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Medications, Comorbidities, and Medical Complications in Stroke Survivors: The CARES Study

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Abstract

Stroke survivors enter rehabilitation units with many medical comorbidities and often experience significant complications during their stay. The 97 stroke survivors discharged home in this study received prescriptions for a mean of 11.3 medications from 5.4 different drug classifications. There were significant correlations between the number of comorbidities and post-stroke complications and the number of different classifications of drugs that were ordered. The purpose of this paper is to 1) identify the types of medications prescribed for stroke survivors who are being discharged home from rehabilitation, 2) explore correlations between medication prescriptions and the number of stroke-related comorbidities and medical complications, 3) identify the cost of medications and the potential impact of medication costs on stroke survivors, and 4) discuss the nurses' role in preparing stroke survivors and their caregivers for medication use after discharge. Rehabilitation nurses have the major responsibility for teaching stroke survivors and their caregivers about their discharge medications.

Keywords

Medications; Comorbidities; Medical complications; Stroke; Cost

Stroke survivors present unique challenges to rehabilitation nurses because most strokes occur in the context of other serious medical diagnoses, which increase the stroke survivors' propensity for developing medical complications during their rehabilitation experience. Unlike many patients seen in rehabilitation units, stroke survivors are more likely to be older and to have other chronic medical conditions. Many stroke survivors are started on new medications, such as antihypertensives or anticoagulants, during their hospitalization in an attempt to control risk factors and prevent recurrent strokes. Furthermore, complications of the stroke, such as depression and seizures may require new medications for control. Nurses are responsible for administering medications while the stroke survivor is an in-patient and for educating stroke survivors and their caregivers about the proper use of medications after discharge.

Diabetes, hypertension, and congestive heart failure are on the increase among stroke survivors (Fang and Alderman, 2001); hypertension is the most common risk factor reported among stroke survivors, regardless of the type of stroke (Williams et al., 2003). Other risk factors for

stroke, such as coronary artery disease, high cholesterol, and atrial fibrillation may also be present and require special medications.

Stroke survivors commonly experience medical complications during their rehabilitation stay. Depression, urinary tract infection, and limb pain have been reported as three of the most common complications experienced among stroke survivors (Doshi et al., 2003, McLean, 2004). The use of medical tubes (tracheostomies, enteral feeding tubes, and indwelling urinary catheters), and associated complications, are also on the increase in rehabilitation units (Roth and Lovell, 2003). The increasing number of comorbidities and complications illustrate the medically active nature of many rehabilitation units today (Roth et al., 2002).

For most stroke survivors, discharge home is only one more step in a long process of recovery. The availability of family caregivers to help in the continuing recovery process has been shown to be an important predictor of discharge home after a stroke. Married stroke survivors, those living with another person, and survivors with unemployed caregivers had a greater chance of being discharged home than those without available caregivers (Ween et al., 2000) (Black et al., 1999) (Stineman et al., 2001) (Sommerfeld and von Arbin, 2001). After discharge, family caregivers assume many health care tasks, including the administration, and or supervision of medications.

Researchers, who have contacted stroke survivors and their family caregivers after discharge, reported that they were frustrated with the lack of information that they received prior to discharge and continued to have questions during the first 6 months at home (Bakas et al., 2004, Bakas et al., 2002, Best, 1994, Clark, 2000, Evans et al., 1992). A systematic Cochrane review examined strategies used to provide information to stroke survivors and their caregivers. They concluded that future work should be directed toward addressing the expressed needs of stroke survivors and their caregivers and identifying appropriate teaching strategies, which can be successfully implemented in clinical practice (Forster et al., 2001).

The purpose of this paper is to 1) identify the types of medications prescribed for stroke survivors who are being discharged home from rehabilitation, 2) explore correlations between medication prescriptions and the number of stroke-related comorbidities, and number of medical complications, 3) identify the cost of medications and the potential impact on stroke survivors, and 4) discuss the nurses' role in preparing stroke survivors and their caregivers for medication use after discharge.

Methodology

Patients The sample for this study were 97 stroke survivors of at least 50 years of age, who were discharged home from one of five hospital systems within the Texas Medical Center between November, 2001 and December, 2003; all stroke survivors had spousal caregivers. The data presented in this article are a part of CARES (Committed to Assisting with Recovery after Stroke), an interdisciplinary, intervention study with stroke survivors and their spousal caregivers that was funded for 5 years by the National Institute for Nursing Research. The study was approved by the university IRB committee and by the IRB committees of the health care systems from which patients were recruited.

Instruments: Demographic data, stroke-related comorbidities, medical complications, and the prescriptions for discharge medications were abstracted from the patient's chart by trained nurses and occupational therapists. The four-factor Hollinghead's formula was used to determine socioeconomic status (SES) (Hollingshead, 1979). A baccalaureate-prepared nurse interviewed stroke survivors in their homes to verify the discharge medication prescriptions,

Data Management & Analysis: All data, except medications, were collected on specially designed scannable data collection forms using Cardiff Teleform software, version 8.1 (Cardiff Software, 2001). The data forms were checked for data completeness prior to scanning. During the scanning process, the Teleform software interpreted and validated the scanned data. All data forms were stored in a locked cabinet in a locked office with access limited to the data management staff. After checks for accuracy, the data were directly scanned to a Microsoft Access database that was stored on a double password protected dedicated computer with no Internet connection. The medications were entered by a registered nurse into a specially designed ACCESS database that allowed the generic and trade names to be entered, and the medications to be classified into categories according to purpose, such as antihypertensives and antidepressants. Information on the average wholesale price (AWP) of sample medications was obtained from the Red Book (Economics, 2004). Data were imported into SAS software, version 8.2 (SAS Institute, 2001) where basic and inferential statistics, including frequencies, means, correlations, t-tests, and chi-square analyses were performed. The sums do not always add to 97 due to missing data.

Results

The average age of the participants was 66.2 (SD = 8.84, range 50-87) and 74 (76.3%) were male; 82 (84.6 %) had at least a high school education and 43 (44.3%) were minorities. Seventy-six had comprehensive insurance coverage (Medicare with supplement, Private insurance or Veterans' health benefits); the remaining 21 had limitations to their health care coverage with the potential for high out-of-pocket costs.

Stroke survivors experienced an average of 2.38 stroke-related comorbidities (SD = .85, range 0-6). The 3 leading stroke-related comorbidities in this study were hypertension (n = 82, 86.5%), history of cardiac related comorbidities, including arrhythmias, faulty heart valves, and coronary artery disease (n = 62, 64.6%), and diabetes n = 37, 38.5%). On average, patients experienced 3.9 complications (SD = 3.18, range 0-13) with the most common being depression (n = 43, 44.8%).

Stroke survivors were discharged home with an average of 11.3 medications (SD = 4.94, range 3-27) per person from 5.4 different drug classifications (SD = 2.07, range 1-12). The number of medications prescribed was correlated with the number of stroke-related comorbidities ($r = .214, p = .04$). Receiving prescriptions for medications from several different drug classifications was correlated with having more stroke-related comorbidities ($r = .203; p = .05$), and more complications ($r = .229; p = .03$). There were no correlations between the number of medications or the number of drug classifications and age, gender, education, socioeconomic status (SES) or the number of days in rehabilitation.

The most common classifications of medications, with an example of one commonly prescribed medication in each classification, can be seen in Table 1. The medication prescriptions were consistent with the stroke-related comorbidities and medical complications identified in the charts. Eighty of the 83 (96.4%) stroke survivors with a diagnosis of hypertension were discharged on antihypertensive medications. Antidiabetic medications were prescribed for 86.5% of those with a diagnosis of diabetes and nine additional stroke survivors who had hyperglycemia. Of the 43 patients with a diagnosis of post-stroke depression, 38 (88.4%) were discharged on antidepressant medications. In addition, 23 patients without a recorded diagnosis of depression were discharged with a prescription for an antidepressant; 61 of the 96 stroke survivors (63.5%) were discharged with prescription for antidepressant medications. Other common complications which were reflected in the medication prescriptions were seizures, infections, especially urinary tract infections, constipation, and pain.

The monthly cost of these medications can be overwhelming for families who do not have medication coverage or those with lower SES. The per dose and monthly average wholesale price (AWP) of 10 common medications used by stroke survivors with risk factors of diabetes, hypertension, and hyperlipidemia, and with medical complications of depression, post-stroke central pain, and seizures are shown in Table 2.

Stroke survivors incur significant costs for medications. In the example above, stroke survivors not eligible for discounts, such as those without insurance or stroke survivors on Medicare without supplements would incur the total monthly cost of approximately \$725/month. In addition, even those with medication coverage, may incur out-of-pocket co-payments of \$200 or more for their medications. After discharge, stroke survivors reported missing utility payments to buy medications, buying less than 30 pills at a time to stretch out the payments throughout the month, skipping doses to make the pills last longer, getting free samples from their physician's offices, and going to Mexico to buy medications at reduced cost.

Discussion

Stroke survivors were discharged home with an average of over 11 medications from five different drug classifications. The types of medications prescribed were consistent with the comorbidities and complications experienced by the survivors. In this study, 75% of the stroke survivors received prescriptions for Plavix and 23% received prescriptions for anticoagulants. Although previous studies have reported that Asian/Pacific Islanders, blacks, and Hispanics eligible for anticoagulant therapy received it less often than non-Hispanic white nursing home residents (Christian et al., 2003), this study did not find any association between race/ethnicity, SES, or type of insurance and medication prescriptions.

Likewise, post-stroke depression has sometimes been described as under diagnosed and under treated. However, in this study, over 60% of the stroke survivors were discharged with prescriptions for antidepressants. This is consistent with others (Eriksson et al., 2004) who recently reported that only 8.4% of stroke survivors who reported a depressive mood were not on an antidepressant; in this study only 5.3% of those with post-stroke depression were sent home without a prescription for an antidepressant medication. Antidepressant medications were the fourth most commonly prescribed medication, preceded only by antihypertensive, antiplatelet, and antihyperlipidemia medications.

Rehabilitation nurses bear the major responsibility for teaching stroke survivors and their caregivers about the medications that they will taking after discharge home. Yet, very little is written in the literature about this important responsibility. Procedures for preparing stroke survivors and their caregivers for discharge are inconsistent between rehabilitation units. Some send medications home with the stroke survivors, some send prescriptions, and some arrange to have prescriptions mailed to the home. Likewise, some units provide both oral and written information on all medications, some provide a list of medications with no specific written instructions, and some provide no information. Medication discharge instructions, if they occur at all, are frequently left to shortly prior to discharge. Because of the cost of medication, inquiries should be made about insurance coverage. If necessary the nurse should provide information on sources of low cost medications. If the nurse is not familiar with this information, social workers should be involved in the process. In this study we did not encounter any stroke survivors or caregivers who were assisted to obtain medications at reduced cost or no cost, other than free starter samples from doctors' offices. Several medication issues were identified by nurse in this study who visited the stroke survivors in their homes following discharge. These included medications that had been ordered, but were slow in arriving, lack of information about medications that were new, lack of appointments for follow-up laboratory work, failure to not continue medications that the stroke survivor was previously

taking for another chronic disease, lack of transportation to get needed medications, and lack of money to pay for the medications.

We recommend that at least 48 hours prior to discharge the nurses clarify with the physicians what medications will be sent home with the stroke survivor. If Pharm Ds are available within the setting, they may also be involved in preparing stroke survivors for discharge. Written instructions should be prepared and reviewed with the stroke survivor and caregiver with special emphasis on medications that are new (e.g., antiseizure medications), those with potential side effects (e.g., antidiabetic medications), those that may have interactions with foods or other drugs (e.g., anticoagulants), and those that need regular follow-up (e.g., antihypertensive medications). Some stroke survivors may not be able to read, may have poor sensory perception, or cognitive deficits, so different teaching strategies including models and pictures should be used. In addition, a caregiver should be involved in the instruction if the stroke survivor is being discharged home. Prior to discharge, the nurse should ensure that appointments are made for laboratory work or other special procedures that will be necessary within 1-2 weeks after discharge.

The nurse should determine whether the stroke survivor was admitted with medications for another chronic illness that are not included with the current discharge medications and clarify with the physician whether or not those medications should be continued. In addition, the nurse should determine whether or not the stroke survivor has insurance to cover medications or financial resources to either pay for the medications or the co-pay. Nurses should work with physicians to simplify the medication regimes that will be required at home. Discussions about how and when the medications should be taken, where they should be stored, and strategies for dispensing and recording them are important topics that are often neglected. Medication discussions may need to occur over several days to ensure that all topics are covered. Nurses or social workers should also provide information on sources of low-cost medications, which may include assistance in applying for Medicaid, Medicare drug discount cards, or applications to pharmaceutical companies that are available on www.needymeds.com. Since some of these applications can take several weeks, they are best initiated prior to home discharge.

Stroke survivors who are discharged home without understanding the purpose and potential side effects of their medications, without plans for medical follow-up, or without the resources to obtain their medications are at risk for developing excess disability. Rehabilitation nurses can play an important role in preparing the stroke survivors and their families to use their medications safely in their home environment.

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Table 1

The most common classifications of medications taken by stroke survivors.

Classification	Frequency	Percent	Example of drug
Antihypertensive	83	85.6	Lisinopril (Zestril)
Antiplatelet	73	75.3	Clopidogrel bisulfate (Plavix)
Antihyperlipidemia	58	59.8	Atorvastatin calcium (Lipitor)
Antidepressant	57	58.8	Sertraline (Zoloft)
Antidiabetic	32	33.0	Metformin HCl (Glucophage)
Antiseizure	25	25.8	Levetiracetam (Keppra)
Anticoagulant	22	22.7	Warfarin sodium (Coumadin)
Sedative	18	18.6	Zolpidem tartrate (Ambien)
Laxative	17	17.5	Bisacodyl (Dulcolax)
Analgesic/anti-inflammatory	17	17.5	Acetaminophen (Tylenol)
Antihistamine	14	14.4	Fexofenadine (Allegra)
Antibiotic	12	12.4	Trimethoprim/sulfamethoxazole (Bactrim DS)
Antiarrhythmia	9	9.3	Quinidine (Quinaglute)
Antianxiety	8	8.2	Hydroxyzine (Atarax)
Antianginal	7	7.2	Isosorbide Mononitrate (Imdur)
Antipsychotic	6	6.2	Quetiapine (Seroquel)
Cardiotonic	6	6.2	Digoxin (Lanoxin)

Table 2

Per dose and monthly Average Wholesale Price (AWP) of 10 Common Medications Prescribed for Stroke Survivors at Discharge from Rehabilitation

Medication	Dose	Per dose AWP	Monthly AWP
Plavix	75mg daily	\$4.59 per tablet	\$137.70
Lipitor	10mg daily	\$2.58 per tablet	\$ 77.40
Zestril	10mg daily	\$0.879 per tablet	\$ 26.37
Verapamil	120mg daily	\$0.354 per tablet	\$ 10.62
Glucophage	850mg BID	\$1.04 per tablet	\$ 62.40
Avandia	8mg daily	\$5.60 per tablet	\$168.00
Glipizide	10mg	\$0.54 per tablet	\$ 16.20
Neurontin	600mg	\$2.39 per tablet	\$ 71.70
Keppra	500mg	\$2.61 per tablet	\$ 78.30
Zolof	50mg	\$2.87 per tablet	\$ 86.10
TOTAL			\$724.79/month