

Research Article

# Meclizine prescriptions in the Emergency Department and return visits in the elderly population

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## Abstract

**Background:** Meclizine is a commonly prescribed medication for patients discharged from the Emergency Department (ED) with a diagnosis of peripheral vertigo, however it is on the Beers list of medications to avoid in elderly patients.

**Objectives:** This study aims to determine the correlation between use of meclizine and return visits to the ED within 1 week in patients > 65 years old.

**Methods:** This is a retrospective observational study conducted at 2 urban tertiary care EDs over 5 years. Inclusion criteria included patients > 65 years who were given meclizine in the ED or discharged with a prescription. Charts were reviewed for diagnosis, prescriptions and return visits within 7 days.

**Results:** There were a total of 1608 patients over 65 years of age who met inclusion criteria, 669 patients identified as receiving meclizine in the ED and 962 who received no meclizine (ED or ED plus home prescription). Of the meclizine patients, 548 (84.8%) were given home prescriptions, of which there were 36 (6.6%) return visits within 7 days. Patients who were given meclizine while in the ED without home prescriptions (121) had 16 return visits (13.2%). Among the non-meclizine group, 102 patients (10.6%) had a return visit within 7 days.

**Conclusion:** There was no increase in return visits in elderly patients discharged from the ED with a prescription for meclizine after a diagnosis of benign dizziness. Meclizine prescriptions at discharge were associated with fewer return visits to the ED within 1 week. Ongoing dizziness was the most common reason for return visits; there were no documented chief complaints of weakness, syncope/falls, or hypotension.

## Introduction

Dizziness and vertigo are common symptoms encountered by emergency physicians. Not only is the evaluation of dizziness a diagnostic dilemma, the treatment modalities are limited especially in elderly patients. Vestibular suppressant medications are often used during the Emergency Department (ED) stay and administered as a discharge prescription to treat symptoms if peripheral etiology of vertigo is suspected. Medications used to treat peripheral vertigo include antiemetics, antihistamines such as meclizine, or benzodiazepines.

Meclizine is one of the more commonly prescribed

medications for patients discharged from the Emergency Department with a diagnosis of peripheral vertigo. The American Geriatric Society (AGS) has placed meclizine on the Beers list of medications to avoid in patient over 65 years old because of the strong anticholinergic properties resulting in increased risk of confusion, falls/fractures, and overall mortality. Although traditionally used for ambulatory care settings, Emergency Departments (ED) are starting to use the Beers criteria as a guide for ED prescribing. Despite existing recommendations, meclizine is still administered in this vulnerable age group, possibly due to a lack of safer alternatives. The purpose of this study is to evaluate Emergency Department (ED) patients age 65 years old or older who received a prescription for meclizine during their

### More Information

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ED stay. This retrospective study aims to determine the correlation between uses of meclizine and return visits to the ED within 1 week in patients older than 65 years old.

## Materials and methods

This was a retrospective observational study conducted at 2 tertiary care EDs between June 4, 2012 - Dec 31, 2017. Inclusion criteria included all patients age 65 years or older who presented to either ED with a chief complaint of dizziness or vertigo and were subsequently discharged from the ED. We excluded patients who were given a final diagnosis of central causes of vertigo, or who required admission to the hospital. The study group included patients who were either given meclizine in the ED or discharged with a home prescription. A control group included patients 65 or older with chief complaints of dizziness or vertigo who were discharged without any medications.

The electronic medical record was queried using standard SQL queries for age, chief complaint, clinical impression, disposition, medications prescribed in the ED, home prescriptions and return visits within 7 days along with return chief complaint. This study was approved by our institutions Institutional Review Board.

Primary outcomes included return visits to the ED within 7 days. Secondary outcomes included chief complaint on second presentation, specifically gastrointestinal complaints, dizziness, weakness, hypotension, syncope or falls. The meclizine group was stratified by those who received a home prescription and those who only received it while in the ED. Demographic characteristics are reported. The rate of 7-day revisits is reported for each group and each meclizine group was compared to the non-meclizine group using a chi-square test and the chief complaints for the return visits are described. Comparisons were considered statistically significant with a  $p$  - values < 0.05. Data were analyzed using IBM SPSS Statistics version 25.0 (SPSS, Inc, Chicago, IL).

## Results

There were 669 patients age 65 years old or older who were identified as receiving meclizine in the ED during the study period. From available data, 430 patients were female (67%) and 214 were male (33%). Most patients ( $n = 353$ , 55%) were between 65-74 years old, followed by 200 (31%) between 75-84 years old. 90 (14%) patients were 85 years old or older (Table 1). 548 of these patients were given home prescriptions. Of this group, there were 36 return visits (6.6%) within 7 days. Of those return visits, 12 visits were for ongoing dizziness (32.4%). Four return visits were for abdominal pain/nausea/vomiting (10.8%), and 21 return visits (56.8%) were for other minor complaints deemed unrelated to dizziness/vertigo or meclizine. There were no reported chief complaints of weakness, syncope/falls or hypotension. In the control group, 962 patients were seen for

dizziness without any meclizine dispensed during their ED stay and at discharge. Of these, 102 patients (10.6%) had a return ED visit within the week; 12 return visits for dizziness (11.8%), 13 visits for weakness (12.7%), 8 visits for abdominal pain/nausea/vomiting (7.8%) and 61 visits for other (60%). Patients who were only given meclizine while in the ED without home prescriptions (121) had 16 return visits within 7 days (13.2%); 2 return visits for abdominal pain/nausea/vomiting (12.5%), 2 return visits for dizziness (12.5%), 1 visit for weakness (6.3%), 1 visit for syncope/falls (6.3%) and 10 visits for other reasons (62.5%). Patients who were given a prescription for meclizine at discharge had a significantly lower 7-day return visit rate compared to those who did not receive meclizine (6.6% vs. 10.6%,  $p = 0.009$ ) (Tables 2-4).

## Discussion

Dizziness is a common presenting complaint in the ED, especially in the elderly population [1]. In one recent

**Table 1:** Demographics.

	Number	%
Gender†		
Male	214	33
Female	430	67
Age (years)§		
65-74	353	55
75-84	200	31
>85	90	14

$n = 669$  total patients who received meclizine during the study period. † Data on gender not available for all patients. § Data on age not available on all patients.

**Table 2:** Return visits among patients receiving any meclizine (ED or home), meclizine in the ED only, Meclizine prescription and the No Meclizine group.

	Returns	No Returns	Total	%	$p$ - value
ED Only	16	105	121	13.2	0.013
No meclizine	102	860	962	10.6	
Home Rx	36	512	548	6.6	0.009
No meclizine	102	860	962	10.6	
Any meclizine	52	617	669	7.8	0.055
No meclizine	102	860	962	10.6	

$n = 154$  total returns within one week of initial ED visit for dizziness.

**Table 3:** Return visits among patients in all 3 groups.

	Returns	No Returns	Total	%	$p$ - value
Home Rx	36	512	548	6.6	0.012
ED Only	16	105	121	13.2	
No Meclizine	102	890	962	10.6	

**Table 4:** Chief complaints on return visits within 7 days.

Reason for return visit	Meclizine prescribed	%	Meclizine in ED only	%	No Meclizine	%
Gastrointestinal	4	10.8	2	12.5	8	7.8
Dizziness	12	32.4	2	12.5	12	11.8
Generalized weakness	0	0.0	1	6.3	13	12.7
Hypotension	0	0.0	0	0.0	4	3.9
Syncope/Falls	0	0.0	1	6.3	4	3.9
Other	21	56.8	10	62.5	61	59.8



estimate, dizziness and vertigo accounted for approximately 4% of complaints in the emergency department (ED) and cost estimates exceed \$4 billion in health care spending per year [10]. Dizziness is a general term often used to describe various symptoms such as vertigo, lightheadedness, presyncope and disequilibrium. Dizziness in elderly people is especially concerning given the heightened risks of falls, and subsequent decreased functional and psychosocial outcomes [2]. Dizziness has many different causes and is often multifactorial; commonly symptoms can be the result of peripheral causes (vestibular neuritis, otitis media, labyrinthitis, Meniere disease, acoustic neuroma, benign paroxysmal positional vertigo) or central etiologies (migraine, brainstem or cerebellar infarction, multiple sclerosis, mass lesions). Other causes of dizziness can be related to cardiac pathology, electrolyte abnormalities, or medication side effects (particularly polypharmacy that is often common in elderly patients). One national health care survey evaluating balance disorders in the elderly, reported over 40% were related to unclear causes. Of those with formal diagnoses the greatest percentage (11.3%) were related to medication side effects [9].

The diagnosis of benign versus life-threatening causes of vertigo and dizziness is beyond the scope of discussion here, however most complaints of dizziness presenting to the ED are found to be due to peripheral causes and not life-threatening. Once emergent etiologies of dizziness have been ruled out, the challenge becomes how to best manage benign but bothersome symptoms. Several classes of medications are used in the management of peripheral vertigo including antihistamines (meclizine, diphenhydramine), antiemetics (ondansetron, prochlorperazine, promethazine, metoclopramide), or benzodiazepines. All of these medications are used for their ability to suppress the vestibular system however they have differing mechanisms of action and side effects. All of the above classes include drugs that have been identified on the Beers list of medications to avoid in elderly patients (older than age 65) which makes symptomatic treatment in this population difficult [16]. The Beers Criteria were created by the American Geriatrics Society (AGS) as a list of potentially inappropriate medications to be avoided in older adults. The criteria are applicable to older adults with the exception being those in palliative or hospice care. By some estimates, up to 30 percent of hospital admissions in elderly patients may be linked to drug related complications or side effects and so the choice to use these medications identified as higher risk must be weighed against possible harms [5]. As a result of this, therapeutic options for treatment of dizziness in the elderly population are limited.

One of the most effective and commonly prescribed medications for benign dizziness is meclizine, a first-generation antihistamine. Meclizine is an H-1 piperazine-derivative sedating antihistamine. It is well absorbed after oral administration with maximum plasma concentrations reached

between 1.5 and 6 hours post oral dose and has a plasma elimination half-life of 5 to 6 hours. An *in vitro* metabolic study found CYP2D6 be the dominant enzyme for metabolism of meclizine. It is excreted in the urine as metabolites and in the feces as unchanged drug. The onset of action of meclizine is about 1 hour, with effects lasting between 8 to 24 hours [14].

Meclizine has anticholinergic, central nervous system depressant, and sodium-channel blocking properties. It is used therapeutically to treat dizziness, nausea, and vomiting due to motion sickness as well as vertigo associated with vestibular system diseases. While the mechanism of action of meclizine is not fully known, the drug's central anticholinergic action depresses both labyrinth excitability and vestibular stimulation. It is also thought to modulate the medullary chemoreceptor trigger zone and to reduce or inhibit vomiting [15].

Meclizine is on the BEER's list and it is not recommended for use in geriatric patients. Meclizine is highly anticholinergic; its clearance reduced with advanced age, and tolerance develops when used as hypnotic. Its use in geriatric patients increases the risk of confusion, dry mouth, constipation, and other anticholinergic effects or toxicities [16].

Results of this study found there was no increased rate of return visits in geriatric ED patients discharged with a prescription for meclizine after a diagnosis of peripheral vertigo or dizziness. In fact, meclizine prescriptions were associated with fewer overall return visits to the ED within 1 week. A return visit within one week was used as a surrogate for adverse events prompting return to the ED for further evaluation. The 72-hour unscheduled return visit of an ED patient are frequently used as an emergency medicine performance measure and have been proposed as a measure of provider performance [11,12]. A 7 day window for return visits was chosen as a more appropriate surrogate for medication-linked adverse outcomes for a number of reasons. The longer time period allowed for capture of patients who delayed filling prescriptions after initial discharge, gave time for the drug effects of meclizine to reach therapeutic threshold, and allowed for delays in representation to the hospital.

As the most frequently reported side effects of meclizine usage are dizziness, fatigue/weakness, and gastrointestinal distress we focused on those presenting chief complaints as measures of adverse effects of meclizine usage. The results showed that ongoing dizziness was the most common reason for return visits among all groups. In the meclizine prescription group there were no documented chief complaints of weakness, syncope/falls or hypotension, however those complaints were commonly reported among the non-meclizine groups. Falls or reported syncope/hypotension that could increase the risk of falls would be among the more concerning side effects that would limit use in an elderly population. Falls have been linked to serious adverse events (including fractures, hospitalization



and death) within 6 months in up to 50% of elderly patients who presented to the ED for a fall [13]. The risk of these adverse events was increased with use of medications that exhibited sedative properties.

Discharge of the elderly patient with benign dizziness or vertigo is challenging and there may be underlying issues or comorbidities that may contribute to ongoing symptoms of dizziness or vertigo. While our results show that meclizine was associated with fewer return rates to the ED, patients should be evaluated for factors that may impact management and likelihood of return visits, including mobility impairment, balance issues, CNS disorders, fall risk and availability home support [8]. Prescription of meclizine for peripheral dizziness was not associated with increased return visits in geriatric ED patients.

## Limitations

The design of this study was a retrospective chart review based on data extracted from the health systems electronic medical record (EMR) over a 5-year period. As a result, there are significant limitations to the conclusions that can be drawn from these results. While there does appear to be an association between meclizine prescriptions and reduced return visits to the ED within 1 week, no causality can be attributed. Given all analysis was performed in a retrospective manner, there was no opportunity to follow up with patients in specific regard to meclizine use. It was impossible to assess from the EMR whether prescriptions had been filled and if the medication was being taken.

Due to the nature of the retrospective review we were unable to ascertain a relationship between return visit chief complaint and the use of meclizine. It is possible patients who presented with complaints that were attributed to possible medication side effects were not taking the medication or else had other changes in health or behavior that resulted in unrelated complaints.

Elderly patients are frequently taking several home medications with numerous side effects, which may lead to confounding of the results. Other home medication use and possible medication interactions were not controlled for or addressed in this study. In future research this could be clarified with direct interaction with the patient on the follow up visit or through a post-visit survey. We also excluded hospitalized patients, who are likely still receiving treatment for their symptoms; therefore, the exclusion of hospitalized patients may allow more serious meclizine effects to be ignored. It is also possible there is inherent physician bias in who can receive a meclizine prescription. Physicians may prescribe meclizine to patients who are healthier and are taking less medications in general.

Return visits were used as a surrogate for adverse events. The method of data extraction meant that we were restricted to reviewing return visits within our own hospital system.

There was no mechanism to follow up on return visits at outside hospitals, urgent care facilities or with the patient's personal primary care provider. Given the high density of hospitals within the urban area in which the study was performed, it is possible there were follow up visits to EDs outside of our system and subsequently not captured by the EMR. This may have led to underreporting of return visits for medication related complaints.

Suggestions for further research would include a prospective randomized controlled trial in which there is an appropriate follow up mechanism in place to accurately assess for home use of meclizine as well as capturing all return visits to a health care provider, including those outside of a single health care system.

## Conclusion

In summary, there was no increased rate of return visits in geriatric ED patients discharged with a prescription for meclizine after a diagnosis of peripheral vertigo or dizziness. Meclizine prescriptions were associated with fewer overall return visits to the ED within 1 week. Ongoing dizziness was the most common reason for return visits in this group and there were no documented chief complaints of weakness, syncope/falls or hypotension. Short-term benefits of meclizine are apparent, but it is not clear whether the benefits will continue in older patients over a longer period. This paper provides a preliminary direction for the follow-up long-term research and observation.

## Author contributions

Alicia Minns: Conceptualization, methodology, investigation, writing-review and editing, visualization, supervision. Ronald Dunlay: investigation, writing-original draft. Edward Castillo: software, formal analysis. Samantha McGlone: investigation, writing-original draft.

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