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EFFECTIVENESS OF WOUND, OSTOMY AND CONTINENCE–CERTIFIED NURSES ON INDIVIDUAL PATIENT OUTCOMES IN HOME

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PROFESSIONAL PRACTICE

Effectiveness of Wound, Ostomy and Continence–Certified Nurses on Individual Patient Outcomes in Home Health Care

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ABSTRACT

PURPOSE: To assess whether there was a significant improvement and stabilization (not worse at discharge) in pressure ulcers, lower extremity venous ulcers, surgical wounds, urinary incontinence, bowel incontinence, and urinary tract infections in home health care (HHC) patients cared for by a certified WOC nurse.

SUBJECTS AND SETTING: There were 449,170 episodes of care from a national convenience sample of 785 HHC agencies with 447,309 nonmaternity, adult patients between October 1, 2008, and December 31, 2009.

DESIGN: Descriptive and comparative.

INSTRUMENTS AND METHODS: Data from the Outcome and Assessment Information Set documented by HHC clinicians were analyzed using mixed-effects logistic regression, propensity score analysis, and appropriate parametric and nonparametric tests. An Internet survey identified whether WOC nurses provided care to patients in an HHC agency. Home health care agencies identified records of patients receiving WOC nurse visits/consults.

RESULTS: An HHC patient assigned to a WOC nurse had surgical wounds, pressure ulcers, and incontinence problems that were significantly worse than HHC patients not assigned to a WOC nurse. Patients cared for by a WOC nurse showed significant improvement and stabilization of the number of pressure ulcers and surgical wounds and the frequency of urinary and bowel incontinence, despite having problems that were more severe than other patients. Home health care patients not cared for by WOC nurses, with less-severe wound and incontinence problems, also got better.

CONCLUSIONS: WOC nurses are effective in achieving positive health outcomes for pressure ulcers, surgical wounds, and incontinence in HHC patients with severe health problems.

KEY WORDS: certification, home healthcare, pressure ulcer, urinary tract infections, wounds

Introduction

Providing home health care (HHC) is an increasingly important strategy for reducing hospital, rehabilitation, and nursing home lengths of stay and associated costs.[1,2] As a result of shifting care from an inpatient to a community setting, the complexity of care is rising in HHC. Recipients of HHC services are usually older and have complex, comorbid health conditions; many are recovering from recent illnesses or surgical procedures.[2] Wounds and incontinence are frequent health problems in HHC.[3,4] We recently reported that 34% of nearly 300,000 episodes of HHC were for a surgical wound, pressure ulcer, or lower extremity venous ulcer, and 60% of episodes were for urinary or bowel incontinence.[5]

Of the approximately 5000 members of the Wound, Ostomy, and Continence Nurses Society, 13% practice in HHC as a primary site of employment (Nicolette Zuecca, oral personal communication, September 28, 2012). Certified wound, ostomy and continence (WOC) nurses possess expertise that can optimize the health outcomes of HHC patients. However, very little is known about the effectiveness of care provided by WOC nurses in HHC with regard to improvement and stabilization of wound and incontinence problems. In one study,[6] care for chronic wounds of HHC patients provided by WOC nurses resulted

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The authors declare no conflict of interest.

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in 78.5% of wounds healing compared with 36.3% when care was provided by general staff nurses. The purpose of our study was to assess improvement and stabilization of pressure ulcers, lower extremity venous ulcers, surgical wounds, urinary incontinence, bowel incontinence, and urinary tract infections (UTIs) in HHC patients cared for by a WOC nurse. The research question we posed was "Do HHC patients cared for by a WOC nurse show significant improvement and stabilization (not worse at discharge) of pressure ulcers, lower extremity ulcers, surgical wounds, urinary incontinence, bowel incontinence, and UTIs from admission to discharge compared to HHC patients who are not cared for by a WOC nurse?"

Methods

This study employed a descriptive and comparative design. Home health care agencies were recruited using multiple strategies including e-mails and flyers at home care conferences, through state home care associations, HHC software vendors, and professional organizations, and an article in a home care journal. Deidentified clinical data about HHC patients and their episodes of care were obtained from the Outcome and Assessment Information Set (OASIS Version B-1) of the HHC agencies' electronic health records. OASIS is the patient assessment mandated by the Centers for Medicare & Medicaid Services for all Medicare certified HHC agencies and includes information about demographics, health history, living arrangements, social support, health and functional status, medication and equipment management, need for therapy, and discharge.

Data Preparation

Data of HHC patients who had an admission and discharge OASIS assessment between October 1, 2008 and December 31, 2009 were included. This time period was selected because agencies had experience with OASIS B data collection, prior to initiation of the new OASIS C. There was concern that the lack of familiarity with changes in the new version of OASIS might result in inconsistent documentation. Consistent with Medicare requirements for OASIS data collection, patients were 18 years of age or older and admitted for nonmaternal health conditions. Patients were included only if they received care from an HHC agency that had an in-person WOC nurse (n = 90 agencies) or no WOC nurse (n = 19 agencies). Excluded were patients of HHC agencies that had a WOC nurse who was at an organizational level but never provided consultation or visits to patients and patients who received telehealth nursing consultations, but no in-person WOC nurse visits.

Patients were included only if they had both an admission and discharge assessment. An episode of care, which is a continuous time period during which a patient received periodic home care visits, was the unit of analysis in the models. The procedure for classifying the *International Classification of Diseases* (*ICD*) codes in OASIS into the diagnostic groups used in these analyses has been explained elsewhere.[5] A list of HHC agency patients with a WOC nurse was created by the agencies themselves or generated from within a modified version of an HHC quality improvement software (ie, Home Health Gold, Waterville, Maine). Data were securely transferred to the investigators using remote access software (Citrix Go To Assist, Santa Clara, California) or agencies uploaded their data via the secure Web site at the investigators' university. The study was approved by the institutional review board at the University of Minnesota.

Clinical Conditions, Outcomes, and Predictors

The definitions of the clinical conditions investigated in this study and their OASIS element(s) were as follows: Total number of pressure ulcers (M0450 a-e), total number of lower extremity ulcers (M0470/ M0474), total number of surgical wounds (M0484/M0486), frequency of urinary incontinence (M0520), frequency of bowel incontinence (M0540), and type of intervention (0 = none, 1 = prophylaxis, 2 = active treatment) for an UTI in the past 14 days (M0510). Two types of outcomes were measured for each clinical condition: "improvement" and "stabilization" (not worse at discharge). They were based on the Centers for Medicare & Medicaid Services' definition of outcomes and scored as Yes or No. The description of the cohorts for each outcome was explained in more detail previously.[5]

OASIS data elements were used as predictors of the outcomes of each clinical condition in statistical models. Predictors were selected based on a review of the literature, consultation by WOC nurse clinical experts, consensus among the researchers, and elements available on the OASIS B-1. Some transformed or new predictor variables were needed because they were not available on the OASIS document or more than 1 OASIS element may have defined a predictor of interest. The transformation of new or scaled variables that served as predictors of the outcomes in statistical models has been previously described.[5] Newly created predictor variables were as follows: length of stay, payer categories, age, race/ethnicity categories, activities of daily living, instrumental activities of daily living, prognosis, Charlson index of comorbidity, urinary incontinence history, behavioral problems, severity of nutrition problems, respiratory status, medication management, and caregiver characteristics.

Statistical Analysis

Mixed-effects logistic regression was used to calculate improvement and stabilization for each clinical condition. The mixed-effects logistic regression analysis allows the use of binary (yes/no) outcomes and controls for the

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random effect of agencies. A random effect for the agency variable was used because conditions and patients from different agencies were expected to be more different from those from the same agency. It was originally ex- pected that the indicator for a WOC nurse would be en- tered into models along with predictor variables to get an estimate of the effect of the WOC nurse on outcomes while controlling for other important factors. However, in reviewing these models, we found that many of the pre- dictors were confounded with each other and with having a WOC nurse. Including these in the same model led to convergence problems, variables "blowing up" (ie, having very wide confidence intervals) and having effects in the opposite direction than considered realistically possible.

We suspected that some convergence problems might be due to confounding between the predictors of the outcomes and receiving a WOC nurse at admission. For example, sicker patients would be assigned a WOC nurse. To examine this idea, propensities scores were created to summarize the association of these predictors with having a WOC nurse. A propensity score is the probability of a person being assigned to a particular condition (having a WOC nurse) given a set of known variables. The type of propensity score chosen used an inverse probability of treatment weighting,[7] which resulted in unbiased risk differences with the smallest standard errors and correct type I error rates. To create the propensity score, the predictor variables were regressed on having a WOC nurse, which resulted in the probability estimates of having a WOC nurse (propensity score) for each subject. Table 1 shows the predictors included in the propensity score for having a WOC nurse for each outcome. A logistic regression analysis was then tried including the indicator variable for the WOC nurse, weighted by the propensity score, to determine the effect of the WOC nurse on HHC patient outcomes.

Many of the models at the individual level, including the propensity score, remained problematic. We suspected that the propensity scores for patients receiving a WOC nurse were not adequately adjusting for the more severely ill subjects at admission who were being assigned to a WOC nurse. Further investigation looked at just the actual values of the outcome variables at admission and discharge *separately* in groups of patients with or without a WOC nurse. Graphs were constructed for all the admission to discharge outcomes by WOC nurse status. Paired comparisons (paired *t* test or Wilcoxon matched-pairs signed-rank test) were conducted between the values of the original outcome variables at admission and discharge. Independent comparisons (independent *t* test or Mann-Whitney *U* test) were made between the WOC nurse group and the no-WOC nurse group for admission values and discharge values. Findings showed that for almost every outcome, the 2 patient samples at admission (assigned a WOC nurse or not) were not the same (Figures 1 and 2) and could not be adequately modeled together due to confounding between the severity of their clinical conditions and being assigned a WOC nurse. Therefore, the appropriate individual-level analysis was determined to be the comparisons stated previously (ie, paired *t* test or Wilcoxon test or independent *t* test or Mann-Whitney *U* test) rather than the logistic regression analysis originally planned. Similar to the agency-level outcomes reported in a previous article,[5] stabilization of lower extremity ulcers could not be analyzed as patients with and without a WOC nurse each reached over 99% stabilization, leaving no variance to model.

Results

Analysis was based on 447,309 unique patients in 785 HHC agencies (Table 2). Patients were predominately

TABLE 1.

Predictors Included in the Propensity Score of Being Assigned a WOC Nurse by Outcome

Predictor	PU	SW	LEU	UTI	UI	BI
Race/ethnicity—black or black and Hispanic	X	X	X	X	X	X
Charlson Index of Comorbidity	X	X	X	X	X	X
Lives alone	X	X	X	X	X	X
Poor nutrition		X	X			
Total number of surgical wounds		X				
Urinary tract infection in the past 14 d					X	X
Bowel incontinence frequency	X			X	X	
Activities of daily living	X	X	X	X	X	X
Instrumental activities of daily living	X	X	X	X	X	X
Total number pressure ulcers	X					
Total number of lower extremity ulcers	X		X			

Abbreviations: BI, bowel incontinence; PU, pressure ulcer; SU, lower extremity ulcer; SW, surgical wound; UI, urinary incontinence; UTI, urinary tract infection.

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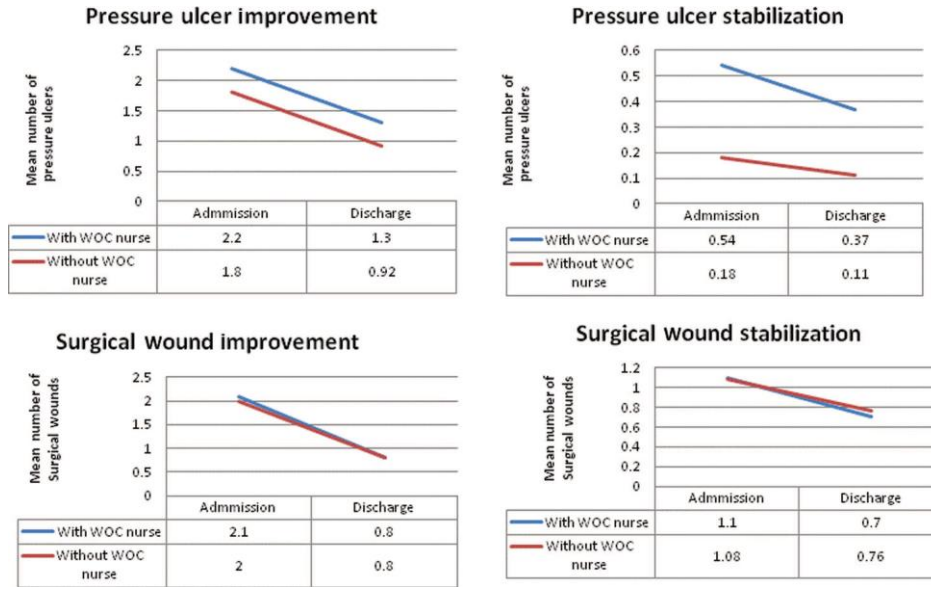

FIGURE 1. The number of pressure ulcers and surgical wounds in patients at admission to and discharge from home health care (HHC) who were and were not cared for by a WOC nurse. All data presented are means. Results show that both groups of HHC patients significantly improved or stabilized in their clinical conditions (all $P < .001$), but those cared for by a WOC nurse had more severe problems at admission to HHC.

elderly and white, with slightly more women than men. About one-third (29%) lived alone and nearly all patients required assistance with activities of daily living (94%) or instrumental activities of daily living (99%). Obesity was present in 15% of the sample. Only 3% of patients had severe nutritional compromise, requiring parenteral or enteral therapy. Approximately 6.2% were heavy smokers. The prognosis for the majority of patients (75%) was a partial or full recovery. Patients represented all regions of the country: Midwest (11%), Northeast (19%), South (59%), and West (11%). About two-thirds were admitted from a hospital or other facility (eg, nursing home or

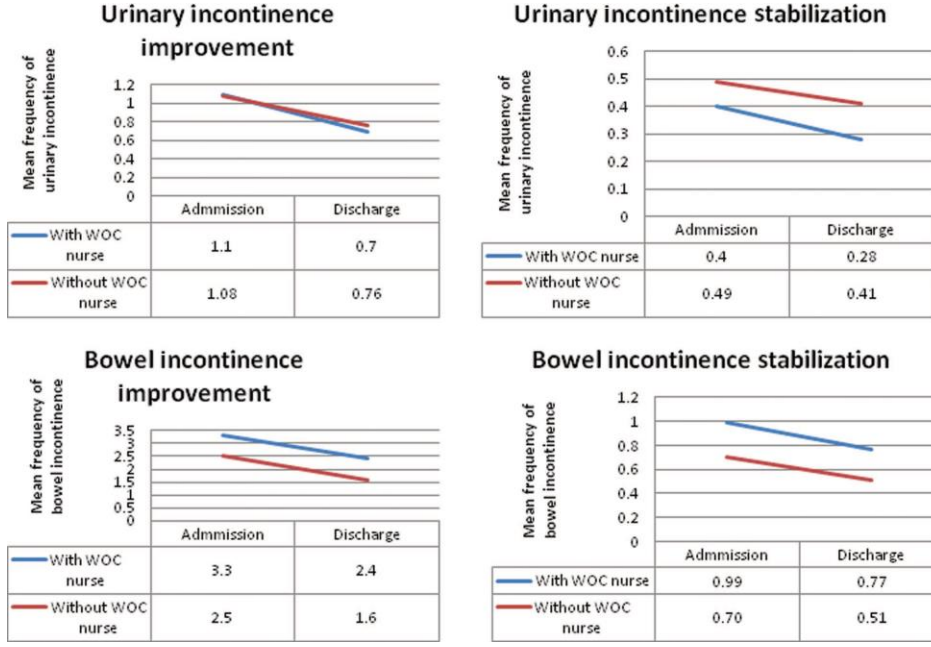

FIGURE 2. The frequency of urinary and bowel incontinence in patients at admission to and discharge from home health care (HHC) who were and were not cared for by a WOC nurse. All data presented are mean frequencies. Results show that both groups of HHC patients significantly improved or stabilized in their clinical conditions (all $P < .001$). Patients cared for by a WOC nurse had more severe problems at admission to HHC except for those in the analysis of urinary incontinence stabilization.

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TABLE 2.
Characteristics of Home Health Care Patients

Variables	% Patients (n = 447,309 Patients)
Age at admission, y	
18-64	18
65-74	23
75-84	32
85	27
Female gender	65
Race/ethnicity[a]	
White	80
Black	13
All others	9
Payer[a]	
Medicare	92
Medicaid	7
All others	8
Admitted from a facility[b]	
Hospital	48
Other type of care facility	22
Length of stay in days	
≥120	14
1-30	35
31-60	42
61-90	9

[a]Sum is greater than 100% because more than 1 response could be selected.
[b]Remainder of patients is admitted from the community.

TABLE 3.
Percentage of Episodes of Care in Home Health Patients by Primary Diagnosis

Description of Reason for Home health Care (*ICD-9* Codes)	% Episodes of Care, n = 449,170 Episodes of Care[a]
Infectious and Parasitic Diseases (001-139)	0.3
Neoplasms (140-239)	2.1
Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders (240- 248, 251 - 279, Except Diabetes)	0.6
Diabetes (249-250)	5.5
Diseases of the Blood and Blood-Forming Organs (280-289)	0.6
Mental Disorders (290-319)	3.2
Diseases of the Nervous System and Sense Organs (320-389)	6.0
Diseases of the Circulatory System (390-428, 429, 439-459, Except Heart Failure or Cerebrovascular Diseases)	11.2
Heart Failure (428)	4.6
Cerebrovascular Disease (430-438)	4.5
Diseases of the Respiratory System, Except Chronic Obstructive Pulmonary Diseases (460-489, 493, 495, 497-519)	2.7
Chronic Obstructive Pulmonary Diseases (490-492, 494, 496)	3.5
Diseases of the Digestive System (520-579)	1.8
Diseases of the Genitourinary System (580-629)	2.2
Diseases of the Skin and Subcutaneous Tissue (680-709)	4.1
Diseases of the Musculoskeletal System and Connective Tissue (710-739)	7.2
Congenital Anomalies (740-759)	0.1
Injury and Poisoning (800-999)[b]	10.8
Symptoms, Signs, and Ill-Defined Conditions (780-799)[c]	28.9

rehabilitation center), and the vast majority had services paid for by Medicare. Approximately three-quarters of patients were discharged from HHC within 60 days.

Each episode was treated as an independent event in the analyses. Analysis was based on 449,243 episodes of care; only 0.4% had more than 1 episode of care. Table 3 shows the percentage of episodes of care used in the various analyses by primary diagnoses. Primary diagnoses represent the reason for HHC and are based on ICD codes. The most frequent reasons for home care, shown by the primary diagnosis, were as follows: symptoms, signs, and ill-defined conditions (28.9%), which is frequently used to indicate the need for physical therapy and rehabilitation; diseases of the circulatory system such as heart failure, cerebrovascular disease, and hypertension (11.2%); and injury and poisoning (10.8%), such as fractures, wounds, or problems with medications.

The number of episodes of care for each analysis of an outcome is shown in Table 4. The total number of episodes

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Residual Codes; Unclassified; All E Code	0.4

Abbreviation: ICD-9, *International Classification of Diseases, Ninth Revision.*

[a]Sixty-five episodes were missing.

[b]"Injury and Poisoning" often indicates problems with medications.

[c]The category "Symptoms, Signs, and Ill-Defined Conditions" is frequently used to indicate that physical therapy and rehabilitation are the primary reason for HHC.

of care was 140,629. The number of episodes of care varied considerably by condition with the greatest number represented by patients with surgical wounds (n = 101,191) and lower extremity ulcer stabilization (n = 10,944) and

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TABLE 4.

Number and Percentage of Patients and Episodes of Care per Outcome

Outcome	Clinical Condition	Total Number of Episodes of Care	Episodes of Care of Patients not Cared for by a WOC Nurse, n (%) Meeting Outcome	Episodes of Care of Patients Cared by a WOC Nurse, n (%) Meeting Outcome
Improvement	Pressure ulcers	645	281 (68)	364 (63)
Improvement	Lower extremity ulcers	414	135 (78)	279 (75)
Improvement	Surgical wound	3,215	1,983 (81)	1,232 (83)
Improvement	Urinary tract infection	7,482	7,227 (86)	255 (85)
Improvement	Urinary incontinence	4,292	2,811 (30)	1,481 (40)
Improvement	Bowel incontinence	1,511	892 (52)	619 (52)
Stabilization	Pressure ulcers	4,290	2,811 (98)	1,479 (95)
Stabilization	Lower extremity ulcers	10,944	6,862 (99)	4,082 (98)
Stabilization	Surgical wound	101,191	97,772 (97)	3,419 (97)
Stabilization	Urinary tract infection	4,401	2,863 (97)	1,534 (98)
Stabilization	Urinary incontinence	8,593	5,353 (94)	3,240 (96)
Stabilization	Bowel incontinence	4,164	2,784 (94)	1,380 (90)

the least for lower extremity ulcer (n = 414) and pressure ulcer (n = 645) improvement. There was no difference in the total number of stasis ulcers between groups (with a WOC nurse vs no WOC nurse) at admission ($P = .95$) or discharge ($P = .81$) and both groups significantly improved at discharge ($P < .001$ for both).

Effectiveness of WOC Nurse

In the analyses of improvement and stabilization of a pressure ulcer or a surgical wound, patients who were assigned a WOC nurse had significantly more wounds than those not assigned a WOC nurse (Figure 1). Patients assigned a WOC nurse had 2.2 ± 1.0 pressure ulcers (mean ± SD) while those not assigned a WOC nurse had 1.8 ± 0.95 pressure ulcers ($P < .001$). Both groups (patients who were and were not cared for by a WOC nurse) significantly improved or stabilized the number of pressure ulcers and surgical wounds at discharge ($P < .001$ for both; Figure 1). Despite the higher number of pressure ulcers, the HHC patients who had a WOC nurse signifi- cantly improved.

Analysis also revealed that patients who were assigned a WOC nurse had significantly higher-frequency scores for both urinary and bowel incontinence at HHC admission than those not assigned a WOC nurse (Figure 2). For example, the frequency score of bowel incontinence of patients at HHC admission who were assigned a WOC nurse was 3.3 ± 1.7, indicating incontinence 4 to 6 times weekly, while that of patients not assigned a WOC nurses was 2.5 ± 1.5, indicating incontinence 1 to 3 times weekly ($P < .001$). Although patients in the analysis of incontinence stabilization who were assigned a WOC nurse had worse bowel incontinence at admission than those not assigned a WOC nurse, they had less-severe urinary incontinence at admission (Figure 2). Urinary and bowel incontinence frequency significantly improved and stabilized by discharge in patients cared for by a WOC nurse and those not cared for by a WOC nurse ($P < .001$ for than groups; Figure 2). Similar to HHC patients with wounds, patients cared for by a WOC nurse significantly improved despite worse incontinence than those not cared for by a WOC nurse.

Analysis of UTI stabilization and improvement revealed no significant difference of intervention type at admission to HHC between patients who were assigned a WOC nurse or not for both outcomes (Figure 3). The score for UTI interventions at HHC admission of patients in the analysis of improvement who were cared for by a WOC nurse was 2.0 ± 0.19, and for those without a WOC nurse, it was 1.9 ± 0.24 ($P = .11$). Both groups showed significant change in types of UTI interventions. However, improvement in the type of intervention for UTIs and stabilization in the type of intervention for UTIs showed virtually no change (Figure 3).

Discussion

This study provides new evidence that HHC patients with pressure ulcers, surgical wounds, and incontinence who were cared for by a WOC nurse showed significant improvement and stabilization of their health problems. Also, there was improvement in the type of intervention for UTIs at discharge. These results support findings of other studies showing a benefit of care by certified specialty nurses. For example, Kendall-Gallagher and Blegen[8]

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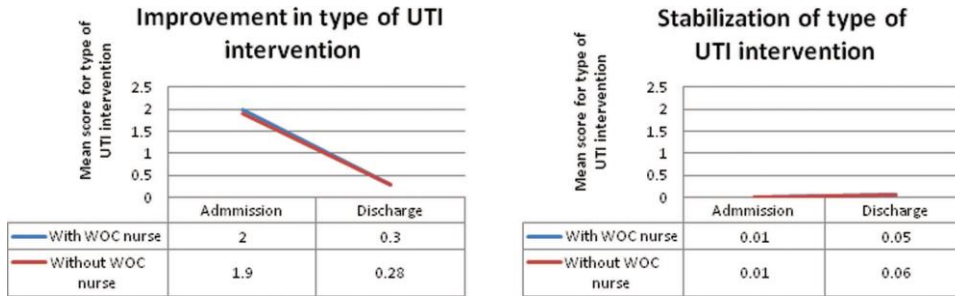

FIGURE 3. Type of intervention for urinary tract infection (UTI) in patients at admission to and discharge from home health care (HHC) who were and were not cared for by a WOC nurse. All data presented are mean scores for type of intervention (0 = none, 1 = prophylaxis, 2 = active treatment). There was no significant difference between groups of patients at admission for either outcome ($P > .05$). Results show that interventions in both groups of patients changed. For the improvement outcome, the type of intervention became better; however, for the stabilization outcome, there was a decline in the type of intervention, although admission and discharge scores were both near zero (all $P < .001$). Patients cared for by a WOC nurse had more severe problems at admission to HHC except for those in the analysis of urinary incontinence stabilization.

showed that there was a significant inverse relationship between the ratio of certified critical care nurses and the rate of patient falls. Arnold and Weir[6] reported faster wound healing in more HHC patients cared for by a WOC nurse than a general staff nurse. This study builds on the findings of Arnold and Weir,[6] strengthening conclusions about the benefit of WOC nursing care and increasing generalizability of the results by having a larger sample size and being able to adjust for multiple factors that might confound the outcomes. Westra and colleagues[5] re- cently reported that more than 50% of HHC patients have some type of incontinence. We believe that this is the first study to evaluate the effectiveness of the WOC nurses with regard to managing the prevalent and challenging problems of urinary and bowel incontinence in HHC patients. The findings extend those of Westra and colleagues,[5] which showed that care by a WOC nurse improved overall HHC agency outcomes for wounds and incontinence.

Home health care patients who were not cared for by a WOC nurse also improved and stabilized their health problems indicating a benefit of HHC nurses and the quality of care provided by the HHC agencies. However, findings show that HHC agencies rely on the expertise of WOC nurses to manage patients with the most severe wound and continence problems, and WOC nurses are able to achieve positive outcomes. In contrast, HHC pa- tients needing routine treatment for UTI or lower extrem- ity ulcer management are similarly assigned to a WOC or other HHC nurse. Although there was a significant decline in stabilization of the type of intervention for UTI for patients with and without a WOC nurse, the change was very small and does not seem clinically meaningful. Other investigators have described advantages of specialty practice certification that might explain the better patient outcomes seen in this and other studies.[9,10]

▪ Limitations

This is a secondary analysis of OASIS data that were collected for clinical assessment of patients and not for research use. While the data are heavily audited for accuracy and completeness, there may be differences in how items are interpreted and answered. Although WOC nurses provide care to ostomy patients, outcomes related to ostomy patients could not be included due to the lack of ostomy data on the OASIS document. Generalizability is incomplete since a convenience sample was used; however, the large sample of HHC agencies and episodes of care and national scope of large and small agencies provide the most substantial evidence to date about the effectiveness of WOC nurses in HHC for managing wounds and incontinence.

▪ Conclusions

The results of this study show the effectiveness of care provided by WOC nurses for HHC patients with pressure ulcers, surgical wounds, and incontinence. Positive outcomes were achieved for improvement or stabilization of health problems that were more severe than other HHC patients not cared for by a WOC nurse. Considering the rise in need for HHC services and increasing complexity of HHC patients, the care provided by WOC nurses seems highly valuable.

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