ORIGINAL RESEARCH

Increased Health Service Utilization Costs in the Year Prior to Institutionalization: Findings from the Canadian Study of Health and Aging

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ABSTRACT

Objectives

The objective of this study was to characterize patterns of formal health service utilization costs during older adults' transition from community to institutional care.

Methods

Participants were 127 adults (age ≥ 65) from the British Columbia sample (N = 2,057) of the Canadian Study of Health and Aging who transitioned from community to institutional care between 1991 and 2001. Health service utilization costs were measured using Cost-Per-Day-At-Risk at five time points: > 12 months, 6–12 months, and ≤ 6 months preinstitutionalization, and ≤ 6 months and 6–12 months postinstitutionalization. Cost-Per-Day-At-Risk was measured for Continuing Care, Medical Services Plan, and PharmaCare costs by calculating total health service use over time, divided by the number of days the participant was alive.

Results

Significant differences in Cost-Per-Day-At-Risk were observed for Continuing Care, Medical Services Plan, and PharmaCare costs over time. All health service utilization costs increased significantly during the 6–12 months and ≤ 6 months prior to institutionalization. Postinstitutionalization Continuing Care costs continued to increase at ≤ 6 months before decreasing at 6–12 months, while decreases occurred for Medical Services Plan and PharmaCare costs relative to preinstitutionalization costs.

Conclusions

The increases in costs observed during the year prior to institutionalization, characterized by a flurry of health service utilization, provide evidence of distinct cost patterns over the transition period.

Key words: transitions, health-care costs, health service utilization, institutionalization, elderly, long-term care, nursing home

Introduction

With the number of older adults increasing in most developed countries, so too is the expected demand for institutional care.[1,2] This poses significant challenges to health-care systems, given the high costs associated with institutionalization of the elderly.[3] In Canada, an estimated 238,000 individuals, aged 65 and over, resided in institutions in 2009.[4] Long-term care expenditures account for approximately 1.5% of the GDP, of which 80% is targeted at institutional care.[4] Similarly, in the United States, long-term care accounts for 1% of the GDP,[4] and nearly 35% of Medicaid expenditures,[5] with 80% of these costs spent on institutional care.[6] The magnitude of the costs has prompted researchers to identify predictors of institutionalization in an attempt to mitigate expenses by preventing or delaying institutionalization.[7,8]

Common predictors of institutionalization include sociodemographic variables such as age, gender, low socioeconomic status, and lower level of education, as well as clinical factors including, poor health, and lower functional abilities.[8] Other predictors can include specific medical conditions such as frailty,[9] cognitive decline,[10] hospitalization for acute medical events such as falls[11] or fractures,[12] or

patterns of prescription medication use.[13] Despite efforts to delay or prevent institutionalization,[7] the precise moment at which it becomes inevitable for an older adult remains unclear.[3]

A number of studies have documented that the actual process of being admitted to a long-term care facility* is a significant life event for older adults and their families.[15,16] The preference for most older adults is to remain in their homes.[13,17] The decision to move into an institution represents not only a transition away from independent living, but is typically the last major decision that they will make.[15] Furthermore, transition to an institutional setting is complex, and can be potentially perilous for the elderly.[15,18] With demand for institutional care expected to increase,[1,2] this period of transition will gain in importance as a key point to target with interventions intended to streamline care delivery, identify at-risk individuals, and improve resource allocation.

For clinicians reflecting on their patients' move from community to institution, a "flurry of activity" prior to institutionalization appears to take place, as care needs multiply and family and health-care professionals attempt to stabilize and keep an elderly person in the community. Specifically, an increase in formal health service utilization (HSU) has been observed during this preinstitutionalization period, and is considered both a predictor of the intent to institutionalize and actual institutionalization.[19] If HSU patterns are unique and identifiable during this transition period, then it may be possible to determine efficient and effective ways to alleviate potential stressors, including unnecessary expenditures for individuals and the health-care system.

The objective of the current study was to characterize the patterns of formal HSU costs before and after transition from community to institutional care, and to examine whether a "flurry of HSU activity" could be substantiated. Service use data separated into three time points prior to institutionalization were compared to service use data separated into two time points following institutionalization among a sample of older adults admitted to an institution over a ten-year period. By examining the process of institutionalization longitudinally, we sought to demonstrate changes in HSU expenditures over time, potentially reflecting changes in an elderly individual's health status,[18] as well as care adjustments made to try and keep an elderly individual in the community. To date, few studies have examined the health events in an older adult's life that precipitate placement in a long-term care facility. We hypothesized that a significant increase in formal HSU costs occurs in the 12 months prior to institutionalization.

METHODS

We analyzed HSU data pre- and postinstitutionalization for a subsample of participants from the Canadian Study of Health and Aging (CSHA) from British Columbia between 1991 and 2001. The CSHA study sample was randomly selected from the British Columbia population aged 65 and older. Baseline CSHA data were collected in 1991–1992 (CSHA-1), with follow-up data collection in 1998–1999 (CSHA-2) and 2001–2002 (CSHA-3) for the original participants. A detailed account of the CSHA methods is available elsewhere.[20]

Participants' CSHA data were linked with their BC Ministry of Health administrative data. The administrative data are from a public and universal health-care system and provides the actual costs billed to the provincial medical plan for continuing care services (home care, home nursing care, hospitalizations, and institutional care), physician services, and pharmaceutical prescriptions, and has previously shown a high degree of reliability in calculating a patient's total cost of service use.[21] The linked CSHA data allow measurement of individual cost patterns over time, making it possible to compare costs pre- and postinstitutionalization. Consent was obtained from CSHA participants in order to link their BC Ministry of Health administrative data. The Ministry of Health Planning and Ministry of Health Services forwarded the list of consenting CSHA participants with identification numbers and masked personal health numbers to the University of British Columbia Centre for Health Services and Policy Research, where the data were retrieved and then linked. This study received ethical approval from the Simon Fraser University Office of Research Ethics.

Participants

Eligible participants were among the $N = 2{,}057$ CSHA participants ≥ 65 years of age from British Columbia who met the following criteria: consented to have their provincial Ministry of Health administrative data linked to their CSHA data; had baseline CSHA-1 screening data; and were institutionalized after their initial CSHA interview in 1991. Baseline measures for participants included: Modified Mini-Mental Exam (3MS) scores,[22] activities of daily living (ADL), co-morbidity, self-rated health, age, and years of formal education.

Variables

The dependent variable of interest was Cost-Per-Day-At-Risk (CPDAR), which provides a summation of HSU costs per day while an individual is alive. CPDAR is calculated as the average cost of services multiplied by the number of days of service received, then divided by the number of days the individual was alive during the study duration (see Figure 1).[23,24] The CPDAR measure was used to evaluate Continuing Care costs, Medical Services Plan costs, and PharmaCare costs over five time points: TIME 1 (> 12 months preinstitutionalization); TIME 2 (6–12 months preinstitutionalization); TIME 3 (≤ 6 months preinstitutionalization); TIME 4 (≤ 6 months postinstitutionalization); and TIME 5 (6–12 months postinstitutionalization). Continuing Care includes costs for home support, home nursing care, hospitalizations, and

$$\text{Cost-Per-Day-At-Risk} = \frac{\text{AVERAGE SERVICE COSTS (\$)} \times \text{DAYS SERVICE RECEIVED (days)}}{\text{DAYS ALIVE WITHIN TIME PERIOD (days)}}$$

FIGURE 1. Equation for calculating Cost-Per-Day-At-Risk

institutional care; Medical Services Plan costs reflect those associated with physician services and specialist visits; and PharmaCare represents costs related to prescription drugs.

Statistical Analyses

Generalized linear modeling was used to perform repeated measures analyses of variance to examine HSU costs over the five study time points (three preinstitutionalization and two postinstitutionalization). A repeated measures design has the advantage of reducing overall variability by using a common participant pool for all variables whereby each participant functions as his or her own control, thus limiting overall error[25] and reducing sample size requirements.[26] The generalized linear model was computed first as a MANOVA with Continuing Care, Medical Services Plan, and PharmaCare costs as the multiple dependent variables in the model, to measure whether there was an overall time effect for total HSU costs. The multivariate test statistic Wilks' lambda and corresponding significance level was used to test the between-subject effects. Separate ANOVAs were then calculated for each of the three components of CPDAR (Continuing Care, Medical Services Plan, and PharmaCare costs) as the dependent variables. Four between-subject variables were the independent variables used in the model: 1) Sex, 2) Living Alone, 3) Cognitive Change, and 4) Last Year of Life. To produce normally distributed values, a logarithmic transformation of CPDAR was necessary. The logarithmic transformation normalized scores, and the significance of the predictors was assessed using the logarithmic transformation of CPDAR, but interpretation of the findings was based on the untransformed model. To validate the analyses of variance, we used Mauchly's test of sphericity,[27,28] and for all three measures of CPDAR it was significant, therefore the Huynh-Feldt correction was applied to the degrees of freedom and the F-statistic to reduce the Type 1 error rate.[29]

To compare differences between time periods for Continuing Care, Medical Services Plan, and PharmaCare costs, *post hoc* paired *t*-tests were computed with a Bonferroni adjusted alpha value of $\alpha = .005$ for multiple comparisons (this was obtained by dividing the standard alpha (.05) by the number of paired comparison (N = 10) and using the resulting value (.005) as the critical alpha threshold for each of the tests). Statistical significance was based on a p value $< .05$. All statistical analyses were performed using SPSS.

RESULTS

Of the 2,057 CSHA participants from British Columbia, $N = 1,636$ consented to have their BC Ministry of Health administrative data linked to their CSHA data, of which there were a total of 127 individuals institutionalized between 1991 and 2001 who met the study inclusion criteria. Baseline characteristics are listed in Table 1. Most were female ($N = 78$; 61%), over the age of 74 ($N = 101$; 80%), and had fewer than 12 years of education ($N = 95$; 75%). Half ($N = 63$; 50%) were living alone prior to institutionalization, as determined using answers to the question, "Do you live here alone?" from CSHA-1 screening interviews. Two-thirds ($N = 84$; 66%) had baseline 3MS scores in the range of 79–100. At baseline, 39% ($N = 49$) of participants had no limitations with their activities of daily living (ADLs), 35% ($N = 45$) had one or two ADL limitations, and 26% ($N = 33$) had three or more limitations, while over 70% ($N = 105$) reported three or more chronic health conditions.

Over the ten-year study period, more than half ($N = 72$; 57%) of the 127 participants died, and the majority experienced cognitive decline ($N = 77$; 61%) (see Table 1). There were seven participants who had multiple institutionalization dates because they went in and out of an institution during the study period. The first institutionalization date was applied as the index date for these participants, because it was assumed that the first institutionalization occurred when the participant was no longer able to live in the community.

Health Service Utilization Costs

For overall HSU costs (defined as the combined total for Continuing Care, Medical Services Plan, and PharmaCare costs), there was a significant time effect for CPDAR ($F = 20.40$; $df = 12,79$; $p < .01$). CPDAR was also significantly different over time for Continuing Care costs, Medical Services Plan costs, and PharmaCare costs (see Table 2), with total costs increasing following institutionalization. Continuing Care costs, which consist of home care, hospitalizations, and institutional costs, made up the largest portion of HSU costs at each time point, while Medical Services Plan and PharmaCare costs constituted a notably smaller portion of the total HSU costs. Figures 2, 3 and 4 illustrate the changes in Continuing Care costs, Medical Services Plan costs, and PharmaCare costs, respectively, at each time point.

All three measures of HSU costs increased significantly in TIME 2 (6–12 months preinstitutionalization) and TIME 3 (≤ 6 months preinstitutionalization), relative to TIME 1 (> 12 months preinstitutionalization) ($p \leq .01$). Continuing Care costs at TIME 3 were six times those of TIME 1, while Medical Services Plan and PharmaCare costs were both three times those of TIME 1. Medical Services Plan and PharmaCare costs declined in TIME 5 (6–12 months postinstitutionalization).

TABLE 1.
Baseline characteristics and changes from 1991–2001 for institutionalized CSHA participants from British Columbia

Characteristic	*Institutionalized (*N*=127)*	
	N	%
Age		
65–74	26	21
75–84	65	51
≥ 85	36	28
Male	49	39
Female	78	61
Education < 12 years	95	75
Living alone prior to institutionalization	63	50
3MS score		
79–100	84	66
50–78	36	28
< 50	7	6
Performance in ADLs		
No assistance needed	49	39
1–2 ADLs require assistance	45	35
3–4 ADLs require assistance	13	10
5–6 ADLs require assistance	9	7
7+ ADLs require assistance	11	9
Chronic Health Conditions		
None	5	4
1–2	17	13
3–4	29	23
5–6	31	24
7+	45	35
Cognitive Change between 1991–2001		
No change	45	35
Cognitive change, no dementia diagnosis	34	27
Dementia diagnosis	43	34
Died between 1991–2001	72	57
Died within one year of institutionalization	25	20

Continuing Care costs differed significantly when compared between each time point ($p \leq .01$). Specifically, TIME 1, TIME 2, and TIME 3 were significantly different from each other ($p \leq .01$), reflecting preinstitutionalization changes in service use. Postinstitutionalization Continuing Care costs decreased significantly from TIME 4 to TIME 5 ($p \leq .01$). Medical Services Plan costs were significantly different ($p \leq .01$) for TIME 1 when compared to TIME 2, TIME 3, and TIME 4, but not TIME 5, demonstrating that costs decreased to baseline levels after 12 months in an institution. PharmaCare costs were significantly different for TIME 1 when compared to TIME 2 and TIME 3 ($p \leq .01$), but PharmaCare costs postinstitutionalization were significantly lower than in the year prior to institutionalization ($p \leq .01$). No significant differences in PharmaCare costs were observed over the first year in an institution.

DISCUSSION

Our findings support the hypothesis that, for this group of elderly participants, a "flurry of activity" occurred during the one-year period prior to institutionalization, as reflected by increases in Continuing Care costs, Medical Services Plan costs, and PharmaCare costs. Important strengths in this study were the use of Cost-Per-Day-At-Risk as a measure of HSU costs, and separating longitudinal data into three preinstitutionalization and two postinstitutionalization time points. CPDAR accounts for the duration of time that an individual is alive, thereby allowing a more precise per day estimate of costs and a greater appreciation of the complex nature of institutionalization.[30,31] This is especially relevant considering that the decision to institutionalize an elderly person is not made from one day to the next but, rather, over a period of time,[32] and for many older adults it can be the last major decision that they make.[15]

The separation of the longitudinal CSHA data into multiple time points pre- and postinstitutionalization made it possible to observe the relationship between changes in the elderly person's HSU costs and placement into a long-term care facility. The changes observed in HSU costs may also be reflective of changes in an elderly person's health status precipitating institutionalization. As would be expected, Continuing Care costs accounted for by far the greatest proportion of overall HSU costs when compared to both Medical

TABLE 2.
Cost-Per-Day-At-Risk for different types of health service utilization costs over time

HSU Variables	*TIME 1*		*TIME 2*		*TIME 3*		*TIME 4*		*TIME 5*		*F*	*df*	p
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*			
Continuing Care costs	8.69	9.53	33.79	47.54	48.82	54.05	107.20	70.19	93.74	55.84	28.55	4, 334	.01
Medical Services Plan costs	.95	.64	2.84	3.91	3.65	5.03	3.35	4.04	1.45	1.45	11.76	4, 360	.01
PharmaCare costs	.74	.81	1.69	2.05	2.01	3.10	1.36	3.79	.85	1.36	12.76	4, 336	.01

Services Plan and PharmaCare costs combined. This finding is consistent with prior cost data research that has demonstrated that hospitalizations and institutional costs account for a considerably larger proportion of health-care utilization among older adults when compared to other services.[33]

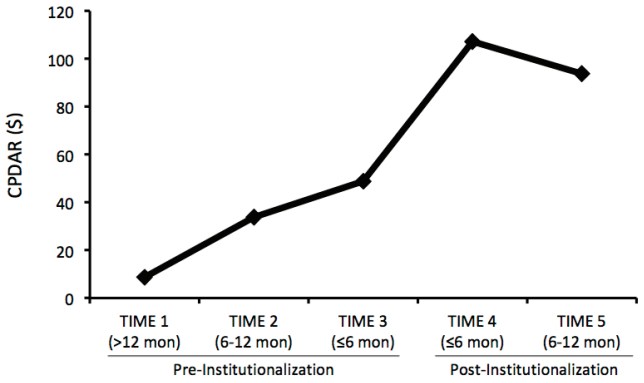

FIGURE 2. CPDAR for Continuing Care costs over time

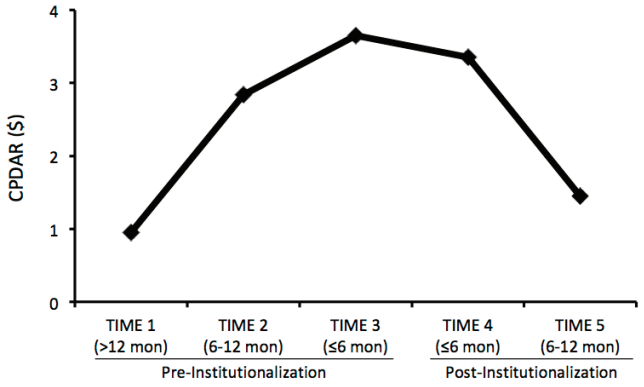

FIGURE 3. CPDAR for Medical Services Plan costs over time

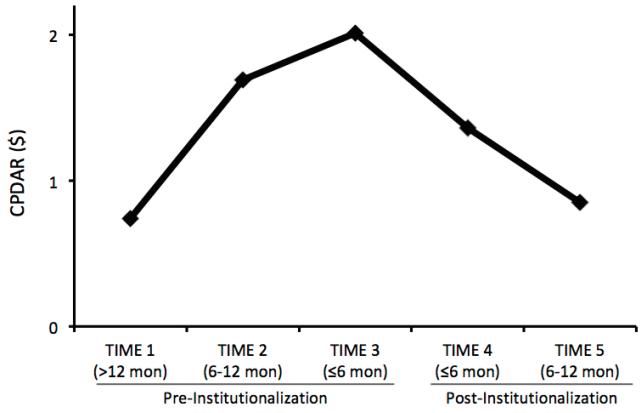

FIGURE 4. CPDAR for PharmaCare costs over time

The significant increase in Continuing Care costs immediately prior to institutionalization potentially highlights changes in an elderly individual's health status. This is consistent with prior research demonstrating that over 80% of older adults admitted to a long-term care facility had been recently hospitalized,[34] often preceded by acute medical events[35] such as myocardial infarction[13] or falls.[11] Continuing Care costs were significantly higher postinstitutionalization relative to preinstitutionalization costs, highlighting that institutionalization is a more expensive alternative to community living.[36,37] Interestingly, Continuing Care costs decreased significantly over the first year following institutionalization, suggesting that the costs of living in an institution are not necessarily constant over the first year. For many older adults, the costs shown in this study over the first year may in fact be an accurate reflection of the true costs of long-term residency. Results from other settings suggest that virtually all elderly residents do not return to the community following placement in a long-term care facility;[38] between 45%[39] and 65%[40] die within the first year, while upwards of 30% can remain in institutional care for three years or more.[39]

Decreases in Medical Services Plan costs and PharmaCare costs were observed following institutionalization, possibly reflecting a consolidation of expenses, as medical and pharmaceutical services are controlled and dispensed by an institution's professional pharmacist, physicians, and nursing staff. It is also possible that institutionalization may result in the temporary stabilization of an older adult's health status, when compared to the preinstitutionalization state, as reflected in the flurry of HSU activity. For example, if institutionalization occurs following discharge from a hospital, health-care professionals may provide a detailed care plan and specific instructions to long-term care facility staff, which could subsequently result in fewer physician visits immediately following the transition relative to the preinstitutionalization period. Even with the risk of readmission of long-term care facility residents to a hospital,[41] the costs are lower than those reflected in the flurry of preinstitutionalization HSU activity.

Reducing dosages or eliminating medications from the patient's care management plan may also have contributed to decreased PharmaCare costs following institutionalization. Once an individual moves into an institution, access to medical services is largely at the discretion of the nursing staff, where health concerns may be triaged by nursing staff before a physician is notified. Similarly, clinical pharmacy services are mandated in long-term care facilities, with the result that inappropriate drug therapy is less likely in an institutional setting.[42] Additionally, generic substitutions initiated by the pharmacist could substantially reduce PharmaCare costs.[43]

Several limitations warrant consideration. First, predicting future HSU by interpreting past utilization rates can be misleading. Participants in this study were institutionalized over a ten-year period from 1991 to 2001, during which changes in health-care policy in British Columbia may have

impacted the provision of health-care services, and may make these results cohort specific. For example, there were reductions in available hospital and institutional beds,[44] discharge of many seniors from institutions and home care programs,[45] and the introduction of a streamlined regional health-care model.[46] However, similar results from research conducted in the adjacent province of Alberta, which underwent its own policy changes,[47] support the generalizability of these findings. Second, this study did not take into account characteristics of the long-term care facilities, such as cost variation between facilities or differing availability of beds. Cost variation due to differing sizes or practices between facilities, could have an influence on HSU costs, while bed availability is an ongoing concern for the health-care system in British Columbia[21] and may potentially affect HSU costs, given that delayed placement into an institution could contribute to increased acute care use.[48] Third, this study only considers individuals who were institutionalized over a ten-year period, and does not provide cost comparisons with individuals who were not institutionalized over this time. Fourth, given that the analyses presented here included aggregate cost measures of Continuing Care, Medical Services Plan, and PharmaCare costs, it was not possible to isolate the costs contributed by specific health services such as emergency department visits, specialist visits or pharmacological treatments alone. Lastly, this study did not examine indirect costs, including burden on caregivers, lost productivity, or health-related quality of life. It is likely that the actual costs involved in transition from community to institutional care are higher than reported here; thus, we provide a conservative estimate.

CONCLUSION

The results from this study provide valuable insight surrounding formal HSU costs over the transition from community to institutional care. Evidence of a one-year preinstitutionalization "flurry" of formal HSU activity and resultant cost increases were observed, demonstrating that HSU over this transition period is distinctive when compared to prior use and use following institutionalization. The dependent measure of Cost-Per-Day-At-Risk provided a more sensitive level of individual cost measurement, and made it possible to take into account time when documenting HSU costs. Future research should attempt to examine the specific drivers responsible for this observed flurry of HSU activity prior to institutionalization. While this paper provides valuable insight in characterizing HSU patterns during the transition to a long-term care facility, the actual causes for these costs were not investigated. It is necessary to consider how medical conditions, such as cognitive impairment, frailty, or falls, may influence CPDAR over the transition period. By characterizing how specific factors influence Continuing Care costs, Medical Services Plan costs or PharmaCare costs over the transition from community to institutional care, it may be possible to identify more precisely where interventions aimed at containing costs and delaying placement in a long-term care facility should be targeted.

* According to the Canadian Healthcare Association, facility-based, long-term care consists of three broad components: 1) accommodation; 2) hospitality services; and 3) health services. The nomenclature differs between provinces and territories. For example, *residential care facility* is used in British Columbia, while *continuing care center* is used in Alberta. The generic term *nursing home* (which is widely used in the United States) is used only in Nova Scotia, New Brunswick, and Newfoundland and Labrador.[14]

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CONFLICT OF INTEREST DISCLOSURES

The authors declare that no conflicts of interest exist.

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