Original Study - Brief Report

Provision of Home-Based Primary Care to Individuals With Intellectual and/or Developmental Disability Is Associated With a Lower Hospitalization Rate Than a Traditional Primary Care Model

William R. Mills MD a,*, Miranda M. Huffman MD a, Jamie Roosa MA a, Krystal Pitzen MA a, Ronald Boyd BS a, Belinda Schraer BS a, Dmitri Poltavski PhD b

a BrightSpring Health Services, Louisville, KY, USA
b University of North Dakota, Grand Forks, ND, USA

Keywords:
Home-based primary care
intellectual and/or developmental disability
IDD
hospitalization rate

ABSTRACT

Objectives: The objective of this study was to determine if providing home-based primary care (HBPC) to individuals with intellectual and/or developmental disabilities (IDD) was associated with a lower hospitalization rate than a control group receiving traditional primary care.

Design and Intervention: Individuals with IDD living in supported residential settings in Ohio were offered HBPC. Individuals electing HBPC made up the intervention group. Those who did not opt for HBPC continued to receive traditional primary care services and made up the control group. Hospitalizations were tracked in both groups.

Setting and Participants: The 757 study participants had IDD diagnoses and received residential support services throughout the study period.

Methods: Annualized hospitalization rate was determined in both groups and was compared using generalized estimating equations while controlling for patients’ age and hospitalization rate in the year prior to the study.

Results: The results showed that group membership had a significant effect on the hospitalization rate (Wald $\chi^2 = 20.71, P < .01$). Being in the control group was associated with a 2.12-fold increase in annual hospitalization rate for a given patient. The overall population hospitalization rate was 329 hospitalizations per 1000 per year in the HBPC-receiving individuals and 619 hospitalizations per 1000 per year in the control group.

Conclusions and Implications: We found that individuals with IDD receiving HBPC were hospitalized at a lower rate than a control group receiving traditional primary care. Expanding access to HBPC may be a worthwhile priority for organizations that support individuals with IDD.

© 2022 The Authors. Published by Elsevier Inc. on behalf of AMDA – The Society for Post-Acute and Long-Term Care Medicine. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Home-based primary care (HBPC) has been shown to reduce hospitalizations, rehospitalizations, and skilled nursing facility placements and improve patient and caregiver satisfaction.1–4 To date, most HBPC outcomes studies have included Medicare beneficiaries, but other populations may derive substantial benefit as well. For instance, congregate living residents can benefit from on-site HBPC provided by physicians and nonphysician practitioners who are familiar with the residential care setting.5,6 Individuals with intellectual and/or developmental disabilities (IDD) are increasingly recognized as high-risk for medical complications and death. Nearly 60% of individuals with IDD have 3 or more chronic conditions in addition to their IDD diagnosis.7 The US IDD population is aging, and the number of persons aged ≥60 years will double to 1.2 million in the next 25 years.7 Many of these individuals have difficulty accessing a physician’s office for care and experience high rates of emergency room and hospital utilization.8,9 They also experience a higher mortality rate than the general population, often due to potentially preventable conditions.10,11 As set forth by the Olmstead Act, individuals with IDD must have access to high-quality services comparable to those available to people without IDD.12,13

* Address correspondence to William R. Mills, MD, Medical Affairs, BrightSpring Health Services, 805 N Whittington Parkway, Louisville, KY 40222, USA.
E-mail address: William.Mills@brightspringhealth.com (W.R. Mills).

https://doi.org/10.1016/j.jamda.2022.05.011
1525-8610/© 2022 The Authors. Published by Elsevier Inc. on behalf of AMDA – The Society for Post-Acute and Long-Term Care Medicine. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Despite evidence of HBPC’s benefit in geriatric and medically complex patients, little is known about the effect of the care model on outcomes in individuals with IDD. Hospitalization rate is a value-based outcome measure that is beginning to be applied to the IDD population. We hypothesized that providing HBPC to individuals with IDD living in residential settings would be associated with a lower hospitalization rate than a control group receiving traditional primary care.

Methods

Our study population included individuals in Ohio who resided in a community living setting for individuals with IDD managed by ResCare Community Living (Res-Care, Inc, Louisville, KY). Individuals with IDD were offered HBPC as an alternative for their primary medical care by an affiliated HBPC practice (Western Reserve Medical Group, Cleveland, OH). Two hundred seven individuals with IDD opted for and received the HBPC care model between April 1, 2020, and February 28, 2022. Written consent was obtained from all HBPC participants. Another 550 individuals with IDD who did not opt for HBPC and were living in the other congregate living settings in the state of Ohio served as a control group. Individuals in the control group continued to receive medical care from their existing, traditional, office-based primary care provider. Individuals in both groups received personal care and nursing support services by ResCare Community Living.

HBPC consisted of regular visits to the community living site by an HBPC physician or nurse practitioner. Patients were visited approximately every 5 weeks, compared with a traditional primary care visit frequency of approximately every 12 weeks. All HBPC services were billed to third-party payors via the physician fee schedule. HBPC visits focused on the evaluation and management of new symptoms, active chronic care management using structured assessment tools, supplementation with monthly phone calls to the patient or their representative.

In the HBPC group, total managed days was calculated as the number of days an individual received HBPC. In the control group, total managed days was calculated as the days an individual served by a medical practitioner from the practice to assist with in-between visit concerns and triage. Eligible patients were also enrolled in chronic care management using structured assessment tools, supplemented with monthly phone calls to the patient or their representative.

A total of 757 individuals were studied (207 HBPC-receiving and 550 control). During the study period, there were 64,404 total managed days in the HBPC group and 170,432 managed days in the control group. Fifty-eight hospitalizations occurred in the HBPC group, and 619 hospitalizations per 1000 per year in the control group. Fifty-eight hospitalizations occurred in the HBPC group, and 619 hospitalizations per 1000 per year in the control group. As shown in Table 1, there were no statistically significant differences in the proportion of males and females ($\chi^2 = 0.305, P = .58$) or the frequency of a particular diagnostic category (ie, mild, moderate, severe, or profound intellectual disability; $\chi^2 = 1.93, P = .59$) between HBPC and control groups. As shown in Table 2, the groups did not differ in age ($M_{control} = 49.12, SD = 18.73, vs M_{HBPC} = 48.99, SD = 18.76; P = .94$) or in the number of managed days ($M_{control} = 307.56, SD = 106.56, vs M_{HBPC} = 317.56, SD = 191.34; P = .53$). The groups, however, did significantly differ in the individual hospitalization rate in the year prior to the beginning of the study.

Table 1

<table>
<thead>
<tr>
<th>Primary diagnostic category</th>
<th>Control, % (n)</th>
<th>HBPC-Receiving, % (n)</th>
<th>$\chi^2$</th>
<th>Two-Sided $P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>39.8 (219)</td>
<td>42.0 (87)</td>
<td>0.58</td>
<td>.62</td>
</tr>
<tr>
<td>Males</td>
<td>60.2 (331)</td>
<td>58.0 (120)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary diagnostic category</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild ID</td>
<td>41.6 (229)</td>
<td>40.6 (84)</td>
<td>1.93</td>
<td>.59</td>
</tr>
<tr>
<td>Moderate ID</td>
<td>27.3 (150)</td>
<td>31.9 (66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe ID</td>
<td>12.9 (71)</td>
<td>10.6 (22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profound ID</td>
<td>18.2 (100)</td>
<td>16.9 (35)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*After adjusting for statistical bias via bootstrapping based on 1000 samples.
During the study period was 0.19 (SD 0.60). Specifically, the control group experienced an average of 1.02 (SD = 3.66) hospitalizations per person per year, whereas in the HBPC group the mean hospitalization rate was 0.32 (SD = 1.29). Because of this unexpected baseline difference between groups, we built a statistical model to control for baseline hospitalization rate in order to appropriately measure the effect of the HBPC intervention.

The distribution of our dependent variable (individual hospitalization rate per person per year) was significantly (P < .01) positively skewed (skewness = 7.15, SE = 0.089), which is fairly common for hospitalization data. For these types of variables, gamma distribution is thought to be most appropriate, as it has shown in generalized linear models to produce parameter estimates with the closest data fit. Thus, in our generalized estimating equations analysis, the dependent variable was specified for gamma distribution with natural log (ln) link function and maximum likelihood parameter estimation method. Beta (β) regression coefficients of parameter estimates were transformed into odds ratios by taking EXP [regression coefficient] or e^β.

The results showed that group membership had a significant effect on the individual hospitalization rate (Wald χ^2 = 20.71, P < .01) even after controlling for patients' age and individual hospitalization rate in the year prior to the beginning of the study. Neither of the covariates was statistically significant. There was also no effect of sex on individual hospitalization rate (P = .22). The main finding of this study was that being in the control group was associated with a 2.12-fold increase in risk of hospitalization. These results are summarized in Table 3. Indeed, the mean hospitalization rate in the HBPC group during the study period was 0.19 (SD = 0.60) compared with 0.99 (SD = 2.94) in the control group.

**Discussion**

This study reports hospitalizations in a population of medically complex individuals with IDD living in residential care settings in Ohio. We compared the hospitalization rate in individuals with IDD receiving HBPC to a similar population that did not receive HBPC, and we found that individuals receiving HBPC were hospitalized at a lower rate than those not receiving HBPC. An unexpected finding was that, in the year prior to the study period, the HBPC group had a significantly lower hospitalization rate than controls. Before we performed this analysis, we hypothesized that the selection of HBPC by a patient or responsible party may have been biased toward individuals with a higher baseline hospitalization rate opting out of traditional primary care, and opting for HBPC. What we found was the opposite. In fact, at baseline, patients who eventually opted for HBPC had approximately one-third of the hospitalization rate of the group receiving HBPC. What caused this baseline difference is uncertain, but potential factors include the following: patients or responsible parties and care team members may have already implemented care plans focused on reducing avoidable hospital admissions, they may have been cared for by primary care providers who were more responsive and engaged than those of the control group, or other congregate living setting—specific factors. These factors require additional study. Despite this baseline difference, we found that patients in the control group were more than 2 times more likely to be hospitalized than patients in the HBPC group, after controlling for the baseline difference in hospitalization rate in the year prior to the beginning of the study (as well as controlling for age). Contributors to the HBPC group’s lower hospitalization rate during the study period may have included: availability of 24 × 7 medical triage for all HBPC patients, early recognition and management of new acute diseases and exacerbation of chronic conditions at frequent visits, a heightened focus on goal-directed care and advance care planning owing to the intrenchment of these facets in the group’s care model, and improved management of the patient as a result of more intimate knowledge of the care setting in which the patient resides (by the practitioner visiting the home). More frequent home visits in the patient’s preferred environment often lead to strong relationships between the HBPC practice and the community living staff, which may result in more effective between-visit care management and medical triage.

Reporting of value-based outcome measures such as hospitalization rate in the management of individuals with IDD is increasingly important to patients, families, advocates, providers, payors, and state and federal policy makers. Although hospitalization can be distressing for most people, individuals with IDD can experience it even more challenging, making this a particularly important quality measure for the population. The HBPC model is typically a more intensive community-based medical model, and one that may be ideally suited to medically complex populations of individuals with IDD who live in residential settings. HBPC providers partner with the staff serving the individual with IDD, using their shared knowledge of the patient as the result of more intimate knowledge of the care setting in which the patient resides (by the practitioner visiting the home). More frequent home visits in the patient’s preferred environment often lead to strong relationships between the HBPC practice and the community living staff, which may result in more effective between-visit care management and medical triage.

**Table 2** Independent Sample t Tests Between the Control and HBPC Groups on Continuous Variables With Bootstrapping

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>HBPC-Receiving</th>
<th>95% CI for Mean Difference</th>
<th>Two-Sided P</th>
<th>Glass Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>49.12 (18.73)</td>
<td>48.99 (18.76)</td>
<td>-3.17, 3.39</td>
<td>.95</td>
<td>0.01</td>
</tr>
<tr>
<td>Managed days, mean (SD)</td>
<td>307.56 (106.56)</td>
<td>317.56 (191.34)</td>
<td>-41.68, 19.27</td>
<td>.53</td>
<td>-0.05</td>
</tr>
<tr>
<td>Hospitalization rate per patient per year in the year prior to program, mean (SD)</td>
<td>1.03 (3.66)</td>
<td>0.32 (1.27)</td>
<td>0.35, 1.08</td>
<td>&lt;.01</td>
<td>0.55</td>
</tr>
<tr>
<td>Hospitalization rate per patient per year during program, mean (SD)</td>
<td>0.99 (2.94)</td>
<td>0.19 (0.60)</td>
<td>0.54, 1.07</td>
<td>&lt;.01</td>
<td>1.33</td>
</tr>
</tbody>
</table>

*After adjusting for statistical bias via bootstrapping based on 1000 samples.
Unadjusted for covariates.

**Table 3** Parameter Estimates for Fixed Effects and Covariates in Generalized Estimating Equations Predicting Individual Hospitalization Rate

<table>
<thead>
<tr>
<th>Parameter</th>
<th>β</th>
<th>SE</th>
<th>95% Wald CI</th>
<th>Odds Ratio</th>
<th>Wald χ^2</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.25</td>
<td>0.20</td>
<td>-0.65, 0.15</td>
<td>0.78</td>
<td>1.53</td>
<td>.22</td>
</tr>
<tr>
<td>Control group</td>
<td>0.75</td>
<td>0.17</td>
<td>0.42, 1.08</td>
<td>2.12</td>
<td>20.71</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Age</td>
<td>0.003</td>
<td>0.005</td>
<td>-0.07, 0.01</td>
<td>1.00</td>
<td>0.29</td>
<td>.59</td>
</tr>
<tr>
<td>Hospitalization rate for the year prior to study</td>
<td>0.03</td>
<td>0.03</td>
<td>-0.02, 0.08</td>
<td>1.03</td>
<td>1.17</td>
<td>.28</td>
</tr>
</tbody>
</table>
services, families, provider organizations, and payors around the goal of enabling people with IDD to spend more time integrated in the community and less time in institutional settings.

This study has limitations. Our population was focused on 1 state, individuals resided in congregate living settings managed by 1 organization, and patients received HBPC from 1 practice. An unexpected finding was that the HBPC had a lower hospitalization rate at baseline. However, we controlled for this difference in our statistical model, and during the study period, the HBPC group was hospitalized at a lower rate than the control group. Larger, longer-term studies are needed to further elucidate the impact HBPC has on these, and other, outcome measures in people with IDD.

Conclusion and Implication

In conclusion, we found that individuals with IDD receiving HBPC were hospitalized at a lower rate than a control group receiving traditional primary care. Expanding access to HBPC may be a worthwhile priority for organizations that support individuals with IDD.

Acknowledgments

The authors wish to express our most sincere gratitude to the direct support personnel, caregivers, nurses, leaders and advocates of programs, homes, and communities that provide support and care for people with IDD.

References