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Secondary Prevention of Cardiovascular Disease in Older Adults

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ABSTRACT

Atherosclerotic cardiovascular disease is extremely common in older adults and the potential benefits of secondary prevention are perhaps greater in this population than in younger patients. While there is good evidence that secondary prevention efforts are justified in patients up to 80 years of age, limited data are available on secondary prevention in octogenarians and there is no evidence to guide treatment in patients ≥90 years of age. Further, the value of secondary prevention may be confounded by prevalent comorbidities, polypharmacy, and limited life expectancy. It is therefore essential that all management decisions be made in relation to individual preferences and goals of care, with understanding by patients that benefits as well as risks may increase with age. Furthermore, research is needed to refine markers to better delineate which older adults are most likely to benefit from preventive therapies.

The incidence and prevalence of atherosclerotic cardiovascular disease (ASCVD), including coronary artery disease (CAD), peripheral arterial disease (PAD), and ischemic stroke, increase progressively with age, and it is estimated that over 80% of men and women 75 years of age or older have clinically manifest CVD.[1] This population is at heightened risk for recurrent CVD events, including death, as well as impaired quality of life, and there is thus substantial opportunity for older patients with CVD to benefit from interventions aimed at secondary prevention (SP). Conversely, older adults may be at increased risk for adverse outcomes associated with all diagnostic and therapeutic interventions, in part due to age-associated non-cardiac vulnerabilities, such as cognitive impairment and frailty. Therefore, the applicability of SP measures based on evidence derived largely from younger and healthier populations to older adults is uncertain and requires careful scrutiny. Accordingly, all recommendations must be individualized, taking into consideration not only the patient's cardiac condition, but also prevalent comorbidities, functional limitations, goals of care, and personal preferences.

In 2013, the American Heart Association published a comprehensive Scientific Statement on Secondary Prevention of ASCVD in Older Adults.[2] The current article provides an overview of the role of SP in older adults and highlights challenges and controversies to implementing preventive measures in elderly patients. As noted above, general concerns relate to availability and quality of data as well as the relevance of preventive goals to older adults who often have comorbid conditions that may be of equal or greater concern than their cardiac issues.

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Abbreviations and Acronyms

ACE = angiotensin converting enzyme

ACS = acute coronary syndrome

ADL = activities daily living

ARB = angiotensin receptor blocker

ASCVD = atherosclerotic cardiovascular disease

BP = blood pressure

CAD = coronary artery disease

CR = cardiac rehabilitation

CVD = cardiovascular disease

DM = diabetes mellitus

HF = heart failure

HTN = hypertension

MI = myocardial infarction

PAD = peripheral arterial disease

SP = secondary prevention

General measures

Among patients at high risk for ASCVD events, including those with prior myocardial infarction (MI), PAD, or stroke, aspirin reduces the risk of recurrent events by about 25%,[3] and aspirin 75–162 mg daily is recommended for SP in all patients with ASCVD in the absence of contraindications.[2] Clopidogrel 75 mg daily is recommended in patients intolerant to aspirin.[2] Moreover, in the Clopidogrel in Unstable angina to prevent Recurrent Events (CURE) trial, the addition of clopidogrel to aspirin provided a further 20% reduction in CVD death, MI, or stroke among patients with non-ST-elevation acute coronary syndromes (ACS), and the absolute benefit was similar in patients younger or older than age 65.[4] Data are limited on the effectiveness of aspirin and other anti-platelet agents among patients over 80 years of age, whereas the risk of major and minor bleeding is higher among older patients prescribed dual anti-platelet therapy compared to aspirin alone. In addition, in patients ≥75 years of age with ACS treated with aspirin, the addition of prasugrel has been associated with increased risk of bleeding compared to clopidogrel.[2] Similarly, bleeding risks are increased when anti-platelet therapy is used in combination with systemic anticoagulants.

Although data in patients 75 years of age or older are limited, long-term beta-blocker therapy is recommended following an ACS.[2] Older patients may be at higher risk for adverse events with beta-blockers, including bradyarrhythmias and fatigue, and dosing should be adjusted accordingly. Several large trials have demonstrated the efficacy of angiotensin-converting enzyme (ACE) inhibitors for SP in patients with or at high risk for ASCVD, even in the absence of left ventricular systolic dysfunction or heart failure (HF).[5] These studies enrolled patients up to 80 years of age with up to 5 years follow-up. Therefore, ACE inhibitors are recommended for SP in older adults with established vascular disease.[2] Angiotensin-receptor blockers (ARBs) are a suitable alternative in patients intolerant to ACE inhibitors due to cough or allergic reactions.[2] ACE inhibitors and ARBs should be used with caution in older adults with significant renal impairment (est. glomerular filtration rate <45 cc/min), and renal function and serum potassium levels should be monitored during initiation and titration. Combination therapy with an ACE inhibitor and ARB is not recommended due to increased risk for adverse events without proven benefits.

Hypertension (HTN)

The prevalence of HTN increases with age, exceeding 70% among persons over age 75, and HTN is both the most common and strongest modifiable risk factor for CAD, PAD, and stroke in older adults.[1,2,6] In addition, numerous randomized trials have demonstrated that treatment of HTN is associated with reductions in stroke, incident HF, and CAD events in elderly patients.[6] In the Hypertension in the Very Elderly Trial (HYVET), 3845 patients ≥80 years of age with systolic blood pressures (BP) ≥160 mmHg were randomized to indapamide supplemented by perindopril as needed to achieve a target BP <150 mmHg or to matching placebo. Over a median follow-up of 1.8 years, active treatment was associated with a 30% reduction in fatal or nonfatal strokes ($p = 0.06$), 64% reduction in HF ($p < 0.001$), 34% reduction in all-cause CVD events ($p < 0.001$), and 21% reduction in all-cause mortality ($p = 0.02$).[7]

From the perspective of SP, an important limitation of HYVET is that only 11.8% of patients had pre-existing ASCVD, and subgroup analysis in this cohort has not been reported. In the Avoiding Cardiovascular Events through Combination Therapy in Patients Living with Systolic Hypertension (ACCOMPLISH) trial, 11,506 patients with HTN were randomized to receive benazepril in combination with either amlodipine or hydrochlorothiazide (HCTZ).[8] The trial was stopped after a mean follow-up of 36 months due to a 20% reduction in CVD events in the benazepril-amlodipine arm compared to amlodipine-HCTZ (9.6% vs. 11.8%, $p < 0.001$). Approximately 41% of patients enrolled in ACCOMPLISH were age 70 or older, 23.5% had prior MI, 13% had prior stroke, and 36% had a prior revascularization procedure. Outcomes were similar in prespecified subgroups defined by age, gender, and presence of diabetes mellitus (DM), but subgroup analysis by pre-existing CVD was not reported. Nonetheless, based on these findings and the proven benefits of renin-angiotensin system inhibitors for SP in older adults discussed above, it seems reasonable to prescribe an ACE-inhibitor or ARB as first line therapy for hypertension in older patients with established ASCVD.

Despite limited data to support treatment of HTN for SP in older patients with CAD, there is robust evidence that anti-HTN therapy is effective for reducing recurrent stroke in patients with an incident cerebrovascular accident.[9,10] In the Perindopril Protection Against Recurrent Stroke Study (PROGRESS), a flexible regimen of perindopril with or without indapamide reduced the risk of recurrent stroke by 28% ($p < 0.0001$) and major ASCVD events by 26% among 6105 patients with a mean age of 64 years, 16% of whom had concomitant CAD.[9] A subsequent meta-analysis of 10 trials involving a total of 38,421 patients with incident stroke confirmed that anti-HTN therapy reduced the risk of recurrent stroke by 30% and all CVD events by 25%.[10]

Taken together, these findings strongly suggest but do not prove that treatment of HTN is likely to be beneficial for SP of CVD in older patients, including octogenarians. Correspondingly, the AHA scientific statement on SP recommends treatment of hypertension in accordance with published guidelines.[2] Similarly, the recently revised guideline for SP of stroke provides a

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class I, level of evidence A recommendation for treatment of HTN in this population.[11]

The BP threshold for initiating anti-HTN therapy, as well as the treatment target for BP reduction in older adults, remains controversial, as evidenced by somewhat divergent recommendations in recently published guidelines.[12,13] The authors of the 8th Joint National Committee report (JNC-8) recommend a treatment goal of ≤150/90 mmHg for all adults 60 years of age or older,[12] whereas guidelines developed by the American Society of Hypertension and International Society of Hypertension advocate a treatment goal of ≤140/90 mmHg for patients less than 80 years of age and ≤150/90 mmHg for those 80 years of age or older. Furthermore, data on anti-HTN therapy for SP in older adults, especially those over 75 years of age, are scarce, and it is therefore not possible to formulate evidence-based recommendations. In this author's opinion, it is reasonable to treat HTN patients <80 years of age who have had an incident ASCVD event with a goal of maintaining the systolic BP <140 mmHg. In patients ≥80 years of age, a treatment target of <150 mmHg is reasonable based on the HYVET study.[7]

A detailed discussion of the approach to BP management in older adults is beyond the scope of this article, and the reader is referred to recent reviews of this topic.[2,6] Briefly, lifestyle modifications provide the foundation for controlling BP, reducing CVD risk, and improving overall health outcomes in patients of all ages. Specific recommendations include maintenance of a desirable body weight (see Jahangir et al in this issue),[14] avoidance of all tobacco products, moderation in sodium and alcohol intake, regular physical activity, and consumption of a prudent diet (e.g. the Dietary Approaches to Stop Hypertension [DASH] diet).[2,6,15] In patients whose BP remains elevated despite behavioral interventions, initiation of drug therapy is appropriate.

Diabetes mellitus

The incidence and prevalence of DM increase at least up to age 65 due to reduced insulin secretion, decreased tissue sensitivity to insulin, and altered body composition, including increased visceral fat and reduced lean body mass.[2,16] As a result, it is estimated that 22%–33% of individuals age 65 or older have diabetes, among whom approximately one-third are undiagnosed.[2,16]

DM is a potent risk factor for ASCVD in older adults, including CAD, PAD, and stroke, and patients ≥75 years of age are at higher risk for these complications than those 65–74 years of age.[16] DM also confers increased risk for microvascular manifestations, i.e., retinopathy, nephropathy, and neuropathy.[16]

Despite the high prevalence and high risk associated with DM in older adults, data are limited on the impact of DM treatment on clinical outcomes in this population. In 3 large trials involving over 23,000 patients with DM, a substantial proportion of whom had pre-existing ASCVD at the time of enrollment, more aggressive control of DM, as measured by lower hemoglobin A1c levels, was not associated with reductions in all-cause mortality, CVD mortality, or major cardiovascular events, including MI or stroke.[17–19] The mean age of patients enrolled in these trials ranged from 60 to 66 years, and subgroup analysis dichotomized at age 65 in the 2 largest trials revealed no significant differences in outcomes between older and younger subjects.[17,18] In all 3 studies, clinically significant hypoglycemia was more common in patients randomized to receive more aggressive DM control.[17–19]

Based in part on these findings, the American Diabetes Association and the American Geriatrics Society have recently published recommendations on the management of DM in older adults.[16,20] Although both organizations support individualization of treatment based on age, comorbidities, and goals of care, general recommendations for level of glycemic control are provided. The suggested target hemoglobin A1c for most older adults is 7.5%–8.0%,[16] corresponding to average glucose levels of 169–183 mg/dl. In healthy older adults with few comorbidities and good functional status, a target hemoglobin A1c of 7.0–7.5% may be appropriate. Conversely, hemoglobin A1c levels of 8%–9% (estimated average glucose levels 183–212 mg/dl) are appropriate for those with poor health, multiple comorbidities, or limited life expectancy.[20] In the absence of evidence to the contrary, treatment goals for SP of ASCVD in older patients with diabetes should be similar to those described for the general population of older diabetics.

Review of DM management in older adults is beyond the scope of this article, but may include lifestyle interventions, oral medications, and/or insulin.[20,21] Additionally, control of concomitant risk factors, as discussed elsewhere in this article and other papers in this issue, is appropriate.

Tobacco

The prevalence of tobacco use declines with age due to a combination of premature deaths related to smoking and successful smoking cessation. In 2008, 9.8% of men and 8.5% of women ≥65 years of age were current smokers, while 54.3% of men and 28.9% of women in this age group were prior smokers.[1] Among older adults with ASCVD, continued smoking remains a risk factor for recurrent events, while smoking cessation is associated with a substantial reduction in risk.[2]

In a meta-analysis of 20 studies, patients with CAD who quit smoking experienced a 36% reduction in mortality and a 32% reduction in the risk of nonfatal MI compared to those who continued to smoke.[22] Similarly, data from the Coronary Artery Surgery Study demonstrated substantial reductions in mortality and reinfarction rates among patients ≥70 years of age who quit smoking compared to non-quitters, [23] while a large population based meta-analysis involving over 1.2 million individuals ≥60 years of age documented salutary effects of smoking cessation even in those ≥80 years of age.[24] Additional benefits of smoking include reductions in sudden cardiac death and stroke, improvement in claudication symptoms in patients with PAD, and attenuation in decline of pulmonary function.[2]

Despite the unequivocal health benefits of smoking cessation in patients of all ages, the efficacy of available smoking cessation interventions is modest. In a recent randomized trial comparing 12 weeks of combination therapy with varenicline

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and bupropion SR to varenicline alone, 53% of patients in the combination group were abstinent at 12 weeks follow-up, but the abstinence rate declined to 31% by 52 weeks.[25] Nonetheless, this outcome is superior to most prior studies, and it is possible that continuation of therapy beyond 12 weeks may have resulted in a higher rate of sustained abstinence. Since this study involved younger patients, the applicability of the findings to older adults with ASCVD is unknown.

All tobacco users should be counseled to quit at every contact with the health system, and it should be recognized that the occurrence of an ASCVD event represents a signal opportunity to encourage smoking cessation due to heightened patient motivation. Those who indicate a desire to quit should be offered counseling alone or in combination with drug therapy. Current options to assist with smoking cessation include nicotine replacement (patch, gum, lozenges, nasal spray, inhaler, and possibly electronic cigarettes), bupropion, and varenicline.

Depression

The prevalence of comorbid major depressive disorder ranges from 15 to 25% among patients with ASCVD, and the presence of depression is associated with a 2-to-4-fold increase in the risk of recurrent events and all-cause mortality.[2] While the prevalence of depression declines with age in patients with CVD, older patients with depression are at heightened risk for adverse outcomes.[26]

Patients with CVD should be screened for depression using a standard self-report instrument such as the Geriatric Depression Scale[27] or Patient Health Questionnaire-9 (PHQ-9).[28] Patients with evidence for depression should undergo additional evaluation and treatment. While both cognitive behavioral therapy and anti-depressant medications are effective for treating depression in patients with CVD, neither approach has been shown to reduce mortality or improve CVD outcomes in these patients.[29,30]

Other risk factors

Management of lipids and obesity are reviewed elsewhere in this issue and will not be discussed here.

Diet

Dietary factors are inextricably linked to the development of CVD risk factors and subsequent ASCVD. For example, high sodium intake is associated with HTN in susceptible individuals, high caloric intake and especially high consumption of simple sugars (e.g. sweetened beverages) are associated with weight gain and type II DM, and low intake of certain nutrients, such as vitamin D, is associated with increased risk for CVD.[2] Conversely, the DASH diet and Mediterranean-style diet have been associated with more favorable CVD risk profiles and outcomes in older adults.[15,31] High intake of flavonoid-rich foods, such as fruits, vegetables, nuts, cocoa, tea, and wine, has also been associated with lower risk of cardiovascular death during long-term follow-up in a study of older adults.[32]

Despite the importance of dietary factors in the primary prevention of CVD, there is limited evidence that dietary interventions are effective for SP in older adults. Several large trials have evaluated the utility of omega-3 fatty acid supplements in patients with CAD. In the GISSI-Prevention trial, 1 gram per day of omega-3 polyunsaturated fatty acids was associated with a 10% reduction in recurrent CVD events.[33] More recently, however, the Alpha Omega Trial failed to show a beneficial effect of omega-3 fatty acids among patients 60–80 years of age with recent MI.[34] Thus, the benefits of omega-3 fatty acid supplements for SP in older adults are unproven. Similarly, trials of multivitamins, B-vitamins and vitamins C, D, and E have failed to show beneficial effects.

In the absence of high-quality evidence, dietary recommendations for SP of ASCVD in older adults are based on consensus opinion. In general, adherence to a Mediterranean-style diet seems prudent. Excess intake of sodium, simple sugars, trans-fats and saturated fats, processed foods, and alcohol should be avoided. Caloric intake should be sufficient to achieve and maintain a desirable weight (see Jahangir et al[14]). To reduce the risk of age-related loss of muscle mass (sarcopenia), protein intake of at least 0.8 g/kg body weight is recommended,[2] and higher intakes are advisable in patients over 80 years of age and in those with manifest sarcopenia. Adequate fiber intake is also recommended for bowel health, but the role of dietary fiber in the primary and SP of CVD has not been elucidated.

Physical activity and cardiac rehabilitation (CR)

Physical inactivity is a potent risk factor for HTN, DM, and ASCVD in people of all ages.[2,35,36] Moreover, the adverse health consequences of physical inactivity are particularly pronounced in older adults due to associated impairments in functional and cognitive status, as well as increased disability and risk of falls.[2] In one study of community-dwelling older adults, those who reported sitting more than 6 hours per day had increased all-cause and CVD mortality relative to those who spent an average of less than 3 hours sitting per day.[37]

In older adults with established ASCVD, initiating an exercise program reduces morbidity and mortality, diminishes disability, and increases active life expectancy.[2] In the Honolulu Heart Program, men aged 71–93 years who walked at least 1.5 miles daily experienced approximately 50% lower risk of recurrent CVD events compared to those who walked less than 0.25 miles per day.[38] In addition, regular physical activity improves physical, cognitive, and psychological function in frail elderly patients.[39]

Current guidelines recommend 150 minutes per week of moderate intensity physical activity (e.g. brisk walking) or 75 minutes per week of vigorous physical activity (e.g. running).[40] However, among people ≥65 years of age, only 14% of men and 8% of women are in compliance with these standards.[2] Furthermore, among people ≥75 years of age, only 18% reported any physical activity of at least moderate intensity.[2] In older

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patients with ASCVD, the proportion of those who engage in regular physical activity is likely to be even lower. There is thus considerable opportunity to improve health outcomes in older adults with ASCVD through effective promotion of a more physically active lifestyle.

Exercise prescription

Although the general approach to exercise prescription is similar in older and younger adults, older patients tend to have lower baseline functional capacity, more comorbidities that might interfere with exercise (e.g. arthritis, PAD, gait or balance disorders), and more barriers to participation in an exercise program (e.g. transportation difficulties, need to provide care for spouse). Therefore, specific exercise recommendations must be individualized to ensure safety and maximize the likelihood of long-term participation.

Before beginning an exercise program, older adults with ASCVD should be evaluated by a physician or other health provider knowledgeable about exercise prescription in older patients, especially those with concomitant comorbidities. Although exercise stress testing is usually recommended prior to embarking on a vigorous exercise program, exercise intensity for the majority of older adults with ASCVD is likely to be mild to moderate. For these patients, an alternative assessment of exercise capacity, such as a 6-minute walk test, is often sufficient and offers the advantages of convenience and much lower cost.[41] A general physical examination, including evaluation of the heart, lungs, neurological system, and gait should also be performed.

Most older adults starting an exercise program in an unsupervised setting should be advised to choose a comfortable activity or combination of activities (e.g. walking, stationary bicycle, swimming) and to begin by exercising at a comfortable intensity for a comfortable period of time, recognizing that all 3 factors (type of activity, intensity, and duration) will vary considerably among individuals. All patients should be encouraged to exercise at least five days per week, and those with very low exercise tolerance (e.g. <5 minutes of walking) should exercise 2–3 times per day on most days, if feasible. Initially, the main goals should be to adapt to regular exercise and to incorporate it into the daily routine. Duration but not intensity should be gradually increased until the patient is able to exercise continuously for 15–30 minutes, after which duration and/or intensity can be further increased. In some patients, high intensity interval training may be associated with greater benefits than conventional aerobic exercise regimens.[42]

In addition to aerobic exercise, strength training is recommended 2–3 days per week to help counteract age-related sarcopenia and to facilitate maintenance of independence in performing routine activities of daily living (ADLs) and instrumental ADLs (e.g. cooking, housekeeping, shopping).[40] As with aerobic exercise, strength training should begin at low intensity using light weights or flexible resistance bands. All major muscle groups should be engaged, including core muscles of the trunk in addition to upper and lower extremities. The amount of resistance should be increased gradually, and patients should be cautioned to avoid excessive resistance due to the potential for injury to muscles and joints. Ideally, instruction from a trained exercise therapist or trainer is advisable when starting a strength training program.

Finally, flexibility and balancing exercises should be included in a comprehensive exercise program. Again, instruction from an exercise specialist can maximize the benefits and minimize the risks of flexibility and balance training. Participation in a yoga or tai-chi class can be particularly valuable for addressing these components of the exercise routine.

Cardiac rehabilitation

CR consists of a structured exercise and education program that occurs in a monitored setting supervised by trained personnel. In numerous studies, including studies involving older adults, CR has been shown to reduce morbidity and mortality following hospitalization for acute MI, unstable angina, percutaneous coronary intervention, or major cardiac surgery (coronary bypass surgery, valve repair or replacement, heart transplantation, congenital heart procedures).[43,44] Based on these data, CR is covered by Medicare Part B and all major insurance companies in the U.S., although copayments may be required. Nonetheless, increasing age is associated with progressively lower rates of participation in CR, and women and non-whites are less likely to receive CR than men and whites, respectively,[2] as also reviewed by Menezes and colleagues in this issue.[45] In one analysis, only 12% of Medicare beneficiaries eligible for CR actually enrolled.[46] Importantly, physician referral is one of the most important factors in determining the likelihood that eligible older patients will participate in CR.[47] Other barriers to participation in CR include lack of transportation, other obligations (e.g. caring for spouse), depression, cognitive impairment, anxiety, and fear of inability to engage in activities at an acceptable level.[48] For these reasons, considerable encouragement, outreach, and resources may be required to increase CR referral and participation rates in older adults.

Challenges and controversies

Older patients with ASCVD often have multiple coexisting chronic medical conditions that may complicate efforts to reduce the risk of recurrent CVD events (Table 1). In addition, the presence of multimorbidity frequently engenders polypharmacy, generally defined as regular consumption of 5 or more medications, and it is common for older adults with CVD to be taking 10 or more medications.[49] Furthermore, not only does adherence decline with the number of medications and the complexity of the dosing regimen (e.g. the number of times medications are taken over the course of the day), but the risk for clinically relevant drug-drug interactions increases progressively with the number of drugs prescribed and exceeds 90% in patients taking 10 or more medications.[50]

Another factor that introduces uncertainty into the value of SP in older adults relates to the anticipated time horizon and magnitude of benefit achieved. For example, an octogenarian with ASCVD and concomitant heart failure has a median life expectancy of less than 2 years, and it is unlikely that such an individual will derive significant benefit, in terms

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Table 1 – Impact of non-cardiac comorbidities on secondary prevention in older adults.

Condition	Impact
Sensory deficits (visual, auditory)	Difficulty understanding and following instructions and medication regimens; if severe, may interfere with daily activities, including exercise; may increase fall risk
Osteoarthritis	May impair exercise tolerance; NSAIDs promote sodium retention and interact with numerous anti-hypertensive drugs
Osteopenia/sarcopenia	Impaired exercise tolerance; increased fall risk
Chronic lung disease	Impaired exercise tolerance; may limit beta-blocker use
Chronic kidney disease	May complicate management of hypertension and heart failure; may limit use of medications (e.g. ACE-inhibitors, ARBs, new oral anti-coagulants)
Cognitive impairment	May limit ability to understand and adhere to secondary prevention interventions, including medications, life-style changes, and an exercise program; increased fall risk
Peripheral arterial disease	Impaired exercise tolerance
Neurological disorders, including stroke	Impaired exercise tolerance and mobility; increased fall risk
Gastrointestinal disorders, including GERD	Reduced tolerance to medications, esp. antiplatelet agents and anticoagulants
Urinary incontinence	Reduced diuretic tolerance and adherence; may interfere with ability to exercise
Depression	Reduced adherence to medications and life-style interventions, including participation in cardiac rehabilitation

Abbreviations: ACE: angiotensin-converting enzyme; ARB: angiotensin receptor blocker; GERD: gastroesophageal reflux disease; NSAIDs: nonsteroidal anti-inflammatory drugs.

Table 2 – Recommendations for secondary prevention in older adults with atherosclerotic cardiovascular disease.

Intervention	Recommendation	Comment
Aspirin	75–162 mg daily in patents with established ASCVD	75–81 mg daily in patients taking another antiplatelet agent or anticoagulant
Clopidogrel	75 mg daily for 1 year in patients with non-ST-elevation ACS	Increased bleeding risk when combined with aspirin in older adults
Beta-blocker	Indicated in patients with MI or unstable angina	See guidelines for agents and dosing;[53] titrate slowly; increased risk for adverse events in older adults
ACE-inhibitor	Indicated in patients with established ASCVD	Consider an ARB in patients intolerant to ACE inhibitors; monitor renal function and potassium
Hypertension	Target <140/90 in patients <80 years of age; <150/90 in patients ≥80 years	Titrate slowly to reduce adverse events; orthostatic hypotension common in older adults
Diabetes mellitus	Individualize treatment targets in older adults (see text for details)	Avoid hypoglycemia; regular eye and foot exams
Dyslipidemia	Statins in most patients with ASCVD	Adverse events, including myopathy, more common in older adults
Tobacco	Avoidance of all tobacco products; counseling and pharmacotherapy as needed	Never too late to quit!
Depression	Screen all older patients with CVD	Additional evaluation and therapy based on results of screening
Obesity	Individualize treatment and goals; diet and exercise as primary therapy	Avoid excessive weight loss; value of weight loss in patients ≥80 years controversial
Diet	DASH or Mediterranean-style diet	Avoid excess intake of simple sugars and saturated fats
Physical activity	Regular aerobic exercise as tolerated at least 4–5 days per week	Combine with strengthening, flexibility, and balance exercises
Cardiac rehabilitation	Indicated following ACS, PCI, or cardiac surgery	Consider home program in older patients unable to attend structured cardiac rehabilitation

Abbreviations: ACE: angiotensin-converting enzyme; ACS: acute coronary syndrome; ASCVD: atherosclerotic cardiovascular disease; CVD: cardiovascular disease; DASH: Dietary Approaches to Stop Hypertension; MI: myocardial infarction; PCI: percutaneous coronary intervention.

of either morbidity or mortality, from aggressive treatment of HTN, DM, dyslipidemia, obesity, physical inactivity, or even tobacco abuse. In this regard, it should be recognized that none of the major trials of risk factor modification for either primary or SP have included very elderly individuals with multiple comorbidities or limited life expectancy. There is thus no substantive evidence upon which to base therapeutic recommendations in this age group. Further, many SP measures may lead to impaired quality of life due to medication side effects, dietary restrictions, increased health care costs, or unwanted disruption of long standing patterns of behavior.

In light of these considerations, it is perhaps not surprising that there is some controversy about the utility and intensity of SP interventions in the very elderly. Differences in recent guidelines for management of HTN have already been mentioned,[12,13] and the use of statins in the very elderly is the subject of ongoing debate.[51,52] Moreover, these issues are unlikely to be resolved by further observational studies or clinical trials because the results of such studies, while informative with respect to the impact of interventions on large populations, may not be applicable to the individual elderly patient with unique clinical, psychosocial, cultural, and financial circumstances. Thus, the design and implementation of SP interventions, as with all clinical decisions

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in older patients but especially the very elderly, must be individualized and must be made with due consideration given to personal preferences and goals of care. Table 2 summarizes current recommendations for SP in older adults.

Statement of Conflict of Interest

The author declares that there are no conflicts of interest.

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