



RESEARCH ARTICLE

The implementation cost of a safety-net hospital program addressing social needs in Atlanta

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Abstract

Objective: To describe the cost of integrating social needs activities into a health care program that works toward health equity by addressing socioeconomic barriers.

Data Sources/Study Setting: Costs for a heart failure health care program based in a safety-net hospital were reported by program staff for the program year May 2018–April 2019. Additional data sources included hospital records, invoices, and staff survey.

Study Design: We conducted a retrospective, cross-sectional, case study of a program that includes health education, outpatient care, financial counseling and free medication; transportation and home services for those most in need; and connections to other social services. Program costs were summarized overall and for mutually exclusive categories: health care program (fixed and variable) and social needs activities.

Data Collection: Program cost data were collected using a activity-based, micro-costing approach. In addition, we conducted a survey that was completed by key staff to understand time allocation.

Principal Findings: Program costs were approximately \$1.33 million, and the annual per patient cost was \$1455. Thirty percent of the program costs was for social needs activities: 18% for 30-day supply of medications and addressing socioeconomic barriers to medication adherence, 18% for mobile health services (outpatient home visits), 53% for navigating services through a financial counselor and community health worker, and 12% for transportation to visits and addressing transportation barriers. Most of the program costs were for personnel: 92% of the health care program fixed, 95% of the health care program variable, and 78% of social needs activities.

Discussion: Historically, social and health care services are funded by different systems and have not been integrated. We estimate the cost of implementing social needs activities into a health care program. This work can inform implementation for hospitals attempting to address social determinants of health and social needs in their patient population.

KEYWORDS

costs and cost analysis, evaluation study, health equity, hospitals, social determinants of health, uninsured/safety net providers

1 | INTRODUCTION

In the United States, cardiovascular disease (CVD) is the most prevalent chronic health problem and the leading cause of mortality among adults in 2016.¹ CVD is estimated to cost \$351.2 billion annually, of which the associated direct cost for health services is \$213.8 billion (average annual, 2014 to 2015).¹ A substantial portion of CVD costs are for heart failure. Direct costs, such as hospitalization, account for 68% of the \$30.7 billion annual heart failure cost.²

CVD disproportionately affects lower socioeconomic populations and some racial and ethnic minorities. Socioeconomic status, race/ethnicity, and cardiovascular health are linked in several ways. Lower socioeconomic status is associated with a higher risk of CVD and heart failure, and non-Hispanic Black populations are at a higher risk of CVD and have a higher incidence of heart failure.³⁻⁶ There are also differences in outcomes with socioeconomic status leading to more heart failure-related hospitalizations, readmissions, and mortality, and non-Hispanic Black populations experience higher CVD and heart failure mortality compared to non-Hispanic white populations.⁵⁻⁸ Some of the disparities in CVD between non-Hispanic Black and non-Hispanic white groups may be caused by CVD behavioral risk factors and stress that are shaped by socioeconomic status and environmental conditions (eg, lack of access to healthy food and safe places for recreation, crime).⁸ In particular, many structural barriers are a result of historical patterns that include social policies, neighborhood segregation, and institutional racism.⁹

Non-Hispanic Black populations in the United States experience an earlier onset of CVD, and this has implications for prevention and health care.⁸ In addition, health care system use differs by race, ethnicity, and income, and this can lead to lower quality care for low income and minority populations.¹⁰ For example, Medicare data show that hospitals with a high proportion of African American patients are also serving more patients who are poor, and these hospitals tend to have fewer nurses per patient days and lower performance on quality measures.¹¹ Improving primary, secondary, and tertiary prevention of risk factors and cardiovascular events can decrease inequities and may reduce inpatient and emergency health care costs.

There is a growing awareness that it is not just access to and the provision of quality health care that shape health care outcomes. A recent report from the National Academies "Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health"¹² notes that social determinants of health (SDOH) impact health care outcomes. SDOH are shaped by the social and economic conditions and include the neighborhood and the built environment, transportation, housing, education, and income.¹³ Health care providers are increasingly involved in improving the underlying conditions that affect community health and by addressing the social needs and risk factors of their patients.^{12,14,15} Targeted SDOH activities for patients have included housing, employment, education, economic security, personal safety, child care, food security, and legal issues.^{13,16} Among a sample of accountable care organizations (ACO), the most common social needs addressed included transportation (95% of ACOs), food (86%), housing (77%),

What This Study Adds

- We conducted a cost analysis of the Grady Heart Failure Program (GHFP) to better understand what it costs to integrate social needs activities into clinical care.
- The GHFP, a hospital-funded outpatient program, allocated 30% of the program cost to addressing social and economic barriers.
- This work may serve as a resource to guide other health care systems providing outpatient care following a hospitalization and seeking to address socioeconomic barriers to treatment plan adherence and health equity.

and economic hardship (36%) with many partnering with community organizations to provide social services.¹⁵ Among interventions implemented in Medicaid managed care organizations, a majority integrated more services to address both social and medical needs through teams that include case managers, social workers, and community health workers (CHWs). Some programs observed reductions in emergency department visits and hospital admissions.¹⁶ A small number of studies show that CHWs improve the use of appropriate health care services^{17,18} and reduce morbidity and mortality for CVD and reduce health disparities when focused on minority communities.¹⁹ Transportation is a SDOH that is a well-documented barrier to medical care.^{20,21} Transportation interventions have demonstrated improvements in medical appointment show rates²²⁻²⁵ and providing rides may be cost saving;²⁶ although, more work in this area is needed.^{22,27} Meeting social needs for patients (through, eg, social services, transportation, home visits) may improve health, reduce hospital readmission, and decrease health care costs.²⁸⁻³³ The present paper adds to this literature by informing the implementation of social needs activities in hospital settings. Using a case study, we provide a description of the cost components of a health care program within a safety-net hospital that works toward health equity through social needs activities for their heart failure (HF) patients.

1.1 | Program description

The Grady Heart Failure Program (GHFP) is a hospital-funded health care program using a multidisciplinary approach that seeks to provide high-quality care to HF patients through a variety of initiatives that include addressing socioeconomic barriers to treatment plan adherence. The program was launched in 2011 to improve health, reduce hospital readmissions, and decrease hospital length of stay and the use of emergency departments. Since the launch, 30-day readmission has declined 23% and the program indicates positive improvements.³⁴⁻³⁷ The GHFP is based in the Grady Health System (GHS), a public safety-net hospital located in downtown Atlanta, Georgia.

GHS patients are eligible for the GHFP if they have a documented diagnosis of heart failure and an absence of other major medical problems that might limit survival and the ability to attend the heart failure clinic. Patients range in age from 23 to 99 years with an average age of 60. Nearly 40% are female, 92% are African American, nearly 77% were insured by Medicaid or Medicare, and 17% were self-pay as the primary payer. Among those reporting highest degree earned, a third report no degree and almost half have a high school diploma or GED. GHFP participants receive an initial consult from one of the GHFP advanced practice providers (APPs; nurse practitioners). The APPs provide patient education, plan the transition to outpatient care, and conduct post-discharge follow-up calls within 72 hours and an outpatient clinic visit within 7 days of discharge. Ancillary staff provide inpatient care and other services.

As shown in Figure 1, five core strategies address the social and economic challenges of the GHFP population. Starting in the Spring of 2018, patient social needs are tracked through the Healthy Planet module of Epic. Different questions on social support, housing, financial strain and problems, transportation, and other concerns are

asked using the care management tool based on the type of visit. Key social needs were tracked/available for 63%-66% of the 916 patients within 6 months of the consult, cross-sectionally, and are reported in the following sections.

For the first strategy, the GHFP partnered with the GHS pharmacy to cover the cost of the initial 30-day medication supply to aid in the financial burden of adhering to a medication regimen.³⁸⁻⁴⁰ GHFP staff also help patients identify affordable options for their medication supply. Thirty-five percent of participants report the inability to afford medications. Financial counselors can assist patients who have difficulty paying for medical care.⁴¹ For the second strategy, Grady financial counselors assess financial status to access future medical and social services from the GHS. Financial counselors are also familiar with other resources that patients may be eligible for including disability, food stamps, Medicaid, or Veteran's Administrations benefits. Fifty-one percent report financial problems and nearly all of the patients have a financial counseling session.

Transportation can be a financial and physical challenge leading to delayed or missed medical care.^{20,21,42,43} Forty-nine percent of

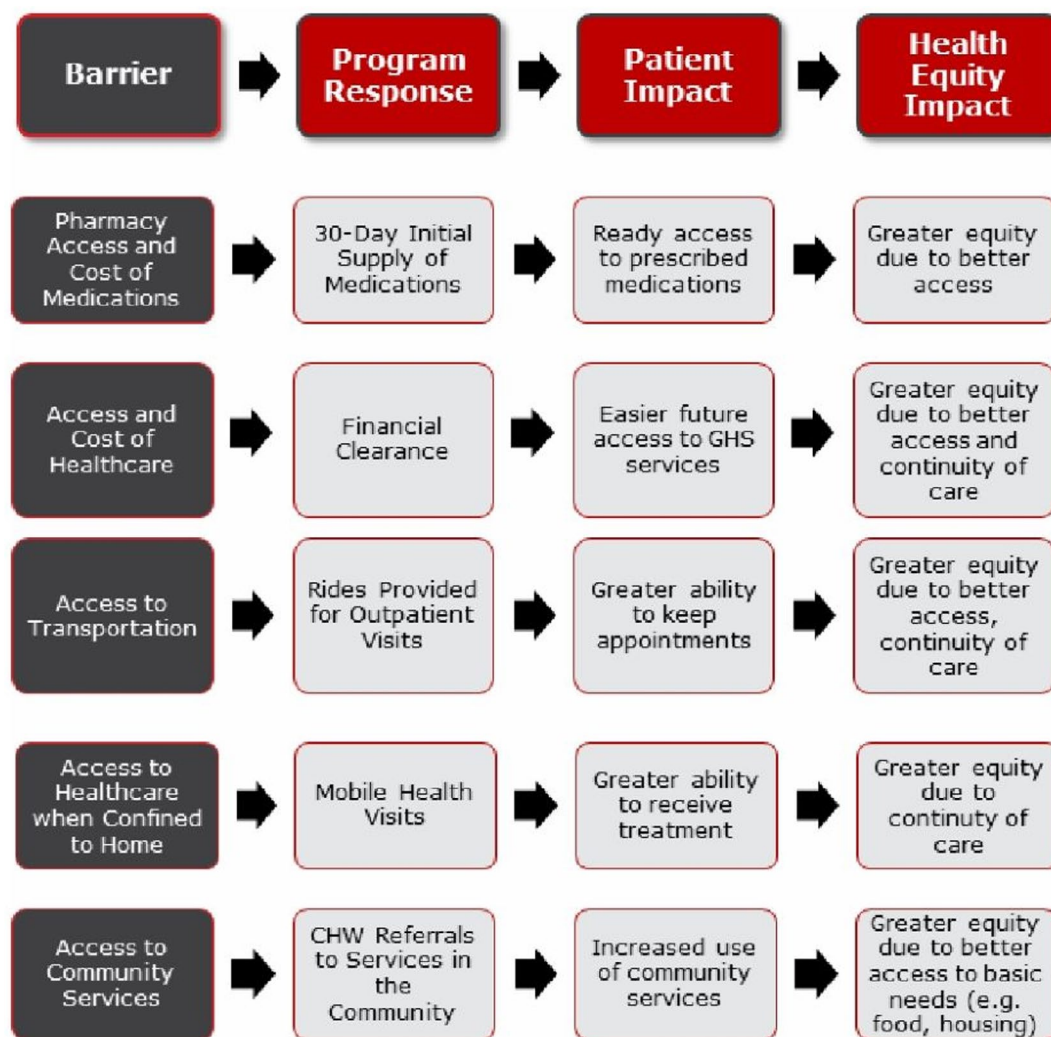


FIGURE 1 The Grady Heart Failure Program's theory of change in response to barriers to health equity [Color figure can be viewed at wileyonlinelibrary.com]

participants experience transportation issues. For the third strategy, there are three methods the GHFP uses to help patients access transportation for continuity of care:

1. Transportation covered by insurance: Some insurers, such as Medicaid provide subsidized transportation to appointments.
2. Public transit: In Atlanta, patients with low income can qualify for half-fare cards to use public transit; and patients with limited mobility can also qualify for rides to transit stops.
3. Ride services: The GHFP partners with a local ride service, Common Courtesy, to provide Uber/Lyft rides to and from appointments. This service is offered at no cost to GHFP participants who are most in need of transportation to medical appointments.

Transportation issues that get resolved through insurance, public transit, and calling family are not tracked but 94 rides through Common Courtesy were provided for this program year.

The fourth strategy addresses patients who cannot travel due to additional mobility challenges by providing home health visits through Grady Mobile Integrated Health (MIH) services.^{31,44} The MIH program includes clinicians that partner with Grady EMS paramedics. These visits allow staff to provide care, medication assistance, and education to patients, review discharge instructions, reconnect patients with primary care, and connect patients with additional resources.

The last strategy maximizes the resources available to GHFP participants through a community health worker (CHW).¹⁷⁻¹⁹ The GHFP CHW integrates culturally competent strategies and builds patients' self-sufficiency through a range of activities, including counseling, connections to food banks and government programs, religious services, housing support, health education, and more. The CHW conducts in-hospital needs assessments and meetings with GHFP patients and further assessment at outpatient clinic appointments.

The GHFP aims to improve adherence to a medical plan through follow-up and by addressing the needs of their patients. Of the five strategies, all new patients receive the 30-day medication supply and are eligible for sessions with the CHW. The CHW works with approximately 25% of patients. The CHW assists with transportation 20-25 times per month, although, additional staff may help to address transportation issues. The remaining 3 strategies are based on need.

The Get With The Guidelines® (GWTG) program was launched to improve hospital care. Institutions collect data for key GWTG® performance metrics on eligible patients or a random sample of eligible patients (if a larger volume institution). The GWTG® program for heart failure recommends that patients have a follow-up visit within 7 days of discharge as it is associated with a lower risk of hospital readmission. They also recommend that this is scheduled by the time of discharge and that a post-discharge evaluation is conducted within 2-3 days. Heart failure patients with a primary diagnosis of heart failure are included in follow-up metrics and secondary diagnosis patients are optional.⁴⁵ Chart reviews were conducted by Grady and follow-up information was available for 860 of the 916

patients and 810 were eligible for inclusion in the performance metrics. Medical reasons and patient refusal may impact eligibility. Of the eligible, nearly everyone was scheduled for a follow-up appointment by time of discharge (99.5%), 93.5% had a follow-up call or post-discharge evaluation within 3 days, and 61.0% had a follow-up visit within 7 days of discharge. While not everyone returned within 7 days, nearly all of the eligible patients had a follow-up visit within 14 days. These rates are an increase from prior years and may be higher than what has been reported in the literature; however, are not necessarily comparable.⁴⁶⁻⁵¹

Historically, social and health care services are funded by different systems and have not been integrated.¹² We focus on a cost analysis of GHFP to answer the following question: What does it cost annually for a safety-net hospital to advance health equity by using a health care intervention that integrates social needs activities into clinical care?

2 | METHODS

We conducted the evaluation from the perspective of a hospital or health care facility program. We used an activity-based, micro-costing approach to estimate the program's component costs. Micro-costing involves the direct enumeration and valuation of each input consumed in operating a program.^{52,53}

2.1 | Cost data collection

Cost data collection for the May 2018-April 2019 program period began during initial in-person site visits in the Fall of 2018. Guided by the site visits, the cost data collection template and a staff survey were developed. We developed the template in Excel (Microsoft) based on standard costing forms⁵⁴ and public templates⁵⁵ and tailored for the GHFP by referring to program documents. We used the cost template to collect data through an iterative process from October 2018 to October 2019. Throughout the process, GHFP staff provided data and the data were discussed during monthly project meetings that included the GHFP manager. GHFP staff were sent questions before each meeting. In addition, the evaluation team conducted in-person site visits and corresponded by e-mail to complete the data collection and verify the data collected.

The cost template captured the unit quantities and unit costs, when available, of each labor and nonlabor resource used in the program. Labor costs included the full-time core program staff (ie, nurse practitioners/RN, medical assistants, program manager, CHW) and the part-time staff supporting the program (medical director, IT, and other medical support). Nonlabor costs included supplies and materials, such as the Heart Failure Guides and home medical supplies (eg, pillboxes, blood pressure cuffs); staff training and education; equipment (eg, computers, medical equipment); and facilities costs.

Because there was no cost center or separate budget, cost information reflects expenses to the program, estimates based on

expenses to GHS, and best estimates provided by GHFP staff. The GHFP referred to program and hospital records and input from relevant Grady staff. In some cases, we referred to outside sources. The data sources for each category are described in Table 1. For labor costs, we primarily used actual staff salaries, except for one role, where this information was not available. We added 25% benefits for full-time employees. Some positions were contract or part-time and ineligible for benefits. The facility cost included maintenance and utilities reported by GHS. This was determined by taking the overall facility cost at the main GHS and applying it to the proportion of the space occupied by the program. Equipment was inventoried by GHFP staff and valued by online average market prices as invoices were not available. For program supplies and materials, we used the expenditures provided by the GHFP staff and their estimates of units used. Prescription costs for the free medication reflect what the GHS pharmacy pays on the basis of an average of a random sample of charts abstracted ($n = 9$). Transportation costs were determined from invoices and staff time for assisting with transportation needs. MIH home visits included vehicle costs and facilities to support operating and maintaining vehicles; overhead for insuring and operating service; medical supplies; and GHS personnel, including nurse practitioners and drivers. These were estimated using GHS records.

2.2 | Annuitizing equipment and certification

As the upfront cost for equipment covers more than the 1-year program period reported in the present paper, we annuitized the equipment expenditures. To do this, the useful life of the equipment was determined by using guidance from the Internal Revenue Service (IRS): work stations (10 years), laptops and computers (6 years), printers (6 years), and phones (10 years).⁵⁶ GHFP replaces blood pressure monitoring equipment approximately every 5 years so this was used as the useful life. Using the straight-line method for depreciating the equipment over the useful life, the scrap value or value after the useful life was calculated. Depreciation rates by year for the recovery period were determined from the IRS guidance on how to depreciate property.⁵⁶ Then, the scrap value was discounted using a 3% rate and subtracted from the original purchase price.⁵⁷ The value of the equipment for its useful life was then divided by an annuity factor with the 3% discount factor.⁵⁸ The present value annuity factors used were 4.5797 for 5 years of useful life, 5.4172 for 6 years of useful life, and 8.5302 for 10 years of useful life.⁵⁷ The Joint Commission's Certification in Heart Failure is renewed every 2 years so the cost of the certification was divided by 2.

2.3 | Staff time allocation

To estimate how staff time was allocated across program components, we developed questionnaires (see Appendix S1) tailored for each role. Using these questionnaires, we asked staff to estimate the

TABLE 1 Cost categories, data sources, and cost assignments for the cost analysis of the Grady Heart Failure Program, Atlanta

Cost category	Data source	Cost assignment
Personnel		
Medical director	GHS records	Actual salary + 25% benefits
Manager	GHS records	Actual salary + 25% benefits
Population health director	GHS records	Actual salary + 25% benefits
Data dashboard support	GHS records	Actual salary + 25% benefits
	Data contract	Estimate
Program check-in/ Front desk	GHS records	Actual salary + 25% benefits
Patient liaison	GHS records	Actual salary + 0% benefits, survey
Community Health Worker	GHS records	Actual salary + 25% benefits, survey
Nurse Practitioners	GHS records	Actual salary + 25% benefits, survey
Clinic Registered Nurse	GHS records	Actual salary + 25% benefits
Contract / per diem nurse	GHS records	Actual salary + 0% benefits
Counselor ^a	Internet	Average salary + 25% benefits
Phlebotomist	GHS records	Actual salary + 25% benefits
Facilities		
	GHS records	Standard GHS rate based on % of space occupied
Equipment		
Rolling workstations	Inventory and internet, IRS	Market rate value, useful life
Laptops and computers	Inventory and internet, IRS	Market rate value, useful life
Printers	Inventory and internet, IRS	Market rate value, useful life
Phone	Inventory and internet, IRS	Market rate value, useful life
Blood pressure monitoring cuff	Inventory and internet, IRS	Market rate value, useful life

(Continues)

TABLE 1 (Continued)

Cost category	Data source	Cost assignment
Other program-specific		
Joint Commission certification	Reported by GHFP staff	Estimate
Guidebook	Reported by GHFP staff	Estimate
Caregiving workshop	Reported by GHFP staff	Estimate
Annual training for full-time staff	Reported by GHFP staff	Estimate
Medical supplies		
Home supplies—scales	Invoice	Payment
Home supplies—blood pressure cuffs	Invoice	Payment
Medication supply	GHS records	Average of GHS pharmacy payments for a sample
Pillboxes	Reported by GHFP staff	Estimate
Transportation		
Mobile Integrated Health Home Visits	Invoices	Payments
	GHS records	Estimate

Note: Survey indicates that the time allocation survey was used for attributing salary to different components of the program.

Abbreviations: GHFP, Grady Heart Failure Program; GHS, Grady Hospital System; IRS, Internal Revenue Service

^aNo access to salary information.

percentage breakdown of their time across activities during a typical week. The questionnaires were administered in April 2019 via email to key staff: 5 APPs, 1 CHW, and 1 patient liaison. The APP and CHW questionnaires had two parts. In the first part they were asked to indicate the percent time spent on an average week for a targeted list of activities relevant to the APP role or the CHW role. In addition, the APPs and CHW were asked “Now thinking about program activities to reduce barriers to care, please indicate what percent of your time is spent each week, on average, helping patients with the following barriers. These do not have to add up to 100% and can be part of any of the categories above; we just want to understand better how much staff time is spent helping patients deal with these barriers.” The five categories of social needs activities were included for addressing barriers. For the patient liaison survey the social needs activities were not asked separately.

2.4 | Cost calculation

The spreadsheet was completed in 2019 with the data from the current fiscal year, estimates from the 2018 calendar year, or from the

first half of 2019, and information from staff surveys. Partial years were converted to a full year. Unit quantities were aggregated to estimate the total annual cost for the GHFP and by mutually exclusive categories: GHFP health care program (fixed and variable) and social needs activities. This was done to guide implementation and scaling. For example, another hospital would be able to assess the cost of adding the GHFP health care program alone or the social needs activities based on the size of their population. The fixed costs represent what is needed to operate the program: management, space, office equipment, and program certification. Variable costs include personnel, computers, educational materials, and medical supplies that can vary by the number of patients. The costs for social needs strategies are also variable based on need by GHFP patients. We then estimated the annual cost per patient served.

3 | RESULTS

The program has five nurse practitioners who do rotations and spend time working on different programs. Their time on the GHFP is equivalent to four full-time equivalent (FTE) nurse practitioners. Forty-two percent of the total program cost is for four FTE nurse practitioners, including salary and benefits. Results from the staff time allocation survey are shown in Table 2. The median time allocation for nurse practitioners is 30% on initial consults and education, 15% on additional time with the patient following the initial consult but prior to leaving the hospital, 5% on follow-up calls and scheduling appointments, 30% on post-discharge appointments with the patients, and 5% on miscellaneous activities. Across these activities, the amount of time that nurse practitioners spend toward addressing health equity barriers varies and ranged 22%–100%. The most substantial portion of their time is spent connecting patients to other services with a median of 20% (range 15%–60%) amounting to an 0.80 FTE effort when applied to 4 FTEs.

Among the other staff surveyed, the patient liaison spends 60% of their time on follow-up calls and scheduling appointments and at least 20% addressing health equity barriers. The CHW spent time across the following activities: 20% on initial consults and education, 20% on follow-up calls and scheduling appointments, 10% on in-home visits after discharge, 20% meeting with patients after discharge, 5% in team meetings, and 25% on other activities (eg, in-clinic needs assessments). For health equity barriers, the CHW spent 30% providing counseling, 40% linking patients to community services, 25% arranging transportation and mobile visits, and 5% addressing financial counseling.

The GHFP was estimated to cost \$1,333,039 for 916 patients during May 2018–April 2019 (Table 3). The estimated annual cost per patient was \$1455. Of the approximately 1.33 million, 70% was for the GHFP health care program alone, and 30% was for the social needs activities. Of the GHFP alone, 33% was fixed and the remaining can vary by number of patients served. Of the costs attributed to social needs activities, 18% was for providing the 30-day supply of

TABLE 2 Typical time allocation for key staff that worked across components of the program: Grady Heart Failure Program, Atlanta, April 2019

Staff roles (# staff) and activities	# FTE	% Time toward activities			
Patient liaison (n = 1)	1.0				
Team meetings					5.0
Follow-up calls and scheduling appointments					60.0
Other activities					15.0
Addressing social needs ^a					
Coordinating 30-day medication supply					10.0
Arranging transportation					10.0
Community Health Worker (n = 1)	1.0				
Team meetings					5.0
Initial consults and education					20.0
Follow-up calls and scheduling appointments					20.0
In-home visit after discharge					10.0
Meeting with patients after discharge					20.0
Other activities (eg, in-clinic needs assessments)					25.0
Addressing social needs within the activities above ^a					70.0
Arranging financial counseling and financial clearance					5.0
Arranging transportation (eg, ride service, calling family, public transit)					15.0
Arranging Mobile Integrated Health home visits					10.0
Linking patients to other services (eg, specialty clinics, SNAP)					40.0
Nurse Practitioners (n = 5)	4.0	Mean	Median	Range	Total ^c
Team meetings		9.0	5.0	5-20	
Initial consults and education		29.0	30.0	10-40	
Additional time with patients following consult		16.0	15.0	5-25	
Follow-up calls and scheduling appointments		6.0	5.0	5-10	
Post-discharge appointments		32.0	30.0	20-55	
Miscellaneous (eg, following up with lab results)		8.0	5.0	0-20	
Addressing social needs within the activities above ^b		49.9	35.0	22-100	
Assisting with medication supply		2.5	2.5	0-5	10.0
Arranging financial counseling and financial clearance		10.2	10.0	1-20	40.0
Arranging transportation (eg, ride service, calling family, public transit)		6.2	5.0	1-15	20.0
Arranging Mobile Integrated Health home visits		7.0	5.0	0-15	20.0
Linking patients to other services (eg, specialty clinics, SNAP)		24.0	20.0	15-60	80.0

Abbreviations: APP, Advanced Practice Provider; CHW, Community Health Worker; FTE, Full-time equivalent; GHFP, Grady Heart Failure Program; SNAP, Supplemental Nutrition Assistance Program.

^aThe CHW was asked about program activities that could take place within the work activities above. The CHW reported social needs activities (included in the table) and substance use and mental health counseling (30% not shown in table).

^bThese activities are often delegated to the CHW and patient liaison; however, the nurse practitioners address barriers while working with patients and when the CHW and patient liaison are not available. These activities do not necessarily need to sum to 100% time.

^cThe GHFP has 5 APP nurse practitioners who do rotations and spend some time working on different programs. Their time on the GHFP is equivalent to 4 FTE nurse practitioners. The median time allocations from 5 APP surveys were applied to 4 FTEs to attribute their salary to health equity activities.

medications and addressing medication adherence, 18% for mobile services, 53% for navigating services within and outside GHS, and 12% for addressing transportation barriers and for providing transportation to visits. Most of the program costs were for personnel: 92% of the fixed GHFP, 95% of the variable GHFP, and 78% of the social needs activities.

4 | DISCUSSION

To inform the cost of implementing social needs activities into a health care program, we estimated the cost components of the Grady Heart Failure Program (GHFP). The Grady Memorial Hospital, a safety-net hospital in Atlanta, developed and implemented the

TABLE 3 Program costs for May 2018–April 2019, Grady Heart Failure Program, Atlanta

Type (unit)	Quantity	Unit Cost (2019 \$)	Cost (2019 \$)
GHFP health care program			
Fixed—to operate the program			
Personnel (FTE)			
Medical director	0.05	300,000.00	15,000.00
Manager	1.00	175,000.00	175,000.00
Population health director	0.05	180,000.00	9000.00
Data dashboard support	1.20	67,204.00	80,644.80
Facilities (square feet)	765	27.15	20,770.00
Equipment (number)			
Rolling workstations	4.00	3200.00	1110.15
Laptops	4.00	800.00	423.67
Printers	2.00	300.00	79.44
Phone	10.00	75.00	65.05
Blood pressure monitoring cuff	1.00	3000.00	467.59
Other program-specific			
Joint Commission 2-year certification	1.00	4000.00	2000.00
Fixed subtotal			304,560.70
Variable—varies by number of patients			
Personnel (FTE)			
Program check-in and front desk support	0.50	35,000.00	17,500.00
Patient liaison / Licensed Practical Nurse	0.80	63,750.00	51,000.00
Community Health Worker	0.30	70,000.00	21,000.00
Nurse Practitioners	2.30	140,000.00	322,000.00
Clinic Registered Nurse	0.80	93,750.00	75,000.00
Contract/Per diem nurse	1.00	55,000.00	55,000.00
Medical Assistant	0.80	43,750.00	35,000.00
Phlebotomist	0.80	31,250.00	25,000.00
Annual training for full-time staff	7.00	1500.00	10,500.00
Equipment (number)			
Computers	16.00	580.00	1228.65
Educational materials (number)			
Guidebook	1200	5.00	6000.00
Caregiving workshop	1.00	2000.00	2000.00
Medical supplies (annual order)	varies	varies	4771.00
Home supplies—scales (number)	120	19.50	2340.00
Home supplies—blood pressure cuffs (number)	120	31.00	3720.00
Variable subtotal			632,059.65
GHFP health care program total			\$936,620.35
Social needs activities ^a			
Navigating services			
Financial counseling and clearance			
Personnel—APPs, CHW, counselor (FTE)	0.65		68,250
Linking to other services			
Personnel—APPs, CHW (FTE)	1.20		140,000.00
Navigating services subtotal			208,250.00

(Continues)

TABLE 3 (Continued)

Type (unit)	Quantity	Unit Cost (2019 \$)	Cost (2019 \$)
Medication assistance			
Personnel—APPs, patient liaison (FTE)	0.20		20,375.00
Medication supply (patient)	650	78.10	50,765.00
Pillboxes (number)	36	0.14	5.04
Medication assistance subtotal			71,145.04
Transportation assistance			
Personnel—APPs, CHW, patient liaison (FTE)	0.45		44,875.00
Uber/Lyft through brokerage service (rides)	94	12.21	1148.15
Transportation assistance subtotal			46,023.15
Mobile Integrated Health (MIH)			
MIH (visits)	144	250.00	36,000.00
Personnel—APP, CHW (FTE)	0.30		35,000.00
MIH subtotal			71,000.00
Social needs activities subtotal			\$396,418.19
TOTAL: GHFP health care program and social needs activities			\$1,333,038.54

Abbreviations: APP, Advanced Practice Provider; CHW, Community Health Worker; FTE, Full-time equivalent; GHFP, Grady Heart Failure Program; MIH, Mobile Integrated Health.

^aPersonnel time for social needs activities is exclusive from personnel time in the GHFP category.

GHFP to improve care, plan the transition to outpatient care, provide education, conduct follow-up, and address socioeconomic barriers for more than 900 heart failure patients annually. Recognizing that clinical outcomes are shaped by the broader social, economic, and physical environments, the program acknowledges the importance of SDOH such as, income and transportation, and are helping to address these barriers.¹⁴ We found that for a recent year, the cost of this program is an estimated \$1.33 million. Thirty percent of the program cost was attributed to the five strategies to address social needs that assist in mitigating social and economic conditions: financial counseling, free 30-day medication supply, transportation for those most in need, home visits for those most in need, and a Community Health Worker.

Many health care providers are also recognizing that health outcomes are influenced by social and economic conditions and racism and stressors in the physical environment.¹²⁻¹⁵ Some providers are working to address SDOH and social needs by screening for housing issues, food insecurity and poverty, and providing referrals;⁵⁹ investing in housing;⁶⁰ and providing free transportation to health care.⁶¹ In addition, at a larger scale, some state Medicaid agencies have identified the following Medicaid Accountable Care Organization priorities: caring for complex populations, leveraging existing Medicaid initiatives, integrating behavioral health services, supporting care coordination, and addressing SDOH.⁶²

Given the growing recognition of SDOH, the present cost analysis may provide a roadmap for other hospitals attempting to address SDOH and social needs in their patient population. In addition, few nurse-lead heart failure programs report the complete cost to implement such programs.⁶³ The information from the present case study can be used to inform the resource requirements. We used standard

costing methods that included cost templates tailored to the program and balanced quality against feasibility to ensure enough detail while not being overly burdensome to hospital staff.⁵⁴ This information coupled with additional salary information (Appendix S2) can assist hospitals in similar contexts. In addition, the costing approach could be applied in other health care settings for programs interested in monitoring and evaluation.

Our cost study found that 42% of the total program cost was for 4 FTE nurse practitioners including salary and benefits. On average, 30% of their time was spent on initial consults and 30% was spent on discharge appointments. The salaries are representative of the national average (Appendix S2). The per patient cost of the total GHFP cost is \$1455 and some inpatient and outpatient activities may be reimbursed for insured patients. These visits are an opportunity to address the complex social needs of patients seen at safety-net hospitals and nurse practitioners may spend a third of their time doing so during their consults and outpatient visits. One full-time Community Health Worker accounted for 5% of the total program cost and provided counseling and connected patients to services and can help alleviate some of the nurse practitioners' time. Assuming the same salaries and levels of financial counseling and linking to services; facility costs scaled to the size of the program; and that everyone received a ride to their follow-up appointment (at \$12 each way; this average will vary by market and other factors), the per patient cost is approximately \$3930, \$1720, and \$1250 for programs of 100, 450, and 1800 participants respectively. Some fixed costs are substantial for a small program. It may be possible to have staff take on more roles to adjust for a smaller team, to share resources within the program, to share resources across programs, and/or reduce program costs by making other modifications based on needs and resources. A home visit is

estimated to cost an additional \$500 per patient. That estimate includes GHFP staff time spent identifying the need, communicating with the provider, and providing patient support; and vehicle costs and facilities for operating and maintaining vehicles, insurance, medical supplies, and staff time related to the visit.

4.1 | Limitations and future research

There are several limitations of this study. First, some program costs were estimates and sampling uncertainty was not accounted for in this analysis. However, the total cost is comprised largely of staff and actual salaries were used. Summaries from the Bureau of Labor Statistics show that health care practitioners and health care support salaries in Atlanta are close to the nationwide average for their respective occupational groups.⁶⁴ Second, the findings presented in this paper are for a single program serving heart failure patients in a safety-net hospital in Atlanta. This population may not be generalizable to other populations. Third, we did not compare these costs relative to outcomes. Although these activities show potential for reducing readmissions³⁴⁻³⁷ and reducing hospital readmissions is one way to improve health at a lower cost,⁶⁵ the focus of the present paper was to inform implementation of existing strategies. Addressing social needs is important; however, health care providers may be concerned about using resources if the benefits are not observed by their health system. Demonstrating impacts to hospital readmission, length of stay, and mortality risk is an important area for continued research. In addition, while the present paper outlines the resources needed for integrating specific strategies into health care, patients may still experience some unmet social needs. Finally, there are other ways that social care could be integrated into health care. These include adjustment (eg, reducing patient need for in-person visits), assistance (eg, providing transportation), alignment (eg, investing in community ride programs), and advocacy (eg, promoting policies that change transportation infrastructure).¹² We did not compare different approaches for addressing SDOH. Such comparisons can guide decisions about investments.

4.2 | Implications for policy and practice

Social determinants of health are the root cause of many disparities observed in CVD health outcomes that disproportionately affect racial and ethnic minorities and lower socioeconomic status individuals in the United States.¹² Health care system use differs by race and income¹⁰ and can reinforce structural inequities through lower quality of care.⁶⁶ Hospitals and, in particular, safety-net hospitals are anchor institutions in the community and can play an important role in addressing inequities by helping with social needs, as well as assisting with physiological needs. Every contact is an opportunity to understand and assist with the complex health and social needs. This program shows that health care systems can drive health equity through follow-up and social

needs activities for a low SES population; however, this requires dedicated funds for staff to support vulnerable patients.

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AUTHOR CONTRIBUTION

DW and AO designed and lead the program. MJM, JMC, RIL, MM, AO, DW contributed to the conception and design of the evaluation. All authors contributed to the conception of the manuscript. KEM, JMC, MM, MJM, and RIL drafted the manuscript. JMC, MJM, DW, RIL, KEM, AO, and TTI were involved with the acquisition of the data. KEM and JMC conducted the analyses. KEM, JMC, MJM, DW, AO, and RIL were involved in the interpretation of the data. All authors made critical revisions to the content that is included in the manuscript. All authors approved the manuscript.

DISCLAIMER

The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. Use of trade names and commercial sources is for identification only and does not imply endorsement by the US Department of Health and Human Services.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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