission and