



Published in final edited form as:

*Prog Cardiovasc Dis.* 2014 ; 57(2): 197–203. doi:10.1016/j.pcad.2014.08.001.

## Risk stratification in very old adults: How to best gauge risk as the basis of management choices for patients aged over 80

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### Abstract

Cardiovascular disease (CVD) is the leading cause of mortality in older adults, however, in the elderly accurate stratification of CVD risk to guide management decisions is challenging due to the heterogeneity of the population. Conventional assessment of CVD and therapeutic risk is based on extrapolation of guidelines developed from evidence demonstrated in younger individuals and fails to weight the increased burden of complications and multimorbidity. Using a comprehensive geriatric based assessment of older adults with CVD that includes an estimation of complexity of multimorbidity as well as traditional risk assessment provides a patient centered approach that allows for management decisions congruent with patient preferences. This review examines the complexity of risk stratification in adults over 80, assessment methods to augment current tools and the basis of management decisions to optimize patient and family centered goals.

### Keywords

Multimorbidity; polypharmacy; cardiovascular disease; risk stratification; elderly

### Introduction

Currently, 13% of the United States population is over the age of 65 years. However, as survival rates increase, adults aged 65 and older will increase to comprise 19% of the population by 2030, with nearly 19 million adults aged over 85.<sup>1</sup> Cardiovascular (CV) disease (CVD) affects approximately 40 million individuals over the age of 65 and is the leading cause of morbidity and mortality in that population.<sup>2</sup> For individuals over the age of 80 the prevalence rises to encompass 83% of men and 87% of women.<sup>2</sup> Heterogeneity among very old adults is vast and current risk stratification methods to predict an individual's health trajectory is challenging when compared to younger individuals. The majority of cardiovascular practitioners stratify risk based on standardized scores that have been developed and validated in middle aged adults; however, in the very elderly their value in discrimination of who will benefit rather than be harmed by a specific management strategy or intervention is unreliable. Further, standardized guidelines that are frequently

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used and promoted for common CV conditions do not accommodate for the very old adult with significant multimorbidity, polypharmacy, and goals of care not focused on mortality.<sup>3,4</sup> For the patient over 80 that has already reached their anticipated life expectancy the relevance and utility of predicting 10 year mortality is shadowed by the importance of quality of life and maintaining independence. This article will focus on the challenges of stratifying risk in very old adults, assessment methods to augment current practices, and management decision processes for optimum patient centered care.

## Traditional Risk Stratification

Conventional assessment of CV and therapeutic risk is frequently based on validated instruments that are optimal for differentiation in patients in their 50's and 60's without significant comorbidities.<sup>5-7</sup> Although some do encompass well defined factors such as hypertension (HTN), diabetes mellitus (DM), increasing age (up to 79), cholesterol, and smoking, they lack the ability to distinguish attributed risk from the complexity of multiple contributing disease processes. Furthermore, they do not allow for the addition of sensitive predictors of outcomes in very elderly patients such as pulse pressure, cognitive impairment, disability, functional status and frailty.

## Current Clinical Practice Guidelines

Despite the high prevalence of CVD in older adults, their corresponding under representation in randomized controlled trials of disease modifying therapies is significant.<sup>8,9</sup> The resulting effect is that clinicians are required to extrapolate standard practice guidelines based on trial data derived from younger adults.<sup>10</sup> Patients over 80 are essentially absent from most pivotal randomized clinical trials which can result in either the omission of evidence based beneficial therapies or the underestimate of risk of procedures without survival benefit for that patient cohort.<sup>11,12</sup> Recent updates to American College of Cardiology/American Heart Association (AHA/ACC) guidelines have expanded the content related to elderly patients and highlighted the difficulty in evaluating and managing adults >75 due to specificity of symptoms and limitations of diagnostics.<sup>10,13,14</sup> The guidelines also recognize the presence of discordant outcomes when stratified by age and the higher risk of complications experienced by older adults.<sup>10,13,14</sup> Population based recommendations however remain non-specific for the very elderly suggesting that decisions should be undertaken after incorporating age-related issues, careful consideration of patient and family preferences, functional capacity, quality-of-life and end-of-life issues, as well as alternative management strategies.<sup>4</sup>

## Role of traditional risk factors in very elderly

### Hypertension

Hypertension in the elderly individual is frequently combined with other significant physiological hemodynamic changes such as low renal blood flow, lower intra vascular volume, reduced cardiac output (particularly during activity), increased pulse pressure and marked vascular stiffness and resistance.<sup>15</sup> The result is that many will require a combination of medications to control their blood pressure (BP) and hence be exposed to

significant adverse effects. The overwhelming evidence documents that treating significant HTN at any age, including the very elderly, reduces CV and cerebrovascular events.<sup>16,17</sup> Previous guidelines based on expert opinion recommended a goal BP of less than 140/90 mmHg for older adults with an acceptable systolic BP of 140–145 mmHg in individuals over 80 years of age if tolerated, and particular caution to the aggressive reduction of BP (to below 130/70 mmHg) in octogenarians with comorbidities due to the increase in adverse events.<sup>18</sup> Recent updates have now suggested an even higher goal of less than 150/90 mmHg; however, the changes remain controversial.<sup>19</sup> Practitioners should plan on starting each therapy at a low dose and slowly but consistently increasing medication with frequent contact to monitor for adverse drug events.

### **Dyslipidemia(DYS)**

Numerous trials have documented the beneficial effects of statin therapy on CVD and mortality.<sup>20–22</sup> The age range, however, for the majority has not included adults over 80 years and hence the benefits have not been extrapolated to managing octogenarians. The single randomized controlled trial that recruited older adults specifically showed a benefit in statin therapy for secondary prevention but not for primary prevention of DYS.<sup>23</sup> The gap in management strategy lies in the continued treatment of DYS in the octogenarian and nonagenarian that has been taking and tolerating medications for several years and/or has a significantly low future life expectancy. Recent developments of Pooled Cohort Risk Equations may allow for more accurate mortality risk estimations.<sup>24</sup> Currently, guidelines suggest caution in using high intensity statin therapy in individuals over 75 years of age and that therapy decisions should be balanced between benefits, life expectancy, comorbidities and treatment priorities.<sup>25</sup>

### **Smoking**

The prevalence of smoking decreases with age but remains a significant risk factor contributing to 30% of attributable risk in strokes and 36% in first myocardial infarction (MI). Smoking also aggravates angina symptoms and can precipitate silent MI seen in older adults. Although the relative risk for MI or death attributed to smoking in an individual over 70 is twice that of an individual 55–60,<sup>26</sup> older adults are 20% less likely to be advised to quit smoking by health care providers. Very elderly individuals may be resistant to changing long-term lifestyle habits and providers may minimize anticipated benefits, however the impact of smoking and the positive effects of cessation continue to be demonstrated irrelevant of age.

### **Diabetes**

Epidemiological evidence has demonstrated the association between uncontrolled DM and an increased of CVD.<sup>27</sup> For the older adult, the burden of DM is linked to significant morbidity, reduced functional status, and mortality secondary to CVD events.<sup>28</sup> Despite this, the goal of tight glycemic control in reducing CVD in adults over 80 has not been established due to the dearth of evidence from previous randomized control trials and the occurrence of significantly higher occurrences of hypoglycemia and mortality.<sup>29</sup> Currently, opinion suggests that for older adults who are functional, cognitively intact and have a significant future life expectancy, risk and management of DM should be consistent with

goals developed for younger adults.<sup>28</sup> Management and goals for older adults with comorbid conditions or life expectancy < 10 years should balance glycemic control with risk of adverse events and for those with life expectancy < 5 years glucose lowering management should be established on an individual basis.<sup>28</sup>

## Multimorbidity

The conceptual approach to disease-centered care with consideration of comorbid conditions has not been a main focus of prior management strategies. Evidence based clinical practice guidelines continue to focus on single disease entities and therefore create barriers to their application in adults with numerous interacting comorbid disease processes.<sup>30</sup> As a more patient-centered approach has evolved the concept of multimorbidity allows not only the consideration of how each comorbid condition interacts with the primary disease but the changing and varying interaction of all conditions.<sup>31</sup> The prevalence of multimorbidity (the coexistence of 2 or more chronic conditions) rapidly increases with age such that it occurs in over 70% of 75 or older.<sup>32</sup> In Medicare beneficiaries with heart failure the burden of multimorbidity is significant with over 50% having 5 or more coexisting chronic conditions.<sup>32</sup> The health care burden of multimorbidity is marked with individuals costing 3 times the national average per capita spending of Medicare beneficiaries and the highest 30 day readmission rates. Evaluation of multimorbidity should include not only the contributing effects of chronic and acute diagnoses but also the prevalence of common and frequently under-recognized geriatric syndromes such as dementia, falls, delirium, incontinence, weight loss, depressive symptoms and functional status decline.

## Polypharmacy

Older adults with multimorbidity are frequently seen by many general and specialist providers and as a result receive multiple therapies. Often the standard of care for individual chronic illnesses leads to polypharmacy and potential drug-drug interactions for individuals with multiple chronic illnesses.<sup>30</sup> Polypharmacy, defined as taking 4 chronic medications, is associated with non-adherence<sup>33</sup> as well as inappropriate prescribing, drug interactions, adverse drug events, hospitalization, and mortality. Adverse consequences including poor adherence are not only related to the number of medications but also to the regimen complexity.<sup>34</sup> Studies have estimated that 50% of older adults are taking at least one medication with no ongoing indication, and many of these drugs are initiated during hospitalization, such as stress ulcer prophylaxis and antipsychotics for delirium.<sup>35</sup> Paradoxically, a further consequence of polypharmacy is therapeutic omissions by patient or provider of potentially beneficial medications.<sup>36</sup> Ensuring patients are on as few medicines as necessary to manage their diseases and provide evidence based mortality benefit should be the optimal goal. This also leads to improvement in adherence and patient safety, and reduce medication costs for the patient.

## Frailty

Frailty is an emerging and important geriatric syndrome affecting approximately 20% of community dwelling adults over 80.<sup>37</sup> It encompasses a biological decline across multiple interrelated organ systems and a subsequent loss of reserve in response to stressors, such as

acute illness.<sup>38,39</sup> In older patients hospitalized with CVD it is estimated that the prevalence is over 50%.<sup>40</sup> Frailty is an independent predictor of subclinical CVD,<sup>41</sup> coronary artery disease,<sup>42</sup> and congestive heart failure mortality.<sup>43</sup> It confers an increased risk of hospitalization, and institutionalization, and 2 fold mortality.<sup>37,44,45</sup> Currently, there is no widespread standard for assessment of frailty in the CV setting despite the recognition as a significant factor in the evaluation of an older adult with CVD. There are numerous multidimensional assessment tools that have been developed to measure physical frailty<sup>46</sup> and range from a composite score of clinical deficits to physical performance based criteria.<sup>37,47,48</sup> As a prognostic tool, assessment of frailty in combination with other risk factors is an invaluable addition to assist providers in defining the optimum management strategy.

## Cognitive Impairment

The presence of dementia significantly increases the financial cost, management complexity and mortality rates for an older adult.<sup>49,50</sup> Hypertension and frailty are now recognized in association with and may well be significant risk factors for the development of mild cognitive impairment, a prodromal phase of Alzheimer's type dementia.<sup>51,52</sup> For an individual that has both HTN and mild cognitive impairment, institutionalization and mortality rates are similar to those with dementia and significantly higher than those with HTN alone.<sup>53</sup> In older adults who are classified as frail the prevalence of cognitive impairment is 5 times greater than those who are not frail and the coalescing of these factors causes a more rapid decline in cognition and disability.<sup>54</sup> High rates of unidentified cognitive impairment in older adults suggest that periodic screening is necessary to accurately establish future risk and determine benefits of simplification of treatment strategies.

## Evaluation methods

A comprehensive evaluation incorporating all contributing risks is essential to provide the most accurate assessment of absolute risk and benefit of treatment strategies. Inquiring about primary concerns and symptoms provides an initial framework to direct interpretation of further findings. Although disease focused evaluation of symptoms may allow for assessment of the primary CVD, they may well not be congruent with the most significant or problematic symptoms of the patient. Allowing the older adult to prioritize concerns and functional limitations can allow for a more patient centered assessment of risk and hence care plan. Figure 1 highlights essential elements of the process of evaluation. After establishing primary concerns, a comprehensive assessment should allow for interpretation of the severity and acuity of the primary CV problem as well as other CV disease processes, complications and the presence of traditional CVD risk factors amenable to intervention. Assessment of multimorbidity should include contributions of chronic and acute disease processes as well as an evaluation for coexisting geriatric syndromes and functional status. Table 1 provides an overview of commonly used valuable tools for assessment of the geriatric population.

## Prognostication and Management Decision Making

Contributing factors to management choices involves both prognosis and patient preferences and goals. Prognosis may not only include mortality but also disability and dependence. Although median future life expectancy for a person aged 80 is approximately 7 years the range can vary significantly depending on functional status, and the presence of significant comorbid disease.<sup>55</sup> For example, the presence of Alzheimer's disease is associated with a 2–4 times risk of mortality at any age.<sup>49</sup> By evaluating the contributing risk of all factors the provider can gauge whether an individual has a higher, average or lower risk of the potential outcome. Patient preferences and priority of goals should also be balanced with prognostic evaluation. All interactions within and among current conditions, therapies and future therapies should be considered before communicating a detailed plan to the patient and significant family involved in the care. This should include the discussion of all benefits and harms to the patient without influence of the provider's personal priorities and values. Finally, for the very elderly the importance of frequent reassessment of symptom priority, benefit and risk, adherence and alignment with patient centered goals is essential.

## Conclusions

The challenges of stratifying risk in the very elderly and hence balancing patient centered management strategies are immense due to the vast heterogeneity seen in this population. Although CV clinicians are adept at calculating disease centered risk in younger populations, their sensitivity of risk stratification and judgment for detecting overall risk burden from multimorbidity is imperfect. A comprehensive geriatric based evaluation incorporating all contributing factors is essential to provide the most accurate assessment of absolute risk and benefit of treatment strategies to guide management decisions in older adults. Assessment of geriatric syndromes, complexity of multimorbidity and polypharmacy along with patient preferences and goals into management plans can lead to optimum patient centered care.

## Acknowledgments

Dr. Bell is supported in part by K12HD043483-11, Mentored Clinical Scientist Development Award from NICHD and the Eisenstein Women's Heart Service Fund

## Abbreviations

<b>BP</b>	Blood pressure
<b>CV</b>	Cardiovascular
<b>CVD</b>	Cardiovascular disease
<b>DM</b>	Diabetes mellitus
<b>DYS</b>	Dyslipidemia
<b>HTN</b>	Hypertension
<b>MI</b>	Myocardial infarction



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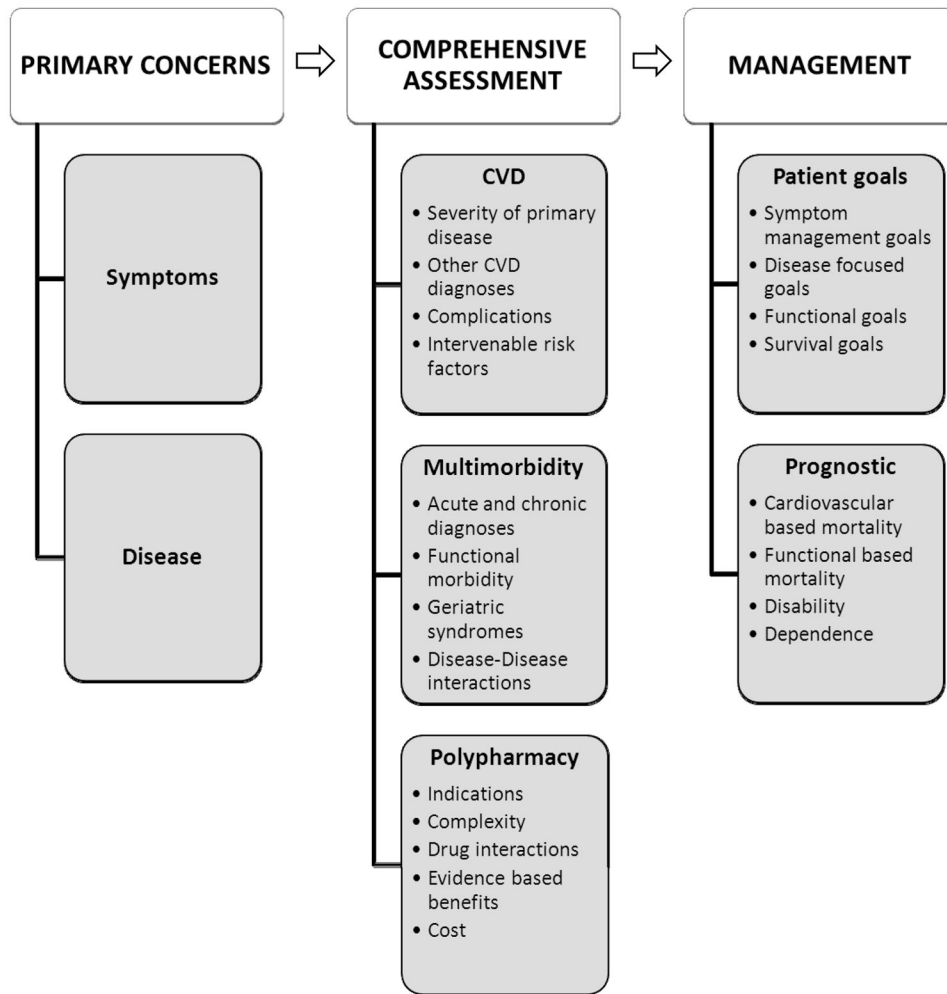
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**Figure 1.** Overview of proposed comprehensive assessment for risk stratification in adult over 80

**Table 1**

## Summary of Assessment Tools for Screening for Common Geriatric Conditions

	Assessment Tool
Frailty	Fried Frailty Scale: Grip strength, gait speed, exhaustion, weight loss and activity questionnaire <sup>37</sup> Short Physical Performance Battery <sup>56</sup>
Functional Status	Katz Activities of Daily Living <sup>57</sup> Lawton Instrument of Activities of Daily Living <sup>58</sup> Timed up and Go <sup>59</sup> Functional Reach <sup>60</sup>
Cognition	Montreal Cognitive Assessment ( <a href="http://www.mocatest.org">www.mocatest.org</a> ) Mini-COG <sup>61</sup>
Weight loss/Sarcopenia	Grip strength Body Mass Index change loss > 5%
Depression	Geriatric Depression Scale <sup>62</sup> Patient Health Questionnaire <sup>63</sup>