



Acute Healthcare Utilization of a Multidisciplinary Neurocognitive Dementia Patient Cohort

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Background and Purpose Upon referral from the primary care provider (PCP), dementia is diagnosed either by a neuropsychological evaluation (NPE) or at a multidisciplinary neurocognitive clinic (MNC). Following the NPE, patients continue receiving care from their PCP. In contrast, patients at the MNC are followed by a multidisciplinary care team that provides expertise across specialties in dementia care and education for the patient, family members, and care providers. The purpose of the study was to determine the utilization of acute healthcare services during the 2 years following a diagnosis of dementia in patients from the MNC and NPE.

Methods A retrospective review was performed of 581 electronic medical records from January 2010 through December 2014 for 2 cohorts of patients diagnosed with dementia 1) by a neuropsychologist or 2) in a MNC. Acute-care hospital admissions, emergency room (ER) visits, and nonroutine PCP visits were identified. Categorical demographics and utilization variables were summarized by frequency. Chi-square analysis was used to analyze demographic characteristics and overall utilization between MNCs and NPE. Utilization in comparison with various demographic characteristics was analyzed using Spearman correlation coefficients and negative binomial regressions.

Results Patients evaluated in the MNC were older, more severely impaired, and lived alone more often compared with NPE patients, but there was no increase in hospital admissions and ER visits. Patients who underwent NPE were 1.58 times more likely to have a nonroutine PCP office visit than patients evaluated in the MNC ($p=0.0093$).

Conclusions Performing follow-up in multidisciplinary clinics provides patients with more education and may help to reduce the utilization of healthcare services.

Key Words neurocognitive clinics, healthcare utilization, dementia care.

INTRODUCTION

Adults with a dementia diagnosis are associated with higher rates of acute-care hospitalizations and emergency room (ER) visits, including during 1 year prior to the diagnosis and 2 years following the diagnosis compared to elderly without dementia.¹⁻⁵ A dementia diagnosis has been associated with higher costs for acute-care hospital admissions and ER visits compared to the same services provided for the nondementia population.⁶⁻⁹ The increasing cost of healthcare stems partly from the high costs of acute healthcare hospitalizations and ER visits.¹⁰ A steadily increasing major financial burden on healthcare systems is providing care for the dementia population; for example, the total Medicare and Medicaid payments for Alzheimer's disease (AD) care were estimated to be USD\$ 221 billion in 2016, rising to USD\$ 277 billion in 2018.^{11,12}

Interventions to reduce hospital utilization, ER visits, and nonroutine primary care pro-

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vider (PCP) visits in the dementia population have been unsuccessful, with few exceptions.¹³⁻¹⁷ As the degeneration progresses, dementia patients develop new symptoms that include personality changes and abnormal behaviors. Educating caregivers about what these clinical changes will look like and how to react to them should lower healthcare utilization, thus lowering the financial burden on society. Monitoring dementia progression and education may be efficiently performed at multidisciplinary neurocognitive clinics (MNCs). A MNC consists of a clinical pharmacist, neurologist, social worker, and neuropsychologist, with each expert assessing not only the dementia severity of the patient but also the effect of the dementia on their lifestyle. The MNC provides both the patient, family members and caregivers with education about what to expect from dementia and its progression, and recommends lifestyle changes as necessary regarding medication assistance, financial assistance, driving restrictions, and institutional care.¹⁸

We hypothesized that a MNC that provides direct clinician time with the patient and education during follow-up visits will reduce the utilization of acute healthcare services. We retrospectively reviewed 2 years of data on acute healthcare utilization (acute-care hospital admissions, ER visits, and nonroutine PCP visits) following the diagnosis of dementia in patients who were followed up in an MNC and patients with a similar diagnosis who were diagnosed in a neuropsychological evaluation (NPE).

METHODS

This study performed a retrospect review of 581 electronic medical records of patients who were referred for a cognitive evaluation by their PCP (Spectrum Health, IRB No. 2018-072). The patients were in two cohorts according to being 1) diagnosed and followed up in an MNC and 2) diagnosed in an NPE and not followed up in an MNC. Data collected included age, sex, living arrangements, marital status, duration of cognitive dysfunction prior to the diagnosis, diagnosis type, severity of dementia, Montreal Cognitive Assessment (MoCA) score, number of hospital admissions, number of ER visits, number of nonroutine PCP visits, and frequency of being diagnosed with confusion, alteration in mental status, or delirium during an ER visit, hospital admission or nonroutine PCP visit. This study included patients with a diagnosis of AD, vascular dementia (VaD), or a mixture of AD and VaD, but not patients diagnosed with frontotemporal dementia, PD with dementia, or Lewy-body dementia.

Following a PCP referral for memory loss or dementia, a patient was evaluated in the MNC or in an NPE. After the initial visit, the patient is provided with a dementia diagno-

sis and safety recommendations.¹⁸ During subsequent visits to the MNC, the healthcare providers provided the patient and their caregivers with education about the natural progression of dementia and changes in the clinical picture, including potential behavioral changes in response to medication exposures, infections, alterations in sleep-awake cycles, environment changes, and the dangers of delirium and acute-care hospitalization. Strategies to manage behavioral or clinical changes were also discussed during the MNC follow-up visit. The provided education varied between the dementia patients, since those diagnosed in an NPE who were followed up by their PCP might not receive the same education regarding dementia and the natural course of the dementia.

Diagnosis

AD was diagnosed according to the recommendations from the National Institute on Aging/Alzheimer's Association workgroups on diagnostic guidelines for AD.¹⁹ VaD was diagnosed based upon the National Institute of Neurological Disorders and Stroke criteria.²⁰ MoCA scores of 20–26, 13–19, 6–12, and <6 were considered to indicate mild, moderate, severe, and profound dementia, respectively.

Statistical analyses

Categorical demographics and utilization outcomes were summarized by frequency and (percentage) values. Numeric data that were normally distributed were summarized as mean±standard-deviation values, while numeric data that were not normally distributed were summarized as median (25–75th percentile) values. When comparing the demographic characteristics and overall utilization between MNC and NPE, chi-square tests were used for categorical variables and odds ratios were produced when appropriate. The numeric variables were analyzed using two-sample two-tailed independent *t*-tests for normal data and a Wilcoxon rank-sum tests for nonnormal data. When comparing the utilization for various demographic characteristics, Spearman correlation coefficients were produced for the total utilization versus continuous variables, and negative binomial regressions were used when comparing the total utilization for categorical variables. All statistical analyses were performed using SAS Enterprise Guide software (version 7.1, SAS Institute, Cary, NC).

RESULTS

Study demographics

MNC diagnoses involved nearly twice the number of subjects ($n=385$) than did NPE diagnoses ($n=196$). Those seen in MNCs were a mean of 4 years older than those who un-

derwent NPEs ($p < 0.0001$). Even though MNC patients were older, the median duration of symptoms prior to diagnosis in both cohorts was 24 months, which is consistent with previously published data.¹⁸ Along with age, the living situation differed between the two cohorts: fewer MNC than NPE patients were married ($p = 0.0017$), and fewer MNC patients lived with a spouse or partner ($p = 0.0038$) (Table 1).

The type and severity of dementia differed between the two cohorts. A higher proportion of the MNC patients were diagnosed with AD compared to those who underwent NPE. MNCs diagnosed VaD less often in their cohort ($p < 0.0001$). The MNC cohort had more-severe dementia at the time of diagnosis than those who underwent NPE (moderate-to-severe impairments in 66.6% versus 21%) despite the duration of symptoms prior to diagnosis being similar ($p < 0.0001$) (Table 1).

Healthcare utilization

Total healthcare utilization was similar between the 2 cohort (MNC 73.3% versus NPE 76.0%, $p = 0.47$). The frequency of nonroutine PCP visits was lower for MNCs (46.8%) than for NPEs (58.2%) during the 2 years following a dementia diagnosis ($p = 0.0093$). Patients evaluated in an NPE were more 1.58-fold likely than those in the MNC cohort to have a non-routine PCP office visit [95% confidence interval (CI)=1.12–2.24] (Table 2). The NPE cohort had a higher rate of nonrou-

tine PCP visits per patient compared with the MNC cohort (3.5 and 2.7, respectively). In contrast, MNCs had a higher proportion of patients with more-severe disease using healthcare resources (Table 3). Consistent with the differences in dementia type, MNCs had a higher proportion of AD patients seeking acute care while NPEs involved a higher proportion of VaD patients (Table 3). There were no intergroup differences in delirium or confusion-related diagnoses at non-routine PCP visits (Table 4).

There was no overall difference in dementia-related diagnoses in the ER and hospitalizations between the two cohorts. Dementia severity—rather than the cohort—was a significant predictor of ER utilization ($p = 0.0318$). More specifically, the incidence of moderate-severity dementia was 1.38-fold higher (95% CI=1.08–1.76) than that of mild dementia. Even though the severity was higher in the MNC, there were no differenc-

Table 1. Patient demographics

	MNC (n=385)	NPE (n=196)	p
Age, years	80.4±6.4	75.6±8.0	<0.0001
Sex, male	163 (42.3)	78 (39.8)	0.5566
Married	203 (52.7)	130 (66.3)	0.0017
Living situation			0.0038
Alone	100 (26.0)	30 (15.3)	
Spouse/partner	200 (51.9)	128 (65.3)	
Other	85 (22.1)	38 (19.4)	
Duration of symptoms, months*	24.0 [12.0, 36.0]	24.0 [14.0, 40.0]	0.1379
Dementia type			<0.0001
AD	317 (82.3)	95 (48.5)	
VaD	32 (8.3)	79 (40.3)	
AD+VaD	36 (9.4)	22 (11.2)	
Dementia severity			<0.0001
Mild	128 (33.4)	154 (79.0)	
Moderate	170 (44.4)	33 (16.9)	
Severe or profound	85 (22.2)	8 (4.1)	

Data are mean±standard deviation, median [25–75th percentiles], or n (%) values.

*Data missing for three patients.

AD: Alzheimer’s disease, MNC: multidisciplinary neurocognitive clinic, NPE: neuropsychological evaluation, VaD: vascular dementia.

Table 2. Utilization proportions

	MNC (n=385)	NPE (n=196)	p
Utilization			
ER	221 (57.4)	109 (55.6)	0.68
Nonroutine PCP	180 (46.8)	114 (58.2)	0.0093
Hospital	139 (36.1)	72 (36.7)	0.88
Total	282 (73.3)	149 (76.0)	0.47

Data are n (%) values.

ER: emergency room, MNC: multidisciplinary neurocognitive clinic, NPE: neuropsychological evaluation, PCP: primary care provider.

Table 3. Hospital utilization according to dementia severity and diagnosis by clinical group

	MNC (n=139)	NPE (n=72)	p
Dementia severity			<0.0001
Mild	35 (25.2)	58 (80.6)	
Moderate	69 (49.6)	11 (15.3)	
Severe or profound	35 (25.2)	3 (4.2)	
Dementia type			<0.0001
AD	114 (82.0)	23 (31.9)	
VaD	13 (9.4)	39 (54.2)	
AD+VaD	12 (8.6)	10 (13.9)	

Data are n (%) values.

AD: Alzheimer’s disease, MNC: multidisciplinary neurocognitive clinic, NPE: neuropsychological evaluation, VaD: vascular dementia.

Table 4. Diagnosis of dementia patients according to nonroutine PCP utilization by clinical group

	Total (n=895)	MNC (n=492)	NPE (n=403)
Delirium	0 (0)	0 (0)	0 (0)
AMS/confusion	149 (16.6)	71 (14.4)	78 (19.3)
Delirium and AMS/confusion	1 (0.1)	0 (0)	1 (0.3)
None	745 (83.2)	421 (85.6)	324 (80.4)

AMS: alteration in mental status, MNC: multidisciplinary neurocognitive clinic, NPE: neuropsychological evaluation, PCP: primary care provider.

Table 5. Diagnosis of dementia patients according to emergency room utilization by clinical group

	Total (n=783)	MNC (n=526)	NPE (n=257)
Delirium	3 (0.4)	2 (0.4)	1 (0.4)
AMS/confusion	210 (26.8)	146 (27.8)	64 (24.9)
Delirium and AMS/confusion	3 (0.4)	1 (0.2)	2 (0.8)
None	567 (72.4)	377 (71.7)	190 (73.9)

AMS: alteration in mental status, MNC: multidisciplinary neurocognitive clinic, NPE: neuropsychological evaluation

es in delirium or confusion-related diagnoses in the ER (Table 5). For hospitalizations, there was no difference in dementia severity or dementia diagnostic symptoms between the cohorts, as also seen in the ER.

Overall, the diagnosis type of dementia ($p=0.05$), age ($p=0.65$), marital status ($p=0.36$), and living arrangements ($p=0.33$) did not influence the overall healthcare utilization. There is no significant evidence of a correlation between the duration of symptoms and the total utilization of healthcare services ($p=0.1379$).

DISCUSSION

A dementia diagnosis is associated with an increased utilization of ER services and hospital admissions—people with dementia have nearly twice as many ER visits and hospital admissions as do age-matched seniors without dementia.¹ Behavioral and psychological symptoms of dementia—especially agitation, aggressiveness, and personality changes—are significant drivers of ER visits and inpatient hospitalizations.²¹⁻²⁴ Consistent with these previously published data, the overall severity of dementia was found to be a predictor of ER utilization in the present study. In contrast, the MNC cohort did not have an increase in hospitalizations or ER visits compared with the NPE group. The NPE cohort, which predominantly consisted of VaD patients, who are generally high utilizers of acute-care services, utilized nonroutine ambulatory services more often than did the MNC patients. This contrasts with published data that VaD patients utilize ambulatory services less often than do AD patients.²⁵

This study found that diagnoses in NPEs and MNCs were not predictors of ER utilization. This is counterintuitive, because the MNC patients were generally older and more likely to live alone than the NPE patients. Published studies show that advanced age, living situation, and severity of dementia are independent risk factors for ER utilization.^{26,27} Dementia severity was the only identified predictor of ER utilization that was independent of whether the patient went to the NPE or MNC. No relationship was found between severity and diagnostic symptoms during the utilization of acute-care services.

These data suggest the benefits of an MNC multidisciplinary team in reducing healthcare utilization, given that increasing healthcare utilization is directly related to the escalating costs associated with a growing dementia population.^{1,2-6,8}

Care provided by multidisciplinary clinics for chronic disorders leads to greater patient satisfaction and improved outcomes.^{28,29} The results of the present study support this benefit, with one possible reason being the availability of clinicians who specialize in degenerative disorders at both the initial evaluation and follow-up visits. The evaluations for the NPE cohort were performed as NPEs whereas the ongoing care was provided by PCPs. In contrast, the MNC provided education to both the patients and their caregivers about unexpected and expected clinical changes and situations, and medications to avoid. It is known that having a spousal caregiver is a predictor for in-hospital admissions of patients suffering from dementia.³⁰ Directing education toward caregivers is therefore critical to decreasing the overall healthcare utilization.

Limitations

This study was subject to several limitations. It had a retrospective design, follow-up data might have been lost if a patient sought services at an outside healthcare system, the unstructured nature of the NPE cohort may have resulted in heterogeneous data, and the education provided by neuropsychologists and PCPs was not quantified and so varied among the providers, which may have biased the utilization. Moreover, only primary diagnoses of dementia were recorded for hospital and ambulatory utilizations, and so other primary diagnoses that were indirectly affected by dementia might have been missed. Several neuropsychologists participated in the NPEs, and the education they provided may have varied. In addition, the patients included in NPE cohort had many PCPs. Furthermore, this study utilized data from a single neurocognitive clinic, which might limit the ability to generalize the results.

Conclusion

This study suggests that the provision of MNCs for adults mitigates healthcare utilization by a population that is traditionally dependent on the healthcare system. Reducing healthcare utilization and dependence in this group will provide distinct benefits for both the individual patients and the overall healthcare system. Additional studies are needed to verify the present findings in other communities and health systems.

Author Contributions

Conceptualization: Timothy Thoits. Data curation: Timothy Thoits, Janani

Sadasivan. Formal analysis: Timothy Thoits, Jessica L Parker, Nicholas J Andersen. Investigation: Timothy Thoits, Janani Sadasivan. Methodology: Timothy Thoits, Jessica L Parker, Nicholas J Andersen. Writing—original draft: Timothy Thoits, Janani Sadasivan. Writing—review & editing: Timothy Thoits, Jessica L Parker, Nicholas J Andersen.

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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