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Medications Use and Patient Outcomes at Two Indianapolis Area Skilled Nursing Facilities: a Retrospective Chart Review

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Background: Residential health care has changed over time. Skilled nursing facilities (SNF) as an alternative to standard long-term care are understudied.
Objective: To describe current prescribing patterns of medication use in two Indianapolis SNFs.
Method: Chart review to examine associations between medication use and outcomes such as weight changes, falls and re-hospitalization. Discharged patients had to be residents for at least 14 days.
Results: 35 charts were reviewed. 17 (48.6%) patients were male, 22 (62.9%) were Caucasian, 15 (42.9%) had Medicaid, 6 subjects (17%) visited the emergency department, 5 (14.3%) visited the hospital during their stay at the selected facilities, 14 (40%) suffered falls, 23 (65.7%) took antidepressants, 15 (42.9%) received antibiotics and 4 (11.4%) had high anticholinergic burden. Duration of stay ranged from 14-362 days (median 41), age ranged from 40-95 (median 75), number of diagnoses 4-23, mean 12 (±4.105), weight change from loss of 52# to gain of 35.7# (median -5.6), Beer's violations 0-3, mean 0.46 (±0.761) for patients aged ≥65 and the maximum scheduled medications at one time 3-24, mean 9.26 (±4.273). Of the 15 (42.9%) patients that received antibiotics there were 24 instances of use, 19 (79.2%) of those fit the facilities criteria for appropriate use of antibiotics.
Conclusion: There are few associations between exposures: use of antibiotics or antidepressants, anticholinergic burden, or deviations from Beer's criteria. This may be due to small sample size or be an indication of careful prescribing at these facilities.

Introduction

The geriatric population is at a large risk of problems from medications. The first risk is polypharmacy; as age decreases and health declines the medication burden for the geriatric population also increases.[1] The majority of residents at skilled care nursing facilities (SNUs) are geriatrics, therefore that was the population targeted in this study. Not all residents studied were of the geriatric population though, since there are also residents in rehabilitation programs and under disability in these facilities.

There are many specific points of medication use that could be studied for any variety of reasons leading to interesting discoveries that may eventually guide and alter prescribing practices in the future. One concerning point of medication use is the potential overuse of antibiotics. Up to 50-75% of long-term care residents use antibiotics in a single year and 22-89% of those uses may be deemed to be

unwarranted.[2, 3] Potential concerns with this excessive use include microbial development of drug resistance, adverse events from the medications, drug interactions and increased cost to the resident.[2] To prevent these problems, there is a recommendation for antibiotic protocols to be in place to assist in determining whether an antibiotic should be used or not.[2, 3] There are many studies available to recommend protocols including a study by Leob *et al* in 2001.[2,3]

Another concern in prescribing practices is the diagnosis and treatment of depression. Teresi *et al* performed a study in 2001 that found 5-31% of residents in long-term care displayed symptoms of depression and only 15-27% of that population received treatment for depression symptoms.[4] An added concern is that the early symptoms of dementia frequently overlap with depression symptoms and can complicate diagnosis, necessitating treatment and monitoring by a psychiatric specialist.[4]

Another potential study point is the concerning anticholinergic side effects of many medications currently on the market. The geriatric population is not only at an increased risk due to polypharmacy, but also because of an increased sensitivity to anticholinergic effects with age.[5-7] 20-60% of geriatric patients have anticholinergic exposure with at least 1 prescribed medication.[5, 8] The potential anticholinergic problems include incontinence and cognitive impairment that may cause such consequences as falls, fractures, and wounds resulting in infections, or vehicular accidents.[5, 7] The consequences of anticholinergic drug effects have stimulated many studies into determining the anticholinergic effect that various medications can have in the body and there are now several ways in which to measure that.[5] Serum radioreceptor anticholinergic activity assay (SAA) is a laboratory test that can be used on medications but has been shown to have no direct association to anticholinergic reactions in patients.[5] Drug affinity to muscarinic receptors can be tested *in vivo*, but application of results is only reflected in peripheral effects, not the cognitive effects of the medications because it does not put into consideration the blood-brain barrier (BBB) which protects the nervous system.[5] Expert-based drug lists are the most clinically relevant method as it uses a list compiled by experts based on what has been seen to cause anticholinergic effects in practice.[5] At least 3 different drug lists have been published in journals for anticholinergics by August of 2011 based on an EBSCO database search. The anticholinergic drug scale (ADS) was based entirely on SAA reports and is therefore not truly 'expert-based' and is suspect in strength of findings due to the doubt that is placed in results from the SAA.[5, 7, 8] The Anticholinergic risk scale (ARS) takes into account both peripheral and central effects of anticholinergic side effects but no literature review was performed in its development, weakening the evidence behind its use.[5] The anticholinergic cognitive burden scale (ACB) was developed

by Boustani, Campbell *et al* in 2008 and did use both a clinical study with expert assistance and a literature review in development of their scale.[5]

With the general sensitivity to medications of the geriatric population, there have been several different prescribing criteria for use in geriatrics to minimize complications. Side effects of concern include confusion, constipation, depression, and falls leading to broken bones and immobilization.[9] The two most commonly used are Beers criteria and the Canadian criteria.[9] Beers criteria, which is the list used in most of the USA, was originally written in 1991 and has been updated several times including in 2003 then again in 2011 after this study was initiated.

Methods
Population

Skilled nursing facilities in the Indianapolis area were selected as the site of the study due to heavy geriatric population, researcher connections with the facilities and variety of residents from long-term care to rehab patients. Patients were required to have been inhabitants of the facilities after July 1st, 2010, already discharged and to have been residents for a minimum of 14 days. This was to ensure that records were complete for a resident's entire stay, the patient had sufficient data for use, and that the chart was still at the site for data collection.

At conclusion of the study there were a total of 35 residents studied. The most common diagnoses are listed in table 1 and patient characteristics are listed in tables 2 and 3.

Table 3

Diagnosis	Frequency (%)
Hypertension	27 (77.1%)
Hyperlipidemia	19 (54.3%)
Depression	18 (51.4%)
GERD	15 (42.9%)
Diabetes	12 (34.3%)
Anemia	11 (31.4%)
COPD, Hypothyroid	10 (28.5%)
Pneumonia	9 (25.7%)
CHF/Constipation/Insomnia	8 (22.9%)

Table 2

Characteristic	Number (%)
Male	17 (48.6%)
White	22 (62.9%)
Married	12 (34.3%)
Facility 1	15 (42.9%)
Medicaid	15 (42.9%)

Table 3

Characteristic	Average
Age (years)[1]	74 (40-95)
Duration of stay (days)[1]	41 (14-362)
Weight change (pounds)[1]	-5.6 (-52-35.7)
Diagnoses[2]	11.97±4.1
Maximum meds used at once[2]	9.26±4.3
Beers violations (per resident)[2]	0.46±0.76

[1]median (range)
[2]mean±SD

Data Collected

The data collection sheet included information in regards to gender, ethnicity, duration of stay, age, marital status, insurance coverage, admission and discharge locations, emergency department (ED) or hospital visit, diagnoses, weight changes, falls, injuries, catheters and tubing, behavioral problems, indications for antibiotic use, pain control, and medication use for each resident. Several students volunteered to assist with data collection from resident charts assisting the primary researchers, and several hours were dedicated to reviewing each chart to collect all available data.

Statistical Analysis

Statistical analysis was performed by use of SPSS with x^2, Fisher's exact test and T-tests used for analysis. Significance was determined to be at P=0.05.

Results

The facilities in the study had a protocol in place for use of antibiotics adopted from Loeb *et al*. Resident charts were scanned to find indications for antibiotic use. 15 residents (42.9%) consumed 24 courses of antibiotics, 19 (79.2%) of which fit the criteria listed in the protocols. There was no analysis of association to end points at this time.

Documented diagnoses of depression were present in 51.4% of patients while an even more residents (65.7%) were taking antidepressants, which do have multiple uses. When analysis of this data was preformed however, there was no noted correlation to gender, age, ethnicity, Medicaid status, duration of stay, weight change, and occurrence of falls, violations to Beers criteria or ACB score.

Anticholinergics showed no significant correlation to ethnicity, Medicaid status, duration of stay, weight loss, need for ED visit, gender, occurrence of falls or number of diagnoses the resident had, however there was an inverse relationship to age that was tending toward significance but had not quite attained it (r = -0.323, p = 0.058). In relation to that, Beers criteria violations were studied, but only in patients 65 years old or older limiting the number of residents to 26 instead of 35. That data displayed no significant correlation to gender, ethnicity, Medicaid status, duration of stay, weight change, and occurrence of falls, number of diagnoses or ACB score.

Discussion

Compliance with the Loeb protocol was improved compared to earlier studies that initially supported the use of protocols, but could still use improvement as there is not complete compliance. There is a potential that analysis can be done to determine if there was an influence on end points in a future study as this study just analyzed compliance to protocol.

Increased recognition or over-diagnosis and alternate use could account for the increased rate of use of antidepressants and could also influence findings, accounting for the lack of any significant correlations. Other potential causes include appropriate treatment

evening results or an inappropriate selection of endpoints for correlation.

The suspected cause of the inverse relationship between ACB score and patient age is the increased caution used in prescribing for the geriatric population because of Beers criteria which is well followed, as noted by only 2 patients (7.7%) having more than one violation and the average number of violations being 0.5.

There are some limitations to this study though. The small sample size limits the power of the study, but a larger sample could strengthen results and would be more feasible with electronic records instead of paper charts. Another limitation is that the multiple uses for antidepressants may cause confusion in that part of the study and was not taken into account. To clarify the use of antidepressants, a psychiatric evaluation for all residents would need to be implemented on a regular basis to ensure appropriate treatment of any conditions such as depression and dementia. With the lack of results noted in this study, there is little reason to endorse a larger study unless different endpoints are selected.

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