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Original Research

Preventive healthcare use among males with multiple sclerosis

S.L. LaVela [a,b,*], T.R. Prohaska [c], S. Furner [c], F.M. Weaver [a,d]

[a] Center for Management of Complex Chronic Care, Hines VA Hospital, Hines, IL, USA
[b] Institute for Healthcare Studies, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA
[c] University of Illinois at Chicago School of Public Health, Chicago, IL, USA
[d] Program in Health Services Research, Stritch School of Medicine Loyola University, Maywood, IL, USA

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SUMMARY

Objectives: To understand preventive healthcare use by males with multiple sclerosis (MS).
Study design: Cross-sectional survey with secondary comparative data.
Methods: Primary survey data were collected from male veterans with MS ($n = 1142$) and compared with national surveillance data for a general veteran population ($n = 31{,}500$) and a general population ($n = 68{,}357$). Analyses compared use by group and identified variables associated with service use by male veterans with MS.
Results: More veterans with MS had a cholesterol check (93%) than the general veteran population (89%, $P < 0.001$) and the general population (78%, $P < 0.001$). More veterans with MS had received annual influenza vaccination (69%) than the general veteran population (58%, $P < 0.001$) and the general population (42%, $P < 0.001$). More veterans with MS (81%) had ever received pneumonia vaccination than the general veteran population (67%) and the general population (51%) ($P < 0.001$). Colon screening was received by 55% of veterans with MS, 49% of the general veteran population ($P < 0.001$), and 39% of the general population ($P < 0.0001$). Fewer veterans with MS (34%) had received a prostate-specific antigen (PSA) test and digital rectal examination than the general veteran population (46%, $P < 0.001$) and the general population (36%, not significant). In males with MS, variables independently associated with cholesterol checks were: white race [odds ratio (OR) = 3.75] and living in the south (OR = 1.95); variables independently associated with influenza vaccination were increased age (OR = 1.03) and being a non-smoker (OR = 0.55); increased age was independently associated with colon screening (OR = 1.02); variables independently associated with PSA testing were increased age (OR = 1.08) and being employed (OR = 3.31), and being unemployed was independently associated with pneumonia vaccination (OR = 0.16).

* *Corresponding author.* Center for Management of Complex Chronic Care, 5000 S. 5th Avenue (151H), Hines, IL 60141, USA. Tel.: +1 708 202 5895; fax: +1 708 202 2499.
E-mail address: sherri.lavela@va.gov (S.L. LaVela).
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Conclusions: More males with MS received several recommended preventive health services (e.g. cholesterol and colon screening, influenza and pneumonia vaccination) than males without MS. The Veterans Health Administration is meeting many prevention needs in males with MS, but there is room for improvement in areas such as reducing disparities in PSA screening and increasing respiratory vaccinations to meet national targets.

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Introduction

Multiple sclerosis (MS) is a chronic potentially debilitating neurological condition[1] affecting approximately 400,000 individuals in the USA.[2] Having a disability, such as MS, is a risk factor for unmet healthcare needs.[3] Individuals with physical disabilities report difficulty accessing primary care services,[4] and often lack opportunities to participate in preventive healthcare activities.[5,6] Literature suggests that disabled populations are less likely to receive preventive health care. In fact, the relationship is often inverse; i.e. as the level of disability increases, the provision of health maintenance services decreases.[3,7,8]

As a potentially underserved group, individuals with MS may experience health disadvantages due to a lack of focus on preventive health care compared with the general population. People with lifelong disabilities experience typical health and ageing processes in addition to idiosyncratic changes related to their primary disability. Disability-related concerns may displace preventive health care during routine visits. Along with disability management and treatment of the disease, vigilant attention to preventive health care is necessary to achieve comprehensive care and well-being.[2]

Abundant research has demonstrated reduced morbidity and mortality as a result of routine use of preventive healthcare services. The Centers for Disease Control and Prevention (CDC) routinely uses the Behavioral Risk Factor Surveillance System (BRFSS) to document preventive healthcare utilization by the US population. These data are limited because CDC BRFSS publicly available data are indiscernible at the level of specific disability, including MS. Equitable preventive health service provision is necessary to promote health, preserve independence, and reduce/delay chronic disease; however, little is known about the use of a full spectrum of preventive healthcare services in persons with MS. The content of the BRFSS survey was replicated and conducted with individuals with MS in order to obtain this valuable, comparable population-based surveillance data for persons with MS; information that is key to guiding preventive health care.

MS is more prevalent in females than males.[9] As a result, literature on males with MS is limited, including sparse data on preventive health use in males with MS. The Veterans Health Administration (VHA) is a large integrated healthcare system that provides care to nearly 30,000 individuals with MS,[10] most of whom are males. Thus, VHA affords a rich dataset on males with MS, providing a valuable opportunity to identify public health disparities.

The use of several preventive health services (influenza and pneumonia vaccinations; cholesterol, colon and prostate cancer screening) by male veterans with MS and non-MS male cohorts were compared, and variables associated with preventive service use in males with MS were identified. This study is unique and valuable in its provision of primary data (using BRFSS items) on preventive healthcare use for a large cohort of males with MS.

Methods

Design

Primary data were collected using a cross-sectional survey mailed to veterans with MS. Secondary data from the national CDC BRFSS survey spanning the same time period were downloaded to provide comparison group data. This study was approved by the Institutional Review Board at the Hines VA Hospital and the Office for the Protection of Research Subjects at the University of Illinois at Chicago.

Sample

The sample comprised three cohorts of males: veterans with MS ($n = 1142$), general veteran population ($n = 31{,}500$) and general population ($n = 68{,}357$).

Veterans with MS

Surveys were distributed along with 'members' mailings' from a congressionally chartered veterans service organization (VSO) to a national cohort of veterans with an International Classification of Diseases (ICD)-9 diagnosis of MS (diagnosis confirmed by Veterans Benefits Department for VSO eligibility). Veterans Administration (VA) researchers conducted the survey using the VSO membership mailing address list, which included both current users and non-users of VA health care. Surveys were distributed to 2777 males with MS; 735 were returned undeliverable and the denominator was adjusted to 2042 accordingly. Surveys were returned by 1142 male veterans with MS.

Comparison groups

Comparison group data were derived from the CDC BRFSS database. There were 264,684 respondents to the 2003 BRFSS survey; 160,284 females and 4543 individuals with missing data for veteran status were excluded. After these exclusions, the study sample included 99,857 adult males from the CDC BRFSS database for the comparison groups. CDC-trained

interviewers identified the respondents' gender directly (to identify adult men), asking only if necessary. The general veteran population included those who served on active duty in the US Armed Forces and were retired or discharged from military service ($n = 31{,}500$); the remaining cohort comprised the male general population ($n = 68{,}357$).

Data sources

The BRFSS survey is a standardized instrument used by the CDC to monitor disease, health, risk behaviours and preventive healthcare use within the US population.[11] Using BRFSS items, primary data were collected for the MS cohort and secondary data were downloaded for the comparison groups.

Multiple sclerosis health care questionnaire (MS-HCQ)
Reliable and valid questions (exactly worded) from the CDC BRFSS survey[12] were used to design the 72-item MS-HCQ. The MS-HCQ assessed sociodemographics (age, race, education, marital status, employment, region of residence), health behaviours (smoking and drinking), comorbidities (diabetes, hypertension, hypercholesterolaemia, coronary heart disease, stroke, asthma and prostate cancer) and preventive health service use (cholesterol check, influenza and pneumonia vaccination, colon and prostate cancer screening) in veterans with MS. Additional questions were added to assess MS disease duration and age when diagnosed.

CDC BRFSS database
For the comparable time period, population-based national BRFSS survey data[13] (sociodemographics, health behaviours, comorbidities and preventive health service use) were downloaded to provide non-MS comparison group data. Using formulae established by CDC, data were weighted to account for differences in selection probability (among geographic regions and adults per household).[14]

Key outcome measures

Self-reported receipt of each preventive health service was measured in terms of existing recommendations (endorsed by expert organizations/guidelines). Responses were dichotomized as yes/no to having received age-appropriate preventive health services within recommended time periods.

Cholesterol check was examined for men aged ≥35 years in the prior 5 years. Annual influenza vaccination was assessed for males aged ≥50 years. Males aged ≥65 years were evaluated for ever having received a pneumococcal polysaccharide vaccination (PPV). In males aged ≥50 years, colon cancer screening was evaluated by receipt of a colonoscopy within the prior 10 years or a sigmoidoscopy within the prior 5 years. In men aged 50–70 years [45–70 years for African American (AA) men], prostate cancer screening in the past year was examined by prostate specific antigen (PSA) test, digital rectal examination (DRE), PSA or DRE, and PSA and DRE.

Statistical analyses

Bivariate analyses
Participant characteristics. Bivariate comparisons (Chi-squared or t-tests) of male veterans with MS and each of the non-MS male comparison groups (general veteran population and general population) were made for sociodemographic variables (age, race, education, marital status, employment, region of residence), health behaviours (smoking and drinking) and number of comorbidities. For males with MS, age at diagnosis and duration of MS were described. Since most preventive health services examined are recommended for adults aged ≥50 years (except cholesterol), group comparisons were made for this age group.

Preventive services. To assess differences between use of age-/race-appropriate and recommendation-specific preventive health services, Chi-squared tests were used to compare the proportions of males who received each preventive healthcare measure (males with MS vs each non-MS group).

Multivariate analyses
For males with MS, multivariate regression analyses were used to identify variables associated with the use of each preventive health service. The dependent variable (receipt of preventive health service) was dichotomous, taking the value of 1 for receipt of the service (if age appropriate and recommended) and 0 for not having received the service. Separate multivariate logistic regression models, adjusted for appropriate variables, were built to generate odds ratios (ORs) and 95% confidence intervals (CIs) for each preventive health service. Several variables were considered for inclusion in the multivariate analyses as independent variables. These included sociodemographic characteristics (age, race, education, marital status, employment, region of residence), duration of MS, age at MS diagnosis, health behaviours (smoking, drinking), and comorbidities. Individual and groups of covariates were examined for inclusion in each model to assess model fit. The model with the best fit, based on inclusion of variables documented in the literature as important associations, statistical significance and guided by the −2 log likelihood, was used for each preventive service.

An alpha level of 0.05 was used to determine statistical significance. Statistical analyses were performed using SAS Version 9.1 (SAS Institute Inc., Cary, NC, USA) and Stata Version 10 (Stata Corporation, College Station, TX, USA).

Results

The response rate was 56% for the mailed MS-HCQ (1142/2042 male veterans with MS). For the secondary data from the CDC BRFSS database, the national median response rate was 53%.[13] Table 1 shows sociodemographic characteristics, health behaviours and comorbidities for males aged ≥50 years, as most preventive health services examined are recommended for adults aged ≥50 years in the USA (except cholesterol).

Sociodemographic characteristics, health behaviours and comorbidities

The mean age at MS diagnosis was 38 years [standard deviation (SD) 11] and the mean duration of MS was 25 years (SD 12). More male veterans with MS were White (93%) than males in the

Table 1 – Characteristics of male participants aged ≥50 years: comparisons of veterans with multiple sclerosis (MS), general veteran population and general population.

	MS (n = 962)	General veteran (n = 25055)	P-value (MS vs general veteran)	General population (n = 21316)	P-value (MS vs general population)
White (%)[a]	n = 953	n = 24,796		n = 21,078	
	92.76	85.58	<0.001*	73.13	<0.001*
Age (years):	n = 962	n = 25,055		n = 21,316	
Mean, SD	63.77, 8.64	66.11, 9.80	<0.001*	60.50, 9.36	<0.001*
Range	(50–93)	(50–99)		(50–99)	
Did not graduate high school (%)[b]	n = 957	n = 25,006		n = 21,254	
	4.49	8.50	<0.001*	17.41	<0.001*
In paid employment (%)[c]	n = 957	n = 25,010		n = 21,273	
	4.60	27.18	<0.001*	42.30	<0.001*
Married (%)[d]	n = 955	n = 25,010		n = 21,270	
	77.38	76.69	0.61	75.15	0.11
Region of residence (% south)[e]	n = 954	n = 25,055		n = 21,316	
	28.51	38.31	<0.001*	36.99	<0.001*
Current smoker (%)[f]	n = 955	n = 24,967		n = 21,244	
	14.03	17.55	0.004*	18.92	<0.001*
Chronic drinker (%)[g]	n = 954	n = 24,777		n = 21,066	
	2.94	4.84	0.006*	5.06	0.003*
Age at MS diagnosis (years):	n = 932				
Mean, SD	38.36, 10.65	n/a	n/a	n/a	n/a
Range	(17–77)				
Duration of MS (years):	n = 932				
Mean, SD	25.30, 12.31	n/a	n/a	n/a	n/a
Range	(1–63)				
Number of comorbidities[h]	n = 962	n = 25,055		n = 21,316	
Mean, SD	1.49, 1.18	1.23, 1.05	<0.001*	1.11, 1.04	<0.001*
Range	(0–7)	(0–6)		(0–6)	

n is the total number of subjects for which a value for the particular indicator under consideration is assigned.
SD, standard deviation.
*P = 0.01.
a White (reference: Black/African American, Asian, Hispanic, Native Hawaiian/Other Pacific Islander, American Indian or Alaska Native).
b Did not graduate from high school [<elementary school, elementary (Grades 1–8), some high school] [reference: high school graduate/general educational development,some college/technical school, and college graduate (≥4 years)].
c Currently employed for wages (reference: unemployed/unable to work, retired or unemployed/able to work).
d Married (reference: separated, divorced, widowed or never married).
e South (reference: west, midwest, northeast); residence was based on US census regions.[24]
f Current smoker (reference: past smoker or never smoked).
g Chronic drinkers were defined as having consumed ≥2 drinks per day in the past 30 days (reference: non-chronic drinker).
h 'Comorbidities' was presented as a count of the following chronic conditions: diabetes, hypertension, hypercholesterolaemia, coronary heart disease, stroke, asthma and prostate cancer.

general veteran population (86%, $P < 0.001$) and general populations (73%, $P < 0.001$). Among males aged ≥50 years, on average, veterans with MS (64 years, SD 9) were younger than the general veteran population (66 years, SD 10, $P < 0.001$) and older than the general population (61 years, SD 9, $P < 0.001$). Compared with males in the general veteran and general populations, fewer male veterans with MS did not graduate from high school (9% and 17% vs 4%; $P < 0.001$), were in paid employment (27% and 42% vs 5%; $P < 0.001$) and lived in southern states (38% and 37% vs 29%; $P < 0.001$). Fewer male veterans with MS were current smokers and chronic drinkers than both non-MS groups ($P < 0.01$); however, older males with MS had more comorbidities, on average, than both non-MS groups ($P < 0.01$).

Preventive health services

Table 2 shows bivariate comparisons of preventive health service use by group. Table 3 presents multivariate regression findings of variables independently associated with preventive health service receipt by male veterans with MS.

Cholesterol check

Of males aged ≥35 years, a greater proportion of veterans with MS (93%) had received recommended cholesterol screening (during the prior 5 years) than the general veteran population (89%, $P < 0.001$) and the general population (78%, $P < 0.001$). Multivariate findings showed that younger male veterans with MS were more likely to have received a cholesterol check (OR = 0.97, 95% CI 0.95–1.00, $P = 0.03$). The OR of having a cholesterol check was higher for male veterans with MS who were White (OR = 3.75, 95% CI 1.85–7.59, $P < 0.001$), lived in the south (OR = 1.95, 95% CI 1.04–3.66, $P = 0.04$) and had more comorbidities (OR = 1.80, 95% CI 1.38–2.35, $P < 0.001$).

Influenza vaccination

In males aged ≥50 years, receipt of an annual influenza vaccination was higher in veterans with MS (69%) than the general

TABLE 2 – Use of preventive healthcare services[a] among male participants: comparisons of proportions of veterans with multiple sclerosis (MS), general veteran population and general population.

	MS %	General veteran %	P-value (MS vs general veteran)	General population %	P-value (MS vs general population)
Cholesterol checked[b] within the past 5 years:	$n = 1122$	$n = 29,816$		$n = 47,488$	
≥35 years of age	93.08	88.83	<0.001*	78.28	<0.001*
Influenza vaccination within the past year[c]:	$n = 962$	$n = 25,055$		$n = 21,316$	
≥50 years of age	68.62	57.83	<0.001*	42.07	<0.001*
Pneumococcal polysaccharide vaccine ever[d]:	$n = 386$	$n = 13,528$		$n = 6078$	
≥65 years of age	80.93	67.20	<0.001*	51.49	<0.001*
Colon screening[e] in persons ≥50 years:	$n = 962$	$n = 4740$		$n = 4084$	
within past 5 years	54.97	49.05	<0.001*	38.83	<0.001*
within past 10 years	61.42	53.09	<0.001*	42.28	<0.001*
Prostate screening[f]: 50-70 years [45–70 for AA]	$n = 717$	$n = 1977$		$n = 2475$	
PSA past year	51.38	55.50	0.03**	45.84	0.004*
DRE past year	49.29	53.04	0.05**	44.36	0.009*
PSA or DRE past year	66.95	64.54	0.18	55.14	<0.001*
PSA *and* DRE past year	34.21	45.91	<0.001*	35.77	0.39

AA, African American.
*P = 0.01.
**P = 0.05.
a Item response rates for each variable for all groups were ≥93%.
b Veterans Health Administration/Department of Defense Clinical Practice Guidelines (2007) advocate screening men aged ≥35 years every 5 years.[25]
c Advisory Committee on Immunization Practices (ACIP) (2006) recommends annual influenza vaccination in persons ≥50 years of age and persons at high risk for medical complications from influenza.[26]
d ACIP (1997, 2010) recommends pneumococcal polysaccharide vaccination (PPV) for persons ≥65 and persons at increased risk for pneumococcal disease or its complications, including those who are unvaccinated (or unknown status) and those who have not received PPV within 5 years (and were <65 years of age at the time of vaccination).[27,28]
e US Preventive Services Task Force (USPSTF) (2002) recommends colorectal cancer screening for persons ≥ 50 years of age.[29] A 10-year interval has been recommended for colonoscopy and 5-year intervals for sigmoidoscopy because of lower sensitivity, but there is no direct evidence with which to determine the optimal interval. Studies have suggested that sigmoidoscopy every 10 years may be as effective as sigmoidoscopy at shorter intervals. The colon screening question was part of the 2003 optional modules in which 10 states participated resulting in a smaller *n* value for the CDC sample ($n = 8824$).
f USPSTF (2002) found good evidence that prostate-specific antigen (PSA) screening can detect early-stage prostate cancer, but mixed and inconclusive evidence that early detection improves health outcomes. If early detection improves health outcomes, those most likely to benefit from screening are men aged 50–70 at average risk, and men aged > 45 at increased risk (African American or first-degree relative with prostate cancer).[30] The American Cancer Society (2008) believes that the PSA blood test and digital rectal examination (DRE) should be offered yearly.[31] The prostate screening question was part of the 2003 optional modules in which 10 states participated resulting in a smaller *n* value for the CDC sample ($n = 4452$).

veteran population (58%, $P < 0.001$) and general population (42%, $P < 0.001$). The multivariate regression showed that male veterans with MS who were older were more likely to have received an influenza vaccination (OR = 1.03, 95% CI 1.01–1.05, $P = 0.002$). The OR of influenza vaccination was lower in male veterans with MS who were current smokers (OR = 0.54, 95% CI 0.36–0.81, $P = 0.003$) compared with past/never smokers.

PPV

Bivariate comparisons among males aged ≥65 years showed that a higher proportion of veterans with MS compared with the general veteran population and general population had ever received a PPV (81% vs 67% and 51%, respectively, $P < 0.001$). The logistic regression model for PPV receipt lacked predictors that improved the model significantly. The only covariate that yielded a significant model was one with intercept plus employment alone ($P = 0.05$). The OR of having a PPV was lower in male veterans with MS who were currently employed (OR = 0.16, 95% CI 0.03–0.96, $P = 0.05$) compared with those who were not currently employed.

Colon cancer screening

Of males aged ≥50 years, a greater proportion of veterans with MS (55%) received either a sigmoidoscopy or colonoscopy within the prior 5 years than those in the general veteran population (49%, $P < 0.001$) and the general population (39%, $P < 0.001$). Likewise, 61% of veterans with MS met guidelines for colon screening at least once within 10 years compared with 53% of the general veteran population and 42% of the general population ($P < 0.001$). Multivariate findings showed that male veterans with MS who were older were more likely to have received a colon screening (OR = 1.02, 95% CI 1.01–1.04, $P = 0.006$).

Prostate cancer screening

Among males aged 50–70 years (45–70 for AA), fewer veterans with MS received an annual PSA test compared with the general veteran population (51% vs 56%, $P = 0.03$); however, more veterans with MS received an annual PSA test compared with the general population (46%, $P = 0.004$). Fewer veterans with MS (49%) received an annual DRE compared with the general veteran population (53%, $P = 0.05$), but a greater proportion of veterans with MS received an annual DRE

Table 3 – Multivariate regression: variables[a] associated with receipt of preventive health services in male veterans with multiple sclerosis (MS).

	Cholesterol check ($n = 1069$)	Influenza vaccination ($n = 922$)	Pneumonia vaccination ($n = 356$)	Colon screening ($n = 914$)	Prostate screening ($n = 677$)
Age	0.97 (0.95–1.00)**	1.03 (1.01–1.05)*	–	1.02 (1.01–1.04)*	1.05 (1.02–1.09)*
White	3.75 (1.85–7.59)*	0.73 (0.40–1.33)	–	–	1.11 (0.62–1.99)
Did not complete high school	1.46 (0.33–6.40)	1.95 (0.84–4.56)	–	–	0.81 (0.30–2.18)
Married	1.12 (0.63–1.98)	1.17 (0.84–1.64)	–	–	1.36 (0.94–1.98)
In paid employment	1.01 (0.34–3.00)	0.72 (0.38–1.36)	0.16 (0.03–0.96)**	0.87 (0.46–1.63)	3.31 (1.35–8.11)**
Residence: south	1.95 (1.04–3.66)**	0.92 (0.67–1.25)	–	–	1.10 (0.77–1.59)
Current smoker	0.76 (0.38–1.51)	0.54 (0.36–0.81)*	–	0.78 (0.52–1.15)	1.41 (0.89–2.23)
Chronic drinker	1.30 (0.16–10.32)	2.07 (0.80–5.36)	–	1.66 (0.70–3.92)	2.37 (0.78–7.23)
Comorbidities	1.80 (1.38–2.35)*	1.08 (0.95–1.22)	–	1.03 (0.92–1.16)	1.13 (0.98–1.31)

Data are presented as odds ratios (95% confidence intervals).
*$P = 0.01$.
**$P = 0.05$.
a Reference groups: age is continuous; White (vs non-White); did not complete high school (vs completed general educational development test, high school or more education); married (vs not married); in paid employment (vs unemployed); living in the south (vs west, midwest, or northeast); current smoker (vs past/never smoker); chronic drinker (vs non-drinker/occasional drinker); and comorbidities (diabetes, hypertension, hypercholesterolaemia, coronary heart disease, stroke, asthma and prostate cancer).

compared with the general population (44%, $P = 0.009$). Fewer veterans with MS received PSA and DRE in the past year compared with the general veteran population (34% vs 46%, $P < 0.001$), but there were no significant differences in receipt of both tests between veterans with MS and the general population ($P = 0.39$). Multivariate findings showed that in male veterans with MS, the odds of having PSA screening were higher in those who were older (OR = 1.05, 95% CI 1.02–1.09, $P = 0.005$) and employed (OR = 3.31, 95% CI 1.35–8.11, $P = 0.009$) compared with those who were not currently employed.

Discussion

This study represents the first comprehensive national examination of utilization of multiple preventive health services in a male MS cohort compared with CDC surveillance data. The findings from a large national sample of males with MS help fill a knowledge gap, as preventive healthcare utilization in males with MS is not well represented in the literature.

These data suggest that male veterans with MS are getting most recommended preventive services that were examined in this study, and in many cases to a greater degree than non-MS populations. A significantly greater proportion of male veterans with MS received the recommended cholesterol check, influenza vaccination, PPV and colon screening than males in the general veteran population and general population. Disparities in preventive health in persons with physical disabilities, including MS,[3,8] have frequently been reported in the literature; however, in many cases, the findings of the current study counter these reports. Although a greater proportion of male veterans with MS are receiving recommended care than non-MS groups, it appears that at least a portion of this may be attributable to being a veteran, given that more males in the general veteran population received preventive services than those in the general population. This is possibly a factor of the heavy focus on prevention and monitoring of care quality in VHA. However, it is important to note that not all male veterans with MS receive their care through the VHA. It is possible that those who receive their care from the VHA may have different characteristics (e.g. may have more severe disability) than those who do not receive VHA care, which may impact use of preventive health services. It is also possible that males with MS utilize the healthcare system more than males without MS, resulting in more 'opportunities' for receipt of preventive services. Having a usual source of care has been associated with better healthcare access, including improved receipt of preventive health care.[15] Many individuals with MS have health insurance, a usual source of care and access to speciality care.[16]

Although persons with MS commonly have a regular healthcare provider and have general health and speciality care available,[17] in addition to health insurance,[16] many are still not getting the necessary preventive health care. For instance, in the current study, significantly fewer male veterans with MS than males in the general veteran population received both PSA tests and DRE (fewer than the general population as well, but this difference was not significant). The literature suggests that persons with physical disabilities are reluctant to undergo screening services that are potentially uncomfortable or embarrassing[18]; this may be applicable to some with regard to PSA tests and DRE. Additionally, although greater proportions of males with MS are receiving preventive health services, in some cases, there is room for improvement because national targets are not being met. For example, the Healthy People 2010 target for annual influenza vaccination for non-institutionalized adults is 90%,[19] and in the current study, 69% of males with MS in the recommended age group were vaccinated.

Independent of disability level, routine check-ups with primary care providers have been found to be a critical determinant in the receipt of preventive health services.[20]

The literature documents that primary care providers prefer to serve limited numbers of individuals with disabilities, citing time consumption as the reason.[5] Hence, in order to meet both the disability-specific and primary/preventive healthcare needs of individuals with MS in a seamless cohesive manner, consideration should be given to the establishment of a usual source/provider of care, and provision of routine preventive health evaluations by willing providers (combined expertise of generalists and specialists).

In terms of variables associated with increased use of preventive health services, older age increased the odds of receipt of many services (influenza vaccination, colon screening and prostate screening). Interestingly, being employed increased the odds of receiving PSA screening but was associated with lower odds of PPV, perhaps because PPV is indicated for persons aged ≥65 years and PSA screening was more inclusively considered for those aged ≥50 years (45 years for AA males). Non-smokers were more likely to have received an influenza vaccination, but smoking status was not a factor in receipt of other services. Cholesterol check had a number of variables associated with increased odds of receipt. Since high cholesterol is implicated in many conditions (e.g. heart disease, diabetes), it makes sense that an increased number of chronic conditions increased the odds of screening. Also, recent research suggests that blood cholesterol levels differ based on the phase of clinical stability of individuals with MS[21]; as such, the incredibly high rates of cholesterol screening may be due to attentive monitoring by healthcare providers to understand the MS disease state. The finding that being White increased the odds of cholesterol screening may indicate that racial disparities that exist in the general population also exist in veterans with MS.

Limitations

Data were not available on factors which may have implications on preventive health service use, such as healthcare provider information, source of care (including VHA or non-VHA), informal support availability, mobility status, or exacerbation periods and MS type. The moderate response rate (56%) for veterans with MS may have introduced a non-response bias. These data are self-reported and are subject to recall bias. Differences may exist in responses provided by mail vs interview format,[22] although comparisons of CDC BRFSS data from the two survey modes have been found to be 'largely equivalent'.[23] The comparison groups identified using CDC's secondary BRFSS data may have included individuals with MS, as exclusion data were not available. However, given the small number of persons with MS relative to the general veteran and general populations (>1%), it is unlikely that chance inclusion of those with MS would have modified any true effect.

Conclusions

Preventive health services promote early detection and treatment, reduce complications and prevent disease. Individuals with MS should be offered equitable preventive services and may benefit from education about their importance with specific attention to issues unique to persons with MS. Although receipt of most preventive services in males with MS was better than that for non-MS groups in many cases, the findings suggest areas for improvement, such as reducing disparities in PSA screening and meeting national targets for respiratory vaccinations. In addition, this study identified factors that are independently associated with the use of preventive health services among males with MS, many of which are similar to what literature reports for the general population; these data can be used to target subgroups for tailored interventions for increased receipt of preventive health services.

These findings can be used to guide healthcare providers and policy makers in efforts to reduce disparities and improve health and well-being in persons with MS. To preserve health and quality of life in persons with MS, healthcare systems must accommodate patients with mobility impairments who may require specialized equipment or increased provider time.

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Ethical approval

This study was approved by the Institutional Review Board at the Hines VA Hospital and the Office for the Protection of Research Subjects at the University of Illinois at Chicago.

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Competing interests

None declared. The views expressed in this manuscript are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs.

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