Erectile Dysfunction as a Marker for Cardiovascular Disease Diagnosis and Intervention: A Cost Analysis

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ABSTRACT

Introduction. Erectile dysfunction (ED) is a risk factor for cardiovascular disease (CVD). We examine the costs of screening men with ED for CVD risk factors and the cost savings of treating these at risk men.

Aim. This study aims to evaluate the effect of screening men presenting with ED for CVD risk factors and to determine the cost effectiveness of this screening protocol.

Methods. The known incidence and prevalence of ED and CVD, the rate of undiagnosed CVD, and the effects of CVD treatment were used to model the change in prevalence of acute CVD events and ED as a function of the number of men with ED and CVD. The cost savings associated with reduction in acute cardiovascular (CV) events and ED prevalence was estimated over 20 years.

Main Outcome Measures. Acute CVD event rate reduction and associated cost savings were modeled over 20 years.

Results. The relative risk of ED in men with CVD is 1.47 and the coprevalence of both ED and CVD was estimated at 1,991,520 men. Approximately 44% of men with CVD risk factors are unaware of their risk. If all men presenting with ED were screened for CVD, 5.8 million men with previously unknown CVD risk factors would be identified over 20 years, costing $2.7 billion to screen. Assuming a 20% decrease in CV events as a result of screening and treatment, 1.1 million cardiovascular events would be avoided, saving $21.3 billion over 20 years. Similarly, 1.1 million cases of ED would be treated, saving $9.7 billion. Together, the reduction in acute CVD and ED treatment cost would save $28.5 billion over 20 years.

Conclusions. Screening for CVD in men presenting with ED can be a cost-effective intervention for secondary prevention of both CVD and, over the longer term, ED. **Pastuszak AW, Hyman DA, Yadav N, Godoy G, Lipshultz LI, Araujo AB, and Khera M. Erectile dysfunction as a marker for cardiovascular disease diagnosis and intervention: A cost analysis. J Sex Med 2015;12:975–984.**

Key Words. Erectile Dysfunction; Cardiovascular Disease; Cardiovascular Risk Factors, Cost Analysis; Erectile Dysfunction Treatment; Cardiovascular Disease Treatment

Introduction

Erectile dysfunction (ED) is the persistent inability to achieve or maintain penile erection sufficient for satisfactory sexual performance and affects more than 18 million men in the United States alone [1,2]. It has significant societal cost; over $1 billion a year worldwide is spent on pharmacological treatment of ED [3]. A growing body of evidence links cardiovascular disease (CVD) and ED, with both conditions having similar risk factors including hypertension, hyperlipidemia, diabetes, obesity, and smoking. Because penile arteries have a smaller diameter than coronary arteries, the earliest manifestation of CVD

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may be ED [4]. In fact, a growing body of literature has identified ED to be an independent risk factor for coronary heart disease (CHD) and stroke, on par with smoking and a family history of CHD [1,3–6]. Data from the Prostate Cancer Prevention Trial linked the onset of ED with angina, myocardial infarction (MI), and stroke [5], whereas the Massachusetts Male Aging Study (MMAS) demonstrated that the relative risk (RR) for ED in the setting of CVD is 1.41 (95% confidence interval [CI] 1.05–1.90) even when controlling for age and traditional CV risk factors [2]. A meta-analysis by Dong et al. supports an increased risk of CVD, stroke and all-cause mortality in men with ED [6], and a meta-analysis by Vlachopoulos et al. demonstrated an independent association between ED, CVD, and all cause mortality, showing a greater effect of ED on CVD and mortality in younger men [7]. In men less than 75 years old, ED is predictive of future atherosclerotic cardiovascular events [2,8]. The higher rate of CVD events in men with ED is present even in diabetic men with ED when compared with those without [9]. A recent meta-analysis demonstrated that the RR of CVD in men presenting with ED is 1.47, demonstrating a clear cardiac risk in these men [10].

Although ED has been regarded as a disease of older age, over 20% of men less than 40 years old may suffer from ED [11]. A study of men 18–45 years old presenting with ED demonstrated that more than 50% showed signs of insulin resistance, suggesting vascular dysfunction may occur at a younger age than previously appreciated [12]. Flaccid penile acceleration can predict adverse metabolic profiles in younger men [13]. In fact, a near 50-fold increase in CHD incidence was observed in men 40–49 years old with ED vs. men without, indicating potential prognostic utility of screening for CVD risk in younger men with ED [14]. Importantly, CVD screening at presentation for ED may be most valuable in younger men, as the RR of CVD associated with ED is inversely correlated with age [15].

ED shares an underlying pathophysiology with CVD, specifically endothelial cell dysfunction and impaired nitrous oxide production [16,17]. Accordingly, it is possible that improving overall vascular health may improve ED symptoms. Lifestyle changes resulting in weight loss, lower blood pressure, and higher HDL cholesterol also reduce ED symptoms [16]. Moreover, it is hypothesized that phosphodiesterase type 5 inhibitors (PDE5) treatment may improve endothelial function with resultant improvement in CVD outcomes, as PDE5 treatment decreases pulmonary and coronary vascular tone [18]. PDE5 are commonly used for the treatment of ED in men with CVD, although the effects of PDE5 have not been clearly studied for CVD end points [16,17,19].

Given the clear value of ED as a risk factor for CVD, attempts have been made to incorporate ED screening and treatment into risk stratification for CVD. However, analysis of the MMAS data showed that inclusion of ED screening in the Framingham risk score failed to significantly increase its ability to predict MI or coronary death [2]. Nevertheless, patients presenting with ED provide an opportunity to diagnose and treat underlying CVD. In fact, the third Princeton Consensus Conference recommends cardiac risk stratification in men presenting with ED [20]. This point of intervention may be particularly valuable in men who are not aware of underlying CVD and CVD risk factors (CVDRFs) and who may not otherwise seek regular health care [21].

We perform a cost analysis for screening men over 20 years of age presenting with ED for CVD, assessing the cost and impact of screening and treatment of these men on incidence and prevalence of CVD.

Methods

Pertinent Data Identification and Extraction

A PubMed literature search was performed for the terms "erectile dysfunction," "coronary vascular disease," "coronary artery disease," "incidence," and "prevalence," and articles containing information about the prevalence and incidence of ED within a population of men with CVD were identified. Twenty-two articles were identified with data relevant to the incidence and prevalence of CVD and ED. Of the 22 articles, eight articles clearly defined the prevalence of ED in CVD patients [2,5,9,14,22–25]; these articles provided estimates for the number of men with CVD, as well as estimates for the number of ED cases among these men. For incidence data, three articles contained data sufficient to estimate ED incidence in men with CVD [9,24,26]. Incidence and prevalence rates were then extracted and averaged (Figure 1).

Costs Associated with CVD

The cost of CVDRF screening, including blood pressure measurement, lipid panel, and hemoglobin A1c was determined from Medicare