Occupational Therapy Use by Older Adults With Cancer

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MeSH TERMS
- aged
- neoplasms
- occupational therapy
- utilization review

Occupational therapy may significantly improve cancer survivors' ability to participate in activities, thereby improving quality of life. Little is known, however, about the use of occupational therapy services by adults with cancer. The objective of this study was to understand what shapes patterns of occupational therapy use to help improve service delivery. We examined older (age >65 yr) adults diagnosed with breast, prostate, lung, or melanoma (skin) cancer between 2004 and 2007 ($N = 27{,}131$) using North Carolina Central Cancer Registry data linked to Medicare billing claims. Survivors who used occupational therapy within 1 yr before their cancer diagnosis were more likely to use occupational therapy after diagnosis but also experienced the highest levels of comorbidities. Survivors with Stage 4 cancers or lung cancer were less likely to use occupational therapy. These findings suggest possible disparities in utilization of occupational therapy by older adults with cancer.

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Over the next 20 yr, the burden of cancer for older adults (age ≥65 yr) will increase (Smith, Smith, Hurria, Hortobagyi, & Buchholz, 2009). By 2030, almost 20% of the U.S. population, or approximately 72 million people, will be age ≥65 yr (Administration on Aging, 2011), and 70% of all cancers will be diagnosed within this age group (Smith et al., 2009). Older adults are at greater risk of suffering adverse consequences of cancer and its treatments (Parry, Kent, Mariotto, Alfano, & Rowland, 2011). For example, they are more likely to report having fair or poor health during and after cancer treatment, and their quality of life declines after a diagnosis of cancer, regardless of cancer type (Mohile et al., 2009; Reeve et al., 2009). After treatment, many older adults are unable to return to their previous levels of activity, a situation that decreases their quality of life (Courneya & Friedenreich, 1997; Courneya et al., 2003) and increases mortality and morbidity (Extermann & Hurria, 2007). Moreover, older adults who report daily fatigue, a common symptom of cancer and cancer treatment, are more likely to report depression and experience pain and least likely to report this symptom to their practitioner (Curt et al., 2000).

One possible explanation for older cancer survivors experiencing decreased quality of life is that this population has more limitations in both activities of daily living (ADLs) and instrumental activities of daily living (IADLs) than its younger counterparts (Mohile et al., 2009; Stafford & Cyr, 1997). With the growth in Medicare beneficiaries who have cancer, as well as the advent of health care reform, the need to identify services that effectively improve older adults' quality of care and quality of life will become increasingly important. Occupational therapy has the potential to increase participation in daily activities, improve quality of care and, ultimately, enhance quality of life for adults with cancer (Campbell, Pergolotti, & Blaskowitz, 2009; Clark et al., 1997; Lloyd & Coggles, 1988; Lyons et al., 2011; Palmadottir, 2010). However, little is known about the use of occupational therapy services among the growing number of older adults with cancer.

Research on health services use should begin by examining patterns—how services are used, under what conditions, and by whom (Andersen & Newman, 2005). To date, health services research examining the patterns of use of occupational therapy is scant and is typically bundled with other rehabilitative services such as physical therapy (Cook, Stickley, Ramey, & Knotts, 2005; Freburger & Konrad, 2002). Instead, research is needed to understand large-scale utilization of occupational therapy and the effectiveness of these services for older adults with cancer (Bass-Haugen, 2009; Braveman & Bass-Haugen, 2009; Morello, Giordano, Falci, & Monfardini, 2009).

The Behavioral Model of Health Services Use (Andersen, 1968) is the most commonly used model for predicting health service use (Babitsch, Gohl, & von Lengerke, 2012). The Andersen model considers both the individual and contextual levels by examining three types of factor: (1) *predisposing* (propensity of individuals to use services), (2) *enabling* (resources to access services), and (3) *need* (illness level; Andersen, 1995). *Inequitable access* (disparity) occurs when a predisposing factor (e.g., race) and enabling resources (e.g., income) determine who gets health care instead of need variables (Babitsch et al., 2012).

The Andersen model conceptualizes the complex nature of utilization and has been widely used to shape related inquiry. We used this model to examine differences between users and nonusers of occupational therapy in older adults with cancer and considerable variations in patterns of occupational therapy service use between groups. In particular, we focused on variations in patterns of occupational therapy service use by age, sex, race, cancer type, and stage of cancer (see Figure 1). Because of differences between sex, race, geographic location, and functional abilities in use of health care services and postacute rehabilitation for other diseases, we hypothesized there would be similar differences within the population of people with cancer (Fisher et al., 2003; Ottenbacher et al., 2008). Specifically, we hypothesized that Medicare beneficiaries with cancer who used occupational therapy would be more likely to be White women living in large urban counties, where access to an academic center is more likely to occur; to have breast cancer (the most common cancer type in North Carolina; Carpenter, Yeh, Wobker, & Godley, 2011); and to be diagnosed at Stage III or IV, when adults may have more obvious functional deficits leading to a referral to occupational therapy.

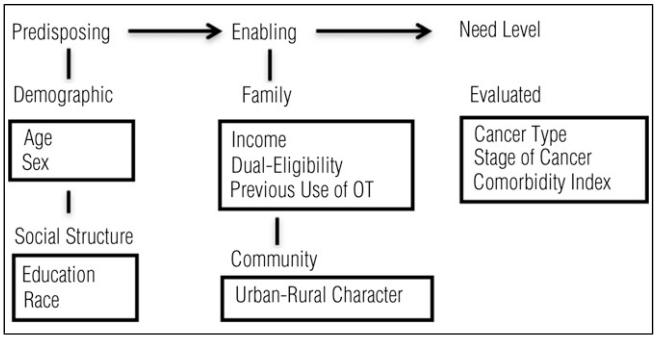

Figure 1. Conceptual model adapted from the Behavioral Model of Health Services Use (Andersen, 1995).
Note. OT = occupational therapy.

Method

Research Design

In this retrospective cohort study, we used secondary data from the Integrated Cancer Information and Surveillance System (ICISS), which links multiple data sources including the North Carolina Central Cancer Registry (NCCCR) and administrative claims from both public and private insurance payers. ICISS includes about 80% of the North Carolina population with cancer (UNC Lineberger Comprehensive Cancer Center, 2010). The other 20% of people with cancer were either uninsured or had insurance plans not captured within ICISS. The University of North Carolina at Chapel Hill institutional review board approved this study.

Sample

The study sample was limited to individuals enrolled in Medicare, aged >65 with incident cases of breast, prostate, lung, colorectal, or melanoma (skin) cancers between 2004 and 2007. These cancer diagnoses represent the five highest incidence rates within North Carolina. Cancer cases in the NCCCR were identified by *International Classification of Diseases for Oncology, 3rd Edition,* diagnosis codes and were subsequently linked to the Medicare insurance claims files (UNC Lineberger Comprehensive Cancer Center, 2010). These cases were further linked to the area resource file for county-level data.

We excluded adults who (1) qualified for Medicare because of end-stage renal disease or disability, (2) were diagnosed at death or during an autopsy, (3) were diagnosed before their 66th birthday, (4) had a previous diagnoses of cancer, or (5) were not enrolled in Medicare Part A or Part B (and thus would lack claims data). See Figure 2 for a participant flowchart.

Occupational therapy users were defined as beneficiaries who had submitted a billing claim for occupational therapy service using *Current Procedural Terminology;* the *International Classification of Diseases, Ninth Revision*, clinical modification section; and Healthcare Common Procedure

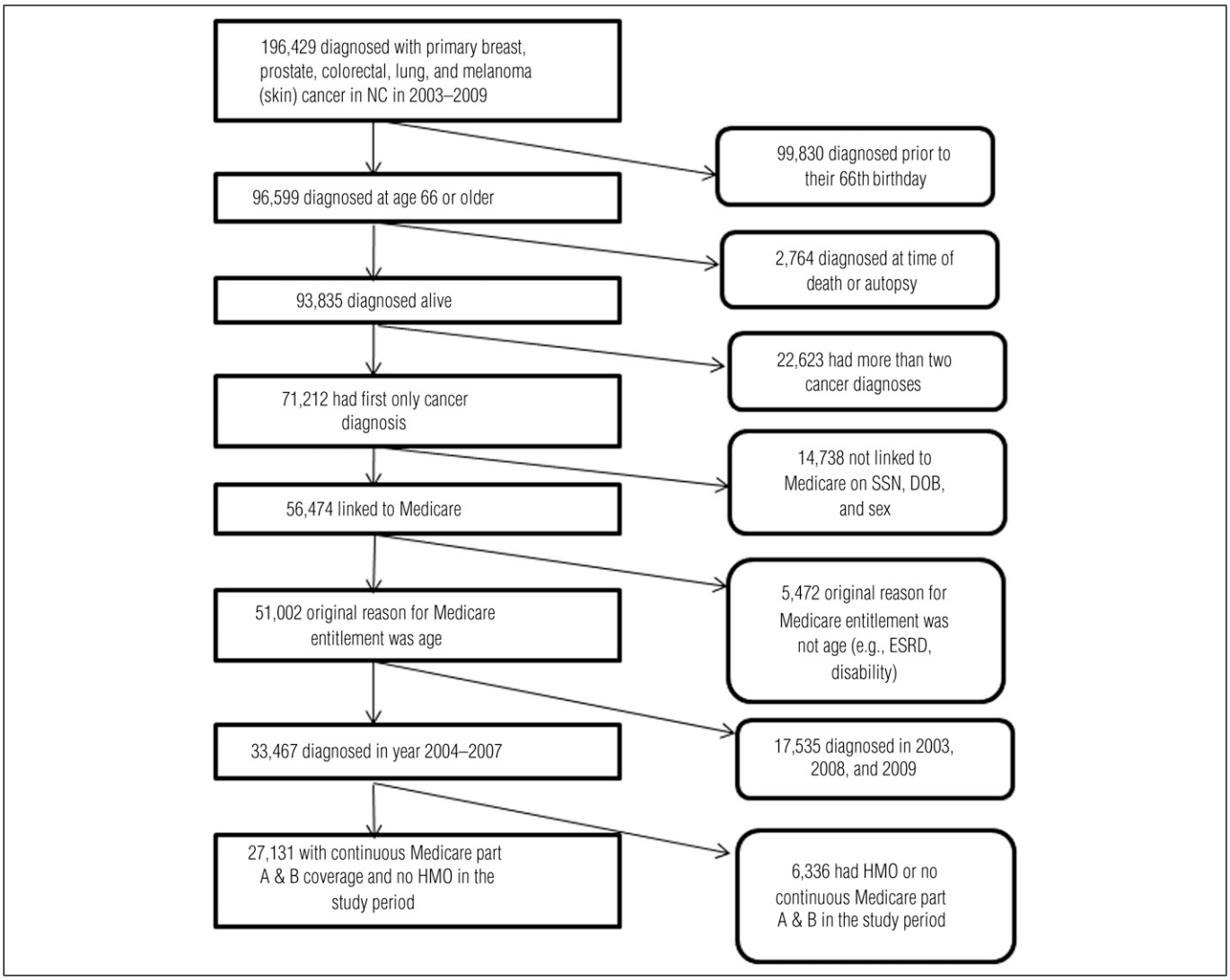

Figure 2. Participant flowchart for the study period, which was from 12 mo before diagnosis to 24 mo after diagnosis or Medicare record of death, whichever came first.

Note. DOB = date of birth; ESRD = end-stage renal disease; HMO = health maintenance organization; NC = North Carolina; SSN = social security number.

Coding System codes (see UNC Lineberger Comprehensive Cancer Center, 2010). We identified 28 codes that best defined use of occupational therapy services from inpatient, outpatient, home health, hospice, and skilled nursing facilities. This coding includes evaluations and treatments for rehabilitation as well as palliative and end-of-life care. The final sample consisted of 27,131 older adults with various forms of cancer, of whom 8,720 used occupational therapy services during the 2 yr postdiagnosis.

Study Variables

Our primary dependent variable was occupational therapy use within 2 yr of the date of the cancer diagnosis. To check the basis of this decision, we examined the relationship of time and therapy utilization related to cancer, using histograms and frequency tables, to see whether there was a specific pattern or signal for when occupational therapy use spiked. Frequency of occupational therapy visits appeared stable throughout the time frames initially chosen (1 yr, 18 mo, and 2 yr). Within oncology research, Sehl, Satariano, Ragland, Reuben, and Naeim (2009) found that limitations in ADLs and IADLs persisted beyond 1 yr for older women with breast cancer. In addition, Reeve et al. (2009) examined adults with cancer pre- and postdiagnosis and found that although some older adults were able to improve within the first year, others did not recover compared with the general health scores of adult control participants without cancer more than 19 mo after the cancer sample's diagnoses. Thus, the 2-yr time period was chosen based on clinical experience of the first author (Pergolotti) and the literature describing functional deficits from a cancer diagnosis as still present after 1 yr or longer (Deimling, Sterns, Bowman, & Kahana, 2005; Reeve et al., 2009; Sehl et al., 2009; Sehl, Lu, Silliman, & Ganz, 2013).

Independent variables were chosen on the basis of the conceptual model, literature review, clinical experience of

the first author (Pergolotti), and available data (Andersen, 1995). *Predisposing* variables included age, sex, race, and county-level percentage of adults with less than a high school degree. *Enabling* variables included eligibility marker for low socioeconomic status (measured as Medicaid supplement to Medicare), county classification as defined by the U.S. Department of Agriculture Economic Research Service (2013) continuum coding scheme (rural [<19,999], urban [>20,000], and metropolitan [>250,000]), county-level average household income, and previous use of occupational therapy (defined as at least one claim for an occupational therapy visit in the year before the date of cancer diagnosis, ending the month before diagnosis). *Need* variables included cancer type, cancer stage, and comorbidity status.

Comorbidities were measured with the Charlson Comorbidity Index (CCI; Klabunde, Potosky, Legler, & Warren, 2000), which uses inpatient, outpatient, and physician claims from 12 mo before cancer diagnosis until the month preceding diagnosis. This index was categorized into none, 1, 2, 3, and ≥4 comorbidities, with higher scores associated with increased risk of mortality and morbidity (Klabunde et al., 2000). Tumors were staged as 0–IV, with IV representing the most progressed (Greene et al., 2002).

Data Analysis

In bivariate analyses, we compared occupational therapy users and nonusers using likelihood ratio chi-square tests for categorical variables (race, county classification, cancer type) and dichotomous variables (sex, dual eligibility for Medicare and Medicaid) and *t* tests for continuous variables (age, education, household income, stage, CCI). The multivariable analyses used a hierarchical regression approach to assess the contribution of the different types of care utilization determinants, as outlined in the Andersen model (Nathans, Oswald, & Nimon, 2012; Quick, 2010). A binomial distribution was chosen for this analysis because of the dichotomous dependent variable (yes or no—use of occupational therapy within 2 yr of diagnosis of cancer).

Each generalized linear model was analyzed with a log link to obtain relative risk ratios (RR) of occupational therapy use and the corresponding 95% confidence intervals (CIs). We chose RR because of the outcome event having >10% incidence (McNutt, Wu, Xue, & Hafner, 2003). The first model included only predisposing variables, and the second model added the enabling variables. In the third model, need variables were added to the second model.

We found missing data within three of the variables (rural–urban character, household income, and cancer stage). Less than 0.01% of the variables were missing. Cases with missing variables were excluded. Because of the large sample size, we used a significance level of $p < .001$ for all tests. The software used for this analysis included RStudio for Unix (v.0.96.122; RStudio, Boston) and SAS/STAT software, Version 8 of the SAS System for Unix (SAS Institute, Cary, NC).

Results

Of the 27,131 North Carolina Medicare beneficiaries who were diagnosed with breast, prostate, lung, colorectal, and melanoma cancers in 2004–2007, only 32% (8,720) used occupational therapy within the first 2 yr of their cancer diagnosis. In the bivariate analyses (Table 1), older adults who used occupational therapy were significantly older (77 yr vs. 75 yr) and disproportionately female (55% vs. 43%). As for differences between groups within the enabling variables, occupational therapy users were more likely to be dually eligible for Medicare and Medicaid (17% vs. 12%), to use occupational therapy within 1 yr before cancer diagnosis (28% vs. 15%), and to be from metropolitan areas (64% vs. 60%). Occupational therapy users were more likely to be diagnosed with breast (25% vs. 19%) and colorectal cancers (21% vs. 16%); to be Stage I (22% vs. 18%) and Stage III (14% vs. 12%); and to have one (28% vs. 26%), two (13% vs. 10%), three (6% vs. 4%), or more than four comorbid conditions (6% vs. 4%).

Hierarchical linear regression identified variables associated with the use of occupational therapy services in three different models in sequential fashion (Table 2). When only considering predisposing variables (Model 1), occupational therapy users' age, sex, and education were the strongest predictors of occupational therapy use. The strength of the relationships between predisposing variables and occupational therapy use was attenuated when adding enabling variables (Model 2). Including the need variables (Model 3) lessened the predictive ability of age, sex, race, dual eligibility, and previous occupational therapy use.

According to Andersen's model, need variables would predict utilization. Within the final model, however, predisposing, enabling, and need variables all predict use. As we hypothesized, for every 5-yr increase in age, adults were 11% more likely to use occupational therapy. Women were 16% more likely, and those who were diagnosed with breast cancer were 14%–23% more likely to use occupational therapy than were adults with prostate and lung cancer. As for adults with different stages of cancer, adults with Stage I, II, or III cancers were more likely to use occupational therapy than those with Stage

Table 1. Demographic Characteristics for the Sample

	Occupational Therapy Users (n = 8,720)		Nonusers (n = 18,411)			Combined Users and Nonusers (N = 27,131)	
Characteristic	n	%	n	%	p	n	%
Predisposing variables							
Mean age, yr	77	—	75	—	<.001	76	—
Sex					<.001		
Male	3,959	45	10,572	57		14,531	54
Female	4,761	55	7,839	43		12,600	46
Education, yr	7.8		8.1		.473	8.0	
Race					.002		
White	7,487	86	15,918	86		23,405	86
African-American	1,168	13	2,257	12		3,425	13
Other	65	0	236	0		301	0
Enabling variables							
Mean household income, $	41,080		40,520		.614	40,700	
Dual eligibility	1,458	17	2,152	12	<.001	3,610	14
Previous OT	2,404	28	2,705	15	<.001	5,109	19
Urban–rural character					<.001		
Larger urban	1,860	21	4,167	23		6,027	22
Metropolitan	5,577	64	11,114	60		16,691	62
Rural	1,282	15	3,124	17		4,406	16
Need variables							
Cancer type					<.001		
Breast	2,200	25	3,426	19		5,626	21
Prostate	1,806	21	5,150	28		6,956	26
Lung	2,248	26	5,469	30		7,717	28
Colorectal	1,799	21	2,972	16		4,771	18
Melanoma	667	8	1,394	8		2,061	8
Stage					<.001		
0	681	8	1,479	8		2,160	8
I	1,904	22	3,235	18		5,139	19
II	2,511	29	5,689	31		8,200	30
III	1,215	14	2,195	12		3,410	13
IV	1,233	14	3,334	18		4,567	17
Unknown	1,063	12	2,266	12		3,329	12
CCI					<.001		
0	4,038	46	10,076	55		14,114	52
1	2,454	28	4,827	26		7,281	27
2	1,104	13	1,907	10		3,011	11
3	545	6	725	4		1,270	5
4+	534	6	649	4		1,183	4

Note. — = not applicable; CCI = Charlson Comorbidity Index; OT = occupational therapy. Education, mean household income, and urban–rural character are county-level variables. Bivariate analyses were performed with χ^2 tests for categorical variables and t tests for continuous variables. Bonferroni adjustment was made for all p values at individual level. Not all percentages add up to 100 because of rounding error. Observations with missing values were excluded.

0 or Stage IV. Last, adults with a score ≥1 on the CCI were more likely to use occupational therapy.

In terms of race in the fully adjusted model, African-Americans were 4% more likely to use occupational therapy. This finding was marginally significant in the intermediate model, and the CI included 1.00 in the final model. Also, household income and urban location had no relationship to use of occupational therapy services

Table 2. Model Predicting Occupational Therapy Use—Risk Ratios

Variable	Model 1 RR [95% CI]	Model 2 RR [95% CI]	Model 3 RR [95% CI]
Predisposing variables			
Age by 5-yr increments	1.15 [1.14, 1.16]	1.11 [1.10, 1.13]	1.11 [1.10, 1.12]
Women	1.28 [1.24, 1.33]	1.24 [1.19, 1.28]	1.16 [1.11, 1.21]
Education	1.20 [1.14, 1.27]	1.09 [1.00, 1.19]	1.11 [1.03, 1.20]
African-American vs. White	1.09 [1.04, 1.14]	1.06 [1.01, 1.11]	1.04 [1.00, 1.09]
White vs. other	1.34 [1.08, 1.66]	1.36 [1.10, 1.69]	1.37 [1.10, 1.69]
Enabling variables			
Household income		1.03 [0.99, 1.06]	1.02 [0.99, 1.06]
Dual eligibility		1.10 [1.05, 1.15]	1.08 [1.04, 1.13]
Previous use of OT		1.41 [1.36, 1.46]	1.35 [1.30, 1.40]
Metro vs. urban		1.03 [0.98, 1.07]	1.02 [0.98, 1.07]
Metro vs. rural		1.07 [1.01, 1.13]	1.06 [1.00, 1.12]
Need variables			
Breast vs. prostate			1.14 [1.06, 1.21]
CRC vs. prostate			1.12 [1.05, 1.19]
Melanoma vs. prostate			1.09 [1.01, 1.18]
Breast vs. lung			1.23 [1.17, 1.29]
CRC vs. lung			1.21 [1.15, 1.27]
Melanoma vs. lung			1.18 [1.09, 1.27]
Prostate vs. lung			1.08 [1.01, 1.15]
Stage I vs. unknown			1.20 [1.13, 1.28]
Stage II vs. unknown			1.16 [1.10, 1.23]
Stage III vs. unknown			1.20 [1.14, 1.27]
Stage I vs. Stage 0			1.16 [1.08, 1.24]
Stage II vs. Stage 0			1.12 [1.04, 1.20]
Stage III vs. Stage 0			1.16 [1.08, 1.25]
Stage 0 vs. Stage IV			1.10 [1.01, 1.19]
Stage I vs. Stage IV			1.27 [1.19, 1.35]
Stage II vs. Stage IV			1.23 [1.15, 1.30]
Stage III vs. Stage IV			1.30 [1.20, 1.35]
CCI: 1 vs. 0			1.15 [1.11, 1.20]
CCI: 2 vs. 0			1.16 [1.10, 1.22]
CCI: 3 vs. 0			1.29 [1.23, 1.37]
CCI: 4+ vs. 0			1.30 [1.23, 1.37]
CCI: 3 vs. 1			1.13 [1.07, 1.19]
CCI: 4+ vs. 1			1.13 [1.07, 1.19]
CCI: 3 vs. 2			1.11 [1.05, 1.18]
CCI: 4+ vs. 2			1.12 [1.06, 1.12]
Akaike Information Criterion[a]	32472.85	32141.44	31845.49

Note. $N = 27{,}131$. Occupational therapy users $n = 8{,}720$. CCI = Charlson Comorbidity Index; CI = confidence interval; CRC = colorectal cancer; RR = risk ratios. Household income is defined as average household income per county in $10,000 increments.
[a]Akaike Information Criterion (Burnham & Anderson, 2004): Smaller numbers signify a better fitting model. For the final model, only significant need-level variables are reported.

(RR = 1.02, 95% CI [0.99, 1.06]). Previous use of occupational therapy remained the strongest predictor over and above all other predictors within the model, and adults who used occupational therapy within 1 yr before their diagnosis were 35% more likely to use occupational therapy after diagnosis.

Discussion

Some disparities in care were suggested by the findings. Only 32% of the sample used occupational therapy within the first 2 yr of their cancer diagnosis, a rate lower than the estimated ≤87% of adults who are in need of such services (Holm et al., 2012; Lehmann et al., 1978). The occupational therapy users were significantly older than nonusers, and women were the majority. The literature substantiates this finding (Evashwick, Rowe, Diehr, & Branch, 1984; Holmes, Freburger, & Ku, 2012; Stoddart, Whitley, Harvey, & Sharp, 2002). Although we hypothesized that occupational therapy users would differ by race and that race would predict use of occupational

therapy, the difference appears to be small based on percentage of users. African-Americans appeared more likely to use the service; however, the magnitude of relative risk is small and minimally significant. This finding could be considered encouraging because it suggests only a minimal difference based on race, and that difference gives the advantages to African-Americans.

Freburger et al. (2011) reported that sociodemographics predicted increased use of higher institutional rehabilitation. However, as Freburger et al. described, even relatively small increases in use by minority groups may be concerning when considering the differences of outcomes and quality of survivorship for minorities overall (National Cancer Institute [NCI], 2011). Therefore, a small difference in use of services by minority compared with White patients may actually be more likely because of delayed, unmet health care needs and delayed use of services (Freburger et al., 2011; Moon & Shin, 2005).

Surprisingly, household income and the rural or urban character of the county of residence did not predict use of occupational therapy. Unlike in previous studies (Freburger et al., 2011; Harada, Chun, Chiu, & Pakalniskis, 2000), geographic location did not seem to be related to disparities in utilization. Harada et al. (2000) examined the geographic location of the hospitals where adults with hip fractures received physical therapy and found location to be highly important. Their findings may speak to the differences between health service use for urban and rural hospitals, not necessarily the county in which the adult lives as was examined in this study. Also, our finding could be related specifically to North Carolina; Freburger et al. (2011) did not examine adults from North Carolina. It could also be specific to the use of health care after a diagnosis of cancer, which may be different than for other conditions (Au, Udris, Fihn, McDonell, & Curtis, 2006). These results are different from previous research, even though the designation of rural and urban character was similar to other studies examining health service use (Jacobs, Kelley, Rosson, Detrani, & Chang, 2008; O'Malley, Forrest, Feng, & Mandelblatt, 2005). This curious finding suggests a need for additional investigation of the spatial distribution of access to occupational therapy relative to residence and cancer care sites and the need for more detailed individual level variables for analysis.

Beneficiaries with breast, colorectal, and melanoma skin cancer were more likely to be seen by an occupational therapist when compared with adults with prostate and lung cancer. Although those with a lung cancer diagnosis were the largest group, they were the least likely to be seen by an occupational therapist. This finding is disconcerting because the literature shows that older adults with lung cancer are most likely to experience a decline in ADLs, specifically, bathing, dressing, getting in and out of a chair, and using the toilet, after their diagnosis (Reeve et al., 2009). Compared with breast cancer, adults with lung cancer were more likely to report poorer health status (Hewitt, Rowland, & Yancik, 2003). Baker, Denniston, Smith, and West (2005) identified similar results and stated that adults with lung cancer report the most problems, including feeling helpless and dependent. Moreover, Esbensen, Østerlind, Roer, and Hallberg (2004) reported that having a diagnosis of lung cancer alone predicted poor quality of life and called for targeted interventions for this group. Adults with lung cancer are typically diagnosed at a later stage and have poorer survival rates than adults with the other cancer types represented in this study (NCI, 2011). However, considering their poorer survival rates and quality-of-life status, older adults with lung cancer may need special attention and intervention.

Adults with Stage IV cancers were least likely to be treated with occupational therapy, although recent literature suggests that occupational therapy would be beneficial for this population (Kasven-Gonzalez, Souverain, & Miale, 2010; Schleinich, Warren, Nekolaichuk, Kaasa, & Watanabe, 2008). Similar to what Cheville (2005) reported, a considerable number of adults with late-stage cancer do not have access to occupational therapy services, although they may benefit from such services. According to Cheville, cancer rehabilitation (understood as making specific gains toward restoring previous levels of independence and functional ability) is commonly "dismissed as an oxymoron" (p. 219), particularly within the later stages. This stereotype could explain why older adults with later stage cancers were least likely to be seen by an occupational therapist in this study. Future research is warranted to examine whether other predictors of use may determine use at this stage, including attitudes, values toward health care, or availability of occupational therapists to provide care.

Previous use of occupational therapy remained the strongest predictor in the final model. Once adults are aware of the services available, they become more likely to use them again. The literature on cancer rehabilitation commonly reports physician unawareness of occupational therapy and poor communication among fields as barriers to use because a referral is needed for access to care (Cheville, 2005; McCartney, Butler, & Acreman, 2011). Possibly, physicians (or nurse practitioners) who are aware of occupational therapy are more likely to refer. Future research could focus on awareness of occupational therapy as a potential way to expand access to care.

To our knowledge, this is the first study to examine the patterns of use of occupational therapy alone in a population-based study. These results suggest underuse of occupational therapy by older adults with cancer, a population with considerable functional needs. Given the known relationships between functional status and overall well-being in cancer care, further research exploring both barriers to occupational therapy use and opportunities for intervention will be critical in strengthening cancer survivorship care in North Carolina and beyond.

Limitations and Future Research

Our study had several limitations. First, because the types of occupational therapy provided are tailored to clients' specific needs, types of occupational therapy intervention and evaluation are likely to differ among adults. Moreover, occupational therapy billing codes do not include diagnosis codes to verify the reason for therapy. Some of the adults in our study may have been receiving occupational therapy for other reasons. Second, data were lacking on important predictors of occupational therapy use not found in claims data, such as personal beliefs and individual functional status. Third, although billing codes for occupational therapy could be used to represent other services such as physical therapy, a conservative approach to the codes was used to decrease that possibility. Fourth, income and education level were represented at the county level. Fifth, the study was conducted only in North Carolina, which may limit its generalizability.

To examine for the first time the patterns of use of occupational therapy by older adults with cancer, we identified several predictors of occupational therapy use in this population, including sex, age, previous use of occupational therapy, cancer type, and stage. Our results suggest possible underuse of occupational therapy by older adults with cancer. Future research could narrow the focus to one cancer type because cancers differ by type and stage. Moreover, research could include other large surveys linked to Medicare claims, which would include both functional status and billing claims and provide a more thorough understanding of the appropriateness, effectiveness, and possible disparity of occupational therapy services.

These analyses addressed an important problem that has received little attention. We identified several sociodemographic variations and lower usage than reported need in the patterns of occupational therapy use of older adults with cancer. Although cancer rehabilitation, defined to include occupational therapy and physical therapy, has been recommended, we noted large numbers of older adults not receiving services and considerable differences between those who did and did not use occupational therapy (Holm et al., 2012; Lehmann et al., 1978; Movsas et al., 2003; Ross, Petersen, Johnsen, Lundstrøm, & Groenvold, 2012; Stafford & Cyr, 1997). Because the burden of cancer and its treatments is greater for older adults, we stress that future researchers continue to understand the utilization of occupational therapy services and the appropriateness of the services for this population; it is especially critical for adults with lung cancer, who demonstrate the highest need and are least likely to use occupational therapy. Although evidence for occupational therapy is growing in other fields, we reiterate the need for future research within this population.

Implications for Research and Practice in Occupational Therapy

This study is the first description and analysis of the use of occupational therapy services by older adults with cancer. Examination of use of occupational therapy is the first step to understanding the quality of care provided to older adults. The findings from this study suggest the following implications for occupational therapy research and practice:

- Occupational therapy practitioners need to address the possible disparity in occupational therapy utilization by older adults with lung and Stage IV cancers. As noted, adults with these cancers may need specialized care; research is needed on effective and evidence-based intervention to improve their quality of life.
- Increased awareness of occupational therapy services by practitioners (oncologists, nurse oncology practitioners, etc.) and by older adults may increase access and utilization of occupational therapy services for older adults with cancer.
- Occupational therapy researchers need to take an active role in health services research to examine access to occupational therapy in other populations to outline and understand possible disparities in access to care.
- Occupational therapy associations need to work with oncology professional associations to build bridges and partnerships for research to improve practice and outcomes for people with cancer. ▲

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