Published in final edited form as:

Geriatr Nurs. 2017 ; 38(3): 213–218. doi:10.1016/j.gerinurse.2016.10.013.

Characterizing the High-Risk Homebound Patients in Need of Nurse Practitioner Co-Management

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Abstract

By providing more frequent provider visits, prompt responses to acute issues, and care coordination, nurse practitioner (NP) co-management has been beneficial for the care of chronically ill older adults. This paper describes the homebound patients with high symptom burden and healthcare utilization who were referred to an NP co-management intervention and outlines key features of the intervention. We compared demographic, clinical, and healthcare utilization data of patients referred for NP co-management within a large home-based primary care (HBPC) program (n=87) to patients in the HBPC program not referred for co-management (n=1027). A physician survey found recurrent hospitalizations to be the top reason for co-management referral and a focus group with nurses and social workers noted that co-management patients are typically those with active medical issues more so than psychosocial needs. Co-management patients are younger than non-co-management patients (72.31 vs. 80.30 years old, $P<0.001$), with a higher mean Charlson comorbidity score (3.53 vs. 2.47, $P=0.0001$). They have higher baseline annual hospitalization rates (2.27 vs. 0.61, $P=0.0005$) and total annual home visit rates (13.1 vs. 6.60, $P=0.0001$). NP co-management can be utilized in HBPC to provide intensive medical management to high-risk homebound patients.

Introduction

Advanced practice nurses (APNs), which include nurse practitioners (NPs),¹ have been critical in the care of older adults with chronic conditions.² Though APN interventions vary

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broadly, many involve clinical counseling,^{3,4} comprehensive assessments,³⁻⁶ interdisciplinary care coordination,³⁻⁶ patient education,^{3,4,7} transitional care, and telephone follow-up.³ Studies have found APN interventions to be particularly beneficial for older patients at high risk of poor post-discharge outcomes⁸⁻¹⁰ and have demonstrated reduced care utilization specifically among high-risk subgroups.¹¹ Although studies differ in the criteria used to describe patients' risk status,¹²⁻¹⁴ the concept of "complex chronic disease" is generally linked to aging and frailty in addition to the presence of multiple medical comorbidities, high healthcare utilization, and polypharmacy.¹⁵

NPs provide more education to patients about their illnesses^{16,17} and improve patient compliance with medications and care.¹⁶ These skills may be particularly effective in the home, where the NP can observe the individual's home situation, include caregivers in care-related conversations, and develop a relationship with the patient.¹⁸ Given the reported success of NPs in enhancing the care of complex patients, further research is necessary to examine how they can be successfully utilized in caring for homebound patients with multiple medical comorbidities and high healthcare utilization. Therefore, we implemented co-management of patients by an NP and a physician primary care provider (PCP) who practice in an interdisciplinary team within a home-based primary care (HBPC) program serving the urban homebound. Based on previous interventions,³⁻⁷ the NP's role within the interdisciplinary care team was focused on maintaining ongoing communication with patients' PCPs and providing timely medical assessment and decision-making via home visits and telephone calls, particularly after hospital discharge. The intervention has resulted in reductions in annual hospitalization and readmission rates at 18 months follow up.¹⁹

NP-PCP collaboration within a multidisciplinary care team is critical in enhancing the care of medically complex patients, and it is important to understand which subgroup of patients is most likely to benefit from this collaborative care model. We hypothesized that co-management is most beneficial for patients with active medical issues who have high healthcare utilization and require frequent home visits. This paper uses a mixed methods approach to describe the homebound patients who were referred to the NP co-management intervention. We describe patient demographics, medical comorbidities, and frequency of home visits and hospitalizations. We also provide findings from physician surveys and a focus group with nurses and social workers on reasons for referral to co-management and specific elements of the care model that are most beneficial for this sub-group of patients.

Intervention

There are approximately 2 million older adults in the U.S. who are homebound and have difficulty accessing traditional medical care.²⁰ The Mount Sinai Visiting Doctors Program (MSVD), which serves more than 1,500 homebound patients in Manhattan, 85% of whom are over 70 years of age,^{21,22} is the largest academic HBPC program in the United States. MSVD has an interdisciplinary staff of physicians, NPs, registered nurses (RNs), social workers (SWs), and administrative assistants who provide primary care, palliative care, and social services to the urban homebound. The physicians are certified in internal medicine or family medicine and many are also geriatricians or palliative medicine specialists. Physicians are the PCPs for their patients. They see patients every 10-12 weeks and make

more frequent or urgent visits when there is clinical need. MSVD patients have access to 24-hour physician telephone coverage.²² PCPs are the main point of contact for their patients, while RNs assist with triage and SWs see all patients on admission and as necessary by referral afterwards.

While the majority of MSVD patients are not hospitalized, a small group of patients is admitted frequently²³ or has higher symptom changes and frequent urgent visit needs. To address this, MSVD implemented the NP co-management program in January 2012. Aims of the program were to identify high-risk patients, improve quality of care for patients, reduce caregiver stress, and decrease provider burnout. MSVD PCPs could refer to co-management those patients who met the following criteria: frequent hospitalizations and emergency department (ED) visits, profound caregiver stress, or uncontrolled symptoms such as diabetes, severe wounds, congestive heart failure, or chronic obstructive pulmonary disease.

For this intervention, one NP previously serving as a provider at MSVD cared for all patients requiring co-management for the entire duration of the NP co-management program, from January 2012 until May 2016. At the initiation of the co-management program, the NP had 9 years of experience as a nurse in the fields of geriatrics and home care.

Referral process

Patients were referred to the co-management program through a referral form in the electronic medical record (EMR) that was completed by the PCP and sent to the NP to review along with the patient's chart. The PCP indicated the reason for referral, including frequent hospitalizations or uncontrolled symptoms, and particular symptoms or diseases prompting the need for co-management, such as pain, dyspnea, or depression. The physician noted medication management issues, including adherence or anticoagulation monitoring, as well as issues impacting quality of life, such as caregiver stress or lack of home care. If the referral was deemed appropriate for co-management, the NP scheduled the initial co-management visit and obtained a more detailed patient history from the PCP. In addition, the NP regularly reviewed hospitalization lists for patients with frequent admissions to identify co-management referrals.

NP role

The NP became the provider on record for all co-management patients. Among his visits, the NP conducted post-discharge visits no later than 14 days after a patient's hospital or ED discharge and within 7 days when possible. Taking into account the visits conducted by both the NP and PCP, patients enrolled in NP co-management were seen at least monthly by one of these two providers. NP visits averaged 60 minutes in duration.

In addition to making home visits, the NP triaged acute patient problems, mainly by addressing telephone calls at a provider level in a timely manner. Triage could involve speaking with the patient, caregiver, home care nurse, therapist, or other providers and the NP's tasks included adjusting medications, requesting home care nurse visits, or ordering labs or imaging.

Materials and methods

Design

This observational study was approved by the Icahn School of Medicine at Mount Sinai Institutional Review Board (protocol #12-00399). This was a mixed methods study that included a survey, focus group, and chart review. We used a survey and a focus group to collect data from PCPs, RNs, and SWs about the patients who they considered would benefit most from co-management and the particular aspects of co-management that they deemed valuable for these patients. Additionally, using a chart review we conducted a quantitative analysis to compare the demographic and medical characteristics of patients who were and were not referred for NP co-management.

Sample

We administered an anonymous online survey to all 13 physicians (PCPs) active in MSVD in July 2013. All the physicians had previously consented to participation in the NP co-management intervention. A focus group was conducted with all MSVD SWs (N=5) and RNs (N=2) in July 2013.

Our total patient sample consisted of all 1114 patients who were active in MSVD for at least 30 days in the 1.5 years between January 1, 2012 (the start of the co-management program) and July 1, 2013. No MSVD patients were excluded from the sample. Of the 1114 patients, 1027 were non-co-management MSVD patients and 87 were MSVD patients enrolled in NP co-management for at least one day during the study period. MSVD patients were referred to the co-management program using the criteria described above under *Intervention*. Any patient enrolled in co-management for at least one day during the study period was included in our sample as a “co-management” patient. There was no specific consent process for patients referred to co-management, as the intervention became the standard of care for any patient referred to co-management by his/her physician. However, the patient was given the option of refusing co-management services.

Measures

Physician survey—The objectives of the survey were to assess reasons for referral to co-management, processes of care for co-management patients, degree of NP-physician collaboration, and overall experience with the intervention. The survey was created by author MJ in collaboration with an expert on questionnaire construction. It was reviewed for face validity by three individuals involved with the NP co-management program, including one MSVD physician (author LD), and feedback was integrated into the final version of the survey that was disseminated to MSVD physicians.

The survey consisted of 24 questions designed specifically for this project. There were 20 multiple choice questions, of which the majority had a Likert-type scale of responses. There were also four short response questions. Questions focused on physician satisfaction with NP co-management and their perceptions of the program's impact as well as their impressions of the utility of specific elements of co-management. Physicians were also specifically asked to list 3 reasons for which they refer patients to co-management.

Focus group—Focus group topics included referral to co-management, patient care, the co-management process, and social work needs. Focus group participants described the types of patients who were referred to co-management, the patients who they felt benefited most from the intervention, and specific elements of the intervention that they found were particularly valuable for patients.

Chart review—We compared demographic and clinical data as well as home visit and hospitalization rates of MSVD patients referred by their PCPs for co-management to MSVD patients not referred for co-management. Demographic information, diagnoses, and hospitalizations were obtained from the EMR. We compared the co-management sample with the non-co-management MSVD patient sample on the following demographic characteristics: age at admission to MSVD, gender, race/ethnicity, enrollment in MSVD for more than one year, marital status, and insurance status. We also compared the following comorbidities according to the two groups: depression, skin ulcers, diabetes mellitus, chronic pulmonary disease, congestive heart failure, dementia, cerebrovascular disease, peripheral vascular disease, anxiety disorders, renal disease, obesity, malignancy, myocardial infarction, and rheumatic disease. Information on patients' home visits was obtained from billing records and the NP's direct documentation of encounters.

Analysis

Multiple choice responses from the physician survey were populated in the aggregate into a Microsoft Excel spreadsheet. Short responses were populated into the Excel spreadsheet verbatim as written by the provider in the online survey. Author MJ reviewed the responses to each survey question as well as reviewing the survey for common overarching themes.

Author MJ took notes during the focus group. The data were then reviewed with a focus on analyzing keywords in context to identify common themes.

We used T-tests and Chi-square analyses as appropriate to test for statistical significance in continuous and categorical variables when comparing the demographic and clinical characteristics of co-management and non-co-management patients. Prevalence rates of diagnoses were calculated based on the Enhanced ICD-9-CM codes described by Quan et al. and the ICD-9 codes most commonly associated with each diagnosis among the MSVD patient population. Charlson comorbidity scores were obtained using previously described groupings of ICD-9 codes.²⁴

Patient hospitalization rates were calculated by dividing the total number of hospitalizations during the patient's time in MSVD by the patient's total days in MSVD. For those patients referred to NP co-management, we calculated their baseline hospitalization rates during their time in MSVD before co-management enrollment.

Annualized home visit rates were calculated based on days of observation in MSVD for non-co-management patients and for both their time in MSVD alone and their time enrolled in co-management for co-management patients.

T-tests were used to test for statistical significance of hospitalization and home visit data comparing co-management to non-co-management patients. Paired T-tests were used to compare home visit rates for co-management patients before and after enrollment in co-management. Analyses were conducted using the SAS 9.4 software.

Results

Characteristics of referred patients

Between January 1, 2012 and July 1, 2013, 87 patients (7.81%) of the 1114 MSVD patients were referred to co-management. Co-management patients were younger than non-co-management MSVD patients (72.31 vs. 80.30 years old, $P<0.001$) (Table 1), with a higher mean Charlson comorbidity score than non-co-management patients (mean score: 3.53 vs. 2.47, $P=0.0001$; 56.32% vs. 38.27% with score ≥ 3 , $P=0.001$). Co-management patients had lower rates of dementia and higher rates of depression, skin ulcers, anxiety disorders, obesity, myocardial infarction, congestive heart failure, peripheral vascular disease, chronic pulmonary disease, diabetes, and peptic ulcer disease than non-co-management MSVD patients.

Co-management patients had higher annual hospitalization rates during their time in MSVD before enrollment in co-management, compared with non-co-management patients (2.27 vs. 0.61, $P=0.0005$). A greater percentage of co-management than non-co-management patients had at least one hospitalization (56.32 % vs. 27.65%, $P<0.001$) during their time in MSVD before co-management. Before co-management enrollment, co-management patients received an average of 13.1 total home visits annually, compared to an average of 6.60 visits yearly for MSVD patients not referred to co-management ($P=0.0001$).

Our survey for MSVD physicians gave respondents the option to write in up to three reasons for which they typically refer patients to co-management. The most frequently cited reason was recurrent hospitalization, followed by the need for more frequent home visits, complex wound care, and high symptom burden (Figure 1). Physicians could also write cases in which they would *not* refer a patient for co-management despite the patient meeting eligibility criteria. One common theme centered around provider-patient relations, which included a difficult patient/family dynamic, patient refusal to speak with other providers or the need to have direction from just one provider, or, conversely, a strong connection between the PCP and patient/family. Another case in which physicians may not have referred patients to co-management was if they felt that increased visit frequency would have no benefit or if numerous services were already in place with little benefit for the patient. Lastly, two providers noted that they would not refer patients with end-of-life related needs. In responses to the multiple choice question asking whether co-management is beneficial for end of life patients, 11 of 13 PCPs agreed or strongly agreed while 2 providers disagreed. MSVD RNs and SWs expressed that co-management is more indicated for acute issues rather than for end of life issues, unless a patient transitioned to end of life care while already enrolled in co-management.

Focus group participants noted that co-management patients were typically those with medical conditions that had potential for improvement rather than patients with complex

psychosocial issues. Although social work services were available to all co-management patients, these patients had less social work involvement at any given time than non-co-management patients, with their top social work need being care coordination.

Intensive care management

The NP provided increased home visit frequency for co-management patients; the patient's physician PCP continued to make home visits, though less often. After enrollment in co-management following a period of being in MSVD alone, co-management patients received fewer physician visits (6.5 vs. 12.3 visits/year, $P=0.0021$) but more annual home visits overall (17.1 vs. 13.1 visits/year, $P=0.067$). All 13 PCPs agreed or strongly agreed that the increased number of combined visits by the NP and physician was beneficial for co-management patients. All PCPs also agreed or strongly agreed that calls from co-management patients were addressed faster than they would be otherwise, and focus group participants similarly noted that telephone calls were returned promptly for co-management patients. Focus group participants noted that urgent issues were typically addressed faster for co-management patients and all PCPs agreed or strongly agreed that the NP was more available than PCPs to make unscheduled urgent visits. In addition, 12 of 13 physicians agreed or strongly agreed that co-management patients are more likely to be seen sooner after hospital discharge than non-co-management patients.

Discussion

The high-risk homebound patients referred to MSVD's NP co-management program tended to be younger than the non-co-management MSVD population at their time of admission to MSVD. A possible explanation for this finding is that older individuals whose goals of care were palliative may have been less likely to be referred to NP co-management. Although the majority of providers noted in the survey that NP co-management is beneficial for end-of-life patients, this was not mentioned specifically as a common reason for referral to co-management. As expressed in the focus group, co-management was considered to be more beneficial for patients with active medical issues who required more frequent provider contact and intensive medical management rather than for palliative care patients. This finding is consistent with SW and RN comments that co-management patients tended to have more medical issues than psychosocial issues requiring social work intervention. Additional research could help to understand why co-management is not used more frequently for palliative care and to elicit factors that could help facilitate the use of this model in palliative care if providers think it would be beneficial for this patient population.

Patients referred to co-management had higher Charlson comorbidity scores and higher prevalence of most diseases with the exception of dementia. Co-management patients had higher baseline healthcare utilization than non-co-management patients, including frequent hospitalizations and a need for more home visits. These were also the characteristics for which the largest proportion of MSVD physicians referred patients to co-management.

MSVD's NP co-management program, which has successfully reduced healthcare utilization,¹⁹ addressed the needs of a high-risk subset of homebound patients in several ways. As in similar interventions,²⁵ MSVD's co-management patients received more

frequent home visits due to increased visits by the NP. Consistent with our findings, many NPs spend approximately 60 minutes per visit^{14,18} and maintain a panel size of around 50 patients.²⁶⁻²⁸ It appears that many of the conditions of co-management patients, such as wounds and pulmonary disease exacerbations, may benefit from more frequent follow-up by the NP. Focusing on real-time clinical triage through telephone accessibility allowed MSVD's NP to address medical issues promptly in an attempt to prevent unnecessary ED admissions or hospitalizations. Multiple studies have cited phone availability as an element of APN interventions.^{3,25-28} As reported elsewhere,¹⁸ our NP's follow-up calls included communication with family members, home care nurses, pharmacists, and physicians. Since the time after hospital or ED discharge can be particularly vulnerable for medically complex geriatric patients, the NP's phone accessibility, real-time clinical troubleshooting, and focus on follow-up visits within 7-14 days of discharge may have been particularly beneficial for these patients.

One limitation of our study was the delivery of the intervention by a single NP who was involved in co-management since program implementation. The NP's unique background and approach to co-management likely shaped elements of the program. Second, referral to co-management was not mandatory for MSVD patients with specific symptoms or hospitalization rates. Providers may not have used uniform criteria when referring patients to co-management. Additionally, our survey for MSVD providers was a new tool designed for this study and not validated by formal testing. However, survey questions and format were reviewed by an expert on questionnaire construction and the survey was pilot tested by three individuals familiar with the co-management program to achieve maximal clarity and avoid bias in survey wording and format. Lastly, though MJ was the sole author to analyze common themes from the survey and focus group, results were reviewed with the co-authors.

Conclusions

Our findings demonstrate that the homebound patients referred to NP co-management at MSVD tended to be younger than the general MSVD population on admission to MSVD, with lower rates of dementia and less need for social services but with more medical comorbidities and higher healthcare utilization. The intervention aimed to reduce the symptom burden and hospitalizations of these patients by increasing home visit frequency, promptly addressing patient issues, and providing more intensive care in the post-discharge period. Though our work to date demonstrates a positive impact of co-management on healthcare utilization,¹⁹ further studies should continue to assess healthcare outcomes and costs with greater duration of patient enrollment in co-management. The NP co-management model at MSVD addressed the needs of a complex and vulnerable subset of patients. It can be incorporated into other HBPC programs as the number of elderly, homebound individuals grows and health policy promotes reimbursement of high-value, patient-centered care that reduces unnecessary ED and hospital visits.

Acknowledgments

The authors thank Yasmin S. Meah, MD and Cameron R. Hernandez, MD for their participation in the implementation of the nurse practitioner co-management program. We are grateful to Eric J. Lee, MPH for statistical analysis, Mathew Jacob for data acquisition support, and Elizabeth Scott for data management.

Funding: This work was supported by the Y.C. Ho Helen and Michael Chiang Foundation; the Fan Fox and Leslie R. Samuels Foundation; the National Institute on Aging K01AG047923 (Dr. Ornstein); and the Jewish Foundation for Education of Women (Dr. Jones).

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Figure 1.
Physician referral to co-management.

Table 1
Patient Characteristics

	Co-Management ^a (N=87)	Non-Co-Management (N=1027)	P-Value
Mean (SD) age at MSVD admission: years	72.31 (15.86)	80.30 (13.71)	<0.001 ^b
% Female	70.1	76.8	0.16
% White	33.3	38.2	0.44
% in MSVD >1 year	78.2	79.3	0.81
% Single, widowed, or divorced	64.4	58.1	0.26
% with Medicaid	63.2	61.0	0.68
Mean (SD) Charlson score	3.53 (3.05)	2.47 (2.38)	0.0001 ^b
% with Charlson comorbidity score ≥ 3	56.32	38.27	0.001
<i>Patients with Diagnosis (%)</i>			
Depression	58.6	34.6	<0.001
Ulcers of skin	52.9	30.0	<0.001
Diabetes mellitus	47.1	29.7	<0.001
Chronic pulmonary disease	39.1	19.8	<0.001
Congestive heart failure	34.5	21.3	0.005
Dementia	34.5	51.9	0.002
Cerebrovascular disease	29.9	27.4	0.61
Peripheral vascular disease	27.6	12.4	<0.001
Anxiety disorders	23.0	13.6	0.017
Renal disease	20.7	17.8	0.50
Obesity	18.4	10.0	0.015
Any malignancy	17.2	16.7	0.89
Myocardial infarction	10.3	4.3	0.011
Rheumatic disease	9.2	5.2	0.11
<i>Healthcare Utilization</i>			
% of patients with ≥ 1 hospitalization	56.32	27.65	<0.001 ^b
Annualized hospitalization rate	2.27	0.61	0.0005 ^b
Total home visits/year	13.1	6.60	0.0001 ^b

^aRefers to co-management patients at baseline (i.e., while in MSVD alone, before co-management enrollment)

^bT-test; all other P-values in this table were obtained using the Chi-square test.

MSVD: Mount Sinai Visiting Doctors Program; SD: Standard Deviation