

Prescribing patterns of gerontological nurse practitioners in the United States

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Abstract:

Purpose: To identify the prescribing patterns of gerontological nurse practitioners (GNPs) as reported on the Gerontological Nurse Practitioner Practice Profile. Specifically, the study examined (a) GNPs' frequency of prescribing certain categories of medications for older adults; (b) the influence of practice, education, and experience variables on prescribing practices of GNPs; and (c) the rate of prescribing inappropriate medications for older adults based on the list of medications on the modified Beers Criteria.

Data sources: The study was part of a larger descriptive survey that examined the practice characteristics of GNPs using the Gerontological Nurse Practitioner Practice Profile. A stratified random sample of 1000 GNPs certified by American Nurses Credentialing Center was sent surveys; 472 usable surveys were returned. Only the 234 GNPs who indicated that they were currently practicing full time as a GNP were included in this analysis.

Conclusions: Ninety-three percent of the respondents indicated that they had prescriptive privileges. The most commonly prescribed types of medications were analgesics, antihypertensives, cardiovascular drugs, and diabetic medications. The prescribing patterns of these GNPs were not influenced by education, years of practice, or selected practice characteristics. There was a significant difference in the prescribing of inappropriate medication among office-based GNPs and those who worked in long-term care settings. The GNPs in the ambulatory care setting had a tendency to prescribe inappropriate medications more frequently than those in long-term care facilities. Overall, self-reported prescribing of inappropriate medications among the GNPs participating in this study, however, was low. Implications for practice: The findings of this study indicate that GNPs are prescribing medications for complex medical conditions.

Keywords: Prescribing practice; gerontological nurse practitioners; inappropriate medications.

Article:

Introduction

Numerous studies have documented the effectiveness of nurse practitioners' (NPs') management of the care of complex patients in various clinical settings, and eventually, many of the regulatory constraints inhibiting expanded practice authority for NPs have been eliminated (Pearson, 2005). By 2000, all states had some prescriptive authority for NPs. However, the inability to prescribe controlled substances, limited drug formularies, and the requirement for physician/NPs mutually agreed upon clinical practice guidelines hinder full prescriptive privileges for NPs (Bowman & LeRoy, 2002; Hodnicki, Dietz, McNeil, & Miles, 2004; Pearson, 2005; Pulcini & Vampola, 2002).

Over time, NP prescribing has become more complex as the scope of practice of NPs has broadened to encompass more diverse populations of patients. Prior to the early 1980s, contraceptives and hormonal treatments were the leading categories of medications prescribed by NPs (Batey & Holland, 1985; Rosenaur, Stanford, Morgan, & Curtain, 1984). More recent studies indicate that analgesics, anti-inflammatory drugs, antibiotics, and topical steroids are the drugs NPs most frequently prescribe (Goolsby, 2005; Pulcini & Vampola, 2002). Pulcini and Vampola found, however, slight variations in the types of drugs prescribed

depending on the specialty of the NPs. Although gerontological nurse practitioners (GNPs) have been included in national studies, the sample of GNPs remains under 10% of NPs included in recent studies (Goolsby; Pulcini & Vampola). Given that older adults are prescribed about 30% of all medications, a study examining prescribing patterns of GNPs is warranted to further the understanding of the quality of care provided by GNPs (Goulding, 2004).

Background

Previous research on NP prescribing patterns has focused primarily on family NPs. Munroe, Pohl, Gardner, and Bell (1982) found that less than 6% of medications prescribed by family NPs were for chronic disease management. Batey and Holland (1985) found that 75% of all medications prescribed by adult/family NPs were anti-infectives, respiratory agents, analgesics, and hormones. Similarly, LaPlante and O'Bannon (1987) found that the most frequently prescribed drug categories were antibiotics (30%), respiratory medications (19%), and anti-inflammatory preparations (13%). Hodnicki et al. (2004) reported that the top medications prescribed by NPs in Georgia were for ear, nose, and throat/ respiratory conditions, followed by contraceptives and cardiovascular drugs. Other studies have shown similar trends in the most frequently prescribed medications (Hamric, Lindebak, Worley, & Jaubert, 1998; Moody, Smith, & Glenn, 1994).

Practice characteristics of GNPs were studied extensively in the 1980s; however, little research exists that examines specifically GNP prescribing practices (Dietrich, Chambers, & Resnik; 1990; Garrard et al., 1990; Kane et al., 1988). Early GNPs were not granted prescriptive authority, and thus earlier research provided no data on prescriptive practices. Later, Mahoney (1994) studied GNPs' prescriptive practices and compared the decision-making processes of GNPs to those of physicians utilizing identical case scenarios. Two hundred ninety-six GNPs and 373 physicians participated in their survey. When given hypothetical case vignettes in which older adults presented to their practice with the three problems of insomnia, joint pain, and stomach discomfort, GNPs scored higher than the physician group on the appropriateness of prescribing. Moreover, no significant differences were found in the GNPs' prescribing patterns based on their level of prescriptive authority. However, no information is available on general prescribing practices of GNPs, and this is integral to understanding the complexity and diversity of their role with the rapidly growing, older adult population. Additionally, although there has been increased attention to prescription of inappropriate medications to older adults, no research has examined this issue in the context of the prescribing practices of GNPs (Dhall, Larrat, & Lapane, 2002; Fick et al., 2001; Goulding, 2004).

The purpose of this study, therefore, was to identify the prescribing patterns of GNPs as reported by the GNPs on the Gerontological Nurse Practitioner Practice Profile. Specifically, the study examined (a) GNPs' frequency of prescribing certain categories of medications for older adults; (b) the influence of education, experience, and practice setting variables on the prescribing practices of GNPs; and (c) the rate of prescribing inappropriate medications based on the modified Beers Criteria (Beers, 1997).

Method

This study was part of a larger descriptive survey that examined the practice characteristics of GNPs (Kennedy-Malone, Penny, & Fleming, 2008). The target population for the study consisted of 3456 GNPs certified by the American Nurses Credentialing Center (ANCC). A stratified random sample of 1000 was chosen from the ANCC's list of certified GNPs. A total of 472 usable surveys were returned. Only 234 respondents were included in the analysis. These GNPs were employed at least 35 h per week in a setting that involved direct patient care.

Frequency of prescribing categories of medications

Respondents were asked to indicate how often they prescribed 23 categories of medications by circling the appropriate response: *never*, *occasionally* (1–5 prescriptions per week), *frequently* (6–15 per week), or *regularly* (greater than 15 per week). In addition to frequencies for each of the 23 categories, the average number of these 23 drug types that were *regularly* prescribed and an average rating of prescribing frequency across the 23 drug types were calculated. A higher mean on each of the variables indicated greater frequency of prescribing. The

categories of medications used in this study were similar to the list of medications identified in other studies examining prescribing patterns of NPs (Towers, 1989).

Frequency of prescribing inappropriate medications

The survey also contained a list of 29 medications from the modified Beers Criteria (Beers, 1997). Developed by nationally known experts in the field of geriatrics, the Beers Criteria include medications that should be avoided in older adults. The GNP's were asked to indicate how often they prescribed these medications using the same rating scale as previously described; the medications were not identified on the survey as inappropriate for older adults.

Frequency ratings for each of the 29 drugs were calculated, as was a total score, or the sum of all ratings for the 29 drugs. A total score of 0 indicated no prescribing of inappropriate medications for older adults. Higher scores indicated more inappropriate prescribing behavior.

Potential influencing factors

The study considered two spheres of influence factors: (a) educational preparation and work experience and (b) work setting characteristics. Educational preparation and work experience included three factors: levels of basic registered nurse (RN) education, associate degree or diploma versus a bachelor's or generic master's degree program, years of experience as an RN before becoming an NP, and years of experience as an NP.

Six factors were included within the sphere category of work setting characteristics. The type of area was classified as urban, suburban, or small city/rural. The states in which GNP's practiced were categorized into one of the four U.S. Census Bureau regions of the country: Northeast, Midwest, South, and West. A third factor was number of principal practice settings: single versus multiple settings. Next, the principal practice settings were grouped into five broad types: hospital, long-term care, office, center/clinic, and other. Because of small numbers in the center/clinic and other settings, only the first three broad types were used for the analyses. Whether or not the work setting received the majority of its funding from governmental sources was the fifth factor, and the final potential influence was whether or not the GNP was the first GNP at the principal practice setting.

Table 1 Selected characteristics of certified GNP's working full time with direct patient contact

Characteristic	Number (%)
Gender	
Male	10 (4)
Female	220 (96)
Ethnic origin	
White/non-Hispanic	209 (91)
Black	6 (3)
Other	15 (7)
Age	
Less than 40 years	49 (21)
40–50 years	105 (46)
Over 50 years	74 (32)
Mean = 46.3 years	
Range = 28–64 years	
NP education	
Certificate	16 (7)
Master's	173 (76)
Post-master's certificate	33 (14)
Other	6 (3)
NP specialty by education	
Adult NP	26 (11)
Family NP	9 (4)
Gerontological NP	154 (67)
Other or combination	41 (18)

Table 2 Education and experience of certified GNP's working full time with direct patient contact

Characteristic	Number (%)
Basic RN education	47 (20)
Associate degree	45 (20)
Diploma	125 (54)
Bachelor's degree	13 (6)
Generic master's degree	
Highest nursing education	
Associate degree/diploma	5 (2)
Bachelors degree	6 (3)
Master's degree or above	216 (95)
Years experience as RN prior to NP	
10 years or less	93 (41)
More than 10 years	134 (59)
Mean = 13.6 years	
Range = 0–35 years	
Years experience as NP	
5 years or less	105 (46)
More than 5 years	123 (54)
Mean = 7.8 years	
Range = 1–29 years	

Findings

Sample characteristics

The 234 respondents were primarily female (96%) and Caucasian (91%). They tended to be middle aged (mean age = 46.3 years), and most were master's prepared (76%) as a GNP (67%) (Table 1). Virtually, all were currently board certified (99%), most by both ANCC and American Academy of Nurse Practitioners (AANP). For the most part, the respondents described their relationship with the physicians at their principal practice setting as a collaborative one (85%). Only 11% noted that their primary practice setting was independent, while 4% said they were *supervised* by physicians.

Over half (54%) of the GNPs received their basic nursing education at the bachelor's level. For about 6%, a generic master's was the basic RN education. The rest were equally split between a diploma program (20%) and an associate degree program (20%). Ninety-five percent had achieved at least an MSN (Table 2).

These NPs averaged more than a decade of experience as RNs prior to completion of an NP program (mean 13.6 years). Although the mean number of years as an NP was around 8, the range of experience extended from newly graduated NPs to very experienced gerontological NPs. Some GNPs had almost 30 years of advanced clinical practice (Table 2).

Respondents were practicing in 38 states and the District of Columbia. These GNPs were fairly equally distributed throughout the Northeast (26%), Midwest (31%), and South (31%); fewer of the respondents (12%) were practicing in the West. Over half (58%) practiced in an urban area, with 20% in suburban areas and 22% in small cities or rural areas.

Over half of the respondents said they were the first GNP in their principal practice setting, and nearly 50% said their setting received most or all of its funding from a governmental source. The primary practice setting for half of the GNPs was some form of a long-term care facility. About one fourth of the GNPs were in hospital settings and almost 20% worked in a medical practice office. Almost half of the respondents worked in two or more practices.

Table 3 Percent of GNPs who regularly prescribe selected drug types

Drug type	Percent prescribe regularly
Antihypertensives	41
Analgesics	40
Cardiovascular drugs	38
Diabetic medications	35
Diuretics	35
Anti-inflammatories	30
Antimicrobials	30
Gastrointestinal medications	29
Vitamin preparations	20
Inhalants, nonsteroidal	19
Bronchodilators	18
Psychoactive	18
Anticoagulants	15
Inhalants, steroidal	15
Expectorants	13
Antihistamines/decongestants	11
Topical nonsteroidal preparations	11
Topical steroidal preparations	6
Muscle relaxants	4
Contraceptives	2
Steroids	2
Antivirals	2
Vaginal preparations	2

Prescribing patterns

Of the 234 respondents, 93% indicated that they had prescriptive privileges. Almost two thirds (63%) had Drug Enforcement Administration numbers. Among those authorized to prescribe controlled substances, about 6%–9% reported that they regularly prescribed drugs in controlled categories II, III, IV, and V.

The respondents were asked to indicate how often they prescribed 23 types of medications, and Table 3 shows the percentages of respondents who regularly prescribed these various types of medications. The most commonly prescribed types were antihypertensives, analgesics, cardiovascular drugs, diabetic medications, and diuretics. On average, the respondents regularly prescribed medications from four of the drug types. Their mean rating of prescribing frequency across the 23 drug types on a scale of 0 (*never*) to 3 (*regularly*) was 1.5.

Table 4 GNP's patterns of inappropriate prescribing based on the 1997 modified Beers Criteria

Medication	Percent prescribe never	Percent prescribe occasionally	Percent prescribe frequently or regularly
Amitriptyline (Elavil)	60	35	5
Doxepin (Sinequan)	79	20	1
Lorazepam (Ativan)	20	65	14
Diazepam (Valium)	80	18	2
Chlordiazepoxide (Librium)	93	7	0
Diphenhydramine (Benadryl)	44	48	8
Hydroxyzine (Vistaril)	67	27	5
Cyproheptadine (Periactin)	83	16	<1
Promethazine (Phenergan)	54	40	6
Cimetidine (Tagamet)	65	27	8
Dicyclomine (Bentyl, Antispas)	71	28	1
Hyoscyamine (Anaspaz, Cystospaz)	89	11	0
Propantheline	98	2	0
Belladonna alkaloids	89	10	1
Trimethobenzamide (Benzacot, Tigan)	77	23	<1
Dipyridamole (Persantine)	73	24	3
Disopyramide (Norpace)	80	17	3
Methyldopa (Aldomet)	77	21	2
Ticlopidine (Ticlid)	74	23	3
Methocarbamol (Robaxin)	76	21	3
Carisoprodol (Soma)	84	15	<1
Chlorzoxazone (Parafon Forte)	90	9	1
Metaxalone	95	5	0
Cyclobenzaprine (Flexeril)	55	39	6
Indomethacin (Indocin)	59	40	1
Meperidine (Demerol)	94	6	0
Pentazocine (Talwin)	97	3	0
Propoxyphene (Darvon)	67	28	5
Chlorpheniramine	83	16	1

The 1997 modified Beers Criteria of inappropriate medications for Americans aged 65 years and older lists 29 medications (Beers, 1997). The GNPs were asked how frequently they prescribed each of these medications, using the same 0–3 scale. Ninety percent or more of the GNPs never prescribed 6 of the 29 drugs (see Table 4 for percentages of GNPs who *never*, *occasionally* or *frequently*, and *regularly* prescribed each medication).

The total score (sum of frequency ratings for all the 29 medications) indicates the level of inappropriate prescribing. Total scores could range from 0 to 87. GNPs in this survey had fairly low total scores, ranging from 0 to 39. While only 6% never prescribed any of the 29 drugs (score of 0), three fourths had very low scores (11 or less). The most commonly prescribed inappropriate medications were lorazepam (14% prescribed frequently or regularly), diphenhydramine (8%), and cimetidine (8%).

Effects of selected factors on prescribing behavior

Relationships of potential influence factors with GNP prescribing patterns were examined. Two spheres of potential influence factors were examined: educational preparation and work experience containing three factors, and work setting characteristics, which contained six factors.

The factors were studied to determine whether they had an effect on GNP prescribing behavior, using the mean rating of prescribing frequency for the 23 drug types and the total frequency of prescribing inappropriate medications from the Beers criteria. To ensure that redundant or confounding factors did not exist, the relationships among the potential influence factors within each sphere were investigated. The issue of conducting multiple tests was balanced with the issue of missing potential confounds or redundancy by using a Bonferroni approach to correct individual alpha levels while setting experiment-wise alpha at .10. Given the exploratory nature of the research, we used the same Bonferroni approach to evaluate relationships with prescribing behavior (Keppel, 1982).

Educational preparation and work experience

t tests were conducted to compare GNPs whose basic nursing education was at the associate/diploma level with those whose basic nursing education was at the bachelor's level or above, on years of experience as an RN before becoming an NP and on years of experience as an NP. There was no statistically significant difference in years of NP experience between the two groups. There was, however, a statistically significant difference in years of experience as an RN before becoming an NP, $t(225) = 5.45, p < .0001$; associate/diploma mean = 17.1 years; BSN/master's mean = 11.2 years. This may be attributed to the fact that RNs at the associate/diploma level have to spend time earning their BSN before entering an NP program. These two variables may be confounded, and further analyses with them will have to be viewed with caution.

Pearson's correlation coefficient was calculated between years of experience as an RN prior to NP and years of experience as an NP. The correlation of -0.23 suggested a slight negative relationship. This was not at a level to cause concern about confounding.

The next step was to evaluate the individual effects of the three influence factors on prescribing behavior, specifically the mean rating of prescribing frequency for the 23 categories of drugs and the total frequency of prescribing inappropriate medications from the Beers criteria. Using *t* tests, there was no statistically significant difference on either of the prescribing behavior variables between GNPs with the two categories of basic nursing education. Correlations between years of RN experience and years of NP experience with mean rating of prescribing frequency were both extremely low: $r = .04$ and $r = .12$, respectively. The correlation between years of RN experience and total frequency of inappropriate prescribing was also extremely low, $r = -0.11$. However, the correlation between years of NP experience and inappropriate prescribing was positive and moderate, $r = .28$, suggesting a moderate tendency for the GNPs with more experience to do more inappropriate prescribing.

A multiple linear regression predicting mean rating of prescribing frequency from the three influence variables was not statistically significant. A multiple linear regression predicting inappropriate prescribing from the three influence variables was statistically significant, $F(3, 162) = 4.86, p = .0029$; however, the model accounted for only 8% of the variability and years of GNP experience was the only significant predictor (mirror of the *t* tests).

Relationship of selected work setting characteristics to prescribing behavior

As with educational preparation and experience, the relationships among the work setting characteristics were examined. All six factors within this category were categorical: type of area (urban, suburban, and small city/rural), geographical region of the United States (Northeast, Midwest, South, and West), number of primary practice settings (single vs. multiple), type of settings (hospital, long-term care, and office), funding source (primarily governmental funding or not), and whether or not the GNP was the first GNP at the primary practice setting. A series of chi-square analyses were performed to examine relationships among the six potential influence factors. Of the 15 analyses, 8 yielded statistically significant results. A more detailed description of the examined relationships is reported in the study by Kennedy-Malone et al. (2008). Given the number of significant relationships among these potential influence factors, it must be assumed that there are major confounds between the factors. Therefore, all further analyses must be interpreted with caution.

The individual effects of each of the six influence factors on prescribing behavior were evaluated. Analyses of variance were used for the type of area, geographic region, and type of setting. The number of settings, funding source, and whether or not the respondent was the first GNP data were assessed with *t* tests.

No statistically significant differences in mean ratings occurred in prescribing for the 23 drugs on any of the six potential influence factors. Also, there was no statistically significant difference in level of inappropriate prescribing with regard to geographic region, number of settings, and funding source. However, there was a statistically significant difference with regard to inappropriate prescribing behavior, $t(167) = 3.48, p = .0006$, based on being the first GNP at the practice. GNPs who were the first GNP did more inappropriate prescribing (mean = 9.5) than GNPs who were not the first at their practice setting (mean = 6.0).

Also, there were statistically significant differences in inappropriate prescribing for the type of area, $P(2,165) = 5.505, p = .0074$, and for the type of setting, $P(2,145) = .0053$. GNPs working in office settings were more likely to prescribe inappropriately (mean = 11.5) than GNPs in longterm care settings (mean = 6.8). GNPs practicing in small city/rural areas had significantly higher means on prescribing (mean = 10.9) than either GNPs in suburban areas (mean = 7.1) or GNPs in urban areas (mean = 6.9). Given the confounds among the six influence factors, it was felt to be inappropriate to construct any prediction models.

In summary, the six selected work setting characteristics did not significantly influence the frequency of prescribing drugs from the 23 categories. However, being the first GNP in a practice, working in an office setting, and practicing in a small city/rural areas were related to more inappropriate prescribing.

Discussion

As the most recent study examining prescribing patterns exclusively of GNPs, results from this study indicated that GNPs are prescribing for complex medical conditions in older adults. Our study contradicted the findings of Pulcini and Vampola's (2002) study examining prescribing patterns of NPs. The most frequently prescribed medications in their study included analgesics, antibiotics, topical steroids, over-the-counter cough and cold products, and antiallergy drugs. Their sample, however, included only 22 GNPs (2.5% of total 2001 sample). In our study, antihypertensives were the most frequently prescribed medication, followed by analgesics, cardiovascular drugs, diuretics, and diabetic drugs in this study. Although the most frequently prescribed medications noted by all NPs in the 2004 AANP National Nurse Practitioner Sample Survey (Goolsby, 2005) were non-steroidal anti-inflammatory drugs and antibiotics, the GNPs in that study indicated similar prescribing patterns to the GNP participants in this study. Similar to the findings by Goolsby, GNPs rarely prescribed muscle relaxants, many of which are deemed inappropriate medications for older adults (Fick et al., 2003). GNPs who were the first practitioner in a setting had a tendency to prescribe more of the medications on the inappropriate medication list than those who had a predecessor in the role. No studies that addressed GNP prescribing medications deemed inappropriate could be found for comparison. Findings from this study also indicated that type of practice setting may influence the prescribing of inappropriate medications. GNPs who worked in an ambulatory care setting tended to prescribe more frequently medications on the modified Beers Criteria list than GNPs in long-term care. This could be attributed to the role of the consulting pharmacists in long-term care in periodically reviewing medications of long-term care residents and advising medication regimen changes. Further study is warranted to look at the actual medication records of long-term care patients and the changes made in the selection of medications based on the pharmacist's recommendations. Finally, GNPs who work in less populated areas such as small cities or rural area reported a greater frequency of prescribing inappropriate medications for older adults than GNPs who work in the suburbs and urban areas. This again may be related to the availability of pharmacist for consulting on medications regimens, which may be more readily available in suburban and urban areas. Overall, the GNPs responding to this study self-reported minimal potential inappropriate medication prescribing using the 1997 modified Beers Criteria for comparison.

Study limitations

There are several limitations of this study. The sample population included in the overall analysis of GNPs was small, 234, thus not generalizable to all GNPs who are practicing on a more part-time basis and other NPs who

manage the care of older adults. Although the Gerontological Nurse Practitioner Profile was pilot tested with a small sample of GNPs, only face validity was tested when the instrument was originally developed. Finally, the prescribing patterns of GNPs who responded to the survey may be different from those of the nonresponding population (Kennedy-Malone et al., 2008).

Recommendations

Additional research is needed on NPs' prescribing practices with older adults. Prescribing practices of GNPs across various clinical settings can be compared with physicians' practices to determine if their practice styles differ and if there are differences in patient outcomes when the care is managed by a GNP or their physician colleagues (Mahoney, 1992). Now that there is an updated list of 48 inappropriate medications identified by Beers and colleagues (Fick et al., 2003), it is imperative to look at actual prescribing practices using retrospective chart audits and ascertain whether the incidence of prescribing inappropriate medications by GNPs for older adults is similar to the self-reported incidents indicated in this study. Considering the findings that practice settings may be responsible for the effects on inappropriate prescribing patterns, further studies should examine this variable on GNP practice. Given the results from this study, looking at the actual medication records of longterm care patients and the changes made in the selection of medications based on the consulting pharmacist's recommendations is warranted.

Conclusions

This study validates the complex prescribing practices and the challenges that GNPs face in providing care to older adults. The prescribing patterns of this sample of GNPs reflect a complex array of medications. With an increasing older population, GNPs are in a unique position to provide specialized and comprehensive care. The ability to prescribe medications accurately and with full authority is an integral part of providing quality care.

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