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Patient Factors Associated with the Initiation of Telehealth Services among Heart Failure Patients at Home

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Abstract

Telehealth is an intervention that can assist patients with heart failure to manage their symptoms at home. However, it is reported that between 24–70% of eligible patients do not receive telehealth. This study aimed to explore factors associated with the initiation of telehealth among home care patients with heart failure using the Outcome and Assessment Information Set data (N=2,832). The findings indicate patients who received high-risk drugs education by visiting nurses had an 80% increase in the odds of receiving telehealth, and patients who received no assistance from caregivers had a 46% decrease in odds compared to those who were assisted at least daily.

Keywords

heart failure; Community and Home Care; telemedicine; self-care; Decision Making

INTRODUCTION

Heart failure (HF) is one of the most common diagnoses among Medicare home health care recipients. According to the 2012 statistics from Centers for Medicare and Medicaid Services (CMS), diseases of the circulatory system (Major Diagnostic Classifications 7) was the most frequent diagnosis in home care patients and HF was the number one with 7.5 % (about 0.3 million) of patients diagnosed within circulatory diseases. As a single diagnosis, HF was the second most common diagnosis among home health care patients after diabetes with a rate of 9.5% (CMS, 2013).

Ensuring that patients with HF are able to manage their symptoms can reduce readmissions and improve a patient's quality of life (Jovicic, Holroyd-Leduc, & Straus, 2006; Koelling, Johnson, Cody, & Aaronson, 2005; Musekamp et al., 2017; Tung et al., 2013). The American Heart Association recommends providing self-management to all HF patients on

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discharge from hospital, as the self-care regimen is complex and multifaceted (Yancy et al., 2013). When self-management is adequately performed the readmission rates for patients with HF are reduced by 56% (pooled data from three studies with total of 381 HF patients at 3 months, 6 months, and 1 year periods) (Jovicic et al., 2006). Particularly in persons aged 65 and older, cardiovascular disease (including HF) risk factors and disorders predict and account for the greatest causes of mortality and loss of function (Applegate & Ouslander, 2017).

Home health care has been increasingly used to bridge the gap between acute care settings and the home to alleviate patients' care burden and assist with disease self-management. Of the Medicare beneficiaries discharged from post-acute care to use other services, 37.4% are sent home with home health services (Gage, 2009) and 69% of 7.2 million individuals who received formal home care services in 2000 were over age 65 (NAHC, 2010). Moreover, HF is one of the most common primary diagnoses for home health recipients (NAHC, 2010). Patients with HF are at risk of increased re-hospitalization. Diverse strategies adopted to assist HF patient's self-management include providing educational programs, setting self-management guidelines for patients, and mailing out education materials to encourage self-management (McAlister, Stewart, Ferrua, & McMurray, 2004). One intervention that has been shown to assist with reducing the re-hospitalization rate is telehealth (Kitsiou, Paré, & Jaana, 2015; O'Connor et al., 2016).

Telehealth is the use of electronic information and telecommunications technologies to support clinicians and patients at a distance (NAHC, 2013) and has the potential to help with monitoring of illness for individuals with chronic diseases. The use of telehealth has been shown to improve patient outcomes and reduce care costs (Bowles & Baugh, 2007; Paré, Poba-Nzaou, & Sicotte, 2013). A meta-analysis of 15 systematic reviews indicated that telehealth reduces HF-related hospital admissions compared to usual care (Kitsiou et al., 2015). In addition significant reductions in all-cause 30-day readmission for HF patients using telehealth have been reported, from 19.3% to 5.2% in three years (O'Connor et al., 2016). However, 24–70% of eligible patients do not receive telehealth (Achelrod, 2014). As one of the critical factors of telehealth interventions is patient acceptance and initiation of the technology, identifying the factors that influence eligible patients' initiation of telehealth services is crucial (Woo & Dowding, 2017).

The purpose of this study was to explore patient factors associated with initiation of telehealth services in HF patients' receiving home health services. For this study, initiation is defined as telehealth installment and starting of use at the time of home care admission by HF patients; we use the terms initiation, adoption, and acceptance interchangeably. The study addressed the following research question: what patient factors (e.g. socio-demographic, functional, mental, and disease characteristics) are associated with initiation of telehealth services at the point of referral among home care patients with HF?

METHODS

Conceptual Framework

A modified Unified Theory of Acceptance Use of Technology (UTAUT) model was used as a framework for this study (Figure 1). The UTAUT was developed by Venkatesh et al. (2003) to explain user acceptance of technology (Venkatesh, Morris, Davis, & Davis, 2003). It is one of the most comprehensive frameworks to examine decision making related to technology acceptance and has been used effectively in many studies examining individuals' technology acceptance (Cimperman, Makovec Breni, & Trkman, 2016; Hoque & Sorwar, 2017; Kavita, Cynthia, & Joan, 2012). The theory identifies four key determinants that explain individuals' acceptance and use of technology; Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). Each construct is defined as follows:

- PE is the degree to which using a technology is expected to help in performing certain activities;
- EE is the expected degree of ease associated with the use of the technology/system;
- SI is the degree to which an individual believes that important others think the patient should use the technology/system;
- FC is the degree to which an individual perceives having control using the system when given the resources or technical/organizational supports.

There are four moderators that play a role on the relationship between each construct and an individual's behavioral intention to use the technology; gender, age, experience, and voluntariness of use (Venkatesh et al., 2003). Due to data limitations, we were only able to analyze two main constructs and two moderators of the model in this study. Each element plays a role as a direct determinant of user acceptance and some studies have successfully used a modified UTAUT model by either only using two or three elements or adding other determinants in their study (Chang & Hsu, 2012; de Veer et al., 2015; Hsieh, Kuo, Wang, Chuang, & Tsai, 2017; Knoblock-Hahn & LeRouge, 2014; Wang et al., 2009). We examined EE and FC; categorizing patient's sensory and neuro/emotional/behavioral status as EE and caregiver support and functional status as FC. Age and gender were tested as moderators and initiation of the technology were measured as the outcome 'use behavior.' While we acknowledge the limitations of only using two of the four UTAUT constructs in our analysis, this study is part of a larger mixed methods study exploring a technology (telehealth) acceptance among home care patients with HF. The on-going qualitative study uses all four UTAUT elements to explore telehealth initiation factors. Therefore, we used the UTAUT to enable the integration and interpretation of findings across studies.

Study Design

A cohort study of adult patients (N=2,832) with a diagnosis of HF referred for telehealth services in the period April 2016-March 2017, from one of the largest not-for-profit home care agencies in the US. The organization serves an ethnically diverse patient population across the 5 boroughs of New York City and Nassau, Suffolk, and Westchester counties. It

currently has a Bundled Payment for Care Improvement (BPCI) program for patients with HF and heart attack. Patients who have a heart failure diagnosis and are at risk for hospitalization (e.g., polypharmacy, cognitive impairment, and repeat hospitalization) are eligible for the BPCI program and will receive care from trained Population Care Coordinators over a 90-day period post discharge from hospital; those who are functionally able to, and are agreeable to participate in telehealth in the BPCI program are referred for telehealth services by physicians to assist with the self-monitoring of their condition. The telehealth device recommended for the program is very simple only including a blood pressure machine, pulse oximeter, and weight scale.

Data Source

The Outcome and Assessment Information Set (OASIS-C) was collected for all patients referred for telehealth services. OASIS is the standardized home healthcare assessment dataset for home care recipients mandated by Centers for Medicare and Medicaid Services to be used for Medicare-certified home health agencies since 1999 (NAHC, 2010) and the OASIS-C version was introduced in 2010 (CMS, 2017). It is a comprehensive data set designed to collect information on nearly 100 items related to a patient's demographic information, clinical status, functional status, and service needs. Overall reliability of the data collected using OASIS is satisfactory and it has been used successfully in a number of studies of home care (Kang, McHugh, Chittams, & Bowles, 2016; O'Connor & Davitt, 2012). The OASIS admission data for all eligible patients were used for analysis.

Power analysis.—Sample size was based on the following assumptions: a two-sided χ^2 test with α less than or equal to 0.05; a 30% baseline probability of event (telehealth initiation rate in HF patients); and the percentage difference between female and male patients in telehealth initiation (4% in favor of male) (Foster et al., 2015). A sample of 1021 subjects (511 for each side) would achieve 80% power. The projected sample size for this study was over 830 for each side, thus it was anticipated that the study would have adequate power to detect a significant deviation in telehealth initiation. G*power statistical software were used to calculate power and sample size (Faul, Erdfelder, Lang, & Buchner, 2007).

Measures

Independent variables.—Initially 44 variables from the OASIS that were consistent with the UTAUT model were selected (Table 1). One additional item, language, in the socio-demographic domain that was not collected in OASIS was added from the specific data collected for the organization. After operationalization of sub-variables from the items selected for analysis, a total of 63 variables – 5 for socio-demographic, 13 for EE, and 45 for FC—were analyzed for the association with telehealth initiation. In each variable, categories with small cell number ($n = 20$) were combined to an adjacent category for estimation.

Telehealth initiation outcomes.—Telehealth initiation or non-initiation of telehealth was the binary outcome variable in this study. This outcome variable was extracted from a separate data set collected from the organization outside of OASIS.

Data Analysis

Descriptive statistics were performed to examine sample characteristics. Group differences were evaluated for significance using t-tests for the continuous variables (e.g., age) and Pearson's chi-square test for the categorical or binary variables. Bivariate analyses were conducted for all variables with the outcome variable (telehealth initiation) and correlates with $p \leq 0.25$ were entered into a multivariate model. This cut-off point was chosen as the basis for variable selection based on the recommendation by Hosmer (2000) and having variables with both clinical and theoretical relevance. A multivariate logistic regression analysis was conducted based on the UTAUT framework for each category (Demographics, EE, and FC) to analyze the association between independent variables and telehealth use. The variables that had a p-value less than 0.05 in relationship with the outcome variable were selected for the final multivariate logistic regression model. Covariates in the final model were checked for collinearity using a variance inflation factor. The Hosmer–Lemeshow test was used to examine the goodness-of-fit of models. For discrimination and accuracy, the area under the curve (AUC) was calculated. Stata 14 software was used for all analyses.

RESULTS

Sample

A total of 2,832 patients who were deemed eligible for the BPCI program were referred for telehealth and included in the analysis (Table 2). The telehealth initiation rate was 29.5% ($N=834$). The sample consisted of mostly older adults (mean age 74 ($SD = 13.5$), Median 76, range 22 to 104 years). Patients were primarily Black or African-American (35.9%), female (56%) and Medicare beneficiaries (65%, all types). They were primarily English speaking (57%). The most common comorbidities in this sample were type 2 Diabetes Mellitus (6%), and essential hypertension (6%).

Bivariate Analysis

OASIS variables with $p \leq 0.25$ from the bivariate analysis with telehealth initiation are presented in Table 3 together with how the variables were operationalized. 7 socio-demographic variables, 9 variables in EE, and 25 variables in FC were found to have p-value ≤ 0.25 . These variables were used as inputs for the multivariate analyses.

Multivariate Analysis

Variables that had a p-value ≤ 0.05 in association with telehealth initiation in the multivariate logistic regression models were selected to be entered in the final model. They included 3 from the socio-demographic domain (age, gender, payer source-Medicaid traditional fee-for-service), 1 from the EE domain (anxious) and 5 from the FC domain (respiratory treatment, grooming, prior function-household tasks, high-risk drug education, and frequency of ADL/IADL assistance by caregivers other than home health aide).

The variables included in the final logistic regression model are shown in Table 4. Patients who received education related to high-risk drugs (e.g. anticoagulants) by the visiting nurse had an 80% increase in the odds of initiating telehealth compared to those without education

(OR=1.80; 95% CI: 1.03–3.16). Patients who did not receive assistance on Activities of Daily Living (ADL) from caregivers other than a home health aide had a 46% decrease in odds compared to those who were assisted at least daily (OR=0.54; 95% CI: 0.32–0.91). In addition, compared to those with other types of insurance, the odds to initiate telehealth services was 73% higher (OR=1.73; 95% CI: 1.18–2.56) among patients with traditional fee for service type of Medicaid as a payer source of their home health care and telehealth service.

Other factors associated with telehealth initiation included anxiety (less often than daily OR=1.31; 95% CI: 1.05–1.62), specific functional abilities (the amount of assistance needed with grooming (OR=0.37; 95% CI: 0.20–0.68), and household tasks such as light meal preparation, laundry, or shopping) (Need some help: OR=0.63; 95% CI: 0.49–0.82) and Dependent: OR=0.55; 95% CI: 0.42–0.71) and if they were receiving any type of respiratory treatment (oxygen, ventilator, or continuous/Bi-level positive airway pressure) (OR=1.27; 95% CI: 1.02–1.58).

Moderation effects of both gender and age were examined. Age and prior functional level on household tasks were found to have a statistically significant interaction. This can be interpreted as the association of patients' prior functional level on performing household tasks with telehealth initiation is stronger for patients' whose age is greater or equal to 76 than for those younger than 76.

Goodness-of-fit tests showed that this selected model had adequate model fit (p-value in Hosmer-Lemeshow test = 0.26). The value of the AUC from c-statistics was 0.60. No significant collinearity was found among covariates (all VIF<10).

DISCUSSION

The purpose of this study was to explore patient factors associated with HF patients' initiation or use of telehealth services in a home setting. It identified a number of factors associated with initiation, including functional status, level of anxiety, education provision by the home care nurse, care giver support and sociodemographic factors.

Functional disability is common in patients with HF, reportedly 60% HF patients have limitations in one or more ADLs (Dunlay et al., 2015). In association with these functional limitations and HF self-management, functional limitations and dependency linked to HF have been reported as serious barriers to self-care in patients with HF (Siabani, Leeder, & Davidson, 2013). In our study, grooming and prior ability to perform household tasks, may relate to physical dexterity, which was identified as a main issue with ease of use of telehealth in previous studies (Demiris, Speedie, & Finkelstein, 2001; Seto et al., 2010). The direction of relationship between telehealth initiation and functional status indicated that the more the patients needed help in household tasks prior to their referral to telehealth services, the less likely they were to have telehealth initiated.

Level of anxiety was also found to be associated with telehealth initiation. Patients who reported being anxious less often than daily had a 31% increase in the odds of initiating telehealth services compared to those had no anxiety. Attitudes towards technology,

including anxiety, were tested by Venkatesh et al. in 2003 using the original UTAUT model and was found not a significant factor related to behavioral intention of technology use (Venkatesh et al., 2003). However, in another study computer anxiety was identified as being significantly associated with negative attitudes towards telehealth (Radhakrishnan et al., 2013). Since all of these findings were about anxiety related to technology use, not the general anxiety level in daily life, further research is needed on examining the exact relation that was found in our study.

We also found an association between telehealth initiation and provision of education by the home care nurse. A systematic review of HF self-management education found that evidence-based patient education in 4 categories; knowledge and self-management (including medication review and discussion of side-effects), social interaction and support, fluids management, and diet and activity, can significantly improve patients' health outcomes (Boren, Wakefield, Gunlock, & Wakefield, 2009). Another study specifically for telehealth with Veteran patients with chronic conditions including HF reported that patient education including self-management of their conditions was an essential element of their telehealth program success (Darkins et al., 2008). In our study, patients who received education on high-risk drugs were more likely to have telehealth services initiated compared to those without education. The differences in telehealth use between those who are not taking any high-risk drugs and those taking high-risk drugs but did not receive education were not statistically significant. The reasons why a patient did not receive education although they were taking high-risk drugs are neither reported in the dataset nor found in prior studies.

Caregiver support has also been identified as an essential element of telehealth program success along with patient education (Darkins et al., 2008). Caregiver support factors can contain complex elements including the measure of general day-to-day monitoring of well-being and changes in health status as well as other aspects of HF self-management such as supporting adherence to dietary restrictions, planning and pacing of daily activities and a complex medication regime, and taking emergency measures such as knowing when to call a doctor (Wingham et al., 2015). In our study, the frequency of caregiver support was associated with telehealth initiation. Patients who did not receive assistance on ADLs from caregivers other than a home health aide were less likely to be using telehealth services.

Finally, some socio-demographic factors were related to telehealth initiation. Patients with traditional fee for service type of Medicaid as a payer source of their home health care and telehealth service were more likely to initiate telehealth services compared to those with other types of insurance. Cost, which is a factor previously associated with telehealth acceptance (Rahimpour, Lovell, Celler, & McCormick, 2008; Seto et al., 2010) would not be an issue for this study group as they are all in a BPCI program that covers the telehealth service regardless of their payer source. Further research with more socio-demographic related variables such as income or education is needed to explain this association better. In addition, it is unclear if or how multiple admissions related to HF may affect telehealth initiation rates, and this needs to be addressed in future research studies.

It appears some factors associated with telehealth initiation may be modifiable. High-risk drugs (e.g., hypoglycemics or anti-coagulants) education is a good example. Receiving high-risk drugs education when needed appears to increase the odds of telehealth initiation. Ensuring that patients or caregivers receive the necessary high-risk drug education can be achieved through close communication and subsequent care planning during the referral process. Caregiver support factors could also be addressed during the referral process. Caregiver assistance from someone other than a home health aide was found to be associated with telehealth initiation in current study. To increase telehealth uptake, nurses, case managers, or social workers could coordinate the involvement of informal or formal caregivers to patients who at the time before discharge lack such assistance.

Strengths and limitations

The study has a number of limitations that need to be acknowledged. Firstly the data used for the analysis was from one organization. Although the agency involved in this study is one of the largest home health service providers in the US, there is the possibility that the sample might not represent the wider HF population as the agency serves primarily urban population resides within five boroughs of NYC.

Secondly, the independent variables in this study were restricted to data available from the OASIS assessment dataset. This meant that not all key elements of the theoretical framework were evaluated, and this restriction could account for the relatively low AUC (0.60). In order to improve the performance of the model, future research may need to consider including variables that are not readily available in the OASIS dataset. While the study could only measure two of the four elements of the UTAUT, it did highlight patient factors within the critical determinants investigated. Besides, ongoing qualitative research exploring patient's initiation factors uses all four determinants of the UTAUT model.

Strengths of the study include the relatively large sample (N=2,832), which had enough power to detect the association between selected variables in the model and telehealth initiation. The majority of previous studies exploring telehealth acceptance have had smaller samples (Woo & Dowding, 2017).

CONCLUSIONS

In conclusion, this study adds to the limited body of knowledge on the patient factors associated with telehealth initiation among HF patients receiving home care services. Using data from the standardized OASIS, we found that some elements appear to be related to HF patients' telehealth initiation. Knowledge of such associations and attention to some modifiable factors can inform care planning; for example, the coordination of formal/informal caregiver support and providing additional high-risk drug education for individuals who are referred for telehealth services. Through such approaches it may be possible to improve the efficiency and utilization of telehealth services.

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Figure 1.
A modified UTAUT model.

Table 1.

OASIS items incorporated in analysis (organized according to UTAUT framework)

1. SOCIO-DEMOGRAPHICS INCLUDING GENDER AND AGE

OASIS Item cat.	OASIS Item No.	Title	Type
Patient Tracking	M0066	Age	Continuous
	M0069	Gender	Binary
	M0140	Race/Ethnicity	Binary
	M0150	Current Payment Sources	Binary
Special items		Language	Binary

2. EFFORT EXPECTANCY

OASIS Item cat.	OASIS Item No.	Title	Type
Sensory Status	M1200	Vision	Categorical
	M1210	Ability to Hear	Categorical
	M1220	Understanding of Verbal Content	Categorical
	M1230	Speech and Oral Expression of Language	Categorical
	M1240	Pain Assessment done	Categorical
	M1242	Frequency of Pain	Categorical
Neuro/Emotional/Behavioral Status	M1700	Cognitive Function	Categorical
	M1710	When confused	Categorical
	M1720	When Anxious	Categorical
	M1730	Depression screening (PHQ-2)	Categorical
	M1740	Cognitive, behavioral, and psychiatric symptoms	Binary
	M1745	Frequency of Disruptive Behavior	Categorical
	M1750	Psychiatric Nursing Service	Binary

3. FACILITATING CONDITIONS

OASIS Item cat.	OASIS Item No.	Title	Type
Living Arrangements	M1100	Patient Living Situation	Categorical
Care Management	M2102	Types and Sources of Assistance	
	M2102a	ADL assistance	Categorical
	M2102b	IADL assistance	Categorical
	M2102c	Medication administration	Categorical
	M2102d	Medical procedures	Categorical
	M2102e	Management of Equipment	Categorical
	M2102f	Supervision and safety	Categorical
	M2102g	Advocacy or facilitation	Categorical
	M2110	How Often ADL/IADL assistance	Categorical
ADL/IADL	M1900	Prior Functioning ADL/IADL	
	M1900a	Self-Care	Categorical
	M1900b	Ambulation	Categorical

History and Diagnoses	M1900c	Transfer	Categorical
	M1900d	Household tasks	Categorical
	M1021	Primary Diagnosis	Nominal
	M1021a_sev	Primary Diagnosis Severity	Categorical
	M1023	Other Diagnoses	Nominal
Respiratory Status	M1034	Overall Status	Categorical
	M1400	Short of Breath	Categorical
	M1410	Respiratory Treatments	Categorical
ADL/IADL	M1800	Grooming	Categorical
	M1810	Ability to Dress Upper Body	Categorical
	M1820	Ability to Dress Lower Body	Categorical
	M1830	Bathing	Categorical
	M1840	Toilet Transferring	Categorical
	M1845	Toileting Hygiene	Categorical
	M1850	Transferring	Categorical
	M1860	Ambulation/Locomotion	Categorical
	M1870	Feeding or Eating	Categorical
	M1880	Ability to Plan and Prepare Light Meals	Categorical
	M1890	Ability to Use Telephone	Categorical
Medications	M2000	Drug Regimen Review	Categorical
	M2002	Medication follow-up	Binary
	M2010	Patient/Caregiver High-Risk Drug Education	Categorical
	M2020	Management of Oral Medication	Categorical
	M2030	Management of Injection Medication	Categorical
	M2040a	Prior Medication Management: oral	Categorical
	M2040b	Prior Medication Management: injectable	Categorical
Therapy Need and Plan of Care	M2200	Therapy Need	Continuous
	M2250	Plan of Care Synopsis	
	M2250a	Patient-specific parameters	Categorical
	M2250b	Diabetic foot care	Categorical
	M2250c	Falls prevention	Categorical
	M2250d	Depression intervention	Categorical
	M2250e	Pain intervention	Categorical
	M2250f	Pressure ulcers intervention	Categorical
	M2250g	Pressure ulcers treatment	Categorical

Table 2.

Characteristics of the cohort sample

		All N=2,832	Initiated N=834	Not Initiated N=1,998	<i>p</i> ^d
		n (%) ^a	n (%) ^a	n (%) ^a	
Age, y ^b	Mean (SD)	74 (13.5)	73 (13.3)	74 (13.5)	0.008
	Median	76	75	77	0.008
Gender	Male	1,246 (44.0)	383 (46.0)	863 (43.2)	0.182
	Female	1,586 (56.0)	451 (54.0)	1,135 (56.8)	0.182
Race/Ethnicity ^c	Asian	143 (5.0)	47 (5.6)	96 (4.8)	0.357
	Black or African American	1,022 (35.9)	281 (33.7)	741 (37.1)	0.086
	Hispanic or Latino	848 (29.8)	276 (33.1)	572 (28.6)	0.018
	White	806 (28.3)	223 (26.7)	583 (29.2)	0.190
	Others (American Indian or Alaska Native or Native Hawaiian or Pacific Islander)	29 (1.0)	11 (1.3)	18 (0.9)	0.313
Payer Sources ^c	Medicare (traditional fee-for-service)	1201 (38.5)	363 (43.5)	838 (41.9)	0.437
	Medicare (HMO/managed care/Advantage plan)	829 (26.6)	248 (29.7)	581 (29.1)	0.726
	Medicaid (traditional fee-for-service)	114 (3.7)	49 (5.9)	65 (3.3)	0.001
	Medicaid (HMO/managed care/Advantage plan)	554 (17.8)	155 (18.6)	399 (20.0)	0.397
	Private	336 (10.8)	86 (10.3)	247 (12.4)	0.123
	Others	87 (2.6)	21 (2.5)	67 (3.4)	0.243
Language	English	1622 (57.3)	468 (56.1)	1,154 (57.8)	0.421
	Spanish	601 (21.2)	184 (22.1)	417 (20.9)	0.480
	Others (Unknown, Russian, Italian etc.)	609 (21.5)	182 (21.8)	427 (21.3)	0.790
Comorbidities	Type 2 Diabetes Mellitus	954 (6.0)	276 (5.9)	678 (6.0)	0.667
	Essential Hypertension	954 (6.0)	263 (5.6)	629 (6.2)	0.978
	Atherosclerotic Heart Disease	912 (5.7)	294 (6.3)	618 (5.5)	0.025

Note.

^a All percentage may not add up to exactly 100 percent due to the rounding.^b Age is reported as years with standard deviation. All other data are number of patients (%).^c Mark all that apply item: The total number and percentage may not add up exactly the same as total number in each group or 100 percent due to multiple entries.^d *p* values for significant difference between Accepted and Refused groups (*p* = 0.05).

Table 3.Independent variables for Telehealth Initiation with $p \leq 0.05$ in bivariate analysis

Category	Title	Operationalization	<i>p</i>
Socio-demographic	Age	Binary (<76, ≥76)	0.042
	Gender	Male	0.156
	Race/Ethnicity	Black or African American	0.086
		Hispanic or Latino	0.018
		White	0.190
	Payer source	Medicaid traditional fee-for-service	0.001
Effort Expectancy		Private	0.123
	Vision	3 categories	0.042
	Ability to Hear	4 categories	0.140
	Speech and Oral Expression of Language	4 categories	0.008
	Cognitive Function	4 categories	0.025
	When confused	4 categories	0.011
	When Anxious	4 categories	0.113
	Cognitive, behavioral, and psychiatric symptoms	Pt has memory deficit	0.010
		Pt has none of the above behaviors	0.004
	Frequency of Disruptive Behavior	3 categories	0.079
Facilitating Conditions	Patient Living Situation	3 categories	0.132
	ADL assistance	5 categories	0.011
	IADL assistance	5 categories	0.012
	Medical procedures	5 categories	0.129
	Management of Equipment	5 categories	0.058
	Advocacy or facilitation	5 categories	0.021
	How Often ADL/IADL assistance	6 categories	0.246
	Household tasks	3 categories	<0.001
	Respiratory Treatments	Pt is utilizing respiratory treatment at home	0.211
	Grooming	4 categories	<0.001
	Ability to Dress Upper Body	4 categories	0.001
	Ability to Dress Lower Body	4 categories	0.005
	Bathing	7 categories	0.001
	Toilet Transferring	5 categories	<0.001
	Toileting Hygiene	4 categories	<0.001
	Transferring	5 categories	<0.001
	Ambulation/Locomotion	6 categories	<0.001
	Feeding or Eating	3 categories	0.014
	Ability to Plan and Prepare Light Meals	3 categories	0.144
	Ability to Use Telephone	6 categories	0.004
	Drug Regimen Review	Problems found during drug regimen review	0.095
	Patient/Caregiver High-Risk Drug Education	3 categories	0.102
	Management of Oral Medication	5 categories	0.078

Category	Title	Operationalization	<i>p</i>
	Pressure ulcers intervention	3 categories	0.001
	Pressure ulcers treatment	3 categories	0.213

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Table 4.**Final Multivariate Logistic Regression Model for Telehealth Initiation**

Category	Covariates	Reference	AOR	95% CI	p
Socio-demographic	Age 76	<76	1.01	[0.85, 1.19]	0.951
	Male	Female	1.09	[0.92, 1.29]	0.304
	Payer source (Medicaid traditional fee-for-service)	Other than Medicaid TFFS	1.73	[1.18, 2.56]	0.005
Effort Expectancy	Anxious	None			
	Less often than daily		1.31	[1.05, 1.62]	0.015
	Daily, but not constantly		1.04	[0.80, 1.70]	0.751
	All of the time		0.55	[0.19, 1.39]	0.191
Facilitating Conditions	Respiratory treatment	No	1.27	[1.02, 1.58]	0.030
	Grooming	Independent			
	Utensils must be placed		0.94	[0.74, 1.20]	0.612
	Someone must assist		0.77	[0.58, 1.01]	0.063
	Dependent entirely		0.37	[0.20, 0.68]	0.001
	Prior function: Household tasks	Independent			
	Need some help		0.63	[0.49, 0.82]	<0.001
	Dependent		0.55	[0.42, 0.71]	<0.001
	*High-risk drug education	No			
	Yes		1.80	[1.03, 3.16]	0.039
	Not taking high-risk drugs		1.73	[0.94, 3.18]	0.078
	Frequency of ADL/IADL assistance by caregivers other than HHA	Daily			
	Three or more times per week		0.83	[0.61, 1.14]	0.262
	One to two times per week		1.01	[0.71, 1.44]	0.973
	Received, but less often than weekly		0.66	[0.39, 1.10]	0.111
	No assistance received		0.54	[0.32, 0.91]	0.021
	Unknown		0.46	[0.13, 1.61]	0.226

Note. N=2,832. AOR=adjusted odds ratio; CI=confidence interval; ADL=activities of daily living; IADL= instrumental activities of daily living; HHA=home health aide.

* High-risk drug education: Yes = The patient takes high-risk drugs (e.g., anticoagulants or hypoglycemics) and the patient/caregiver received education from the visiting nurse, No= The patient takes high-risk drugs (e.g., anticoagulants or hypoglycemics), but the patient/caregiver did not receive education from the visiting nurse, Not taking high-risk drugs = The patient does not take high-risk drugs (e.g., anticoagulants or hypoglycemics).