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Impact of a Novel Multi-Specialist Telemedicine Consultation Program Model of Care for Homebound Older Adults

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ABSTRACT

Introduction	In 2015, a centralized Multi-Specialist Telemedicine (TM) Consultation Program was established to improve access to specialist care and enhance continuity of care for homebound older adults in Toronto, Canada. Community-dwelling patients were referred to the program by their primary care providers (PCP), treating specialists, and inpatient physicians for specialist-led post-hospital discharge follow-up care. A clinical nurse specialist (CNS) thereafter collaborated with hospital-based consulting specialists, utilizing videoconferencing technology to facilitate consultations and follow-up visits for homebound patients.
Methods	We conducted a retrospective observational study of the overall intervention including patient characteristics and the number/type of consultations provided by analyzing the clinical charts of each enrolled patient. Satisfaction surveys were conducted after five years of program implementation with patients, family caregivers and healthcare providers utilizing paper-based questionnaires administered by members of our research team. Data were analyzed using summary statistics.
Results	From April 2015 to March 2020, this program supported a total of 216 homebound patients, with an average age of 84 years, and an average Charlson Comorbidity Index (CCI) of 3.36. Patients received a total of 1,003 consultation and follow-up visits from 42 specialist care providers representing 22 unique clinical specialties. 59 (27%) patients and family caregivers and 22 specialist and primary care providers voluntarily completed satisfaction surveys. 100% of surveyed patients and caregivers reported being very satisfied with the program and 86% of physicians reported that the program enhanced their delivery of patient care.
Conclusion	Our TM program had a high participation rate and showed promising results in improving the delivery of patient care by centrally facilitating multi-specialist consultations and maintaining continuity of care for homebound older adults in an urban setting, which may have potentially reduced future ED visits. The program also received high satisfaction rates among providers, patients, and caregivers, indicating a positive response to its implementation.

INTRODUCTION

Homebound older adults are among the most vulnerable patients given their medical and social complexities and functional limitations. Homebound older adults are defined as patients who are unable to independently leave their homes due to mobility and/or illness-related concerns. These individuals often default to accessing acute hospital services to receive medical care. Therefore, emergency department (ED) use, hospitalization, and readmission rates for homebound patients are estimated to be twice that of patients who are not homebound. ED visit rates have been cited to be as high as 68% in

low-income homebound older adults over a one-year period and homebound older adults have been estimated to be among the top 5% of highest utilizers of medical services.[1]

The disproportionate use of acute care services by older homebound individuals is typically the result of significant difficulties in accessing community-based primary and specialist care and inadequate coordination between both specialist and primary care providers (PCPs.)[2] Hence, providing both access to and continuity of care in a centralized fashion can be an effective strategy to prevent ED visits, hospital admissions, and readmissions for older adults with complex care needs, particularly for those who are homebound.[3] Interventions aimed at improving continuity of care delivered through telemedicine have shown promising results in reducing ED visits, hospital admissions, and readmissions among patients [3] and improving patient satisfaction by connecting older adults to care providers, reducing the need to travel and ultimately improving access to care.[4] However, no known programs have been developed to provide older homebound adults with centralized access to multi-specialist care using telemedicine to more comprehensively address their care needs.

In 2013, the Toronto Region of Ontario Health issued a request for proposals to design and implement new innovative models of care built leveraging the use of Ontario Telemedicine Network (OTN) technologies. Mount Sinai Hospital secured funding from the Toronto Region of Ontario Health to launch a nurse-enabled specialist telemedicine (TM) consultation program for older homebound patients across the City of Toronto that leveraged the advanced assessment and management skills of a full-time clinical nurse specialist (CNS) in geriatrics to facilitate consultation and follow-up visits with a variety of specialist care providers. While this program's specific impact in supporting homebound patients living with congestive heart failure has been described in a previous publication,[5] the overall program and its provider, patient, and caregiver satisfaction outcomes have not been formally described in detail. This paper has been written to serve as a source of useful guidance for other healthcare systems looking to better serve older homebound patients by improving their access to and continuity of care from typically 'hospital-bound' specialists.

METHODS

A retrospective observational study was conducted with patients enrolled in the Multi-Specialist Telemedicine Consultation Program that was implemented in Toronto, Canada between 2015 and 2020. This program evaluation received ethics approval from Sinai Health's Research Ethics Board.

Intervention

Mount Sinai Hospital's Department of Nursing in collaboration with its Department of Medicine's Division of General Internal Medicine and Geriatrics created a nurse-enabled specialist telemedicine consultation program that leveraged the role of a Clinical Nurse Specialist (CNS) in Geriatrics to facilitate consults and follow-up visits with diverse specialist providers. While this program was informed by prior studies that investigated the effect of telemedicine on homebound older adults,[3,6,7] this program was unique such that: (a) the CNS recruited to lead this program received additional in-depth training to facilitate specialist consultations aided by additional geriatric assessment and screening methods (b) there was centralized access to multi-specialist care aimed to comprehensively address a multitude of health issues, and (c) there was greater continuity of care across transitions in care environments by enhanced inter-professional team-based communication and collaboration.

The CNS hired for this intervention received in-depth training in conducting comprehensive geriatric assessments from the hospital's geriatricians. The CNS also provided administrative and management support to the program, acting as a central point of contact for patients and families, their PCPs and specialists. Face-to-face consultations were facilitated by the CNS using the Ontario Telemedicine Network (OTN), a secure telemedicine platform for medical interactions installed on a portable computer with a webcam. Upon receiving a referral, the CNS set up two in-person

appointments with the patient. During the first appointment, the CNS conducted physical, functional, and cognitive assessments at the patient's home. The CNS connected with the patient's pharmacy to obtain the patient's prescription medication history. Based on their initial assessment, the CNS determined the urgency with which a specialist consultation needed to take place. A nursing summary report that included test results from blood work, pre-assessment findings, and medication history was provided to the specialist to facilitate their provision of care.

Following the initial appointment, an OTN-enabled specialist consultation assessment visit was arranged by the CNS. During this visit, the CNS returned to the patient's home and set up their digital equipment, remained present during the virtual specialist consultation assessment, reviewed the established plan of care with the patient and their family caregivers following the assessment and updated the PCP regarding the recommendations. If a follow-up visit was required, the CNS would schedule this appointment with the specialist and patient and respectively update the patient medical report electronically. Alternatively, if a patient did not require a follow-up visit, the patient was discharged from the program and transitioned to the care of their ongoing care providers.

Patient Population and Enrollment

The communication between patients and providers is depicted in **Figure 1.** Patients referred to the program were aged 65 years or older, homebound (i.e., unable to leave home without aid due to illness and/or mobility concerns) and resided within Toronto. This program received patient referrals from (1) PCPs and specialists who had homebound patients in their care that required ongoing consultation and follow-up; and (2) inpatient physicians who identified a homebound patient's need for specialist-led post-hospital discharge care.

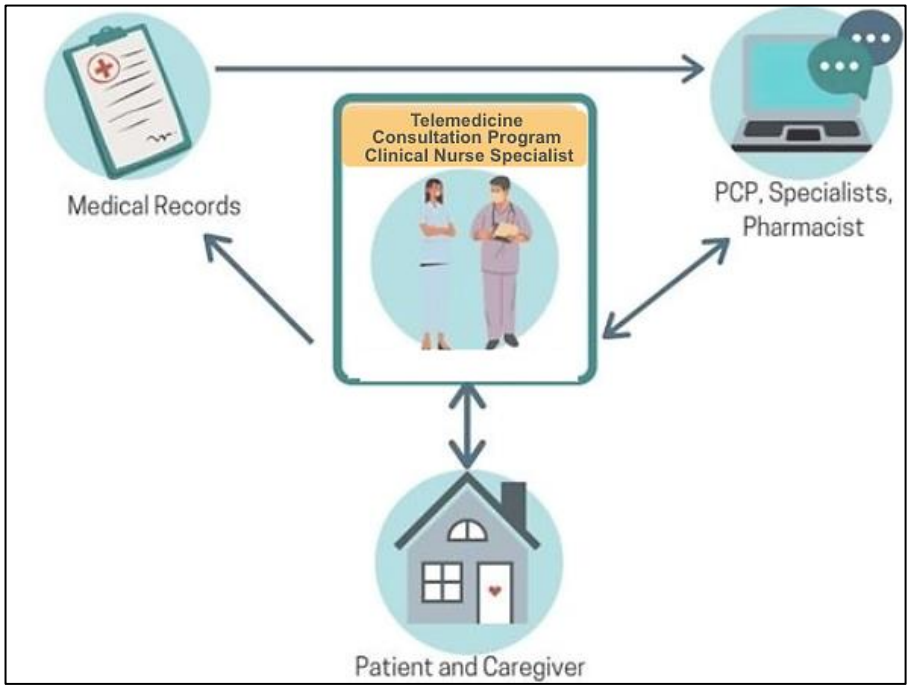

Figure 1: Toronto Central Local Health Integration Network

Program Equipment

Virtual consultations between specialists, PCPs, and their homebound patients were facilitated by the CNS using the OTN secure mobile TM technology platform for medical interactions. At patients' homes, the CNS used an HP EliteBook 850 equipped with a portable Logitech C615 HD Webcam and Jabra Speak 410 portable speaker. To connect with the patient, specialists used their own computers or hospital-designated computers and required access to a webcam and speaker. Secure internet access was obtained using a Rogers RocketTM Stick.

Appointment Scheduling

Participating specialists were principally recruited for this program through the OTN platform which provides specialists the opportunity to offer virtual care. Before partaking in a scheduled TM-enabled appointment, all specialists (n=42) were required to be registered with OTN and have access to an OTN platform-enabled computer. If the specialist was not registered at the time of their recruitment

to participate in this program, the CNS initiated and assisted with their OTN care provider registration process and ensured that the specialist had access to an OTN platform-enabled computer. In advance of the pre-determined appointment date, the CNS connected with the patient or family and provided an explanation of the program's process as well as obtained verbal consent from the patient and family to participate. The CNS scheduled all TM appointments in Ncompass, an online scheduling tool designed for OTN members to schedule and manage videoconferencing events. For repeat consultations or follow-ups, appointments were scheduled at the time of visit and both parties were reminded of the appointment through a confirmation email sent in Microsoft Outlook by the CNS.

Clinical Nurse Specialist (CNS) Role

In their role, the CNS provided administrative and management support to the project. They managed referrals, recruited specialists, set up consultations and follow-up appointments in Ncompass, registered patient visits, and assigned medical record numbers to new patients to link their records to Mount Sinai Hospital's electronic health record. In addition, they prepared a relevant patient history through a chart and medication review and performed a cognitive assessment and a focused geriatrics assessment. The CNS further acted as a central point of contact for patients and family/caregivers, their PCPs and TM specialists.

Primary Care Provider Role

PCPs were a primary patient referral source to the specialist TM program. Prior to a patient's specialist consultation, PCPs assisted the CNS by collecting necessary background patient information as well as ordering blood tests and other investigations required to facilitate a specialist consultation. PCPs were encouraged to attend the consultation. Following the specialist consult, the PCP, if not in attendance of the actual consultation (via OTN), was informed of the specialist provider's findings and recommendations through an official consultation or follow-up note.

Specialist Role

The specialists reviewed all pre-assessment information gathered and conducted a clinical consultation or follow-up with the patient or caregiver and the CNS via an OTN-enabled platform. Following the consultation, the specialist was responsible for sending their recommendations to the PCP with the support of the CNS. Specialists were also supported to refer enrolled patients to other specialists and allied health providers as required.

Measures and Statistical Analysis

Data was collected and reported on regularly to support program quality outcomes. Data collection by the CNS began immediately after the start of the program and included patient characteristics and the number/type of consultations provided by analysis of clinical charts. Satisfaction surveys were conducted in 2020 with patients, family caregivers, and healthcare providers utilizing paper-based questionnaires administered by members of our research team.

Analysis

Summary statistics (i.e., mean, standard deviation, number) were used to describe patient demographics. Categorical variables are presented as percentages. The statistical software package SPSS 15.0 was used for statistical analysis.

RESULTS

Sample Characteristics

Between April 2015 and March 2020, 218 older homebound patients were referred to this program. Only two patients refused to participate (0.09% refusal rate.[8]) As a result, this program supported 216 older homebound patients, with an average age of 84 years, an average Charlson Comorbidity Index (CCI) of 3.36, and a 1-year estimated mortality rate of 52%.[9] (**Table 1**).

Table 1: Demographics of Patients Participating in the Specialist Telemedicine Program

Characteristics	**N, % (n=216)**
Sex (Female)	124 (57.9%)
Age (Mean±SD)	84.2 ± 10.0
Resources	
Living alone	78 (39.2%)
Connected to Local Health Integration Network Home and Community Care Services (LHIN)	150 (74.3%)
Complexity	
≥ 5 Medications	196 (94.2%)
Cognitive impairment	60 (27.8%)
Charlson Comorbidity Index Score	
Unadjusted	
Low (1-2)	89 (42.8%)
Moderate (3-4)	79 (38.0%)
High (≥5)	40 (19.2%)
Age-Adjusted	
Low (1-2)	9 (4.3%)
Moderate (3-4)	13 (6.3%)
High (≥5)	186 (89.4%)

Furthermore, 95% of the patients were found to have at least 3 chronic conditions and 91% were taking five or more prescribed medications at the time of their initial visit. 60 (27.7%) patients were living with some form of cognitive impairment. Collectively, these 216 unique patients received a total of 1,003 consultation and follow-up visits over a five-year period from 42 specialist care providers representing 22 different specialties, an average of 4.6 appointments per patient (median:4, range:1-6). Excluding geriatric medicine, the three most commonly accessed specialties were Cardiology, Psychiatry, and Cardiovascular Surgery, accounting for 77.7%, 4.4%, and 2.8% of all consultations. (**Table 2**). The number of consultations and visits completed each year increased from 100 performed during the first year of the program's operation to almost 400 in 2020. Patients spent an average of 413 days enrolled in the TM program.

Table 2: Specialist Telemedicine Program Consults

Specialty Consulted	**Number of Consults**	**Proportions**
Cardiology	779	77.7%
Cardiovascular Surgery	28	2.8%
Dermatology	9	0.9%
Endocrinology	2	0.2%
Family Medicine (PCP)	10	1.0%
Gastroenterology and Hepatology	2	0.2%
Geriatric Medicine (Separate to CGA)	25	2.5%
Hematology	8	0.8%
Infectious Diseases	3	0.3%
Nephrology	25	2.5%

Neurology	7	0.7%
Orthopedics	1	0.1%
Osteoporosis Specialists (non-endocrinologists or geriatricians)	13	1.3%
Palliative Care	2	0.2%
Physiatry	9	0.9%
Psychiatry	44	4.4%
Respirology	8	0.8%
Rheumatology	8	0.8%
Pain Medicine	19	1.9%
Wound Management (not allied health/nursing)	1	0.1%

Patient Satisfaction

59 patients and family caregivers and 22 specialist and primary care providers voluntarily completed satisfaction surveys. 100% of surveyed patients and caregivers reported being very satisfied with the program and 86% of care providers reported that the program enhanced their delivery of patient care.

DISCUSSION

This study describes the implementation of a unique telemedicine-based initiative aimed to provide older homebound patients with improved access to specialist care and presents a preliminary descriptive analysis of the program's general impact and its overall impact on patient and provider satisfaction. To date, previous studies of telemedicine interventions to support continuity of care have often focused on a narrow range of conditions such as chronic respiratory or heart failure,[3,10] excluded homebound older adults,[10] and have not supported the collaboration between patients' PCPs and specialists.[11] This study demonstrated the feasibility of implementing a program that comprehensively addresses a multitude of conditions in homebound older adults by facilitating virtual specialist consultation and follow-up assessments. The framework presented here may help to guide other sites who are considering instituting a similar model of care.

Given that most patients enrolled in this program had a high number of comorbidities, our program was able to create a central point of contact for these medically complex patients. This helped them to navigate the healthcare system. While not a goal of this study, this finding may have potentially reduced future ED visits for homebound older adults[12] and likely enhanced their quality of care by allowing for better communication between various care providers. A study that examined the outcomes of patients specifically enrolled in this program to better manage their congestive heart failure found that it decreased annualized ED visits and hospitalizations in the year following enrollment.[5] Moreover, an evaluation of the role of interdisciplinary, telehealth-enhanced, home visits (IN-HOME-PD) in the context of homebound patients with Parkinson's disease indicated that quality of life remained stable, bodily discomfort was reduced while use of hospice care and deaths at home increased, indicating this model's potential benefits of providing care continuity and goal-concordant care for diverse populations living with advanced Parkinson's disease.[13]

The benefits of having a central healthcare professional like a CNS, who can navigate the health and social care system, provide informational support around follow-up care, schedule appointments, operate and troubleshoot the use of digital technology, and implement management plans while building relationships with patients and caregivers, has been cited as particularly beneficial for older adults with complex care needs.[14] Moreover, having a central person who can support informational continuity across multiple different healthcare systems (e.g., electronic health record systems) has been reported to be highly valued by older adults and result in better care plan adherence and disease control through enhanced physician-provider relationships.[15]

This study's results demonstrate that the program was well-received by both patients and providers. Additionally, our program had a high participation rate, which refutes the common assertion that older adults are not as willing to engage with technology-based interventions.[16] Existing research has found similar findings concerning patient satisfaction. The use of telemedicine services are rated high in instances where older adults have to operate the technology themselves.[17] Nevertheless, barriers to the uptake of telemedicine, such as poor social determinants of health (e.g., low education, individuals with limited English-proficiency and certain racial/ethnic groups) and the digital divide (i.e., gaps in access and participation in use of technology,[18]) need to be addressed on a larger scale to make the provision of more telemedicine-facilitated care both equitable and accessible to all homebound older adults.[10]

Despite challenges in access to digital technology for older adults with sensory and cognitive impairments,[19] the involvement of a CNS can help mitigate some barriers to its use with these patients. The increasing uptake of digital health interventions to support continuity of care for older adults with complex needs,[10] as demonstrated by our program's uninterrupted operations during the initial stages of the COVID-19 pandemic, highlights the effectiveness of telemedicine programs in ensuring care continuity, particularly when homebound older adults may be hesitant to seek in-person medical care.[20] Such programs hold promise for improving access to specialist care, facilitating communication within interdisciplinary teams, and potentially reducing unnecessary ED visits. Coordinating telemedicine programs like ours with other in-home services for vaccinations, allied health visits, investigations, and proactive longitudinal follow-up, can address homebound older adults' holistic needs without interruption for consultation and orders. Additionally, future studies should explore mechanisms to implement similar CNS-enabled telemedicine programs in nursing or long-term care homes where patients may be homebound to their facility and unable to access certain types of specialist care.

Limitations of the Study and Barriers to the Widespread Scale of this Model of Care

Telemedicine alone can be a disruptive innovation for care providers as the adoption of its model changes the way that they manage their practice and office processes.[21] Thus, having to coordinate integrated care from multiple centers and providers adds a layer of complexity that requires additional clerical resources that, in our study, was managed by the CNS. Secondly, the OTN, whose platform is required for access to the centralized TM program, was originally developed to improve access to care for people living in rural and remote areas through designated care sites. Adapting the technology platform to an urban setting presented unique challenges including the technology's compatibility with different hospital systems as well as OTN connectivity within the city. These technological challenges limited the value of the program during some interactions. More studies are required to establish the generalizability of this study to other urban and rural centers. Lastly, one limitation of the program's evaluation is that satisfaction surveys were only initiated in 2020, after the program had been running for several years. This delayed implementation of feedback collection may have influenced the survey response rates and quality of responses, possibly affecting the accuracy of the satisfaction data. Additionally, we did not conduct a cost-benefit analysis of the CNS role, which could have provided valuable insights into the economic impact and potential cost-effectiveness of implementing the telemedicine program. Understanding the financial implications would be essential for policymakers and healthcare organizations in making informed decisions regarding the sustainability and scalability of such CNS-enabled telemedicine initiatives. Further research that includes a comprehensive cost-benefit analysis would be valuable to assess the program's overall feasibility and long-term viability in improving care outcomes for homebound older adults.

CONCLUSION

With the field of telemedicine to support older adults with complex care receiving increasing attention during the COVID-19 pandemic,[10] we hope that the framework presented here may help to provide guidance for other sites considering instituting this model of care to support homebound patients. Further studies are needed to further explore the experiences of patients and care providers in terms of satisfaction and perceptions of care, as well as determine this program's overall impact on outcomes such as rates of ED presentation, hospital admissions and readmissions and lengths of hospital stay beyond patients living with congestive heart failure.

KEYWORDS

Telehealth, Referral and Consultation, Hospital Costs, Heart Failure

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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All authors except for KMK, AG, and PK were involved in the study concept and design. MAH and NT recruited patients and directly delivered the care model. All authors, with the exception of NT, were involved in data analysis and interpretation. KMK and PK drafted the manuscript, which all other authors extensively revised.

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