Sex and the heart

Professor Mike Kirby FRCP
University of Hertfordshire & Bedfordshire
The Prostate Centre.
London
The Temporal Relationship Between ED and CVD

- 207 CVD men attending cardiac rehab
- 165 age matched controls
- ED in 66% with CVD – discussed in 53%
- ED in 37% controls – discussed in 43%
- ED on average 5 years before CVD

In half the men there were missed opportunities to assess CVD risk

“Men with ED should be specifically targeted for CVD preventative strategies in terms of lifestyle changes and pharmacological treatments”

Discussing Sexual Function in the Cardiology Practice

- 980 cardiologists mailed 31 item questionnaire
- 53.9% responded
- 2% patients referred for help
- 70% cardiologists no advice given
  - Lack of patient initiative 54%
  - Not enough time 43%
  - Lack of training 35%

Nicolai et al Clin Res Cardiol 2013;102
Sex after MI

- AMI may result in reduced sexual activity and function
  - party due to fears about sex triggering another attack or being fatal\(^1\-^3\)

- This may contribute to:\(^1\,^4\,^5\)
  - depression
  - relationship strain
  - reduced QOL
  - Impairment of future childbearing

The evidence

- VIRGO study conducted at 127 hospitals in the US & Spain
- Investigated gender differences in baseline sexual activity, function & patient experience with physician counselling about sexual activity after an AMI
- Included 2,349 women & 1,152 men aged 18-55 yrs
Rates of sexual activity post-MI

- Sexual activity rates & frequency were much lower in the month post-AMI vs the 12 months before.
- Of those who were sexually active prior to the MI, 54% of women & 63% of men had resumed sexual activity within 1 month post-AMI.
- 9% of patients who were not sexually active prior to the MI, had become sexually active within 1 month post-AMI.

Discussing sexual activity post-MI

- Only 12% of women & 19% of men had some discussion with a physician about sex in the month after their AMI.
- Of those, 68% were given restrictions; the most common of which were to:
  - Limit sex (35%)
  - Take a more passive role (26%)
  - Keep the heart rate down (23%)

Who was less likely to receive counselling

- The following factors were significantly associated with receiving no counselling:
  - female gender
  - older age
  - sexual inactivity at baseline

Additional findings

- A number of male & female patients with AMI reported difficulty breathing during sex in the year prior to their AMI (14% in Spain & 19% in the US)

Conclusions

- These results show that very few patients received counselling for sexual activity post-AMI.
- Those who did were commonly given restrictions that are not supported by evidence or guidelines.

Where do we go from here?

- Practice guidelines strongly recommend that physicians counsel their post-AMI patients about resuming sexual activity.

- They say it can be safely resumed soon after an uncomplicated AMI if the patient can cope with mild-moderate physical activity.

What Do The Patients Want?

- More information
- HCP to **initiate** discussion
- Knowledge relieves anxiety, increases confidence and alleviates fear
Patients would like to discuss ED, but they don’t do it

Low correspondence desire vs. action*

Percentage of patients who discussed sexual function with primary-care physician.

Percentage of patients who desire to discuss ED with primary-care physician.

* These results are based on a study of 500 consecutive men over the age of 30 visiting their urologist’s office for problems unrelated to ED.

Although few patients discuss ED with their physicians, most of them would prefer their physician to take the initiative.

Patients reluctant to talk to their doctors about ED – WHY?

- 71% of patients believe ED would not be recognized as a medical problem.
- 68% of patients fear that discussing sexuality may embarrass their doctors.
- 44% of men attending urologists have ED but fail to mention it - most are too embarrassed.

Marwick C. JAMA 1999;281:2173–2174
Quality of Life: Most Men and Women Report Sex Is Important to Their Relationship

Survey of 1300 men and women.

Adding years to life

But also life to years
Is sexual activity beneficial?

  - frequency of intercourse a significant predictor of longevity in men
- Swedish Study (1981)
  - early cessation of sex associated with premature death
- Caerphilly Cohort Study (BMJ 1997)
  - 50% reduction in cardiac death with more than two orgasms per week

- No pattern of increased stroke risk was seen
Predictors of longevity difference: A 25 year follow up

- Past enjoyment of intercourse was a significant & moderately strong predictor of longevity for women. (RR 0.44)
- Calculated to equate to an extra 4.28 yrs of life
- Quantity is more important for men (Duke & Caerphilly study), but women prefer quality!
British Men

- Greater frequency of sexual intercourse was associated with lower age-adjusted death rates in a 10-year study of British men that examined and excluded several possible confounding variables.

- Men reporting an SI of less than monthly had twice the death rate than men reporting at least twice weekly SI.

- The benefits were most apparent for reduced coronary heart disease mortality.
Is Sex Important for a Happy Marriage?

% saying “very important”

- Faithfulness
- Respect
- SEX
- Children
- Interests
- Share chores
- Income
- Religion

A consecutive series of 2187 subjects (mean age 49.9 ± 11.6 years old) attending the Outpatient Clinic for sexual dysfunction was retrospectively studied.

When longitudinal data were analysed, a higher frequency of sexual intercourse significantly reduced the risk of MACE even after adjusting for known CV risk factors for this cohort.

Identifying among mild-to-moderate ED subjects those with lower frequency of sexual activity might provide an opportunity to modify their behaviour and to discover subthreshold comorbidities, possibly preventing forthcoming CV events.

A hug keeps tension away

Couples who held each other's hands for 10 minutes followed by a 20-second hug had healthier reactions to subsequent stress, such as public speaking. Compared with couples who rested quietly without touching, the huggers had:

- lower heart rate
- lower blood pressure
- smaller heart rate increases.

Mechanism oxytocin & cortisol

Similar effects have been found for non-sexual stroking, although this appears to only reduce blood pressure in women who are stroked, not men.

Low testosterone levels are reversible with sexual activity

- In addition to any effects of testosterone levels supporting PVI frequency, there is evidence of the causal arrow pointing in the other direction.

- Successful restoration of erectile function, through any of a variety of forms of nonhormonal treatment (psychological, surgical, vacuum device, yohimbine, prostaglandin E1) can lead to a return of testosterone levels to the typical range for the population.

Sexual activity can help to prevent common adult-onset cardiovascular and endocrine diseases, i.e., coronary heart disease (CHD) and type-2 diabetes

- Frequent vaginal intercourse, masturbation, and, to a lesser degree, other non-coital partnered sexual activity has been shown to be:
  
  related to a decreased hip and waist circumference in both men and women

- In women, both a larger waist size and a higher waist-hip = increased CHD risk.

- In men, a larger waist size is considered to be the most powerful anthropometric measure of CHD risk.

- In both sexes, an increased waist circumference is the strongest predictor of type-2 diabetes

  (Brody, 2004; Mamtani & Kulkarni, 2005; Rexrode et al. 1998; Smith et al., 2005).
Italian men

- Newly diagnosed, never treated hypertensive married men aged 40–49 yrs

- The frequency of sexual intercourse, was 25% lower than in a control group of normotensive men.

- ? Due to less sexual activity

- Blood pressure reactivity to acute stress is a risk factor for the development of hypertension and left ventricular hypertrophy, as well as for myocardial infarction or death in susceptible persons.

Blood pressure reactivity to stress is better for people who recently had penile–vaginal intercourse than for people who had other or no sexual activity

Stuart Brody  Biological Psychology 71 (2006) 214–222

Trier Social Stress Test

1. Baseline blood pressure measurement

2. Speech to unknown panel on your suitability for job in subject's field of interest

3. After 5 minutes, instructed to perform serial subtractions aloud for 5 minutes

4. New blood pressure measurement
Blood pressure reactivity to stress is better for people who recently had penile–vaginal intercourse than for people who had other or no sexual activity.

Stuart Brody  
*Biological Psychology* 71 (2006) 214–222

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**Fig. 1.** Means and standard error bars for stress responses of systolic and diastolic blood pressure as a function of combinations of intercourse and (above) masturbation or (below) “noncoital partner sex” (partnered sexual behavior in the absence of penile–vaginal intercourse).
Recalled frequency of penile-vaginal intercourse and
Resting heart rate, Resting diastolic blood pressure

Lower resting heart rate and lower diastolic blood pressure were both associated with greater frequency of penile-vaginal intercourse in cohabiting subjects

Penile-vaginal intercourse is associated with increased parasympathetic tone

Brody S, Veit R, Rau H. A preliminary report relating frequency of vaginal intercourse to heart rate variability, Valsalva ratio, blood pressure, and cohabitation status.

Blood pressure reactivity to stress is better for people who recently had penile–vaginal intercourse than for people who had other or no sexual activity.

Stuart Brody  
*Biological Psychology* 71 (2006) 214–222

<table>
<thead>
<tr>
<th></th>
<th>Systolic Blood Pressure</th>
<th>Diastolic Blood Pressure</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>114.1</td>
<td>72.2</td>
</tr>
<tr>
<td>Prepare</td>
<td>135.7</td>
<td>88.8</td>
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<tr>
<td>Stress</td>
<td>154.5</td>
<td>104.0</td>
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<tr>
<td>Recover</td>
<td>135.6</td>
<td>96.9</td>
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<tr>
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<th>Systolic Blood Pressure</th>
<th>Diastolic Blood Pressure</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>106.7</td>
<td>64.4</td>
</tr>
<tr>
<td>Prepare</td>
<td>118.2</td>
<td>74.1</td>
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<tr>
<td>Stress</td>
<td>132.0</td>
<td>87.0</td>
</tr>
<tr>
<td>Recover</td>
<td>114.6</td>
<td>75.5</td>
</tr>
</tbody>
</table>

$\Delta$ 22 mmHg  $\Delta$ 17 mmHg
Resting heart rate as a predictor of prognosis in patients with stable CAD

Post hoc analysis in 9580 patients from the TNT study, median follow-up was 4.9 years

JE. Ho et al. Presented at ACC 2009
Is sex safe??

Sex at home

- 14 couples
- Post coronary, home monitoring
- SI with their spouses
- Mean peak HR 117/min
- Mean peak BP 145/88
- Mean peak HR at work 120 beats/minute

Hellerstein HK et al Arch Intern Med 1970;125:987-999
Metabolic response to sexual activity

- 10 couples
- Healthy men aged 25-43 y (mean 33 y) and their wives
- Sexual activity, carried to orgasm (random order)
  - Coitus, man on top
  - Coitus, woman on top
  - Self-stimulation
  - Partner-stimulation
- Oxygen uptake (VO2), HR, and BP measured during sexual activities
- Treadmill exercise testing after sexual activities

Bohlen JG et al. *Arch Intern Med.* 1984;144:1745-1748
Metabolic response to sexual activity

- Partner-stimulation
- Self-stimulation
- Coitus Woman On Top
- Coitus Man On Top

Bohlen JG et al. *Arch Intern Med.* 1984;144:1745-1748
Cardiovascular effects of sex

- The typical maximum workload is approx 3.3-3.4 MET's for less than 30secs

Man on top usually involves most effort...

Ref Bohlen JG et al Arch Intern Med 1984;144:1745-1748
Hellerstein HK et al Arch Intern Med 1970;125:987-999
## MET equivalents

<table>
<thead>
<tr>
<th>Daily activity</th>
<th>MET score rating</th>
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<tbody>
<tr>
<td>Sexual intercourse with established partner</td>
<td></td>
</tr>
<tr>
<td>lower range (‘normal’)</td>
<td>2-3</td>
</tr>
<tr>
<td>upper range (vigorous activity)</td>
<td>5-6</td>
</tr>
<tr>
<td>Lifting and carrying objects (9-20 kg)</td>
<td>4-5</td>
</tr>
<tr>
<td>Walking one mile in 20 minutes on the level</td>
<td>3-4</td>
</tr>
<tr>
<td>Golf</td>
<td>4-5</td>
</tr>
<tr>
<td>Gardening (digging)</td>
<td>3-5</td>
</tr>
<tr>
<td>DIY, wallpapering, etc</td>
<td>4-5</td>
</tr>
<tr>
<td>Light housework, e.g. ironing, polishing</td>
<td>2-4</td>
</tr>
<tr>
<td>Heavy housework, e.g. making beds, scrubbing floors</td>
<td>3-6</td>
</tr>
</tbody>
</table>

Wilson et al, 1981
## Playing away from home…!

<table>
<thead>
<tr>
<th></th>
<th>Japan¹*</th>
<th>Germany² (Frankfurt)</th>
<th>Germany³ (Berlin)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of forensic autopsies</strong></td>
<td>5,559</td>
<td>26,901</td>
<td>1,722</td>
</tr>
<tr>
<td><strong>Sex. activity-related sudden death, n (%)</strong></td>
<td>34 (0.6%)</td>
<td>48 (0.18%) [mean age: 61]</td>
<td>30 (1.7%)</td>
</tr>
<tr>
<td><strong>Men, n (%)</strong></td>
<td>28 (82%)</td>
<td>45 (94%)</td>
<td>28 (93%)</td>
</tr>
<tr>
<td><strong>Extramarital relationship</strong></td>
<td>21 (75%)</td>
<td>36 (75%)</td>
<td>23 (77%)</td>
</tr>
</tbody>
</table>

*The majority performed sexual activity with an unfamiliar (often much younger) partner, in an unfamiliar setting, and after excessive eating and alcohol drinking*

‘Heart beats stay at normal rate
When one beds down with legal mate
But roosting in another’s nest
Flirts with cardiac arrest’

- The majority of coital deaths occur with an unfamiliar partner, in unfamiliar setting, after excessive alcohol and food intake
A retrospective analysis of 36 Cialis clinical trials assessing serious* CVTEAEs in ED patients

- n=14,534

* A serious CVTEAE was defined as myocardial infarction, cardiovascular death or cerebrovascular death.

* One patient who had a MI had been randomised to Cialis but had not taken any study drug. This patient had diabetes and hyperlipidemia and was a smoker. A serious CVTEAE was defined as myocardial infarction, cardiovascular death or cerebrovascular death.

* Adapted from Kloner R et al.
Phosphodiesterase type-5 inhibitor use in type 2 diabetes is associated with a reduction in all-cause mortality

Simon G Anderson, 1,2 David C Hutchings, 1 Mark Woodward, 2,3 Kazem Rahimi, 2 Martin K Rutter, 4,5 Mike Kirby, 6 Geoff Hackett, 7 Andrew W Trafford, 1 Adrian H Heald 8,9

Multivariate Regression model for risk of mortality (N=7860): (Anderson et al Heart 2016)
Of the 1,663 (21.2%) men prescribed a PDE5i (mean age 70.3 years), the proportion of deaths was significantly lower (14.3% versus 18.9%) than those never prescribed a PDE5i (mean age 72.7 years; n = 6197)

There was a 28% reduction in all-cause mortality (univariate logistic regression: 0.72 (0.61, 0.83); P<0.0001)
Phosphodiesterase Inhibitors and All-Cause Mortality in Type 2 Diabetes
Kaplan-Meier Survival Probability

Anderson et al Heart 2016
Phosphodiesterase type-5 inhibitor use in type 2 diabetes is associated with a reduction in all cause mortality

Effect of incident MI by PDE5i category

In the whole cohort, 432 men with no prior CVD history had an incident MI during the observation period. In this subgroup, the incidence of an acute myocardial infarction was less in those with a history of PDE5i use (64/1168, (5.2%); incidence rate ratio of 0.62 (0.49-0.80), p<0.0001) compared to those who were never prescribed PDE5i treatment (368/3757, (8.9%)). This difference remained after adjusting for age (8.5 vs. 5.2 per cent; p<0.0001).

Mortality in PDE5i users with an incident MI during follow-up was also lower (25% vs. 42.7%). In age-adjusted Weibull regression analyses those prescribed a PDE5i had approximately a 40 percent lower mortality risk (HR = 0.60 (0.54-0.69); P=0.001; Figure 4). This lower mortality risk remained after adjusting for age, smoking status, hypertension, use of a statin, metformin, aspirin and beta-blockers (HR = 0.61 (0.53-0.69), p=0.001).
The association between treatment for erectile dysfunction, compared with no treatment for erectile dysfunction, and outcomes after a first myocardial infarction in 43,145 men.

Number of men eligible for inclusion, and those excluded according to the study protocol
Adjusted HRs and 95% CIs for the association between treatment for erectile dysfunction, compared with no treatment for erectile dysfunction, and outcomes after a first myocardial infarction in 43,145 men.

Daniel P Andersson et al. Heart doi:10.1136/heartjnl-2016-310746
Association between treatment for erectile dysfunction and death or cardiovascular outcomes after myocardial infarction

Daniel P Andersson, Ylva Trolle Lagerros, Alessandra Grotta, Rino Bellocco, Mikael Lehtihet, Martin J Holzmann

*ScienceDirect*  
Andersson DP, *et al.* Heart 2017;0:1–7. doi:10.1136/heartjnl-2016-310746

**Figure 2** Adjusted HRs and 95% CI for the association between treatment for erectile dysfunction, compared with no treatment for erectile dysfunction, and outcomes after a first myocardial infarction in 43,145 men. Number of events are depicted above the point estimate for each outcome. MACE, major adverse cardiac event; CVD, cardiovascular disease.

**Conclusions** Treatment for ED after a first MI was associated with a reduced mortality and heart failure hospitalisation. Only men treated with phosphodiesterase-5 inhibitors had a reduced risk, which appeared to be dose-dependent.
CONSENSUS

Erectile dysfunction and coronary artery disease prediction: evidence-based guidance and consensus

G. Jackson,1 N. Boon,2 L. Eardley,3 M. Kirby,4 J. Dea,5 G. Hackatt,6 P. Montorsi,7 F. Montorsi,8 C. Viachopoulos,9 R. Kilner,10 L. Sharlip,11 M. Mimner12

SUMMARY
• A significant proportion of men with erectile dysfunction (ED) exhibit early signs of coronary artery disease (CAD), and this group may develop more severe CAD than men without ED (Level 1, Grade A).
• The time interval among the onset of ED symptoms and the occurrence of CAD symptoms and cardiovascular events is estimated at 2–3 years and 3–5 years respectively; this interval allows for risk factor reduction (Level 2, Grade B).
• ED is associated with increased all-cause mortality primarily due to increased cardiovascular mortality (Level 1, Grade A).
• All men with ED should undergo a thorough medical assessment, including testosteron, fasting lipids, fasting glucose and blood pressure measurement. Following assessment, patients should be stratified according to the risk of future cardiovascular events. Those at high risk of cardiovascular disease should be evaluated by stress testing with selective use of computed tomography (CT) or coronary angiography (Level 1, Grade A).
• Improvement in cardiovascular risk factors such as weight loss and increased physical activity has been reported to improve erectile function (Level 1, Grade A).
• In men with ED, hypertension, diabetes, and hyperlipidemia should be treated aggressively, bearing in mind the potential side effects (Level 1, Grade A).
• Management of ED is secondary to stabilising cardiovascular function, and controlling cardiovascular symptoms and exercise tolerance should be established prior to initiation of ED therapy (Level 1, Grade A).
• Clinical evidence supports the use of phosphodiesterase 5 (PDE5) inhibitors as first-line therapy in men with CAD and erectile ED and those with diabetes and ED (Level 1, Grade A).
• Total testosterone and selectively free testosterone levels should be measured in all men with ED in accordance with contemporary guidelines and particularly in those who fail to respond to PDE5 inhibitors or have a chronic illness associated with low testosterone (Level 1, Grade A).
• Testosterone replacement therapy may lead to symptomatic improvement (improved wellbeing) and enhance the effectiveness of PDE5 inhibitors (Level 1, Grade A).
• Review of cardiovascular status and response to ED therapy should be performed at regular intervals (Level 1, Grade A).

Introduction
Erectile dysfunction (ED) is defined as the persistent inability to achieve and maintain an erection to permit satisfactory sexual intercourse (1). The severity of ED is classified as mild to severe, according to the International Index of Erectile Function (2). Organic ED (i.e. that with an underlying physical aetiology) and coronary artery disease (CAD) are closely linked, as they are both consequences of endothelial dysfunction, leading to restrictions in blood flow (3,4). Similar risk factors have been identified for both conditions, including obesity, diabetes, smoking, hypertension and dyslipidemia (5–8).

The aim of this study is to explore the hypothesis that ED is a predictor for CAD and review the

Review Criteria
We performed an extensive search for articles concerning ED and CAD using multiple sources including PubMed, organizational websites and the expertise of the consensus members. All articles were assessed for levels of evidence and grade accordingly.

Message for the Clinician
ED and CAD frequently coexist. ED may be a marker (warning sign) for occult CAD with a window of opportunity for CAD risk reduction of 2–5 years. All men with ED should be asked about ED at treatment options are safe and effective for the majority. ED is associated with increased all-cause mortality primarily due to increased cardiovascular mortality. Recognizing this link between ED and CAD may improve lives and also save lives.


Disclosures
G. Jackson has conducted lectures for Lilly and Pfizer during the previous 12 months.
The Princeton III Consensus Recommendations for the Management of Erectile Dysfunction and Cardiovascular Disease

Ajay Nehra, MD; Graham Jackson, FRCP, FESC; Martin Miner, MD; Kevin L. Billups, MD; Arthur L. Burnett, MD, MBA; Jacques Buvat, MD; Culley C. Carson, MD; Glenn R. Cunningham, MD; Peter Ganz, MD; Irwin Goldstein, MD; Andre T. Guay, MD; Geoff Hackett, MD; Robert A. Kloner, MD, PhD; John Kostis, MD; Piero Montors, MD; Melinda Ramsey, PhD; Raymond Rosen, PhD; Richard Sadovsky, MD; Allen D. Seftel, MD; Ridwan Shabsigh, MD; Charalambos Vlachopoulos, MD; and Frederick C. W. Wu, MD

Take Home Message

Sexual activity

- Longer life
- Lower BP
- Lower heart attacks & less strokes
- Lower pulse rate
- Longer marriage & Less divorce

BACPR
Welcome to the World of the Cardiac Sexologist

Global CV Risk Perspective

Vascular Disease is an Interplay of Risk Factors
Meeting the Challenges of Current Practice

Key Messages:

- ED is a marker of underlying cardiac disease, but we are not asking!
- Sex is beneficial in terms of life expectancy
- Sex is safe in evaluated patients
- Guidelines exist and exercise tests may be helpful
- PDE5 inhibitor drugs are cardioprotective