Brief Report

An Exploration of the Impact of the "Open Gym" Scheduling Model of Cardiovascular Rehabilitation on Completion, Attendance, and Health Outcomes

Matthew C. Whited, PhD; Jordan M. Ellis, MA; John Taylor Freeman, MA; Ansley T. Corson, MA; Stacey Greenway, MA; Andrew M. Busch, PhD; Amanda L. Whited, PhD; Samuel F. Sears, PhD [AQ00]

Purpose: To explore the effects of implementation of the "Open Gym" (OG) scheduling model of cardiovascular rehabilitation administration on the rate of patient engagement and change in commonly measured clinical outcomes. Little data exist on the potential benefits of the ~~Open Gym~~ model on patient completion, attendance, and clinical outcomes.

Methods: A retrospective chart review was conducted that included the 1-y period both before and after OG model implementation. Bootstrapped regression and analysis of variance were utilized to determine (1) whether the scheduling model is associated with number of sessions attended and program completion, and (2) among those who meet their goals and thus complete the program, if the scheduling model predicts change in cardiovascular rehabilitation clinical outcomes (ie, [AQ05] percent weight change, 6-min walk distance, and peak METS during exercise) when controlling for baseline values. Follow-up analyses controlled for and explored interactions related to age, race, and sex.

Results: In this racially diverse sample (34% nonwhite), patients under either the OG model (n = 125) or the Traditional model (n = 82) attended an equivalent number of sessions and were just as likely to complete their treatment. However, clinical outcomes favored the Traditional model, even as more patients participated in the OG model, especially racial minority patients.

Conclusions: Although the OG model is more consistent with patient-centered care, gains in functional capacity may be diminished. Furthermore, better controlled experiments are needed to examine the effects of implementing the OG model and should include measures of possible mechanisms influencing racial differences.

[AQ06] **Key Words:** cardiac rehabilitation • Open Gym • patient adherence • rehabilitation exercise • ~~Roadmap to Reform~~ • ~~secondary prevention~~ [AQ07] • 6-min walk test

The American Association of Cardiovascular and Pulmonary Rehabilitation's "Roadmap to Reform" (www.aacvpr.org/r2r) details various strategies that aim to increase enrollment and adherence in response to changes by the Centers for Medicare & Medicaid Services to a bundled payment structure. One such strategy is the Open Gym (OG) model, in which patients attend appointments similarly to how they would do so upon completing cardiovascular rehabilitation (CR) in a community gym. That is, there are no longer scheduled classes that patients must attend at specific times. This patient-centered approach provides patients the freedom to schedule appointments at their convenience but still receive individual staff attention (though specific providers could differ upon each visit) and engage in supervised exercise with electrocardiographic telemetry monitoring.

Patient factors, such as socioeconomic status, depression, age, sex, and race, are consistently strong predictors of CR engagement (number of sessions attended and completion rates).[1-4] These factors could be impacted by a more flexible scheduling model that could minimize barriers such as transportation issues and time limitations that are also predictive of poorer program engagement.[3-6] For example, a recent qualitative systematic review and meta-analysis of patient barriers to CR engagement concluded that scheduling was a major factor due to transportation issues and competing social and occupational demands, especially among women.[6] The flexibility of the OG model has potential to ameliorate such issues. At the same time, other factors could negatively impact patient engagement, such as variability in specific providers and the detrimental effect that could have on patient-provider relationship quality. Although many CR programs throughout the country are moving toward the OG model, little research exists to determine the advantages and disadvantages of this model in terms of patient engagement and outcomes. We sought to compare program engagement (attendance and completion rates) and clinical outcomes (6-min walk test [6MWT] distance, peak METS during exercise, and body weight change) prior to, and subsequent to, implementation of the OG model.

METHODS

PARTICIPANTS AND PROCEDURES

Participant data were accessed via the American Association of Cardiovascular and Pulmonary Rehabilitation CR Registry for patients participating in CR for the 12 months prior to, and following, implementation of the OG model. Missing data were identified via initial review, and available data were entered into the Registry and redownloaded to form the final data set. As a retrospective chart review study, informed consent was not obtained. All procedures were approved by the East Carolina University and Medical Center Institutional Review Board.

Author Affiliations: *Department of Psychology, East Carolina University, Greenville, North Carolina (Drs Matthew Whited, Amanda Whited, and Sears, ~~Messrs~~ Ellis and Freeman, and ~~Ms~~ Corson); Vidant Cardiovascular & Pulmonary Rehabilitation, Greenville, North Carolina (~~Ms~~ Greenway); and Hennepin County Medical Center and Minneapolis Medical Research* [AQ02] *Foundation, Minneapolis, Minnesota (Dr Busch).*

Partial salary support for MCW was provided by NHLBI K23 5K23HL10962.

[AQ03] *The authors declare no conflicts of interest.*

Correspondence: *Matthew C. Whited, PhD, Department of Psychology, East Carolina University, East Fifth St, 104 Rawl Bldg, Greenville, NC 27858* [AQ04] *(whitedm@ecu.edu).*

DOI: 10.1097/HCR.0000000000000312

[AQ01]

THE TRADITIONAL SCHEDULING MODEL

The Traditional (TR) model involved 3, 1.5-hr, weekday training sessions that included half-hour educational sessions offered 3 d/wk. Patients arrived to the CR facility at a scheduled time to engage in telemetry recording (all 36 sessions), supervised exercise (30-45 min), per their individualized treatment plans. Medical, nutritional, and psychological education occurred via set class times, and participants were strongly encouraged to attend. A relaxation group was also offered weekly.

THE OPEN GYM MODEL

Our center's OG model differs in some ways from the plan outlined in the Roadmap to Reform (R2R). The R2R suggests a model reminiscent of a community gym where participants sign up for specific 15-min time slots on their own and then attend CR at these selected times. Our center offers broad, 4-hr morning and 3.5-hr afternoon time slots, 3 d/wk, that patients attend without pre-scheduling. This allows for more flexibility, as many of our patients travel >30 min to reach the center. Upon arrival during their appointment window, patients are greeted by a staff member who provides telemetry monitoring based both on the patients' number of sessions competed and individual risk factors and who helps them engage in individualized exercise and nutrition goals. Time allotted to exercise was not limited by this model, only by the patients' medical limitations, and allowed patients the freedom to rest more frequently but still achieve 30 to 45 min of exercise. Patients are also welcomed to the same frequency and content of education classes as the TR model. In contrast to the TR model, patients were not directed to education sessions as a group; education sessions were announced and patients could choose to attend. In both models, staff tracked patient CR attendance during progress review meetings and case managers contacted patients whose attendance appeared to be waning.

Analysis Plan

Bootstrapped analysis of variance/analysis of covariance or logistic regression analyses (IBM SPSS V.24) were used to determine whether (1) the scheduling model was associated with the number of sessions attended and program completion and (2) whether the scheduling model predicted change in CR patient outcomes (ie, body weight, 6MWT distance, and peak METS during exercise) among treatment completers when controlling for baseline values. Follow-up analyses controlled for age, sex, and race (entered into the model as white vs nonwhite), and any significant interactions between main outcomes and covariates were explored. Data are reported as mean ± SD.

Enrollment and discharge dates were examined, and for patients who dropped out of treatment, their last date attended was considered their discharge date. One month of experience with a scheduling model was considered sufficient for categorization. Participants who experienced >1 mo of both models, or <1 mo of both models, were excluded from outcomes analyses. Participants who experienced >1 mo of 1 model but <1 mo of the other model were categorized on the basis of the model they experienced for >1 mo. Completion was defined as meeting pre-defined individualized exercise and other health-behavior goals and graduating from the program, or completing 36 sessions.

RESULTS

Of the 220 patients presenting to CR, 95 presented in the 1-y period prior to the implementation of the OG scheduling model, and 125 presented in the 1-y period that began with implementation (Table 1). Ineligible participants were excluded (n = 13), and remaining patients were categorized as defined in the analysis plan. Groups (TR model, n = 82; OG model, n = 125) did not differ on the basis of age or sex; however, only 26% (n = 21) of patients under the TR model were minority (nonwhite) patients, whereas 40% (n = 49) under the OG model were minority patients (χ^2= 4.2; P = .04).

Patients attended equivalent numbers of sessions between the 2 groups (TR model = 22; OG model = 20; P = .22, η^2= 0.007). Attendance results were consistent when accounting for age, race, and sex (P = .21, η^2= 0.008). Program model did not significantly predict program completion (OR = 0.94; 95% CI = 0.52-1.69). Under the TR model, 52 (64%) participants completed the program, whereas 82 (65%) of participants under the OG model completed the program. Results maintained when accounting for age, race, and sex (OR = 0.84; 95% CI = 0.45-1.56).

Analyses of health outcomes included change in the primary clinical outcomes (ie, body weight, 6MWT distance, or peak METS); controlling for baseline/pre-treatment values within each patient is shown in Table 2.

Among completers (n = 132), patients under the TR model lost a statistically equivalent amount of weight (−0.95 ± 3.7%) compared with patients under the OG model (0.11 ± 3.1%). However, when including age, race,

Table 1

Descriptive Characteristics of Study Population[a]

	Traditional	Open Floor Plan	Total
Age, y	63.0 ± 12.4	63.5 ± 11.6	63.3 ± 11.9
Female Sex	31 (38)	60 (48)	91 (45)
Race			
African American	18 (22)	48 (38)	66 (32)
Non-Hispanic white	60 (73)	74 (59)	134 (65)
Other	3 (4)	1 (1)	4 (2)
6MWT, ft baseline	433.4 ± 114.8	393.7 ± 115.8	410.0 ± 116.8
6MWT, ft discharge	529.6 ± 124.5	450.6 ± 108.4	483.3 ± 121.3
Weight, lb, baseline	210.5 ± 51.6	200.8 ± 44.3	205.0 ± 47.7
Weight, lb, discharge	211.6 ± 49.8	199.3 ± 35.9	204.6 ± 42.8
Peak METs baseline	3.2 ± 1.1	2.9 ± 0.81	3.0 ± 0.92
Peak METs discharge	4.8 ± 1.6	3.9 ± 1.6	4.3 ± 1.7

Abbreviations: METs, ...; 6MWT, 6-min walk test.

[AQ09] [a]Data reported as mean ± SD or n (%). Percentages that do not sum to 100% are due to missing data.

Table 2

Effect of Traditional Versus Open Gym Models on Completer Outcomes in Analysis of Covariance Models[a]

Outcomes	*P* Value	η^2
Without demographic covariates		
Change in body weight	.137	0.017
Change in 6MWT distance	.015	0.050
Change in peak METs	.029	0.039
With demographic covariates		
Change in body weight	.032	0.038
Change in 6MWT distance	.004	0.078
Change in peak METs	.081	0.027

Abbreviations: METs, ...; 6MWT, 6-min walk test.

[a]Models without demographic covariates controlled for baseline weight, baseline 6MWT distance, and baseline peak METS, respectively. Models including demographic covariates also controlled for age, sex, and race (white vs nonwhite).

and sex in the model, the difference in percent weight loss between the TR and OG models was statistically significant. This is likely due to a significant interaction between race and scheduling model ($P = .02$, $\eta^2 = 0.043$). Examination of the interaction showed that nonwhite participants lost more weight under the TR model ($-2.3 \pm 3.4\%$) than those under the OG model ($-0.9 \pm 2.9\%$; $P = .01$, $\eta^2 = 0.055$).

Patients under the TR model had a greater increase in 6MWT distance (82.1 ± 57.5 ft) than those under the OG model (57.2 ± 59.8 ft), and results were consistent when accounting for age, race, and sex. Peak METS also differed on the basis of scheduling model, with patients achieving a greater increase in peak METS under the TR model (1.5 ± 1.4) versus the OG model (1.0 ± 1.4); however, this finding did not remain significant following covariate analysis.

DISCUSSION

Patients under either the OG model or the TR model attended a statistically equivalent number of sessions and were just as likely to complete their treatment. However, differences in clinical outcomes emerged when comparing the 2 scheduling models. On average, patients engaged in the TR model demonstrated more improvement in performance on the 6MWT and weight loss. Although the OG model is more consistent with patient-centered care, these findings suggest that functional status outcomes could suffer in this model. There are several theoretical possibilities as to why outcomes may be less optimal in the OG model. For example, it is possible that there is decreased consistency in patient-staff relationships and less one-on-one attention in the OG model; due to variability in providers with whom the patient interacts, establishing consistent rapport that may enhance patient engagement and accountability could prove more difficult. This may be especially true among minority patients, as we noted that nonwhite patients lost less weight under the OG model than those under the TR model. Also, staff observed anecdotally that attendance at education sessions was lower under the OG model, and this may have influenced differences between scheduling models.

In sum, current results provide novel identification of both key benefits and potential risks to consider when transitioning to an OG model. The OG model is more consistent with a patient-centered care approach and likely reduces the barriers associated with transportation and time limitations, which are significant predictors of poor patient engagement.[3-6] It is notable that there were more patients who initiated CR following the OG model, and this model may have attracted more minority patients with no significant changes in attendance or completion rates. It, therefore, appears plausible that a meaningful benefit of the model overall is enhanced enrollment and accessibility, major goals of the R2R. At the same time, however, results suggest that some clinical outcomes may be poorer in the OG model. If this pattern of apparent increased engagement, combined with less improvement in clinical outcomes when comparing the 2 scheduling models, is borne out in other clinics and data, program evaluation and modification to strengthen clinical effects of the OG model will be warranted.

There are several key limitations of the current study that should be noted when interpreting the results. Other unmeasured changes in policy, staff, and so forth, could also have influenced the differences seen in this study; it is possible that we measured outcomes during a period of transition in which staff were becoming accustomed to providing their typical quality of care within a new treatment delivery structure. In addition, due to a lack of follow-up data, some outcomes that may have been improved by the transition to an OG model (eg, maintenance of home exercise following CR completion; attendance to education or relaxation sessions) were unable to be assessed. Finally, given that our sample was quite racially diverse (32% African American), it is possible that these results may not generalize to other CR programs that primarily serve populations with different demographics.

There are several areas of future research for comparing the TR model and OG model for CR. We observed a concerning finding that the OG model may be particularly detrimental to minority participants, though the model may also attract more minority patients. Furthermore, better controlled experiments are needed to examine the effects of implementing the OG model and should include measures of the mechanisms driving group differences such as less staff attention/encouragement, greater inclusion of patients who are more likely to have poorer outcomes, and less intense exercise sessions. In addition, if future studies corroborate these results and suggest that outcomes in the OG model may suffer, more research would be beneficial to determine specific interventions that may be used to improve outcomes within the OG model. One possible area for future research in this direction would be to incorporate the use of mobile phone apps or other technology that may aid patients in engaging in exercise at home to supplement their CR activities.

As more CR sites embrace the R2R, additional valuable opportunities to empirically examine its effects will emerge and should be embraced to determine how to provide optimal patient care. This study provides a preliminary exploration of the effects of the implementation of the OG model of CR on the rate of program engagement and change in commonly measured health outcomes.

REFERENCES

1. Gaalema DE, Savage PD, Rengo JL, et al. Patient characteristics predictive of cardiac rehabilitation adherence. *J Cardiopulm Rehab Prev*. 2017;37(2):103-110.
2. Prince DZ, Sobolev M, Gao J, Taub CC. Racial disparities in cardiac rehabilitation initiation and the effect on survival. *PMR*. 2014;6(6):486-492.
3. Ruano-Ravina A, Pena-Gil C, Abu-Assi E, et al. Participation and adherence to cardiac rehabilitation programs. A systematic review. *Int J Cardiol*. 2016;223:436-443.
4. Suaya JA, Shepard DS, Normand ST, Ades PA, Prottas J, Stason WB. Use of cardiac rehabilitation by Medicare beneficiaries after myocardial infarction or coronary bypass surgery. *Circulation*. 2007;116(15):1653-1662.
5. Supervia M, Medina-Inojosa J, Yeung C, et al. Cardiac rehabilitation for women: a systematic review of barriers and solutions. *Mayo Clin Proc*. 2017;92:565+.
6. Clark AM, King-Shier KM, Spaling MA, et al. Factors influencing participation in cardiac rehabilitation programmes after referral and initial attendance: Qualitative systematic review and meta-synthesis. *Clin Rehabil*. 2013;27(10):948-959.

AUTHOR QUERIES

TITLE: An Exploration of the Impact of the "Open Gym" Scheduling Model of Cardiovascular Rehabilitation on Completion, Attendance, and Health Outcomes

AUTHORS: Matthew C. Whited, Jordan M. Ellis, John Taylor Freeman, Ansley T. Corson, Stacey Greenway, Andrew M. Busch, Amanda L. Whited, and Samuel F. Sears

[AQ]: Please check if authors name are correctly captured for given names (in red) and surnames (in blue) for indexing after publication.

[AQ01]: Please check whether the right running head is OK as typeset.

[AQ02]: Please check whether the affiliations and social titles of all the authors are OK as typeset.

[AQ03]: Please check whether the disclosure statement is OK as typeset.

[AQ04]: Please check whether the corresponding address is OK as typeset.

[AQ05]: Please define "METS," if deemed necessary.

[AQ06]: Please check whether the key words are OK as typeset.

[AQ07]: Per style, please provide 3 to 5 key words.

[AQ08]: In reference "5," please check whether the page number is OK as given.

[AQ09]: Please define "METs."

[AQ10]: Please check whether the footnote indicator "a" is OK as typeset.

[AQ11]: Please define "METs."