Blood Pressure Screening, Control, and Treatment for Patients With Developmental Disabilities in General Medicine Practices

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Abstract

Background: Little is known about the adequacy of screening for and treatment of hypertension for people with developmental disabilities (DD). Pharmacists may assist in identifying and treating this special patient population. **Objective:** To characterize and compare the screening, treatment, and control of blood pressure (BP) in patients with DD to patients without DD. **Methods:** This retrospective study identified adult patients of primary care practices within a large academic health system who had DD (DD group) and a comparator group without DD (GenMed group). Outcomes assessed included percentage of patients screened, mean BP, percentage of patients with controlled BP, and antihypertensive medications prescribed. **Results:** The DD ($n = 183$) and GenMed groups ($n = 497$) were nearly all screened for BP. Mean systolic BP was significantly lower in the DD group (119.9 ± 14.6 mm Hg vs 122.8 ± 15.4 mm Hg GenMed, $P = .03$), while diastolic BP was no different ($P = .7$). Stroke was documented significantly more often in the DD group (5.5% vs 1.4%, $P = .005$). Of patients with uncontrolled BP, the DD group had significantly higher systolic BP (155.8 ± 14.1 mm Hg vs 147.4 ± 9.5 mm Hg GenMed, $P = .02$). Hypertension was documented in 32% of DD group versus 38.5% of GenMed group, $P = .15$. Of this group, 88.1% of the DD group had controlled BP versus 78.0% of the GenMed group, $P = .09$. Antihypertensive prescribing was not different between the groups. **Conclusion:** DD group patients had similar outcomes for hypertension therapy compared to patients without DD. Those with uncontrolled BP in the DD group tended to have higher systolic BP. Significantly more DD patients had a history of stroke.

Keywords

hypertension, developmental disabilities, retrospective analysis, outcomes

Introduction

Developmental disability (DD) is a collective term for conditions associated with a broad spectrum of intellectual function and physical disability. These impairments can occur anytime between birth and age 22 years. People with DD include individuals with Down syndrome, fetal alcohol syndrome, cerebral palsy, autism spectrum disorder, William's syndrome, Prader-Willi syndrome, and others. Adults with DD are a diverse group of individuals with varying health care needs. It is estimated that there are more than 4.9 million people in the United States with DD.¹ Today, individuals with DD are commonly surviving into older age like their peers, and their health care treatment is often provided by clinicians in a community-based setting. Little data exist regarding the prevalence and treatment of common chronic conditions in individuals with DD.

Hypertension is a major risk factor for cardiovascular disease that contributes to 1 in 7 deaths in the United States each year.² In 2008, it was determined that about 33.5% of

US adults had hypertension.³ Given that adults with DD are now aging in a manner similar to their peers and living well beyond their third decade of life, it is important to determine if screening and medical treatment of hypertension in this group of people is adequate. Adults who have DD have similar risk factors for hypertension as the general population, which includes adverse dietary and lifestyle factors such as obesity and low physical activity.⁴⁻⁷ According to a study by Tyler et al, individuals with autism spectrum disorders have an estimated rate of hypertension that is close to 20%, and they have a higher rate of diagnosis of hyperlipidemia than that of their peers.⁸ Similarly, adults

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with cerebral palsy have been documented to have rates of hypertension and coronary heart disease that mirror or exceed those of the general population.⁹ Individuals with Down syndrome appear to be dissimilar to other individuals with DD in this respect. People who have Down syndrome have lower incidence of hypertension than other people with DD as well as the general population.¹⁰ Overall, with the exception of adults with Down syndrome, adults with DD appear to be at risk for development of hypertension at a rate that is comparable to that of the general aging population. Relatively unique to people with DD are issues associated with the clinic visit, where blood pressure screening and treatment decisions are made. People with DD often experience inadequate physician-patient communication, anxiety during office visits, and experience irregular medical care, all of which are noted to be potential reasons for disparities in disease identification, management, and outcomes.⁴⁻⁷

As hypertension is a significant risk factor for cardiovascular disease, it is vital to examine the prevalence and treatment of hypertension in this population more closely to ensure that these individuals avoid disease and disability and obtain “healthy aging” in a manner on par with that of their peers.

The purpose of this study was to describe and compare blood pressure screening rates, blood pressure control, and treatment between adult patients with DD and those without from common adult general medicine practices in a large academic health system.

Participants and Methods

Study Design

This was a retrospective, cross-sectional study.

Participants

Participants were identified from the adult general internal medicine practices of a large Midwestern academic medical center. Working with the health systems data warehouse, a total of 751 patients were identified as having attended a general medicine clinic in the calendar year 2011 who met the inclusion criteria of (1) being 18 years of age or older; (2) having an ICD9 diagnosis of Mental Retardation (intellectual and developmental disability) code of 317, 318.0, 318.1, 318.2, or 319 or having a diagnosis of one of the more common conditions associated with developmental disability including autism spectrum disorders, Down syndrome, Williams syndrome, fragile X syndrome, cerebral palsy, fetal alcohol syndrome; and (3) treatment by an adult general internal medicine clinician within the previous year. A random sample of 200 patients was chosen to create the DD group, of which 183 had complete data. On chart

review, 17 of the original 200 did not have clear documentation of a DD-related condition, so they were excluded from analysis. The comparison group was constructed using the same data warehouse to identify 500 adult general medicine patients without DD, age 18 years and older, and who were patients of the same adult general internal medicine clinics and same time period as the DD sample. After reviewing the records, 497 had complete data and served as the comparator group. This sample is referred to as the “GenMed” group.

Data Collection Procedure

Researchers obtained data by reviewing the electronic medical record. The patients’ electronic medical records viewed included the problem summary list, physician notes, vital signs, and laboratory data. All study data present during the calendar year of 2012 were documented.

Data

Patient demographic information included age, race, and gender. All blood pressures documented in the medical record during the study period were recorded as were anti-hypertensive medications prescribed. For descriptive purposes, the medications documented as current therapy were those active on patients’ medication list at the end of the study period. The presence of documented medical conditions such as diabetes or chronic kidney disease was obtained so as to determine whether the patients’ mean blood pressures were considered controlled or uncontrolled based on the JNC-8 guidelines.¹¹ Additionally, the presence of hyperlipidemia, coronary artery disease, and history of myocardial infarction or stroke were also documented. The study was reviewed and approved by the university’s human investigations committee.

Analysis

Characteristics of the participants are presented as means with standard deviations for continuous variables and as frequencies with percentage for categorical variables. Comparisons of continuous variables between the DD and GenMed groups were performed using Student’s *t* test. Categorical data were analyzed using χ^2 tests. A subgroup analysis of only those patients who were considered as having uncontrolled blood pressure included comparison of systolic and diastolic blood pressures as well as age using Student’s *t* test and χ^2 test for comparisons of gender and race. In all analyses, a *P* value of $\leq .05$ was considered statistically significant.

Blood pressure control was determined using the JNC-8 classification.¹¹ Patients were classified as having controlled blood pressure if the overall average blood pressures

Table 1. Comparison of Patient Characteristics Between Groups.

Variable	DD Sample (N = 183), Mean (SD) or n (%)	GenMed Sample (N = 497), Mean (SD) or n (%)	P
Gender (male)	96 (52.5)	181 (36.4)	<.001
Race (Caucasian)	162 (89.5)	450 (91.5)	.45
Age	49.4 (11.5)	52.8 (18.0)	.02
Hypertension diagnosis	59 (32.4)	192 (38.6)	.15
Diabetes diagnosis	19 (10.4)	74 (14.9)	.17
Stroke diagnosis	10 (5.5)	7 (1.4)	.005
Chronic kidney disease	5 (3.1)	10 (2.9)	.9
Hyperlipidemia diagnosis	47 (25.8)	138 (27.8)	.7
Coronary artery disease	3 (1.6)	23 (4.6)	.11
Myocardial infarction	3 (1.6)	2 (0.4)	.12
Systolic blood pressure (mm Hg)	119.9 (14.6)	122.8 (15.4)	.03
Diastolic blood pressure (mm Hg)	71.8 (8.3)	71.5 (9.1)	.66
Blood pressure controlled	172 (94.0)	441 (89.6)	.08

for each patient were less than 140 systolic and/or 90 diastolic mm Hg for patients age 18 to 59 years or who had diabetes or chronic kidney disease. For patients age 60 years and above without diabetes or chronic kidney disease, blood pressure was considered controlled if systolic was less than 150 systolic and/or 90 diastolic mm Hg. The average blood pressure, rather than any single blood pressure, during the study period was utilized for this assessment to avoid utilization of a single acute hypertensive/hypotensive episode as a representation of the individual's chronic clinical picture.

Results

Overall Comparison

A total of 183 patients identified as having a condition associated with DD were included in the DD group, while 497 patients were identified for the GenMed group. In the DD group, a documented diagnosis of developmental disability was most common ($n = 63$, 34.4%), followed by cerebral palsy ($n = 50$, 27.3%), mental retardation ($n = 43$, 22.5%), Down syndrome ($n = 17$, 9.3%), autism spectrum disorder ($n = 6$, 3.3%), and fetal alcohol syndrome ($n = 4$, 2.2%).

All patients in the DD group had blood pressures monitored, while 6 patients in the GenMed group did not have blood pressure documented in the record. The DD group had a significantly higher percentage of males and was significantly younger than the GenMed group, while there was no difference based on race. There was a trend for a lower percentage of patients in the DD group to have a documented diagnosis of hypertension as well as diabetes and coronary artery disease. There was a significantly greater percentage of patients in the DD group who had a positive history for stroke documented. The data are presented in Table 1.

The systolic blood pressure was significantly lower in the DD group, while the diastolic pressures were no different (see Table 1). A greater proportion of the DD group had controlled blood pressure compared to the GenMed group, although the difference was not statistically significant ($P = .08$).

Comparison of Participants With Uncontrolled Blood Pressure Regardless of Hypertension Diagnosis

The 11 patients in the DD group with uncontrolled blood pressure had significantly higher mean systolic pressure of 155.8 ± 14.1 mm Hg compared to a mean systolic pressure of 147.4 ± 9.5 mm Hg in the GenMed group, with a P value of 0.02. The mean diastolic pressure of the DD group was higher (86.2 ± 5.5 mm Hg) compared to that of the GenMed group (80.6 ± 11.4 mm Hg), but the difference was not statistically significant ($P = .12$). Age was not significantly different between the 2 groups (DD group mean 54.7 ± 8.2 vs 61.5 ± 11.4 for the GenMed group, $P = .21$), nor were gender (DD 54.5% male vs 35.3% male for Gen Med, $P = .31$) or race (DD 72.7% Caucasian vs 84.0% Caucasian for GenMed, $P = .40$). Of the patients in the DD group, 3 (27.3%) were prescribed no antihypertensive medication, 5 (45.5%) patients were prescribed 1 antihypertensive, 1 (9.1%) was prescribed 2 medications, and 2 (18.2%) were prescribed 3 medications. Of the patients in the GenMed group, 19 (37.3%) had no antihypertensives prescribed, 19 (37.3%) had 1 medication, 4 (7.8%) had 2 medications, 8 (15.7%) had 3 medications, and 1 (2.0%) had 4 antihypertensives prescribed. The difference in prescribing between groups was not significant ($P = .95$).

Table 2. Comparisons of Outcomes of Patients With a Documented Diagnosis of Hypertension.

Variable	DD Sample (N = 59), Mean (SD) or n (%)	GenMed Sample (N = 192), Mean (SD) or n (%)	P
Gender (male)	20 (49.2)	81 (42.2)	.37
Race (Caucasian)	46 (78.0)	166 (87.8)	.09
Age	55.2 (11.7)	64.8 (14.3)	<.001
Diabetes diagnosis	11 (18.6)	57 (29.7)	.13
Stroke diagnosis	3 (5.1)	5 (2.6)	.40
Chronic kidney disease	1 (1.8)	10 (5.8)	.30
Hyperlipidemia diagnosis	28 (47.5)	97 (50.5)	.77
Coronary artery disease	0	19 (9.4)	.01
Myocardial infarction	0	1 (0.5)	.99
Systolic blood pressure (mm Hg)	128.4 (16.5)	132.4 (13.0)	.05
Diastolic blood pressure (mm Hg)	75.2 (7.9)	73.5 (9.8)	.23
Blood pressure controlled	52 (88.1)	149 (78.0)	.09

Table 3. Comparison of Antihypertensive Medications Prescribed Between the 2 Groups for Patients With Documented Diagnosis of Hypertension.

Medication Category	DD Sample, n (%)	GenMed Sample, n (%)	P
ACE/ARB	23 (39.0)	82 (42.7)	.65
Calcium channel blocker	10 (16.9)	36 (18.8)	.85
Diuretic	21 (36.5)	55 (28.6)	.33
Beta-blocker	13 (22.0)	54 (28.1)	.40
Alpha-blocker	3 (5.1)	2 (1.0)	.09

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker.

Comparison of Groups With Documented Diagnosis of Hypertension

A total of 59 (32.2%) patients in the DD group and 192 (36.8%) patients in the GenMed group had a documented diagnosis of hypertension. The DD group was significantly younger, while there was no significant difference in gender or race, though there was a trend toward the DD group having a higher percentage of minority patients (see Table 2). Although not statistically significant, there was a trend for a lower percentage of patients in the DD group having diabetes. There were a significantly greater percentage of patients in the DD group who had documentation of coronary artery disease, but the numbers were small overall.

Systolic blood pressure was significantly lower in the DD group, while there was no difference in diastolic pressures (see Table 2). A higher percentage, although not statistically significant, of patients with DD and a diagnosis of hypertension had blood pressures considered controlled compared to patients in the GenMed group who also had a diagnosis of hypertension.

Overall, there were no differences in prescribing trends of antihypertensive medications between the 2 groups (see Table 3).

Discussion

People who have conditions associated with DD are living longer and more productive lives.^{12,13} Along with living longer comes the same burden that accompanies the aging process for all humans, the development of chronic illness. Screening people for elevated blood pressure is an important function of health systems, leading to discovery of incident cases of elevated blood pressure and monitoring of therapy once initiated. An objective of this study was to compare rates of screening for hypertension by taking blood pressures at each clinic visit in individuals with DD to that of patients without DD cared for in the same clinics. Patients who have DD may not always choose to participate in screening procedures such as blood pressure determinations.^{14,15} It is a positive finding of this study that all patients in the DD group had blood pressures taken and documented, demonstrating cooperation between patient and the health care professional.

A second study objective was to compare the prevalence of hypertension of patients with DD-related conditions to that of patients without from the same general internal medicine practices within this large health system. Physician documentation of hypertension diagnosis was similar between the 2 groups, with a lower proportion of the DD group. As well, the overall blood pressure and percentage of individuals whose blood pressure was considered controlled was similar between the 2 groups, demonstrating no disparity based on these outcomes. In the full cohort of patients in the DD group, a greater proportion had blood pressure under control compared with the GenMed group, both near or over 90%. One of the priorities

of Healthy People 2020 was that 61.2% of all adults with hypertension attain control.¹⁶ The patients in both the DD and GenMed groups in the present study exceeded this goal.

Other research has demonstrated that rates of hypertension for people with disabilities in general tends to be higher than the general population. Analysis of National Health and Nutrition Examination Survey (NHANES) data from 2001 to 2010 found that 39.1% of adults with mobility problems and 36.4% of adults with cognitive limitations had elevated blood pressure compared to 27% of able-bodied adults.¹⁷ The definition of disability used by NHANES is broad, encompassing many conditions, of which DD is a subset. A study of a Dutch sample of older residents with documentation of an DD-associated condition found that 36.8% of people with DD had hypertension.¹⁸ Another study conducted with a small community-based sample of people with DD found hypertension to be of similar prevalence compared to a sample derived from an adult health survey of people living in the same county.⁴ Further work by the Dutch group found that the prevalence of hypertension for people with DD was no different from that of the general Dutch population.¹⁹ Their definition of hypertension was based on older guidelines, which included mean systolic blood pressure ≥ 140 mm Hg and/or mean diastolic blood pressure ≥ 90 mm Hg and/or the use of blood pressure-lowering drugs with differentiation of use for other conditions by chart review. This study also conducted multivariate analyses to examine the association of a number of independent variables with the likelihood of being hypertensive. Older people, people with DD other than Down syndrome, people who lived more independently, people who were able to grocery shop, and people who were obese had higher risk of having hypertension. Altogether, the present study found overall blood pressure control to be similar between the DD and GenMed groups. Likewise, the documented diagnosis of hypertension was also similar between the 2 groups and similar to other studies previously mentioned.

In the subanalysis of patients whose blood pressure was not controlled, patients in the DD group had significantly higher systolic pressures and trend in higher diastolic pressures compared to the GenMed group. Prescribing of antihypertensive therapy was similar between the groups. Further research is needed to identify causes for this discrepancy, whether related to differences in medication adherence or physiologic factors. Another difference identified between the 2 groups was that stroke was more commonly documented in the DD group compared with the GenMed group. This may be due to the relatively small samples size of this study, but may be worth pursuing in larger studies powered to detect differences in stroke rates. Hypertension is a risk factor for other cardiovascular-related conditions such as arterial vascular disease, stroke,

myocardial infarction, and heart failure, as well as chronic kidney disease. It is well documented that patients with DD have elevation of cardiovascular and stroke risk factors, including obesity, lower physical activity, and cholesterol profiles with lower levels of high-density lipoprotein and higher levels of low-density lipoprotein components.⁵

Prescribing of antihypertensive therapy was basically the same between the DD and GenMed groups. Vacek et al reported a study where they used Kansas Medicaid data to characterize antihypertensive therapy for people with DD-related conditions who were between the ages of 18 and 64 and who had claims for hypertension drug therapy for a 1-year period.²⁰ They found the most commonly prescribed medications were angiotensin-converting enzyme/angiotensin receptor blocker (65%), followed by diuretics (50%), β -blockers (34%), and calcium channel blockers (26%). This is somewhat similar to the distribution in the present study, with 39% of patients with DD and a diagnosis of hypertension being on angiotensin-converting enzyme/angiotensin receptor blocker, the most commonly prescribed class of drugs in both the DD group and the Gen Med group. Diuretics were the second most commonly prescribed antihypertensive medications in the DD group, followed by β -blockers and calcium channel blockers. The least commonly used group was the α -blockers. This overall pattern was the same in the Gen Med group.

One limitation of the study may be the fact that the GenMed and DD groups differed from one another in their gender distribution. While the DD group had an almost equal distribution between men and women (49.8% male), the GenMed group had a higher percentage of women (35.9% male). According to the American Heart Association, a higher percentage of men than women have high blood pressure until age 45.²¹ From ages 45 to 54 and 55 to 64, however, the percentage of men and women is similar. Given that the average age of the individuals included in this study was approximately 52 to 55 years, it would be reasonable to assume that the gender differences between these groups may not have a major impact on the findings with regard to the rate and extent of hypertension.

Another limitation is that there were not enough participants within each DD diagnosis to compare outcomes by type of DD condition. Future work may be useful to examine differences in blood pressure control and prescribing by cause of DD. Studies have shown that people with Down syndrome typically have lower blood pressures and that people with mild to moderate cognitive impairment (DD) may have higher prevalence of hypertension.¹⁸

Last, this study made no attempt to link blood pressure control to the antihypertensive drug therapy prescribed. Future studies may be warranted to determine whether patients with DD, or specifically those with genetic causes for DD, have comparable response to antihypertensive therapy as patients in the general population.

Conclusion

Patients with DD-related conditions had blood pressures monitored consistently and were treated for hypertension similarly to other patients within the general medicine population of this large health system. There may be reasons for further research to determine why a subgroup of patients with DD has higher blood pressures compared to patients without DD. As well, stroke was documented more in the DD group. Further research is warranted to determine reasons for these differences.

Declaration of Conflicting Interests

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