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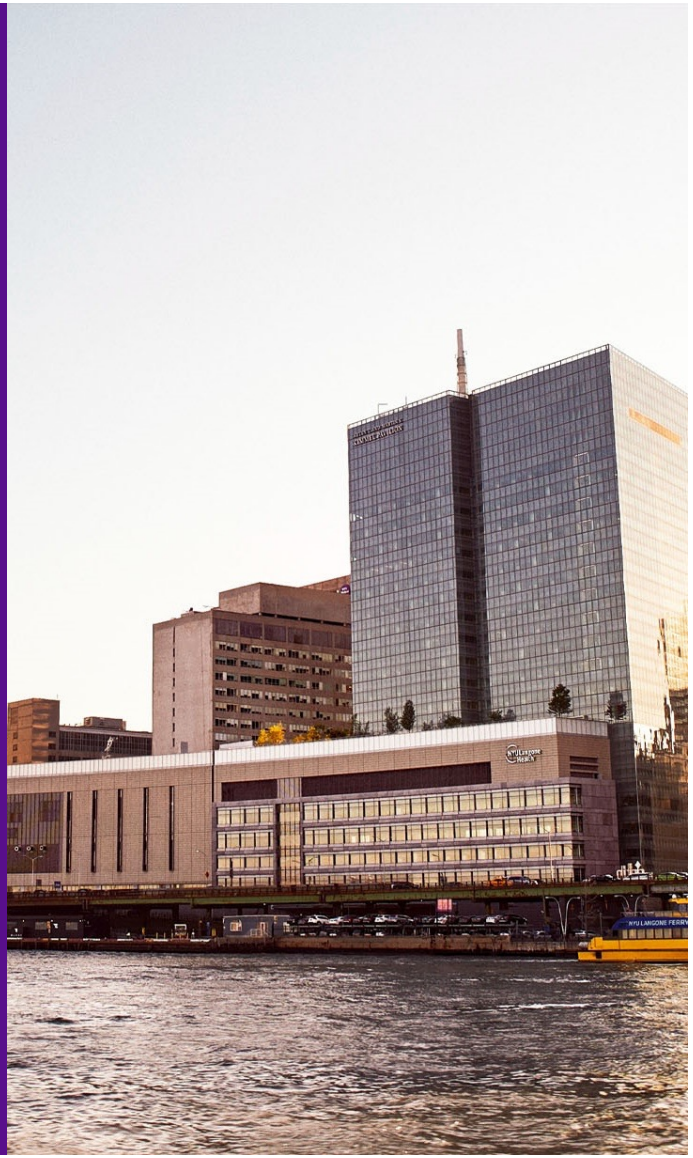
Lifestyle Intervention: Optimizing Nutrition, Exercise, and Sleep Health for Prostate Cancer

Natasha Gupta, MD MSc
Assistant Professor of Urology and Population Health

NYU Langone Health



Disclosures

- Consultant to Movember™

Overview

- Dietary recommendations for prostate cancer
  - Review of the evidence
  - Common questions
  - Other health benefits
- Physical activity
- Sleep health
- Resources for healthy lifestyle changes

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NUTRITION

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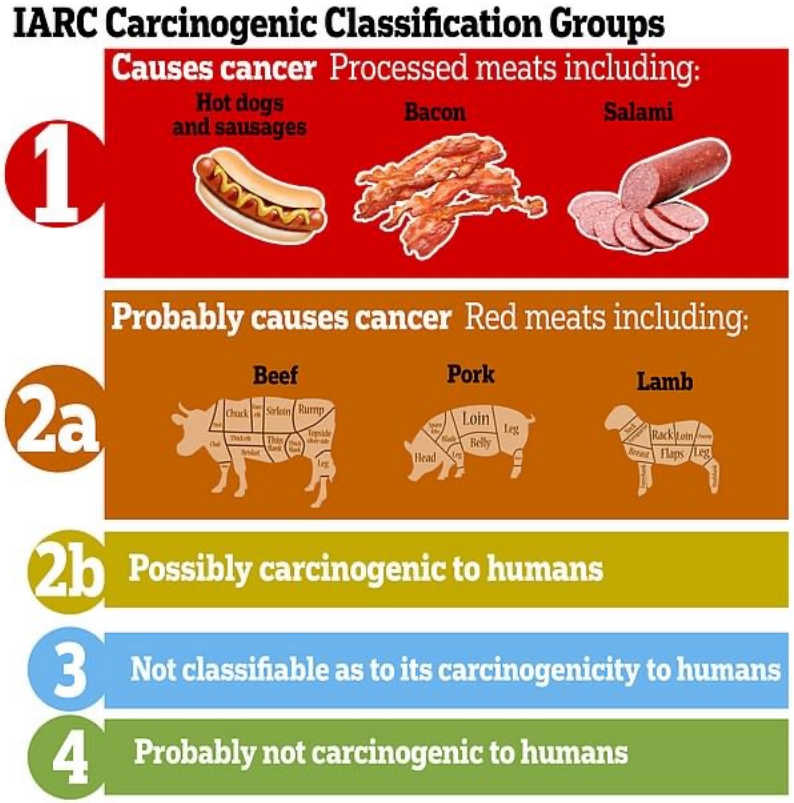
WHO Classifies Meat as a Carcinogen



Same category as arsenic and asbestos

Same category as DDT, lead and mustard gas

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Courtesy of Stacy Loeb, MD MSc PhD (hon)

Why Meat is Carcinogenic

- Heterocyclic amines formed during high-temperature cooking (carcinogenic)
- Nitrites/nitrates in processed meat (carcinogenic)
- Hormones
- Nutrient composition
  - Lower levels of anti-carcinogenic compounds (e.g., fiber, antioxidants) in animal- vs. plant-based foods

Why plant-based foods are beneficial

- Higher levels of anti-carcinogenic/antioxidant compounds
  - Cooked tomatoes (lycopene): 2 serving/wk increase → 20% reduction in progression among men w/clinically-localized prostate cancer
  - Cruciferous vegetables (isothiocyanates and indoles): ~1 serving=1/2 cup/day vs. 0 → ~60% reduced risk of recurrence

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Chan et al. *Cancer Causes Control*, 2006; Richman et al. *Int J Cancer*, 2012; Shen et al. *BMC Public Health,* 2024

National Comprehensive Cancer Network

Eat a diet of mostly nutrient-rich, plant-based foods.

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NCCN Guidelines for Patients®
Survivorship Care for Healthy Living, 2024

National Comprehensive Cancer Network

Foods to limit

- Red meat (beef, pork, lamb)
- Processed meats (ham, hot dogs, deli cuts, bacon, and sausage)

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NCCN Guidelines for Patients®
Survivorship Care for Healthy Living, 2024

Recommended diet for prostate cancer

- Vegetarian/vegan diet
- Mediterranean diet (plant-forward, limits red meat)

Vegetarian/Vegan Diets

Systematic review of the impact of a plant-based diet on prostate cancer incidence and outcomes

Natasha Gupta[1,2], Hiten D. Patel[3], Jacob Taylor[1], James F. Borin[1], Kenneth Jacobsohn[4], Stacey A. Kenfield[5], Scott E. Eggener[6], Carrie Price[7], Meena Davuluri[8], Nataliya Byrne[1,2], Trinity J. Bivalacqua[9] and Stacy Loeb[1,2]

- **Systematic review of literature through 2/28/2022**

- **Vegetarian/vegan diet →**
  - **At-risk men: Risk of developing prostate cancer**
  - **Men with prostate cancer: Oncologic, general health, QOL outcomes**

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Prostate Cancer and Prostatic Diseases, 2022

Risk of Developing Prostate Cancer Over Time

Key cohorts: EPIC-OXFORD/Oxford Vegetarian, Seventh-Day Adventist, UK Biobank

Vegetarians/Vegans

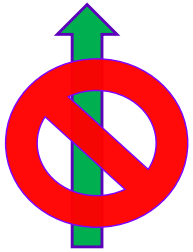
Reduced risk (~30-35%)

Meat-eaters

Increased risk (~54%)

OR

≈overall risk, risk of advanced disease, prostate cancer mortality



NO study found increased risk of prostate cancer with a plant-based diet

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Key et al. *Am J of Clin Nutr,* 2009, Key et al. *Am J Clin Nutr.* 2009, Key et al. *Am J Clin Nutr.* 2014, Key et al, *Br J Can,* 2009, Watling et al. *BMC Med,* 2022, Fraser. *Am J Clin Nutr.* 1999, Mills et al. *Cancer,* 1989, Fraser et al. *Canc Causes Contr,* 2020, Tantamango-Bartley et al. *Am J Clin Nutr.* 2016, Key et al. *Pub Health Nutr.* 1998, Key et al. *Am J Clin Nutr.* 1999, Gilsing et al *Eur J Clin Nutr.* 2016, Chang-Claude et al. *Epi,* 1992

Dietary Intervention for Patients with Prostate Cancer

Active Surveillance (low-risk disease): *Prostate Cancer Lifestyle Trial*

Group 1: Intensive Lifestyle Program
Low-fat vegan diet with supplements, moderate aerobic exercise, and stress management

vs.

Group 2: Control Group (usual care)

Oncologic outcomes
- **↓Progression to treatment, 2 yrs**
- **↓PSA at 1 yr**

General health/nutrition outcomes
- **↓Cholesterol**
- **↓Saturated fat intake**
- **↑Fiber intake**
- **↑Weight loss**
- **Nutritional adequacy (except vitamin D3)**
- **95% adherence**

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Ornish et al. *Proc Natl Acad Sci,* 2008, Ornish et al. *Lanc Oncol*, 2008, Ornish et al. *J Urol,* 2005, Dewell et al. *Nutr Canc,* 2007, Frattaroli et al. *Urology,* 2008, Dewell et al. *J Am Diet Assoc,* 2008, Dunn-Emke et al. *J Am Diet Assoc,* 2005, Kronenwetter et al. *Cancer Nurs.* 2005, Daubenmier et al. *Urology,* 2006,

Dietary Intervention for Patients with Prostate Cancer

PSA increase after cancer treatment: *3 trials (1 RCT, 2 nonrandomized)*

Lifestyle programs with **plant-based diet**

Oncologic outcomes

- **↑Median PSA doubling time at 6 months post-intervention (11.9 to 112.3 months)**
- **↓Mean slope of PSA change**
- **↓Rate of PSA rise**

Nutrition outcomes

- **↑Vegetable protein & fiber intake**
- **↑Lycopene intake**
- **↓Saturated fat intake**

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Carmody et al. *Urology,* 2008, Carmody et al. *J Acad Nutr Diet,* 2012, Saxe et al. *J Urol,* 2001, Saxe et al. *Integr Cancer Ther,* 2006, Saxe et al. *Integr Cancer Ther,* 2008, Nguyen et al. *Integr Cancer Ther,* 2006

Summary of the evidence (32 studies)

- Vegetarians/vegans: ↓ or ≈ prostate cancer risk vs. non-vegetarians
- Patients on active surveillance: ↓ cancer progression + improved overall and cardiovascular health on a plant-based diet
- Patients with recurrence after treatment: slower cancer recurrence on a plant-based diet

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Plant-based diet associated with better quality of life in prostate cancer survivors

Stacy Loeb MD, MSc, PhD (Hon)[1] | Qi Hua MSc[2] | Scott R. Bauer MD, ScM[3,4,5]
Stacey A. Kenfield ScM ScD[3,4] | Alicia K. Morgans MD, MPH[6] |
June M. Chan ScD[3,4] | Erin L. Van Blarigan ScM, ScD[3,4] | Alaina H. Shreves MS[2]
Lorelei A. Mucci MPH, ScD[2,7]

- 3,505 patients with non-metastatic prostate cancer in Health Professionals Follow-up Study

- Greater adherence to a plant-based diet was associated with better quality of life in multiple domains (sexual, urinary, bowel and vitality)

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Cancer, 2024

Dairy and prostate cancer

Higher dairy consumption vs. minimal/none

- ↑ risk of developing prostate cancer (~60%)
- ↑ risk of prostate cancer recurrence/progression (2-3x)
- ↑ risk of lethal prostate cancer (2-6x risk)

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Orlich et al. *Am J Clin Nutr*, 2022; Downer et al. *Int J Cancer*, 2017; Tat et al. *Prostate,* 2018
Pettersson et al. *Cancer Epidemiol Biomarkers Prev,* 2012

Mediterranean Diet
(plant-forward, limits red meat)

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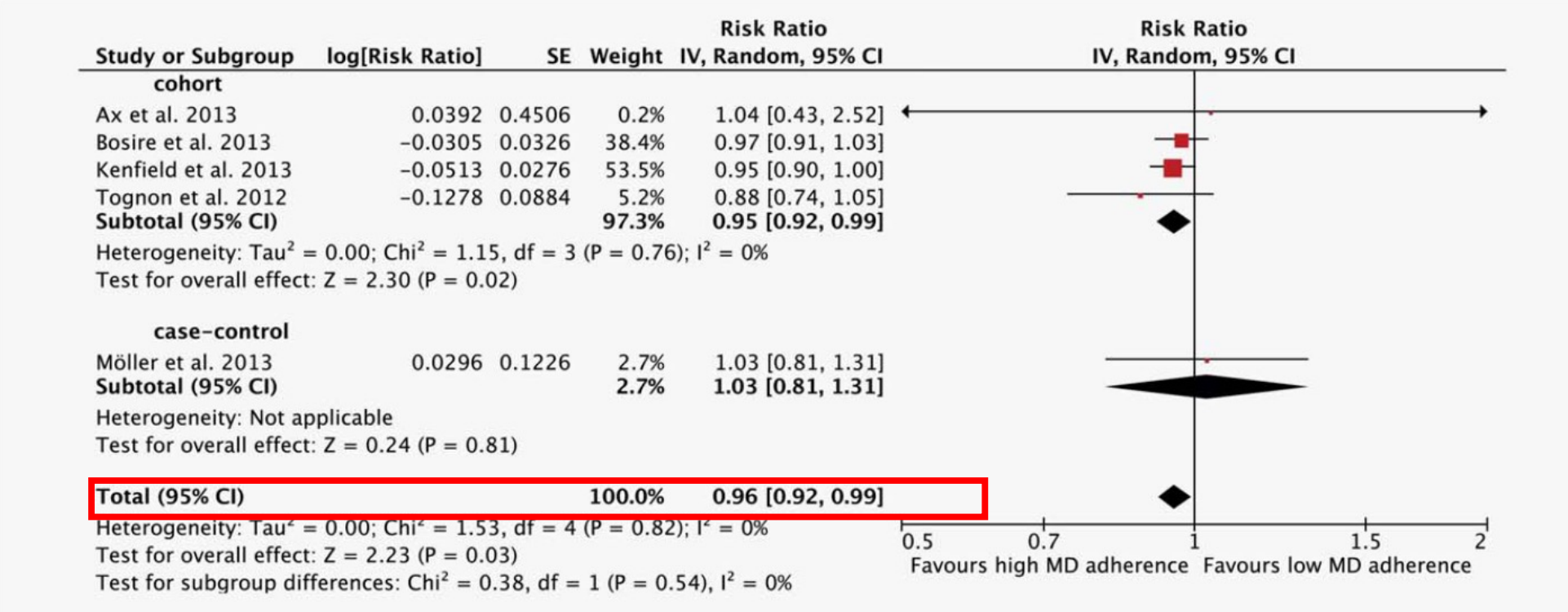
PCa incidence



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Schwingshacki and Hoffman *IJC,* 2014

Adherence to the Mediterranean Diet and Grade Group Progression in Localized Prostate Cancer: An Active Surveillance Cohort

Justin R. Gregg, MD [1]; Xiaotao Zhang, PhD [2]; Brian F. Chapin, MD[1]; John F. Ward, MD; Jeri Kim, MD[3]; John W. Davis, MD[1]; and Carrie R. Daniel, PhD[2]

- Single-center prospective cohort study (n=410)
- 87.3% GG1 disease
- Diet assessed at baseline (score), median f/u 36 months
- Overall trend lower risk of progression for men w/ high adherence to Med diet (HR 0.88, 95%CI: 0.77-1.01)
- Lower risk of progression among non-White men (HR 0.64, 95% CI: 0.45-0.92) and men without diabetes (HR 0.82, 95% CI: 0.71-0.96)

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Cancer, 2021

Mediterranean Diet and Prostate Cancer Risk and Mortality in the Health Professionals Follow-up Study

EUROPEAN UROLOGY

Stacey A. Kenfield[1,2,3,*], **Natalie DuPre**[1], **Erin L. Richman**[4], **Meir J. Stampfer**[1,2,5], **June M. Chan**[3,4,†], and **Edward L. Giovannucci**[1,2,5,†]

Health Professionals Follow-Up Study (n=47,867 men, 1986-2010):

- Median follow-up 23.3 years
- 22% lower overall mortality among men w/ nonmetastatic PCa with higher adherence to Mediterranean diet (HR 0.78, 95% CI: 0.67-0.90)

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Kenfield et al. *Eur Urol,* 2014

Mediterranean diet after prostate cancer diagnosis and urinary and sexual functioning: The health professionals follow-up study

Scott R. Bauer[1] | Erin L. Van Blarigan[2,3] | Meir J. Stampfer[4] | June M. Chan[2,3] | Stacey A. Kenfield[3,5]

- 2,960 patients with non-metastatic prostate cancer in Health Professionals Follow-up Study
- Higher adherence to a Mediterranean diet was not significantly associated with better post-diagnosis sexual or urinary function

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The Prostate, 2018

Eating more plant-based foods (omnivorous/mixed diets)

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Does it have to be all or nothing?

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More plant-based foods → Lower PSA

- N=1,399 men in National Health and Nutrition Examination Survey
- Higher consumption of healthy plant-based diet associated with lower probability of elevated PSA

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Mouzannar et al. *Urology,* 2021

Plant-Based Diets and Disease Progression in Men With Prostate Cancer

Vivian N. Liu, MAS; Erin L. Van Blarigan, ScD; Li Zhang, PhD; Rebecca E. Graff, ScD; Stacy Loeb, MD; Crystal S. Langlais, PhD; Janet E. Cowan, MA; Peter R. Carroll, MD, MPH; June M. Chan, ScD; Stacey A. Kenfield, ScD

- Analysis of the Cancer of the Prostate Strategic Urologic Research Endeavor (CaPSURE) cohort
- N=2,062 men with nonmetastatic PCa
- Median f/u: 6.5 years after food frequency questionnaire
- 47% lower risk of progression (HR 0.53, 95% CI: 0.37-0.74) for highest vs. lowest quintile of intake of plant-based foods

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JAMA Network Open 2024

More plant-based foods → Lower risk of fatal prostate cancer

Health Professionals Follow-Up Study (n=47,239 men, 1986-2014):

- Greater overall plant-based food consumption was associated with a significantly lower risk of fatal prostate cancer

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Loeb et al., *Am J Clin Nutr* 2022

Cardiovascular Health

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Cardiovascular disease

- **Most common cause of death** for men with clinically-localized PCa
- **Leading competing cause of death** for men with metastatic PCa
- Associated with **ED**

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Newschaffer et al. *JNCI,* 2000
Van Hemelrijck et al. *BJUI*, 2016
Elmehrath et al. *JAMA Netw Open*, 2021
Cao et al. *Recent Results Cancer Res* 2016

2021 Dietary Guidance to Improve Cardiovascular Health: A Scientific Statement From the American Heart Association

American Heart Association.

1. Adjust energy intake and expenditure to achieve and maintain a healthy body weight
2. Eat plenty of fruits and vegetables, choose a wide variety
3. Choose foods made mostly with whole grains rather than refined grains
4. Choose healthy sources of protein
a. mostly protein from plants (legumes and nuts)
b. fish and seafood
c. low-fat or fat-free dairy products instead of full-fat dairy products
d. if meat or poultry are desired, choose lean cuts and avoid processed forms

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Lichtenstein et al. *Circulation,* 2021

Plant-based diets and cardiovascular health

Intensive Lifestyle Changes for Reversal of Coronary Heart Disease

JAMA
The Journal of the American Medical Association

Dean Ornish, MD; Larry W. Scherwitz, PhD; James H. Billings, PhD, MPH; K. Lance Gould, MD; Terri A. Merritt, MS; Stephen Sparler, MA; William T. Armstrong, MD; Thomas A. Ports, MD; Richard L. Kirkeeide, PhD; Charissa Hogeboom, PhD; Richard J. Brand, PhD

Quality of Plant-Based Diet and Risk of Total, Ischemic, and Hemorrhagic Stroke

Neurology

Megu Y. Baden, MD, PhD, Zhilei Shan, MD, PhD, Fenglei Wang, MSc, Yanping Li, PhD, JoAnn E. Manson, MD, DrPH, Eric B. Rimm, ScD, Walter C. Willett, MD, DrPH, Frank B. Hu, MD, PhD, and Kathryn M. Rexrode, MD, MPH

A defined, plant-based diet utilized in an outpatient cardiovascular clinic effectively treats hypercholesterolemia and hypertension and reduces medications

CLINICAL CARDIOLOGY

Rami S. Najjar[1] | Carolyn E. Moore[1] | Baxter D. Montgomery[2,3]

Plant-Based Diets Are Associated With a Lower Risk of Incident Cardiovascular Disease, Cardiovascular Disease Mortality, and All-Cause Mortality in a General Population of Middle-Aged Adults

Hyunju Kim, PhD; Laura E. Caulfield, PhD; Vanessa Garcia-Larsen, PhD; Lyn M. Steffen, PhD; Josef Coresh, MD, PhD; Casey M. Rebholz, PhD

Journal of the American Heart Association

Reduced risk:

- Stroke
- CVD
- Hypertension
- Hyperlipidemia
- Mortality

Sexual Health

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Sexual dysfunction is common after prostate cancer (PCa)

- Diagnostic biopsy and all PCa treatments can cause sexual side effects
- Up to 90% of patients experience short- or long-term sexual side effects
  - E.g., erectile dysfunction, penile deformity, orgasmic/ejaculatory dysfunction
- Associated with treatment regret, reduced quality of life, anxiety/depression, reduced relationship satisfaction/social support
- Frequently-reported #1 unmet need among PCa survivors

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Nelson et al. *J Sex Med* 2010 and 2011; Schover et al. *Cancer* 2002; Tal et al. *J Sex Med* 2009; Sanda et al. *NEJM* 2008; Charlick et al. *Transl Androl Urol 2025*

“Canary in the Coal Mine”

ED may precede a cardiovascular event by up to 5y
Most common etiology of ED is vasculogenic
Important opportunity for lifestyle intervention

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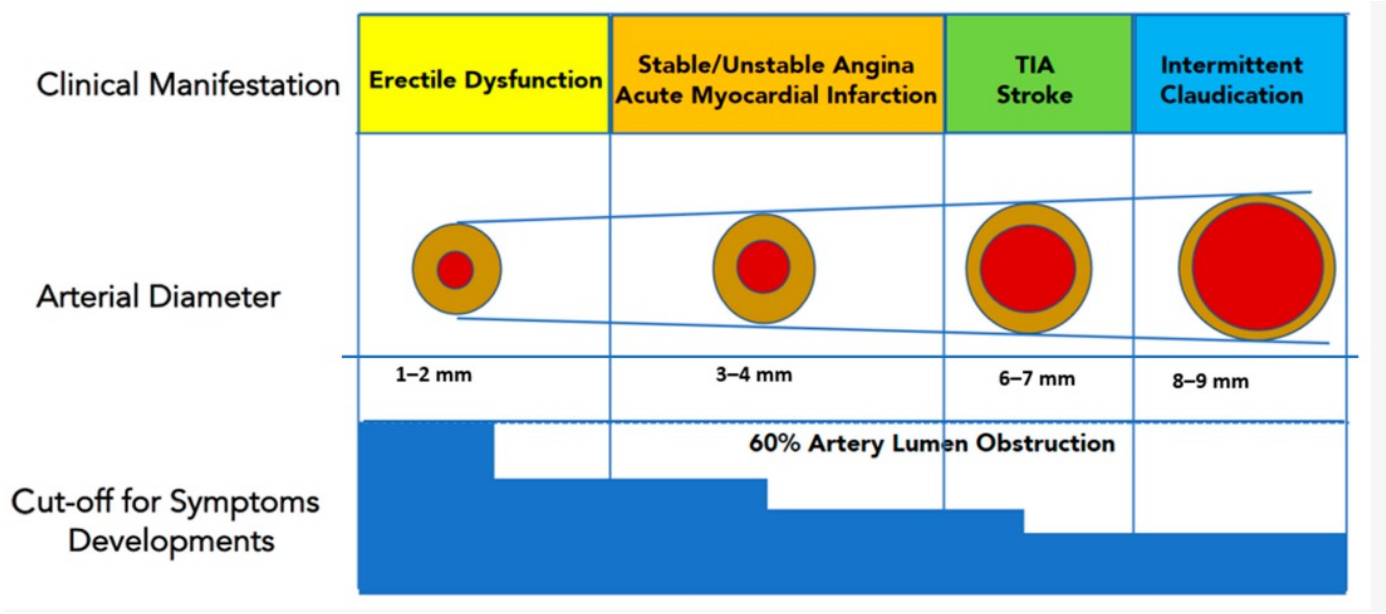
Courtesy of Stacy Loeb, MD MSc PhD (hon)

Small Penile Arterial Diameter → Early Onset of Symptoms



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Sanfilorgi et al. *Biomedicines,* 2021
Courtesy of Stacy Loeb, MD MSc PhD (hon)

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Cancer, 2024

Healthy Plant-Based Diet → Less Erectile Dysfunction

Consumption of a Healthy Plant-based Diet is Associated With a Decreased Risk of Erectile Dysfunction: A Cross-sectional Study of the National Health and Nutrition Examination Survey

Chase Carto, Manjari Pagalavan, Sirpi Nackeeran, Ruben Blachman-Braun, Eliyahu Kresch, Manish Kuchakulla, and Ranjith Ramasamy

Plant-based diet index and erectile dysfunction in the Health Professionals Follow-Up Study

Heiko Yang[1], Benjamin N. Breyer[1], Eric B. Rimm[2,3], Edward Giovannucci[2,3], Stacy Loeb[4], Stacey A. Kenfield[1,5] and Scott R. Bauer[1,6,7]

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Urology, 2022; *BJU Int*, 2022

Mediterranean diet after prostate cancer diagnosis and urinary and sexual functioning: The health professionals follow-up study

Scott R. Bauer[1] | Erin L. Van Blarigan[2,3] | Meir J. Stampfer[4] | June M. Chan[2,3] | Stacey A. Kenfield[3,5]

- 2,960 patients with non-metastatic prostate cancer in Health Professionals Follow-up Study
- Higher adherence to a Mediterranean diet was not significantly associated with better post-diagnosis sexual or urinary function

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The Prostate, 2018

Ways that Eating More Plant-Based Foods Can Support Erectile Function

- Improve blood flow
  - Increase nitric oxide, less atherosclerosis
- Improve nerve function
- Less inflammation (antioxidant properties)
- Weight loss

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Courtesy of Stacy Loeb, MD MSc PhD (hon)

Obesity

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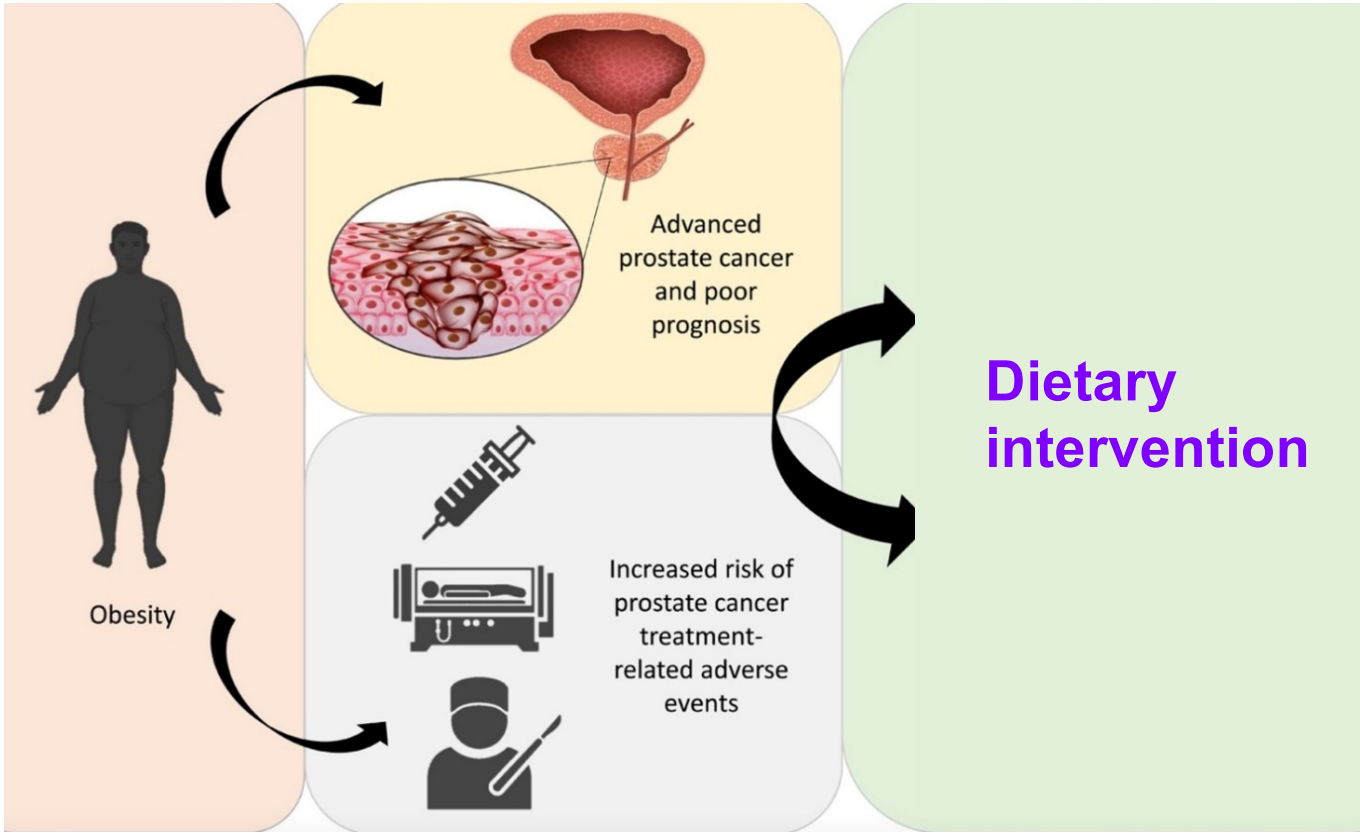
Obesity

Diet →



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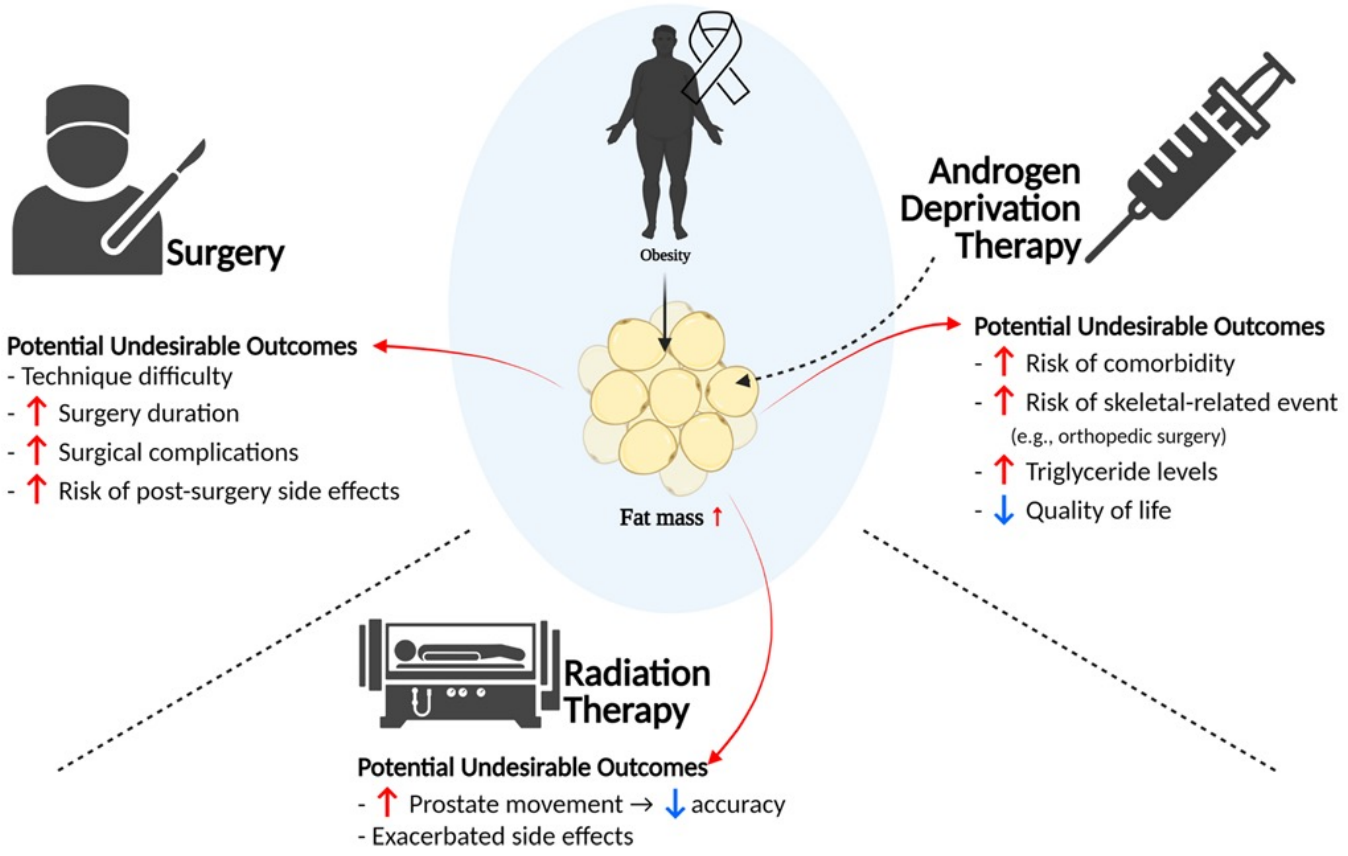
Adapted from Wilson et al., *Crit Rev Oncol Hematol* 2022

Obesity



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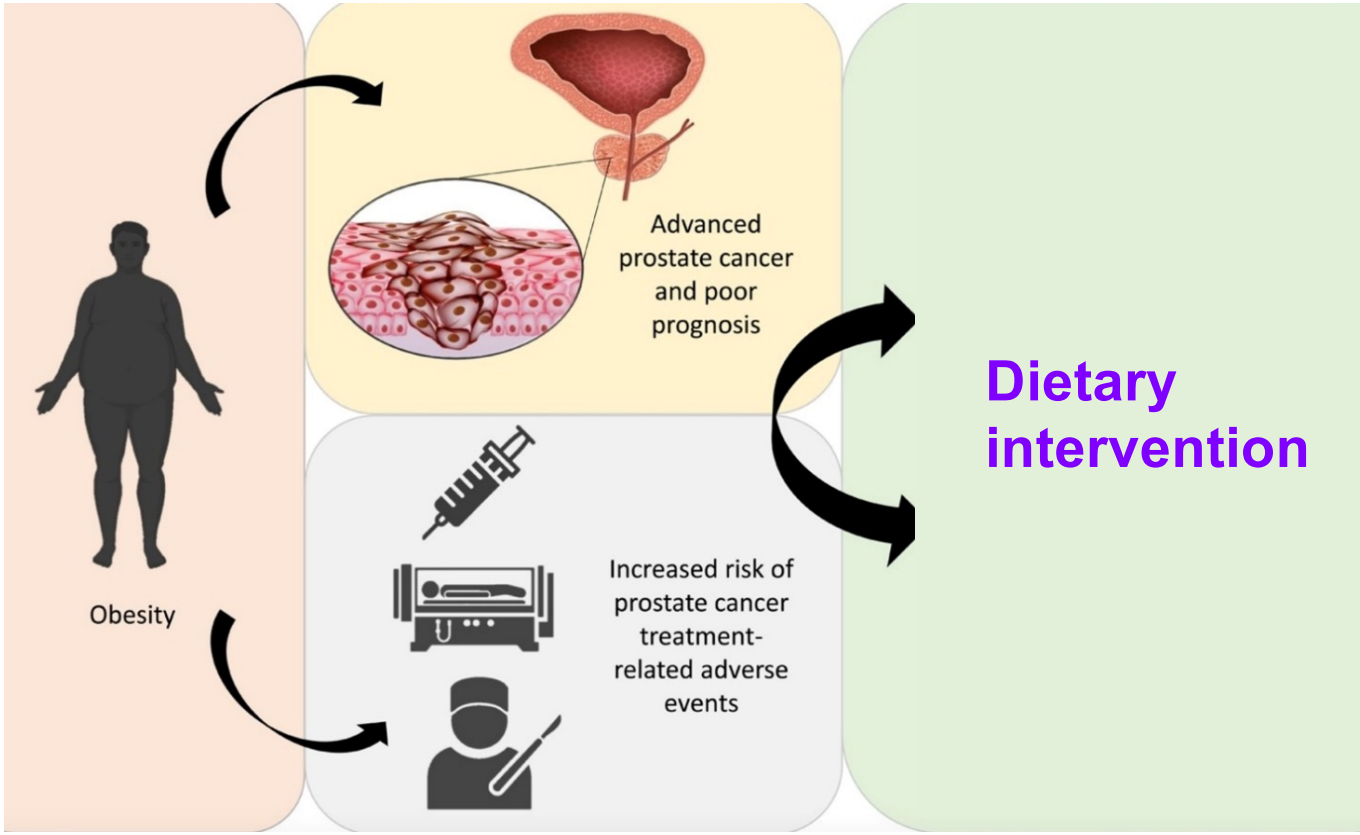
Wilson et al., *Crit Rev Oncol Hematol* 2022

Obesity

Diet →



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Adapted from Wilson et al., *Crit Rev Oncol Hematol* 2022

Plant-based diets and obesity

A Mediterranean Diet and Low-Fat Vegan Diet to Improve Body Weight and Cardiometabolic Risk Factors: A Randomized, Cross-over Trial

Neal D. Barnard[a,b], Jihad Alwarith[a], Emilie Rembert[a], Liz Brandon[a], Minh Nguyen[a], Andrea Goergen[a], Taylor Horne[a], Gabriel F. do Nascimento[a], Kundanika Lakkadi[a], Andrea Tura[c], Richard Holubkov[d], and Hana Kahleova[a]

- 62 overweight/obese adults assigned to **Mediterranean or vegan diet** for 16 weeks → 1 month break → switch to the other diet

- **Vegan diet**: significantly more weight loss compared to Mediterranean diet (net effect: -6 kg, $p<0.001$) and significant decrease in cholesterol

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J Am Nutr Assoc, 2022

Common Questions

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How to get adequate protein?

*(protein per 1 cup, cooked)

*Tofu and nuts especially beneficial for prostate health

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@ MeatlessMonday
# MeatlessMonday

How to get calcium while reducing dairy?

- Dairy milk has 30% of the recommended daily amount of calcium per cup
- Many plant-based milks are fortified with calcium at levels comparable to dairy

Examples: Almond, soy, oat, macadamia nut, and rice milk

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Borin et al. *J Ren Nutr*, 2022

Other plant-based sources of calcium

*Tofu/soybeans, tomatoes, broccoli (cruciferous vegetables) are especially beneficial for prostate health

https://www.elevatenutrition.com/plant-based-calcium-source-2/

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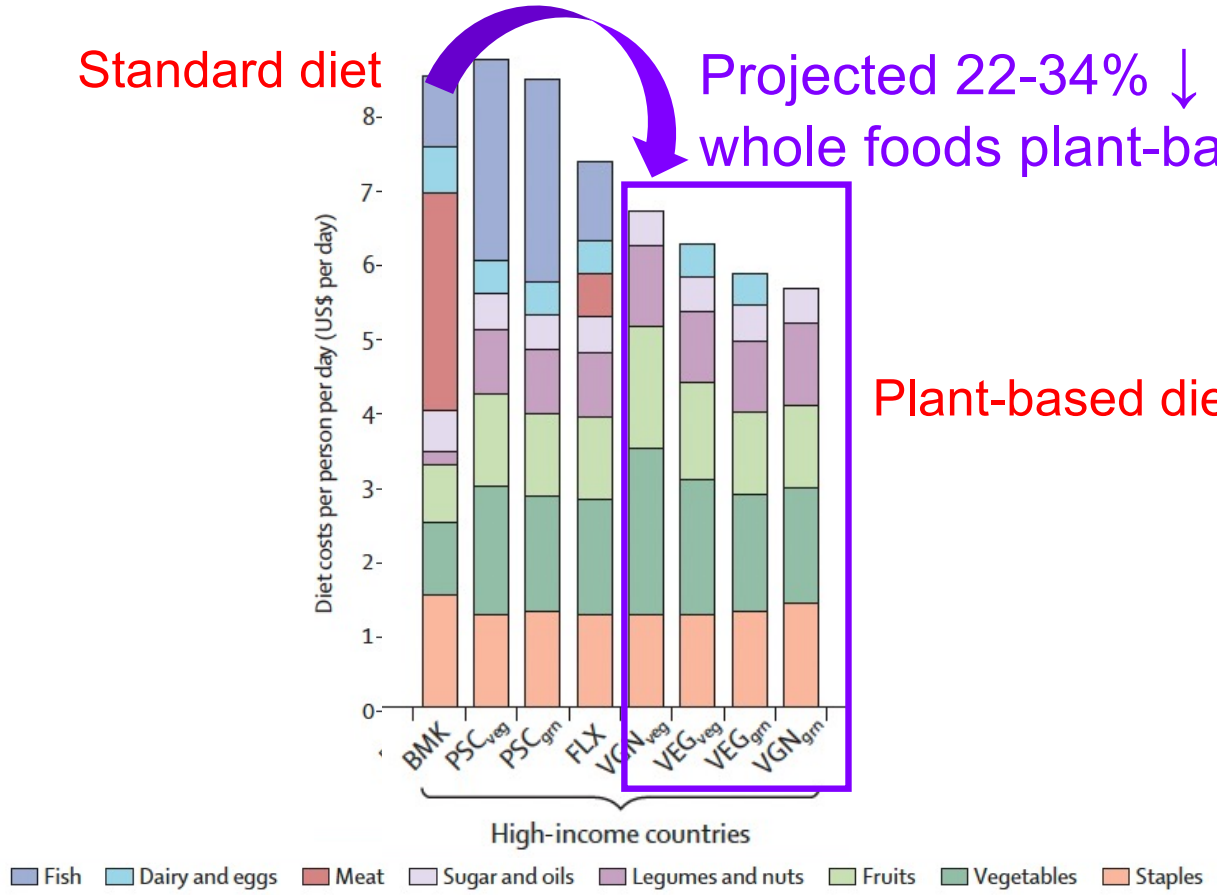
Is it more expensive to eat plant-based?

Standard diet

Projected 22-34% ↓ cost with whole foods plant-based diet



Plant-based diets

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Adapted from Springmann et al. *Lancet Planet Health*, 2021

EXERCISE

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Physical activity

American Cancer Society PCa Survivorship Care Guidelines

- Maintain a healthy weight
- Eat a diet high in fruits/vegetables/whole grains
- **Engage in ≥ 150 mins/week of physical activity**
- Avoid smoking

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National Comprehensive Cancer Network

Guide 2 Benefits of physical activity among cancer survivors	
Improved cardiovascular fitness	Cardiovascular fitness is how well your body takes in and transports oxygen to tissue.
Greater muscle strength	Muscle strength is how well you can move or lift objects.
Better balance	Balance is how well you can control your body's position.
Healthier body composition	Body composition is the amount of fat, muscle, bone, and water in your body.
Less fatigue	Fatigue is being tired despite getting enough sleep.
Better emotional well-being	Emotional well-being is a balance between positive and negative feelings and being happy and satisfied with life.
Improved quality of life	Quality of life is your belief that you have a good life.
Lower risk of cardiovascular events	Cardiovascular events are medical conditions that can damage the heart.

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NCCN Guidelines for Patients®
Survivorship Care for Healthy Living, 2024

National Comprehensive Cancer Network: General Goals of Physical Activity

- ✓ At least 150 minutes of moderate-intensity activity is recommended with an ultimate goal of 300 minutes. That's at least 2½ to 5 hours a week.
- ✓ If you choose vigorous-intensity activity, 75 minutes a week is recommended.
- ✓ You could also do a mix of moderate- and vigorous-intensity activity spread out over the course of the week.
- ✓ All exercise should start with a light-intensity aerobic warm-up and stretching.

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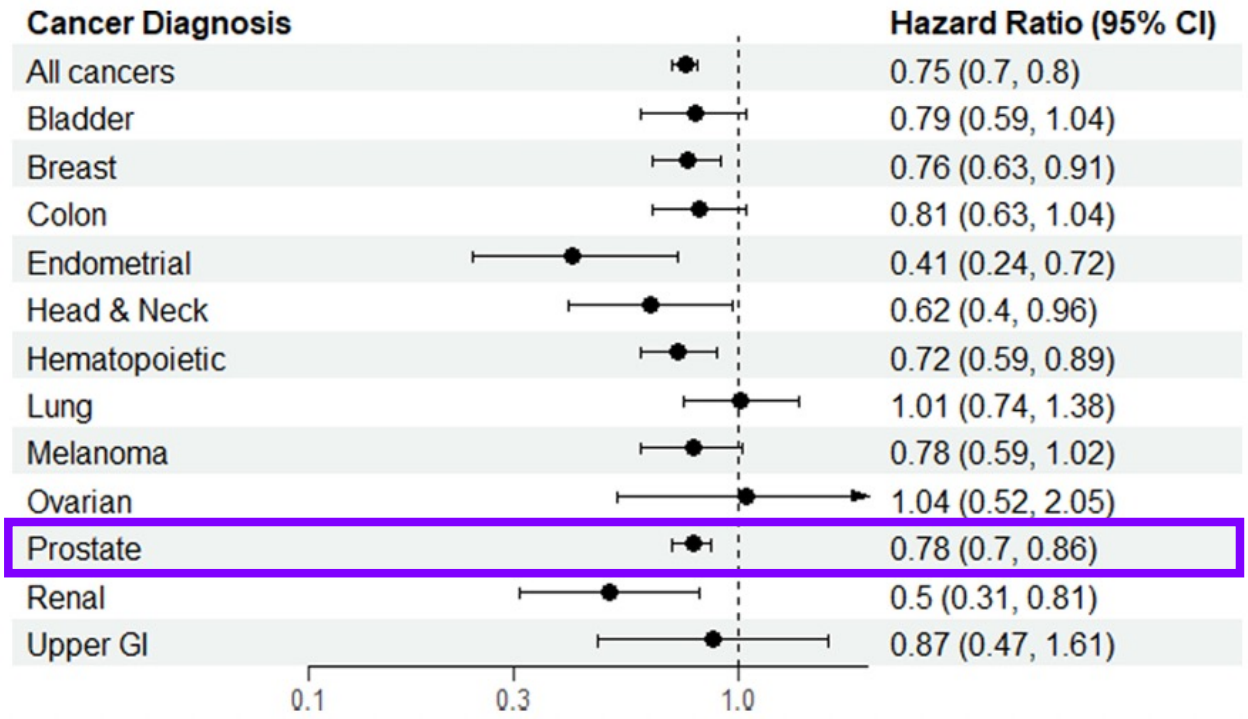
NCCN Guidelines for Patients®
Survivorship Care for Healthy Living, 2024

Pan-Cancer Analysis of Post-Diagnosis Exercise and Mortality

Jessica A. Lavery, MS[1], Paul C. Boutros, PhD[3,4,5,6], Jessica M. Scott, PhD[1,2], Tuomas Tammela, MD, PhD[7], Chaya S. Moskowitz, PhD[1,2], Lee W. Jones, PhD[1,2]

- N= 11, 480 patients from PLCO screening trial, median f/u: 16 years from dx



All cause mortality with adherence to exercise guidelines

JCO 2023

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Exercise and Psychosexual Education to Improve Sexual Function in Men With Prostate Cancer

A Randomized Clinical Trial

Daniel A. Galvão, PhD; Robert U. Newton, PhD, DSc; Dennis R. Taaffe, PhD, DSc, MPH; Prue Cormie, PhD; Oliver Schumacher, PhD; Christian J. Nelson, PhD; Robert A. Gardiner, MBBS, MD; Nigel Spry, MBBS, PhD; David Joseph, MBBS; Colin Tang, MBBS; Hao Luo, PhD; Raphael Chee, MBBS; Dickon Hayne, MBBS, MD; Suzanne K. Chambers, PhD

- N= 112 patients (sexual concern)
  - 6 months aerobic/resistance exercise
  - 6 months exercise + education
  - Usual care

- **Significant improvement in erectile function with exercise** (3.5 difference in IIEF score, p=0.04) vs. usual care

- No additional improvement with psychosexual education

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JAMA Network Open 2025

SLEEP HEALTH

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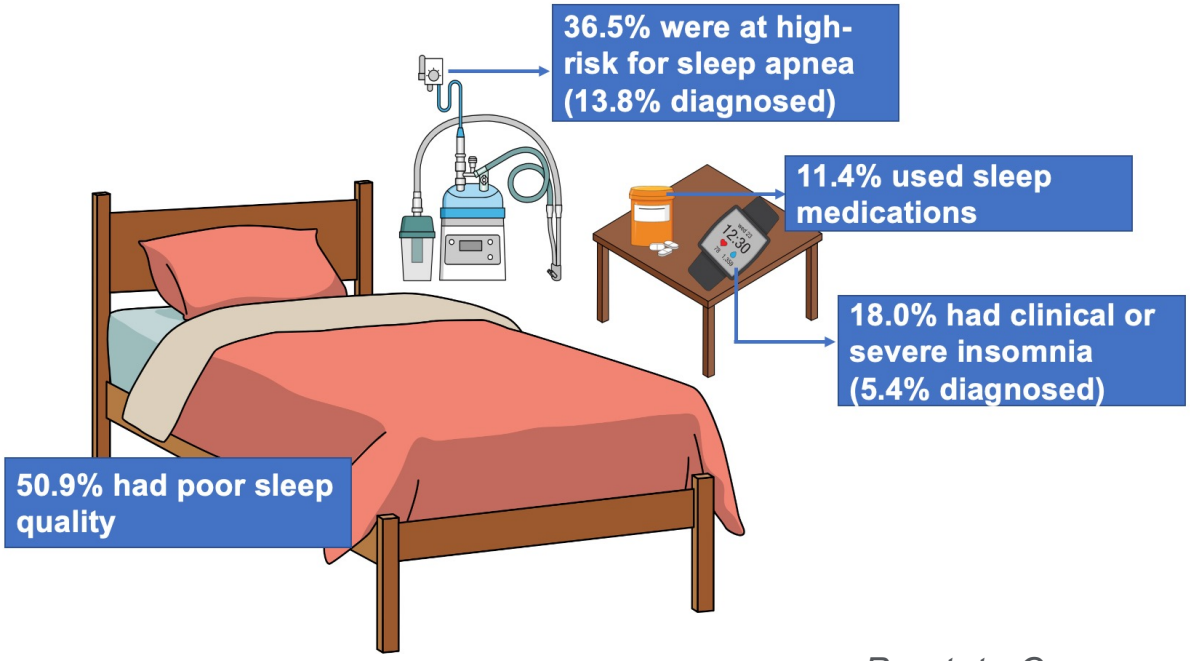
Sleep disturbances are underappreciated in prostate cancer survivorship

Fred Gong[1✉], Stacy Loeb[2,3], Katherine Siu[2,3], Akya Myrie[4], Stephanie Orstad[2,3], Stacey A. Kenfield[5], Alicia Morgans[6], Sameer Thakker[2], Rebecca Robbins[7], Patricia Carter[8], Girardin Jean-Louis[9], Tatiana Sanchez Nolasco[2,3], Nataliya Byrne[2,3] and Natasha Gupta[2,3]

- Cross-sectional survey of N=167 survivors across U.S.
- Validated sleep health questionnaires



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Prostate Cancer and Prostatic Diseases 2022

Poor sleep quality and PCa aggressiveness

Analysis of the REDUCE (Reduction by Dutasteride of PCa Events) chemoprevention trial

- N=5,614 men who completed sleep quality questionnaire
- Men who had trouble falling asleep at night sometimes vs. never had **increased odds of high-grade PCa** (OR 1.51, 95% CI: 1.08-2.09)

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Wiggins et al., *Prostate* 2020

Sleep apnea → Increased risk of ED

- N=50 men with sleep apnea
  - no history of ED
- Mean age: 48 ± 10 years
- Mean duration, sleep problems:

  2.5 ± 1.5 years

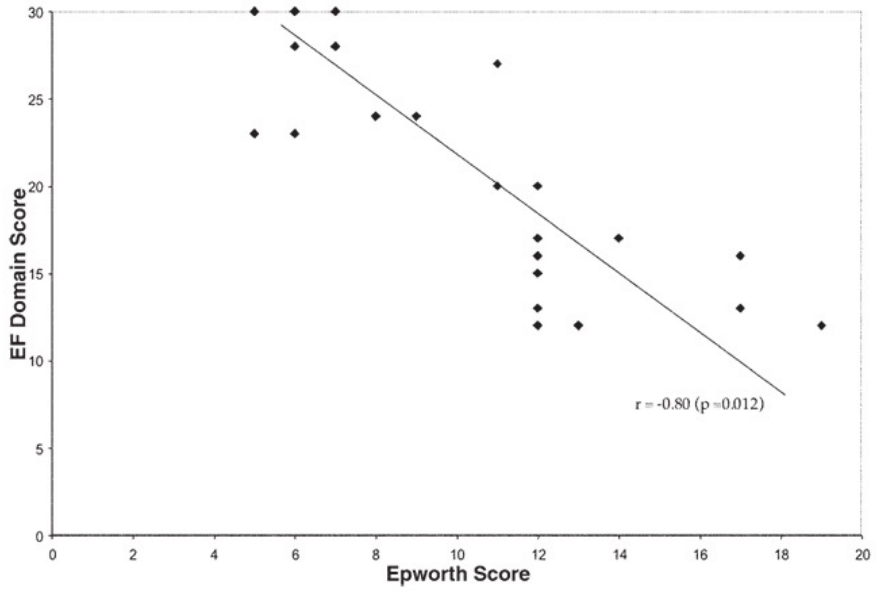

FIGURE 1. *Graphic representation of correlation between Epworth Sleepiness score and IIEF erectile function domain score.*

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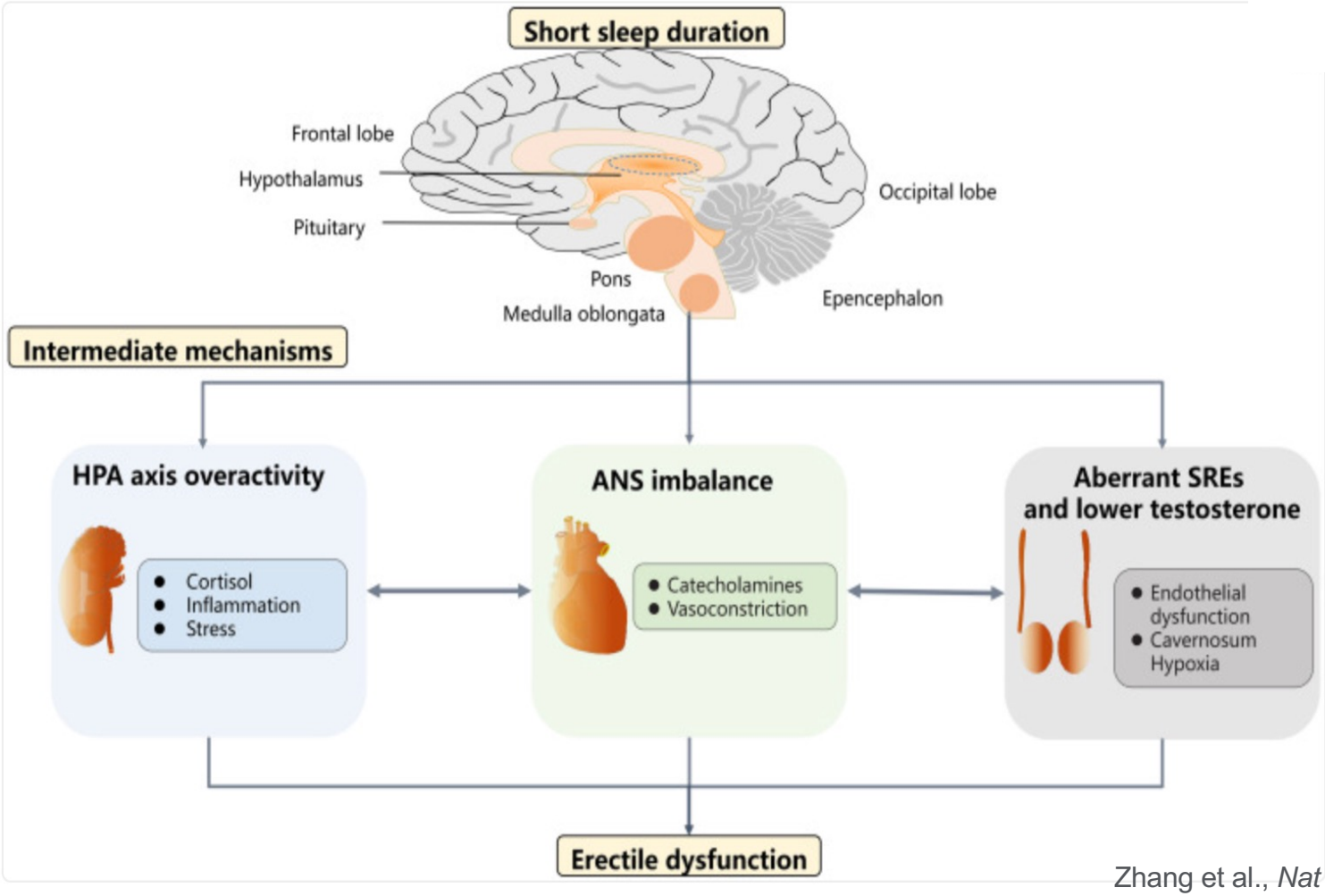
Teloken et al., *Urology* 2005

Mechanisms: Poor sleep → Increased risk of ED



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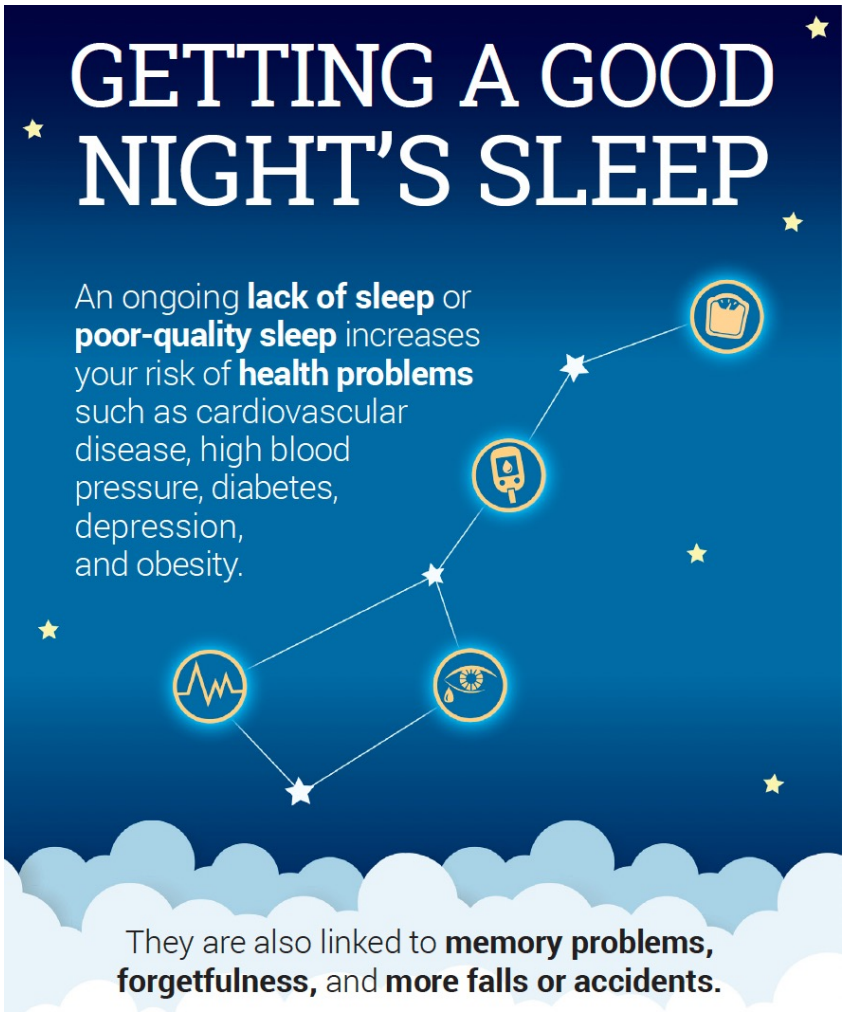
Zhang et al., *Nat Sci Sleep* 2022



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National Institute on Aging, National Institutes of Health
https://www.nia.nih.gov/sites/default/files/sleep-infographic-508.pdf

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Conclusions: Lifestyle Modifications

Eat more plants!

- Plant-based diets are associated with a lower risk of PCa incidence and progression
- Also better for cardiovascular health, sexual health
- A win-win with no downside

Emphasize regular physical activity

- Engage in ≥ 150 minutes/week

Optimize sleep health

- Screen for disorders, referrals to specialists

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Resources for Lifestyle Modification

Documentaries

Game Changers
Forks Over Knives
What the Health

Books

How Not To Die (by Dr Greger)
The China Study (by Dr Campbell)

Meal Service

Purple Carrot

App/Website

Happy Cow
Health.gov physical activity guidelines for Americans
CDC.gov/sleep

Information & Recipes from MD's/RD's

Physicians Committee for Responsible Medicine (pcrm.org)
Nutrition Facts (nutritionfacts.org)

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THANK YOU

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