

## **Health Hot-spotting: Utilizing Novel Alternative Intervention and Data to Create Better Outcomes for Super-Utilizers and Underserved Populations**

Tammy Hawley  
Health and Wellness  
The University of North Carolina at Asheville  
One University Heights  
Asheville, North Carolina 28804

Faculty Advisor: Dr. Kathleen Garbe

### **Abstract**

As little as five percent of a community can take up more than half the total health expenditures. This ratio is, in part, due to the excessive use of the emergency department for medical issues that could instead be addressed through primary care. To better understand why people over-utilize the emergency department, it is necessary to merge patient service utilization data and create an alternative intervention plan that addresses a biopsychosocial model of health. This shows a larger picture of what is going on in patients' lives that one cannot gather in a typical office visit. In addition to being more cost-effective, this union of data and human connection may lead to more effective treatment and wellbeing in patients who are currently underserved or obtain poor outcomes. Bridges to Health is an alternative practice comprised of an interdisciplinary team consisting of a behavioral health specialist, a primary care provider, and a case manager. Data will be collected through chart reviews for patients enrolled in the Bridges to Health Program at the Henderson Family Health Center, and in The Free Clinics of Hendersonville, North Carolina. Analysis of the data for possible correlations, monetary implications, and utilization effectiveness will then be performed. Future research will attempt to explore novel methods for quantifying the impact of such programs on patients' emotional well-being and overall health.

**Keywords: Super-Utilizers, Cost Effectiveness, DIGMA, Health Hot-spotting**

### **1. Introduction**

In an ever-changing healthcare environment, one issue has inevitably emerged: how can providers reduce costs while improving overall patient care and outcomes? Several innovative programs have begun to address this problem, but there are challenges in finding a program highly effective in cutting costs and saving time while simultaneously improving health outcomes. The program Bridges to Health (BTH), established by Dr. Steven Crane in 2010, offers a balance of both individualized and group care while reducing healthcare provider costs. BTH's first year resulted in an emergency department (ED) utilization rate drop from 0.58 per patient per month to 0.23 per patient per month, and a cost savings of \$937 per patient per month.<sup>1</sup> The success of this model has expanded itself to a second BTH program led by Dr. Bryan Hodge, established in 2015. This research is the primary analysis of exactly how effective the newly expanded BTH program is in decreasing utilization rates and costs. In addition, further analysis regarding points of contact and utilization correlations within the program will be explored.

Statistical outliers can account for large costs. A mere 5% of the population accounted for 49.9% of all health expenditures in 2010, and totaled 630 billion dollars, with a mean expenditure of \$40,876 per person.<sup>2</sup> One cost culprit, is habitual over utilization of the ED. Nearly a quarter (13-27%) of these cases have been found to be non-emergency, primary care issues.<sup>2,3</sup> Recent studies demonstrated a drastic change in insurance type and status with utilization, due to the most recent economic downturn. After the 2008 recession, private insurance ED use has

decreased 10% per year, whereas before it was increasing 4% per year. Those without insurance demonstrated no significant change, and those with Medicare saw a considerable rise in utilization (a decrease of 2% per year prior, and increase of 20% per year after).<sup>4</sup>

Super-utilizers are patients who use the ED more than six times in a twelve-month span. Super-utilizer cohort studies not only indicate high rates of poor biological health, such as chronic diagnosis and comorbidity, but also Socioeconomic and Psychological issues are also a major contributing factor of use.<sup>5</sup> Over-utilization of high-cost healthcare services has been linked to an inadequate health/healthcare education, behavioral health issues, and poor community infrastructure.<sup>1,5,6</sup> This cohort generally reports instability in housing, employment, transportation, and personal relationships.<sup>7</sup> It is also suggested that disability is a prominent factor in healthcare super-utilizers.<sup>8</sup>

The complexity of this group has given rise to numerous alternative interventions seeking to treat these patients more holistically. Most have adapted the biopsychosocial (BPS) approach, and employ an interdisciplinary team. There are varying degrees of patient contact and intervention intensity. One intervention lead by Corey Waller, MD, in Grand Rapids Michigan, created an intimate clinical setting in which an identified super-utilizer was given one-on-one hour-long appointments with a primary care specialist, a behavioral health specialist, and a care manager several times a week.<sup>9</sup> The team formulates a long-term patient treatment plan, and the patient continues treatment, gradually reducing clinical visits. Once the patient has graduated, the team establishes the patient with a primary care provider close to their residency, and the interdisciplinary treatment plan is shared with the new primary care physician to create consistency and alleviate some of the burdens of caring for nontraditional patients. This program, in its initial year, yielded a reduction of ED visits by 85% and a cost savings of \$998,400 with just 30 patients.<sup>10</sup> Though effective, this may not be the most cost beneficial in areas treating a high volume of patients. The number of patients a team can see per hour can scale proportionally only to the number of available health care team members.

Alternatively, a less intense study program created an individualized exercise program, and utilized regular follow-up phone calls for a period of 24 weeks post discharge. The intervention group saw more than a 50% reduction in ED utilization than the control group, and reported better quality of life and mental health than the control group.<sup>11</sup> Using phone calls solely as a source of contact saves time and money, but yields a lower amount of positive outcomes than an in person approach. The key to success may be in finding a balance between the efficient scalability required for high patient volumes, and the more intimate one on one contact.

In attempts to find this balance two BTH programs have been established: The Free Clinics (TFC) in Hendersonville, North Carolina, and spearheaded by Steven Crane, MD, and Hendersonville Family Health Center (HFHC), overseen by Bryan Hodge. BTH employs an interdisciplinary team managing drop-in group medical appointments (DIGMAs) and more individualized care, be it short individual sessions, phone calls, “life skill and support” sessions, and even social events such as a walking group. A balanced approach, it seems, might just come from offering more options to patients.

#### 1.2 the bridges to health program

Each BTH program consists of an established care team. The team is comprised of a primary care provider, a case manager, and a behavioral health specialist. Other team members may include a specialist, occupational therapist, and physical therapist as needed. Identified patients are initially connected with a case manager. After initial contact, patients expressing interest are invited to arrive early to a BTH meeting in order to establish a patient file and receive more details about the program. Initial paperwork includes a Patient Health Questionnaire (PHQ-9), a World Health Organization Disability Assessment Schedule 2.0 (WHO.DAS), a Generalized Anxiety Disorder Screening (GAD-7), and a Bipolar Disorder Screening Survey (BDS). PHQ-9s, GAD-7s, and BDSs are given to the patient to fill out every six months. Team members’ and participants’ roles are outlined below:

- **Case Manager (CM):** CMs are registered nurses, and are a primary point of contact with the patient via text, phone calls, and email both during and after business hours. CMs begin contact with patients and establish their general well-being. CMs’ communications with patients are noted in a patient’s files, and urgent messages are relayed to the primary care physician. CMs also provide the patient with resources and information depending on each patient's condition and needs.
- **Behavioral Health Specialist:** Behavioral health specialists start the weekly meetings with focus meditation exercises and give feedback to patients. They also offer individualized one-on-one care for patients in need.
- **Primary Care Provider:** The primary care provider leads the patient goal discussion, and provides any necessary medical care during group meetings (such as prescription refills or referrals), and can also provide one-on-one consultation for more intricate or private health issues directly after the meeting. Providers can also request an extra consultation with a specialist, pharmacist, and physical therapist as needed.

- **Other Patients:** In this model, other patients are crucial team members. They create a support structure, relating through similar situations and issues, and help each other along in their progress. Experience patients become mentors, and new patients become reminders to steer clear of old habits.
- **The Patient:** Arguably the most important team member of all, the patient has to be pro-actively involved in utilizing these resources, and take responsibility for their health. This thwarts dependency issues, and increases the chance for a positive outcome.

DIGMAs are held at TFC twice a week for one hour (Tuesdays at three in the evening and Thursdays at noon), and at HFHC once a week (Thursdays at four in the evening). Small meetings are held between team members prior to each DIGMA, and follow-ups or small individual sessions are held directly afterward. Patients do not have to make an appointment for small sessions, but must attend the group meeting. Each DIGMA can vary in patient size, from one to 12 patients.

This research reports the first seven months of the newly expanded BTH program at HFHC utilization rates and cost. Analysis of HFHC-BTH patients' utilization one year prior to joining the program will be recorded, as well as rates from joining till July 31, 2015. Further cost comparisons between the two BTH programs will be conducted as well.

## 2. Methods

An institutional review board at Pardee Hospital and the University of North Carolina at Asheville approved the BTH program, information gathering techniques, and established consent forms. Both transactional charge data, obtained from Margaret R. Pardee Hospital in Henderson, NC, and utilization data, obtained from Pardee Electronic Medical Records (EMR), was collected for a period of time extending to one year prior to the program's start date.

Transactional charge data for 16 of the 34 active HFHC patients and 35 of the 74 active TFC-BTH patients was obtained, and included ED, outpatient, observation, and inpatient services. Utilization rates for the same services, as well as demographical data, were obtained for 24 of the 34 active HFHC-BTH patients. Unfortunately, utilization data was not available for TFC-BTH patients, though some less extensive demographic data was gathered.

To collect similar data following enrollment in the BTH program, patient charts, established at the HFHC EMR, were reviewed to tally the number of BTH meetings attended, patient phone calls, and behavioral health and primary care visits. Transactional data was similarly recorded. Patient utilization rates and costs were averaged by the number of months patients were actively enrolled, for up to the full seven months of data available. Mean was established and a paired t-test was conducted on internal comparisons of HFHC before and after utilization and cost. Finally, the average dollar amount of patient costs and charges per month was determined for HFHC and TFC, and a student t-test was conducted. P-value from t-test results was established. The confidence level set at 95% ( $\alpha = 0.05$ ) to determine significance.

### 3. Results

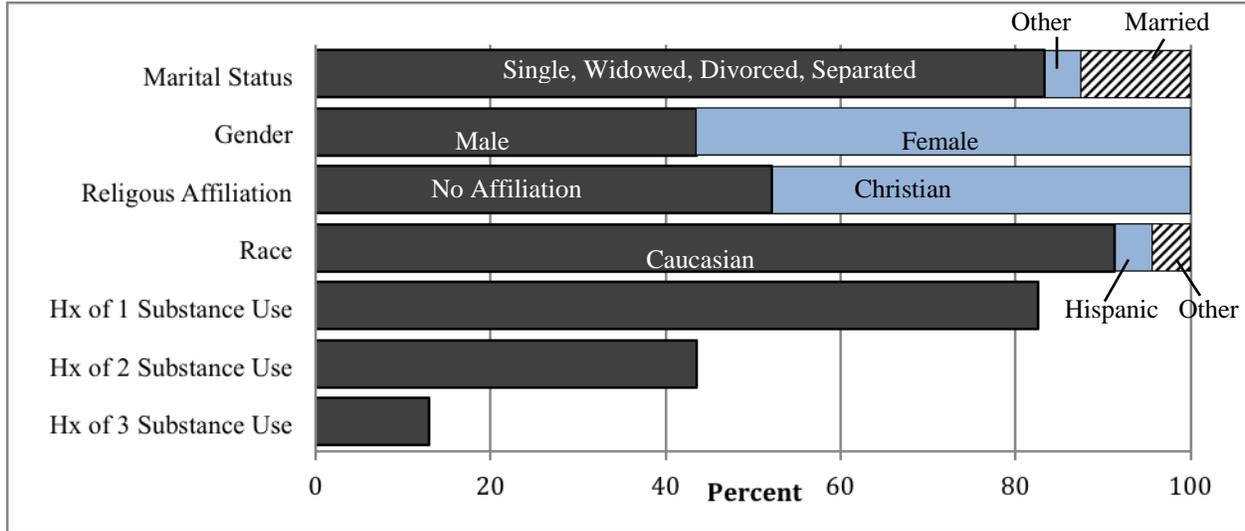


Figure 1. Demographics of the HFHC-BTH cohort of (n=24). Substances include, tobacco, alcohol, and illicit substances. Hx, history.

Figure 1. demonstrates the demographics of the 24 HFHC-BTH patients that qualified for this review. The vast majority (91.3%) of the HFHC-BTH cohort are Caucasian, which is representative of Henderson County (88.9%), but relatively high for Hendersonville (79.7%). More than three-quarters of participants report a history of using only one substance, the most common of which was tobacco. Alcohol and illicit substances were reported less, and in approximately equal amounts. The majority reports no religious affiliation, although 47.8% of the cohort identifies himself or herself as Christian. Marital status was successfully reported revealing the vast majority (83.3%) was either single, divorced, legally separated, or widowed. Only (12.5%) of patients reported currently being married.

Table 1. Utilization and charges before and after joining BTH at HFHC.

Rate per month	HFHC Group Before BTH						HFHC Group After BTH					
	Total Sum	n(Mean)	SD	n(Median)	IQR	Total Sum	n(Mean)	SD	n(Median)	IQR	P†	
Total *	11.7	24 (0.12)	0.22	96(0)	0.17	13.6	24 (0.14)	0.31	96(0)	0.15	0.57	
Emergency Department	5.67	24 (.24)	0.31	24(0.08)	0.5	3.75	24 (0.16)	0.25	24(0)	0.29	0.27	
Inpatient Services	1.58	24 (0.07)	0.16	24(0)	0.83	1.37	24 (0.06)	0.16	24(0)	0	0.5	
Outpatient Services	4.17	24 (0.17)	0.19	24(0.17)	0.25	8.46	24 (0.35)	0.5	24(0.20)	0.5	0.09	
Observation	0.25	24 (0.01)	0.04	24(0)	0	0.01	24 (0.00)	0.00	24(0)	0	0.18	
Charges per month	24083	16 (1505)	2395	16(658)	1352	19338	16 (1209)	1815	16(658)	1322	0.18	

\*Includes ED, outpatient, inpatient, and observation

†For means, Paired t test P-value

SD, standard deviation +/-

IQR, interquartile range

Six months prior to joining HFHC-BTH, patients accrued \$144,499 in gross charges, and after joining accrued \$74,971. Table 1. reports the rate of visits per patient per month and an adjusted estimate of the cost per person per month. Total utilization consists of ED, Inpatient, Outpatient, and Observation visits per month. All of the aforementioned categories slightly decreased, whereas outpatient rates nearly doubled, rising from a mean rate of

0.17 to 0.35 (P=0.09, confidence level set at 95%  $\alpha = 0.05$ ), and accounting for the total increase in utilization. However, ED utilization decreased by nearly half (45.8%) as well. The total charges for all patients per month demonstrated a 20.7% reduction from \$1505 to \$1209 (P=0.18 confidence level set at 95%  $\alpha = 0.05$ ).

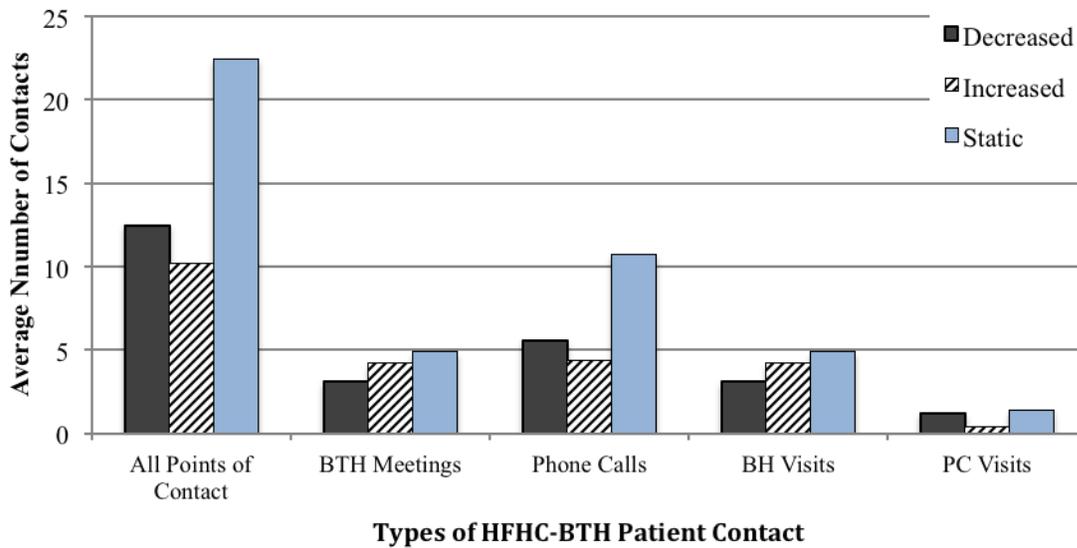


Figure 2. Types of patient contact and the average number of type of contact received by HFHC-BTH patients, who decreased, increased and were static in ED utilization.

Eleven of the 24 patients demonstrated a decrease in their ED utilization, seven patients utilization was static and six increased. Patients who decreased utilization received an average of 5.5 phone calls and 1.8 PC visits, slightly more than their increased utilization counterparts which received an average of 4.4 phone calls and 0.4 office visits (See Figure 2.). Types of contact that demonstrated similar results stem from BTH meetings and BH visits, and those who increased in utilization had more visits on average (4.2 for both) than those who decreased in utilization (3.1 for both). Those who remained static in utilization received the most total contact with an average 22.4 points of contact. An outlier was suspect in the number of phone calls the patient received. A Q-test was performed ( $\alpha = 0.01$ ) confirming it was an outlier ( $P < 0.01$ ) and the data point was excluded from this set.

Table 2. Charges per month and cohort demographics comparisons between two BTH groups, HFHC and TFC.

Variable	HFHC Group					TFC Group					P†
	Gross Total	n (Mean)	SD	n (Median)	IQR	Gross Total	n (Mean)	SD	n (Median)	IQR	
Age		24 (43)	13	24 (42)	24		35 (45)	11	35 (48)	36	0.55
Pre-charges per month	24083	16 (1505)	2395	16 (462)	1868	35123	35 (338)	1231	35 (218)	868	0.33
Post-charges per month	19338	16 (1209)	1815	16 (658)	1352	33833	35 (325)	1070	35 (301)	672	0.45
<b>Sex</b>		<b>n (%)</b>					<b>n (%)</b>				
Female		14 (58.3)					22 (62.9)				0.73
Male		10 (41.7)					13 (37.1)				

†For means, two proportion t test P-value

SD, standard deviation +/-

IQR, interquartile range

Patient demographics and average monthly hospitalization charges prior and post joining the respective HFHC- and TFC-BTH programs are reported in Table 2. The HFHC-BTH patients demonstrated a higher total of charges per month overall than TFC-BTH patients. Prior to joining BTH HFHCs, average total charges were \$1505, which fell by 20.7% to \$1209 afterwards. In addition, TFC-BTH patient charges per month dropped 4% from \$338 to \$325.

## 4. Discussion

The alternative intervention known as Bridges to Health (BTH) has been in place at The Free Clinics (TFC) since 2011. A sister BTH program was established in January 2015 at the Hendersonville Family Health Clinic. This data analysis was conducted on the HFHC-BTH program, after being established for six months. The purpose of this data analysis was to attempt to add identity to the cohort and gain insight into the program's efficacy in reducing utilization and cost.

### 4.1 Hendersonville Family Health Center

Data on utilization rates and demographic information was successfully collected for 24 of the 34 active HFHC-BTH members. Over 80% of HFHC-BTH patients reported having a history of using at least one substance (tobacco, alcohol, illicit). This was expected as this cohort also reports high rates of un-treated behavioral or mental disorders, and many patients attempt to self-medicate.<sup>1,2,5</sup> The vast majority of patients (83.3%) reported not being married. It is unclear if patients are in a committed long-term relationship other than marriage, though difficulty keeping a stable healthy relationship has been a primary issue for many patients. This is in agreement with the larger current super-utilizer cohort profile, and the lack of social support has been expressed by many healthcare providers for this group.<sup>2,7,8,12</sup> This is also complementary to the idea that the HFHC cohort has expressed concerns over isolation, and over a lack of venturing away from home save for necessary trips to the grocery or drug store. Almost half of the patients report a religious affiliation, therefore it may be beneficial to extend a network with local churches to encourage patient social interaction. Another attempt in creating more social support within the BTH groups has been the inclusion of open social events established by the Case Managers. "Lunch and Learn" offers a free open time to join people at TFC to enjoy food (at their bringing), arts and crafts, or just conversation. "Stepping Stones" is a weekly walking group that offers an indoor and outdoor venue (weather dependent) for an hour of walking and conversing. However, over time patient participation has not been retained.

Overall, the reduction of total utilization (sum of emergency, inpatient, outpatient, and observation) has not been established. The total utilization rate per patient per month increased slightly from 0.12 per month to 0.14, though it is not significant ( $P=0.57$ ). Unfortunately, none of the utilization and charges for HFHC before and after could be considered significant. This may be due to the small sample size of utilization and cost data gathered. In the previous analysis of TFC-BTH utilization reported a reduction in ED utilization rate per patient per month from 0.58 to 0.23 ( $P < 0.001$ ).<sup>1</sup> Its sample population for cost and utilization was 34 compared to HFHC's 16 (in cost) and 24 (in utilization). Also, it should be noted that in the previous TFC-BTH analysis the median value was tested using a Wilcoxon rank test.<sup>1</sup> The rank test offers a more accurate representation when the sample population is considerably small.

The ability to gather more complete data can also contribute to establishing more reliable results. A large percent of patients showed no records. This may be due to their use of other hospitals in the local area, the larger region, or even the entire country.<sup>1,2</sup> As of now, there is no sole database for all hospital use, and communications between facilities is a growing issue. Gathering cost information has proven tedious and difficult, as the initial charges list was given in a bulk form of information, costing many hours of manpower to tease out valid charges. Currently, the only way to extract points of contact information is to manually, individually review each patient's chart and tally the findings. Inefficient and time-costly data is burdensome and can discourage reflective analyses such as this one. The optimal goal would be to develop or obtain a software program in which utilization and points of contact can be streamlined into a meta-database upon entry into the electronic record.

Reduction significance cannot be claimed this early in the program. However, there are trends that correspond with each other that indicate some change. Because outpatient services are less severe and less expensive than the emergency and inpatient services, one would expect a reduction in each participant's financial cost. Though HFHC-

BTH outpatient rates rose, both total monthly charges and ED and inpatient services fell. This redirection may stem from patients' increasing health stabilization or healthcare education.

Almost half of the patients demonstrated an individual decrease in their ED utilization. Though HFHC-BTH patients who had the greatest average number of all types of contacts remained static in their ED utilization. This may be due to the infancy of the program, and patients may require more time and relationship building before yielding any significant change in utilization. Phone calls are less intensive, but more flexible than attending a BTH meeting or receiving personal behavioral health visits. Phone calls may be a preferred method of contact for the patient if they are new to the program, and may not have fully committed to utilizing all of the resources BTH has to offer.<sup>11</sup> Alternatively, patients who increased utilization on average attended more BTH-meetings and behavioral health visits than their decreasing counterparts. As a patient decides to make changes in their well-being and they choose to increase participation in the type treatment intensity, one may expect an increase in utilization as several health or behavioral issues that have been neglected over many years are finally being addressed.

## 4.2 Hendersonville Family Health Center And The Free Clinic

TFC has 70 active members, and 35 who had reported charges, whereas HFHC has 34 active members, and 16 with reported charges. TFC has more than twice the number of patients with charges, but the total charges per month for HFHC is about 5 times that of TFC charges. This difference may be correlated to the amount of time patients have been in the program. TFC's patients have on average 14 months in the program, nine months more than HFHC members. There may be a time period that patients and charges begin to stabilize. TFC-BTH analysis as their first year of establishment demonstrated a drop in median charges from \$1167 to \$230 per month ( $P < 0.001$ ).<sup>1</sup> This report's analysis reflected a median of similar numbers to that of the original post-joining charges. HFHC-BTH median post-charge was \$658 per month whereas; TFC-BTH post-charge was less than half of that.

The new HFHC-BTH program is still in its infancy, and has expanded the criteria from the original TFC-BTH program. The initial BTH program was highly selective to uninsured, ED super-utilizers.<sup>1</sup> HFHC-BTH takes patients that are not just super-utilizers, but also have been recommended by other healthcare providers as having increasingly poor health outcomes and instability. If a patient is not a super-utilizer, then utilization rates will not suffice as a measure of progress, and alternative measurements of well-being will need to be developed and explored. Given that a recent study on ED utilization demonstrated an increase of utilization among those with insurance (private or public), the average utilization may be skewed. HFHC-BTH accepts not only those without insurance, but those with Medicare or Charity Care as well.

## 5. Conclusions

This intervention has proven effective, lowering cost and ED utilization, although the significance of this decrease cannot be confirmed at this time. Given the low number of participants with utilization data and charges, a future analysis is recommended after the one-year mark, or when the number of patients with complete records increases above 50. Future research will involve re-evaluating after the program is more established, this will increase data points as the number of programs participants continues to grow, and the delay in charges posting, or patients establishment in the area will improve as well. An exploration of novel methods for quantifying the impact, through PHQ-9, WHODAS 2.0, and survey analysis is worth considering as well.

Utilizing data and cost savings analysis, create real-time snapshots of those who may be in need, and how effective interventions can be, but they can only give us a partial view. To make this cohort's data meaningful it is necessary to explore the patient's perception of well-being and emotional health throughout the program and more importantly for those who have graduated from the program. Given the anticipated shortage of primary care providers for the aging U.S. population, this approach to patient care may provide a new opportunity for primary care to stay small and intimate, while growing larger overall.<sup>8</sup>

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