

# Menopause and Musculoskeletal Health

Dr Sonia Davison  
MBBS FRACP PhD  
Endocrinologist



# Case Study – Helen

52 yrs

- Married, 16yr old twins, 13 year old
- Accountant – works part-time
- Periods stopped 18 months ago
- Worried about her bone health – mother with osteoporosis and fracture  
Asking about HRT (menopausal hormone therapy) - her friends have described this as 'life-changing'



Symptoms:

- Exhausted, cranky, anxiety, poor sleep
- Feels hot generally, night sweats
- Drenching, frequent flushes
- Vaginal dryness, joint aches and pains

# Phases of Female Lifespan:

1. Prepubertal
2. Pubertal
3. Premenopausal/Reproductive
- 4. *Perimenopausal***
- 5. *Postmenopausal***

# What is Menopause?

- The last period / the last 'egg'
- End of fertility
- Average age 45-55 years (median 51-52yrs)
- 80% of women have symptoms
- 20% of women have severe symptoms

*Premature menopause* = before 40 years

- increased risk of osteoporosis if not treated

# Perimenopause

= the time from when symptoms and signs of approaching menopause begin until 12 months after the final period

Median age **45.5 – 47.5 years**

Mean duration **6.25 years (range 0-11)**

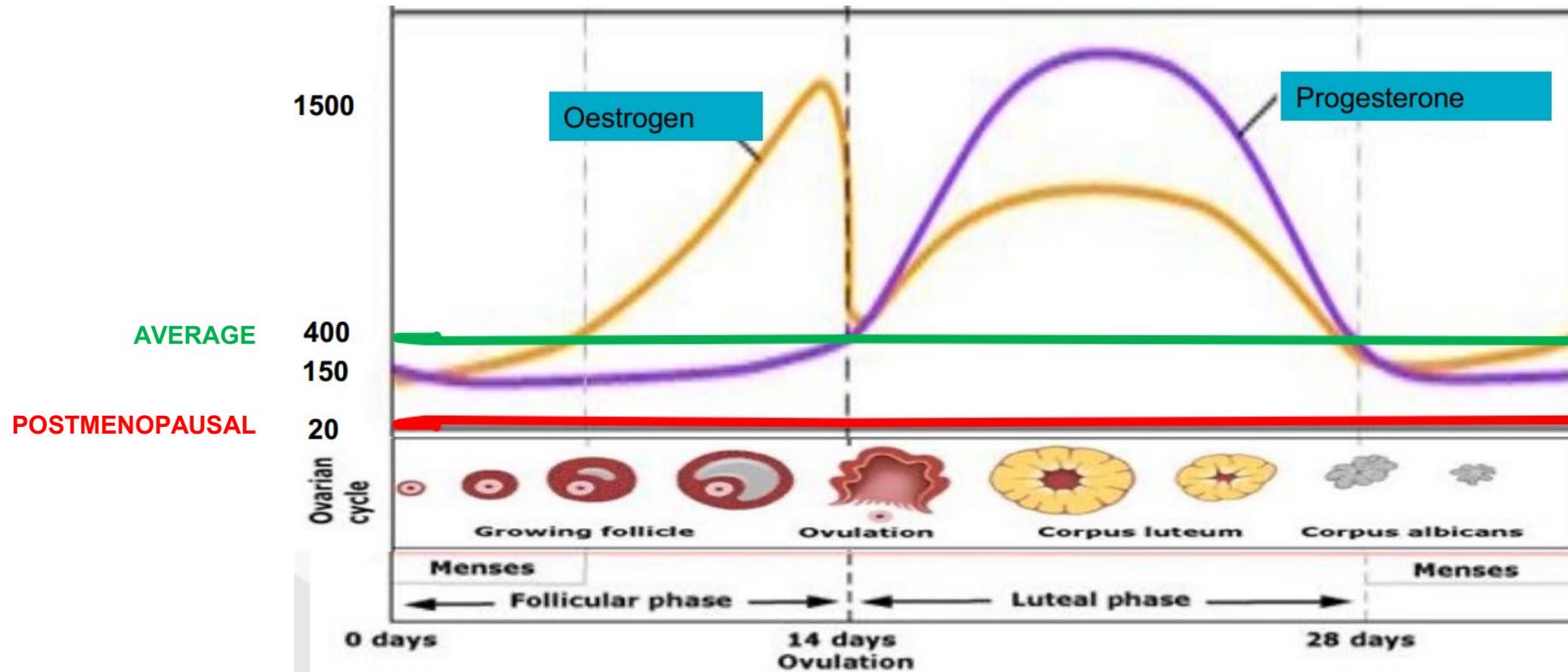
- Irregular cycles (length, volume + pattern of flow) and hormone secretion
- Women may experience menopausal symptoms prior to final menstrual period
- Approximately one-third of cycles egg producing (contraception an issue)

# Menopause is “in vogue”

- Menopause used to be ‘taboo’
- Celebrities have embraced menopause and have related their stories and experiences surrounding menopause
- There are many ‘experts’ talking about menopause and many ‘treatments’ being offered for symptom relief....
- Women are keen for information about menopause
- Researchers and policy planners are interested in the potential ability to intervene at mid-life and improve future health

The image shows a Google search for 'menopause' with a red arrow pointing to the search bar. The search results show approximately 409,000,000 results in 0.34 seconds. The top result is from the Better Health Channel, titled 'Menopause - Better Health Channel'. Below this are search suggestions like 'What are the 3 stages of menopause?' and 'What are the signs of menopause in a woman?'. There are also links to Healthdirect, the Australian Menopause Society, and Johns Hopkins Medicine. To the right, there is a 'Menopause' overview card with sections for Overview, Symptoms, Treatments, and Spec. Below the search results is a People magazine article titled 'Celebrities Who've Talked About Menopause', featuring photos of Michelle Obama, Halle Berry, and Blake Lively. The article is dated October 16, 2023, and is updated. At the bottom right, there is an advertisement for 'Ads by Google' with a 'Send feedback' button.

# Menstrual cycle – oestrogen + progesterone

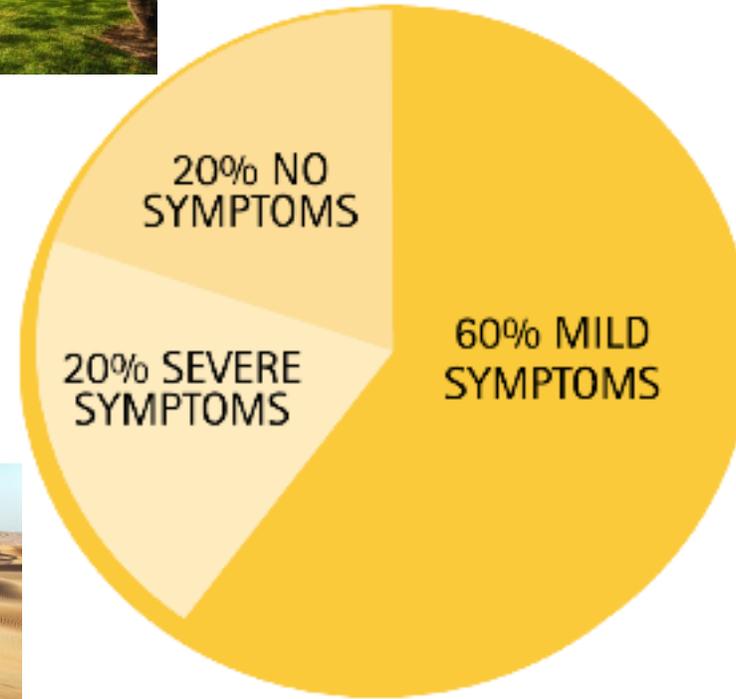


# Why the fuss?

Menopause and perimenopause are natural mid-life events

- Bothersome symptoms
- Mental health
- Quality of life
- Sleep
- Affects choices in life
- Increased risk of osteopaenia / osteoporosis and cardiovascular disease after menopause

# Symptoms



# Symptoms

- HOT FLUSHES
- NIGHT SWEATS
- VAGINAL DRYNESS
- INCONTINENCE
- URINARY FREQUENCY
- LOWERED LIBIDO
- SLEEP DISTURBANCE
- ANXIETY
- MOOD SWINGS
- DEPRESSION
- IRRITABILITY
- MEMORY LOSS
- LESSEned CONCENTRATION
- FATIGUE



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- MEMORY LOSS
- LESSEned CONCENTRATION
- FATIGUE
- MUSCLE/JOINT PAINS
- FORMICATION



**>70%** of women  
**25%** find disabling



# Musculoskeletal Syndrome of menopause

- Musculoskeletal pain
- Arthralgia (joint aches and pains)
- Loss of lean muscle mass
- Loss of bone density with increased fracture risk
- Increased tendon and ligament injury
- Adhesive capsulitis ('frozen shoulder')
- Cartilage matrix fragility / progression of osteoarthritis

Wright VJ et al. *Climacteric* 2024 Oct;27(5):466-72

# Consequences of the fall in oestrogen

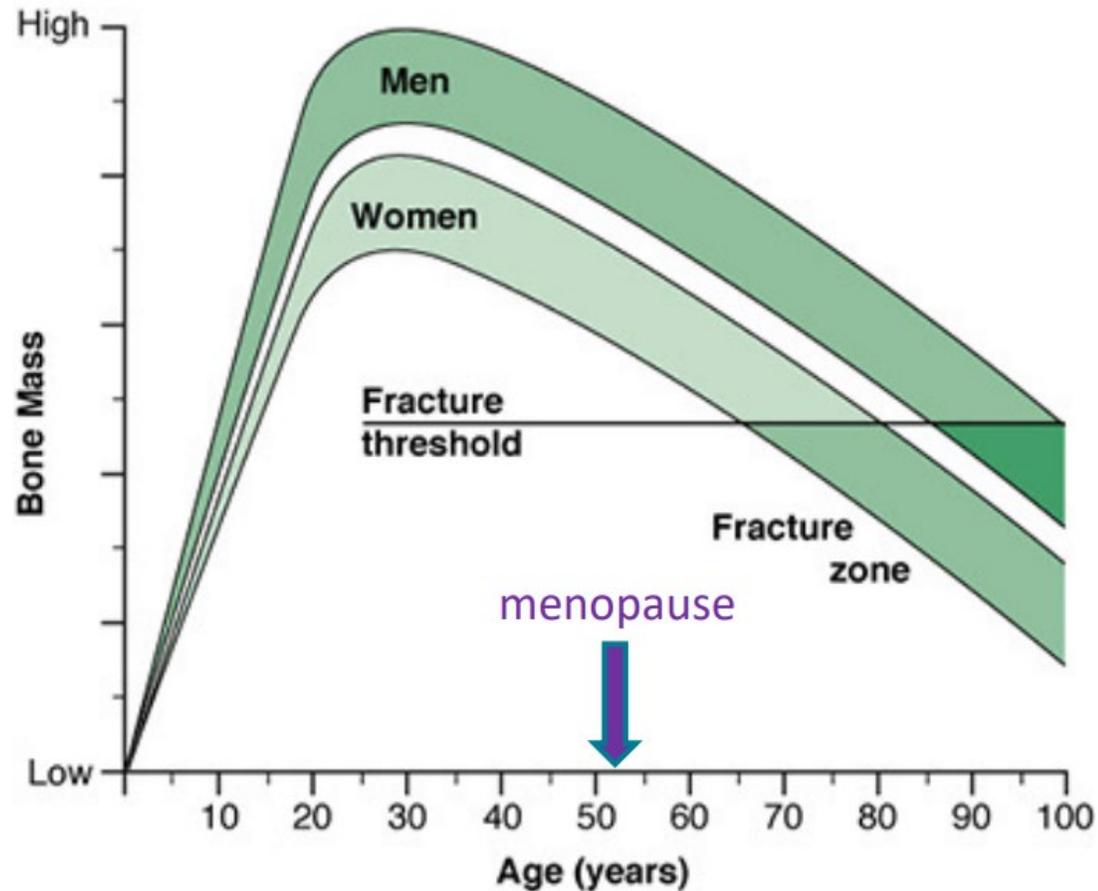
- Increase in inflammation
- Decrease in bone density
- Arthritis
- Sarcopenia – age related loss of lean muscle mass
- Decrease in proliferation of satellite cells (muscle stem cells)

**Table 1.** Musculoskeletal syndrome of menopause: processes and signs.

<i>Process</i>	<i>Signs</i>
Inflammation	Arthralgia, joint pain, joint discomfort, frozen shoulder
Sarcopenia	Poor balance, falls, decreased muscle mass, loss of stamina, walking slowly
Decreased satellite cell proliferation	Decreased muscle mass, inability to gain muscle
Osteoporosis	Loss of height, back pain, stooped posture, low-impact fracture
Arthritis	Arthralgia, joint pain, joint stiffness

[Wright VJ et al. Climacteric 2024 Oct;27\(5\):466-72](#)

# Bone health and osteoporosis as we get older



American College of Sports Medicine. *ACSM's Resource Manual for Exercise Testing and Prescription*. 7th ed. Philadelphia [PA]: Lippincott Williams & Wilkins; 2014. 896

# Osteoporosis

- Osteoporosis results from a loss of bone density or mass, making bones more fragile and more prone to fracture with minimal trauma
- ‘Silent’ disease
  - unless fracture occurs
  - loss of height due to asymptomatic fracture
- Consequences of fracture
  - Chronic pain / deformity / disability / increased mortality



# Osteoporosis

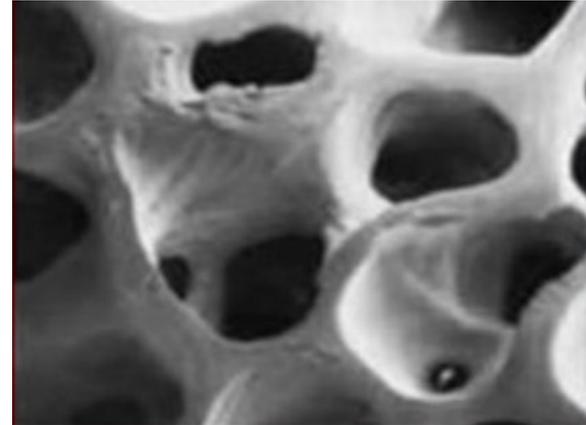
- Eventually affects 50% of elderly women in developed countries (200 million women worldwide)
- Rapid bone loss in the years immediately after menopause due to falling oestrogen
  - 10% reduction in bone density during perimenopause
  - bone density may decline by up to 3% per year in the years around menopause
  - reduction in muscle mass 0.6% per year after menopause
- Lifetime risk for fracture in women = 30-50%
  - 16% symptomatic vertebral fracture
  - 18% hip / 16% wrist fracture
  - 70% of hip fractures occur in women



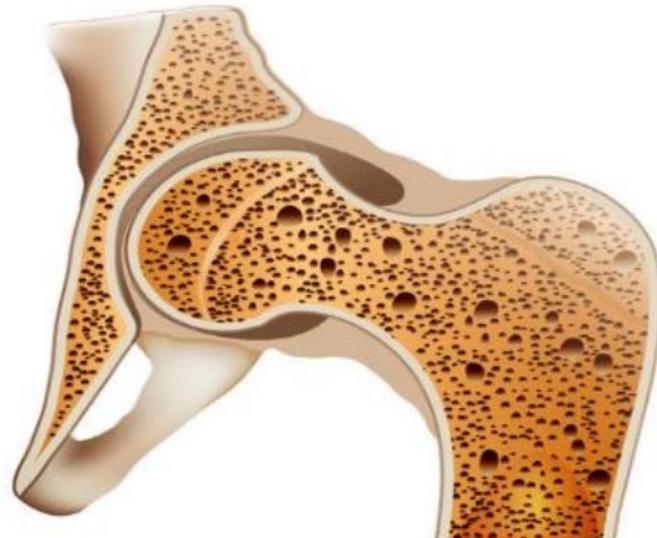
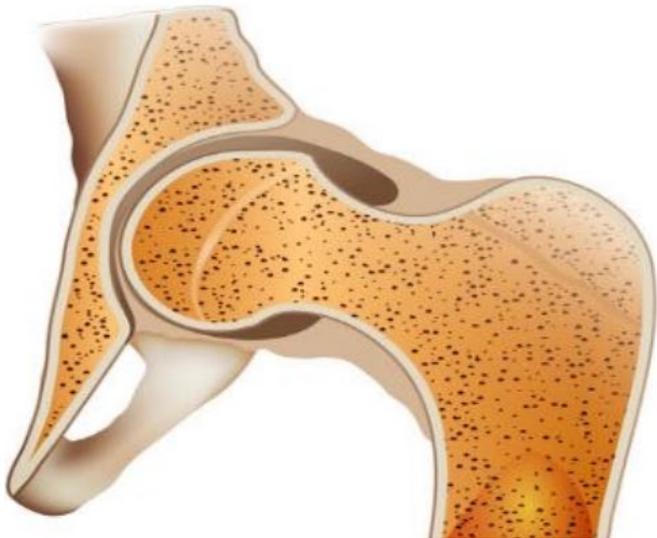
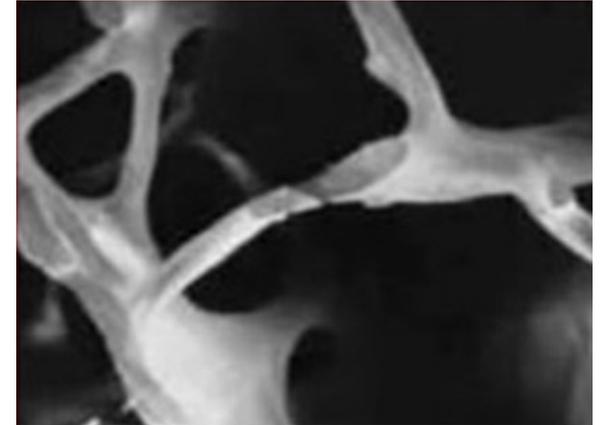
Johnell O et al. Osteoporos Int 2006;17(12):1726-33

# Osteoporosis

Normal Bone



Osteoporotic Bone



# How does a fall in oestrogen lead to musculoskeletal health issues? **INFLAMMATION**

Oestrogen is an inflammatory regulator

- Inhibits the release of inflammatory cytokine TNF- $\alpha$
- TNF- $\alpha$ 
  - degrades muscle proteins / reduces ability of muscle to repair damage
  - released by adipocytes – promotes fat mass accumulation and impairs muscle function

Roth SM et al. *Curr Opin Rheumatol* 2006;18(6):625-30

# How does a fall in oestrogen lead to musculoskeletal health issues? **SARCOPENIA**

= age-related loss of lean muscle mass

- Atrophy of fast muscle fibres / loss of type II fibres (decrease in power), decreased number of motor units / increased intramuscular adipose tissue
- Diagnosed when quantity or quality of muscle is low
- Severe: low muscle strength / low muscle quantity or quality / low physical performance

Fall in estrogen – decline in mitochondrial function / decreased levels of antioxidant proteins / impaired insulin sensitivity

Postmenopause – rapid decrease in muscle mass and strength

Potential interventions:

- maximise protein intake / vitamin D / creatine
- resistance training exercise
- ? hormone therapy

**Cruz-Jentoft AJ et al. Age Ageing 2019;48(1):16-31**  
**Kenny AM et al J Am Geriatr Soc 2005;53:1973-77**  
**Thornton M et al Calcif Tissue Int. 2024 Jan;114(1):38-52**

# How does a fall in oestrogen lead to musculoskeletal health issues? **SATELLITE CELL PROLIFERATION**

Satellite cells = stem cells, located on muscle fibres

- Promote plasticity and regeneration
- Activated following injury to repair muscle tissue
- Oestrogen stimulates activation and proliferation of satellite cells
- Mice studies - 30-60% fewer satellite cells after menopause

**Collins BC et al. Cell Reprod 2019; 28(2):368-81**

# How does a fall in oestrogen lead to musculoskeletal health issues? **LOSS OF BONE DENSITY**

- Estrogen deficiency is associated with significant bone loss
  - Increased fragility and risk of fracture
- Prevention of osteoporosis
  - Appropriate nutrition (adequate calcium / protein) / normal weight for height / weight-bearing exercise / removal of risk factors (smoking / alcohol excess / vitamin D deficiency etc)
- Menopausal hormone therapy
  - Decreases bone resorption
  - Preserves / increases bone density at all skeletal sites
  - Reduces fracture risk

de Villiers TJ et al. *Climacteric* 2013;16(3):316-37  
NAMS Hormone therapy position statement *Menopause* 2022; 29(7):767-94

# How does a fall in oestrogen lead to musculoskeletal health issues? **CARTILAGE DAMAGE AND OSTEOARTHRITIS**

- Cartilage is composed of a dense extracellular matrix and highly specialised chondrocytes – partly regulated by oestrogen
- Osteoarthritis incidence increases dramatically around the time of menopause
- Women experience more debilitating arthritic pain vs. men
- Role of hormone therapy
  - Oestrogen has a protective role in intervertebral discs
  - Decrease in oestrogen leads to changes in connective tissue matrix
    - possibly prevented by hormone therapy

Barnabei VM et al. *Obstet Gynecol* 2005;105:1063-73

# Menopause related symptom management

- Treat symptoms when bothersome
  - Target the treatment to the symptoms
1. Lifestyle measures
  2. Non-hormonal options
  3. Hormone treatment (Menopausal hormone therapy / 'MHT,' [=HRT], vaginal oestrogen)



# The role of MHT (Menopausal Hormone Therapy)

- formally known as HRT (Hormone Replacement Therapy)

- The most effective treatment for menopausal symptoms
- The benefits far outweigh the risks in healthy women around the time of perimenopause / menopause (consensus statements + guidelines)
- Slightly increased risk of breast cancer after 5 years of use



# What is MHT?

- Any form of oestrogen (gels / patches / tablets / vaginal tablet or cream)
  - this helps the symptoms
- Progesterone needed to keep the lining of the uterus thin whilst on oestrogen (can be calming for mood / good for sleep)
  - Not needed after hysterectomy
- Some women add testosterone (mood / libido / well-being)

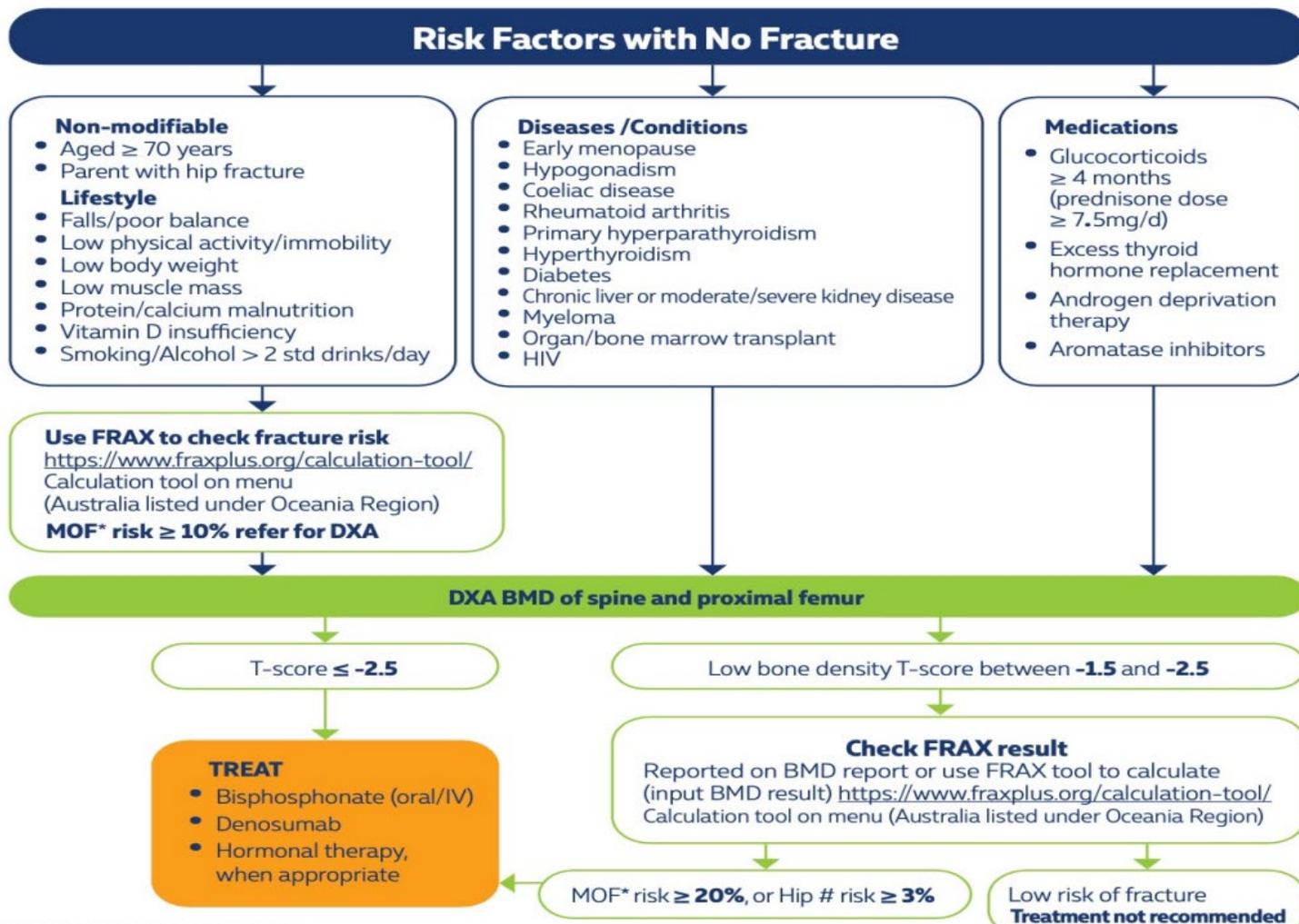


# Clinical Management – Musculoskeletal Health at Mid-Life

1. Testing
2. Nutrition
3. Supplements
4. Exercise
5. Specific Treatments



# Testing – Bone Density Scan (DXA)



# Nutrition / Supplements

## Vitamin D3

- In some studies has improved bone density at the hip and reduced incidence of falls
- Can reduce bone turnover markers

## Calcium

- Postmenopause – 1300mg per day via diet

## Vitamin K2

- Has been associated with an increase in bone density in postmenopausal women with osteoporosis

## Protein – dietary

Lee AM et al J Steroid Biochem Mol Biol. 2014 Oct:144  
Sami A et al Calcif Tissue Int. 2020 Jan;106(1):88-93

# Nutrition / Supplements

## **Magnesium**

- Can improve aches and pains
- Can increase vitamin D3 levels

## **Creatine**

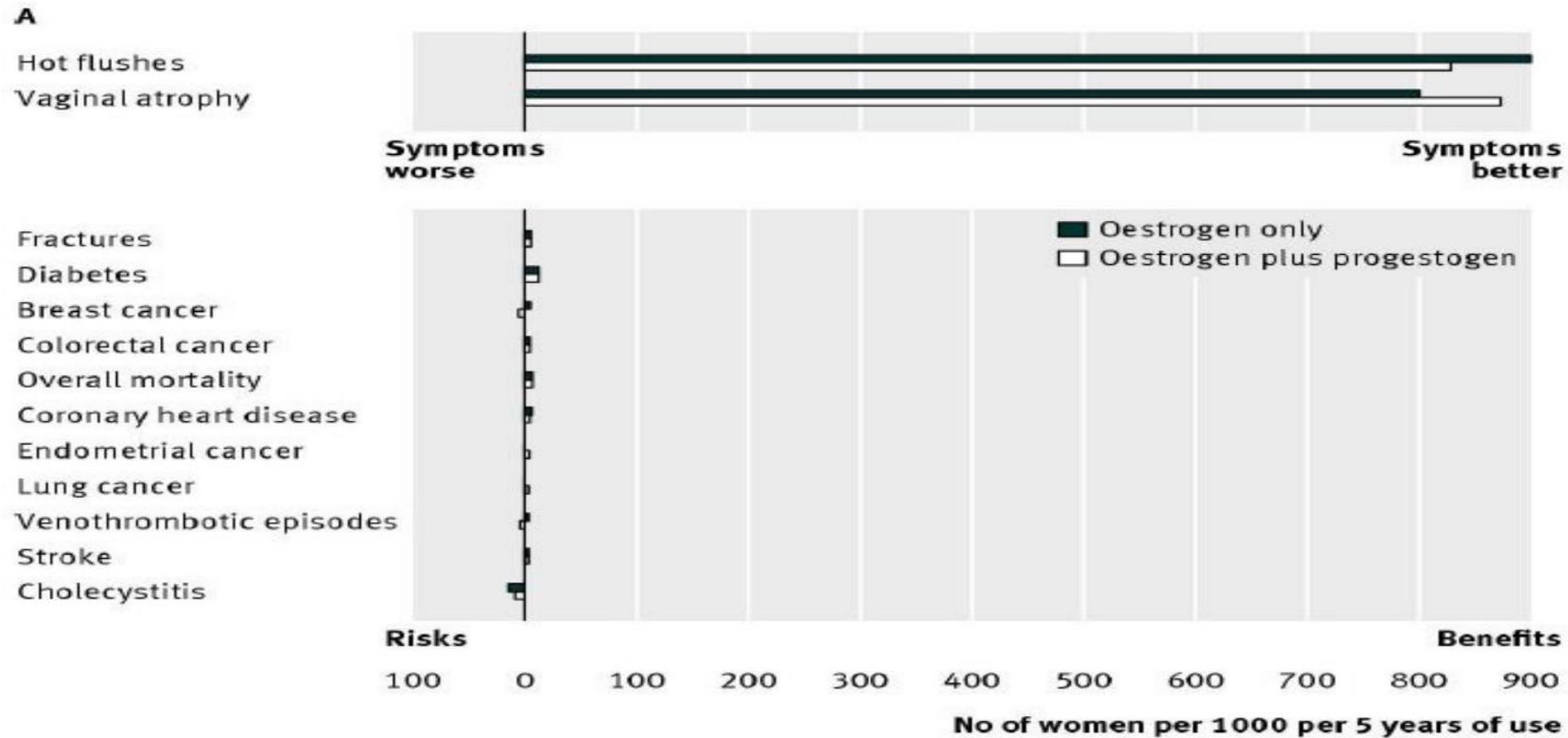
- Preliminary research – may improve bone density and muscle power

## **Menopausal hormone therapy**

- May improve joint aches and pains
- Improves bone density and reduces fracture risk

Kuang X et al Nutr Res. 2021 Jun;90:24-35  
Cordingley D et al Nutrients. 2022 Feb;14(3):544  
Barnabei VM et al. Obstet Gynecol 2005;105:1063-73

# Risks and benefits of MHT between 50-59 yrs or <10 yr after menopause



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 CLINICAL  
 ENDOCRINOLOGY  
 & METABOLISM

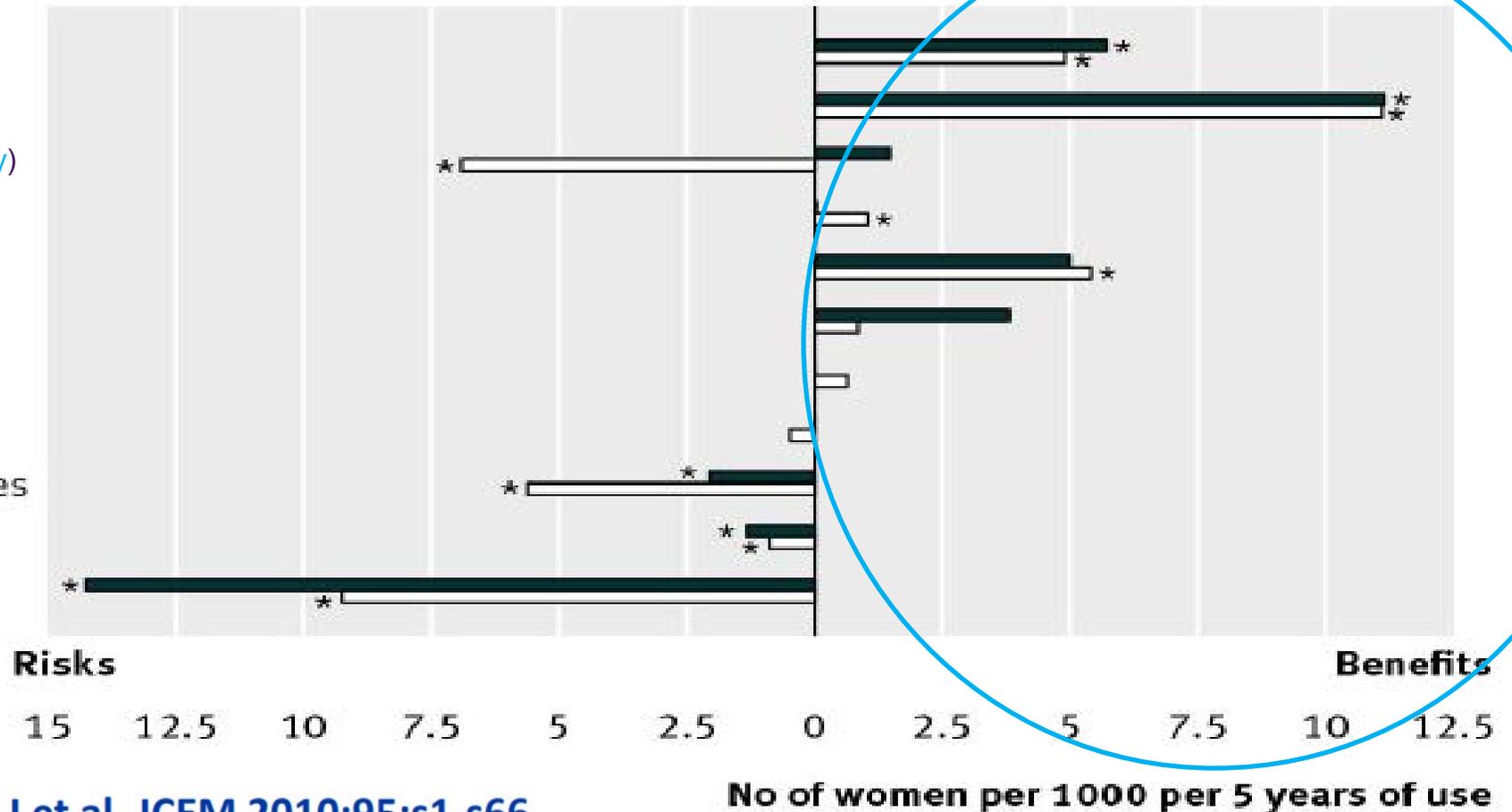
Santen R J et al. JCEM 2010;95:s1-s66

# Risks and **BENEFITS** of MHT between 50-59 yrs or <10 yr after menopause

**B**

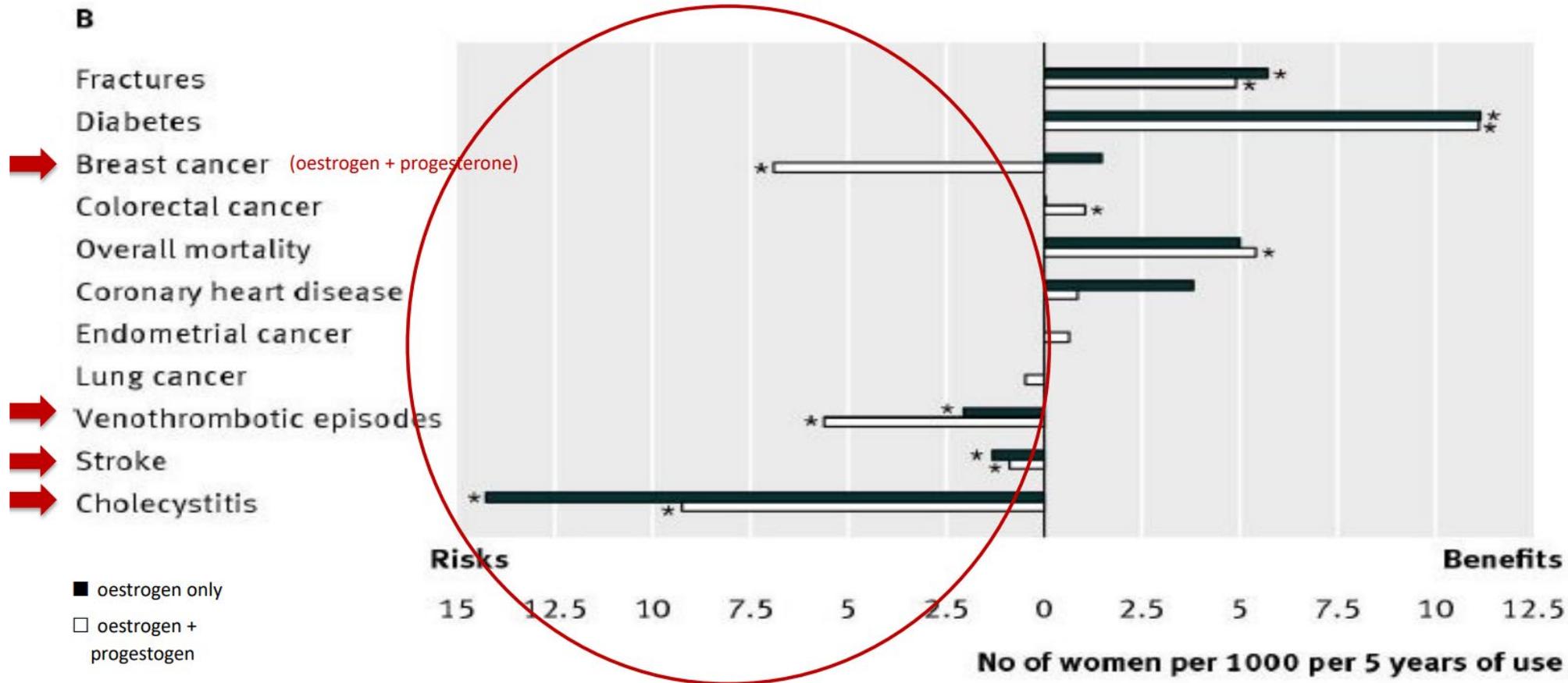
- ➔ Fractures
- ➔ Diabetes
- ➔ Breast cancer (oestrogen only)
- Colorectal cancer
- ➔ Overall mortality
- ➔ Coronary heart disease
- Endometrial cancer
- Lung cancer
- Venothrombotic episodes
- Stroke
- Cholecystitis

- oestrogen only
- oestrogen + progestogen



Santen R J et al. JCEM 2010;95:s1-s66

# RISKS and benefits of MHT between 50-59 yrs or <10 yr after menopause



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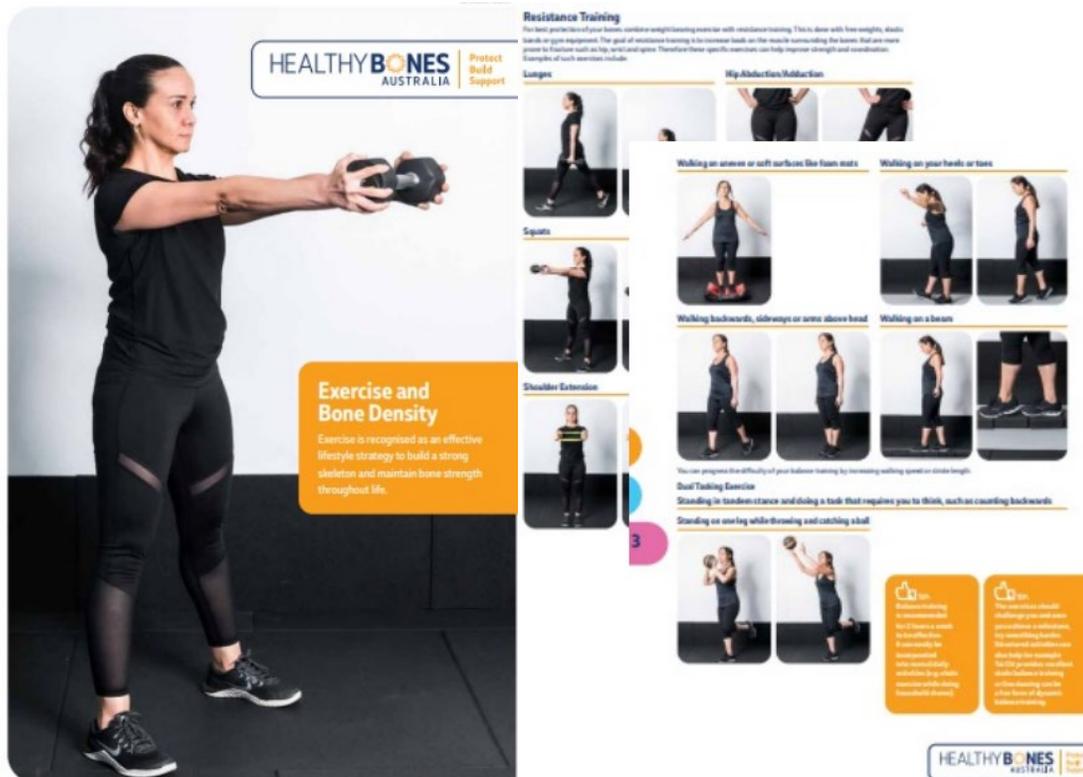
Santen R J et al. JCEM 2010;95:s1-s66

# Exercise – “Use it or lose it!”

- Exercise – 2.5 hours per week
- Weight-bearing for bone density (dance / jogging / skipping / running)
- Resistance training – (heavier weights with lower repetitions more effective for muscle power)
- Kieser training
- Personal training
- Brisk walking
- Swimming (good for heart and muscle, not bone)
- Benefits: Heart / bone / mental health / weight



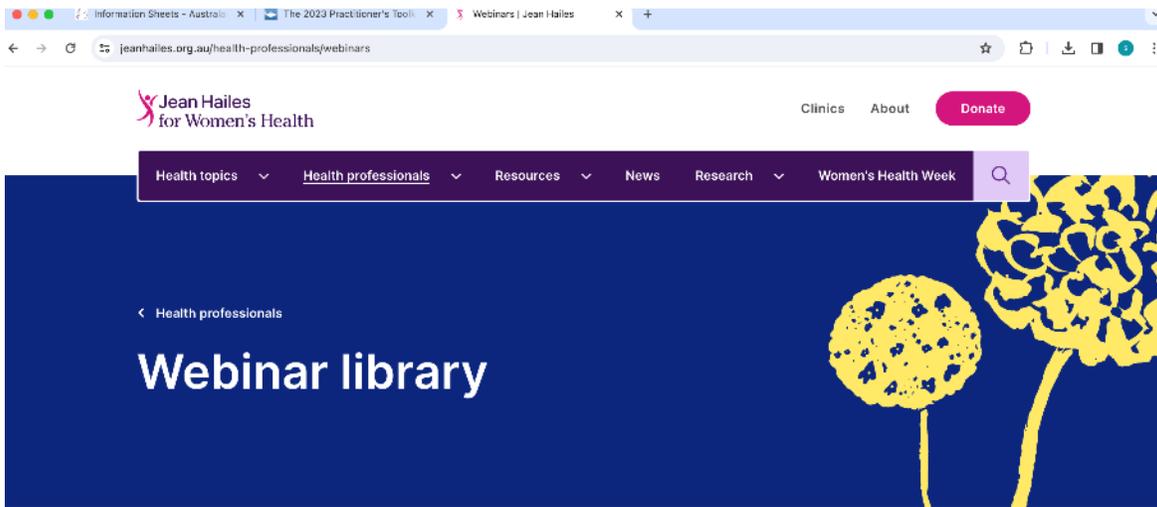
# Resources – Healthy Bones Australia



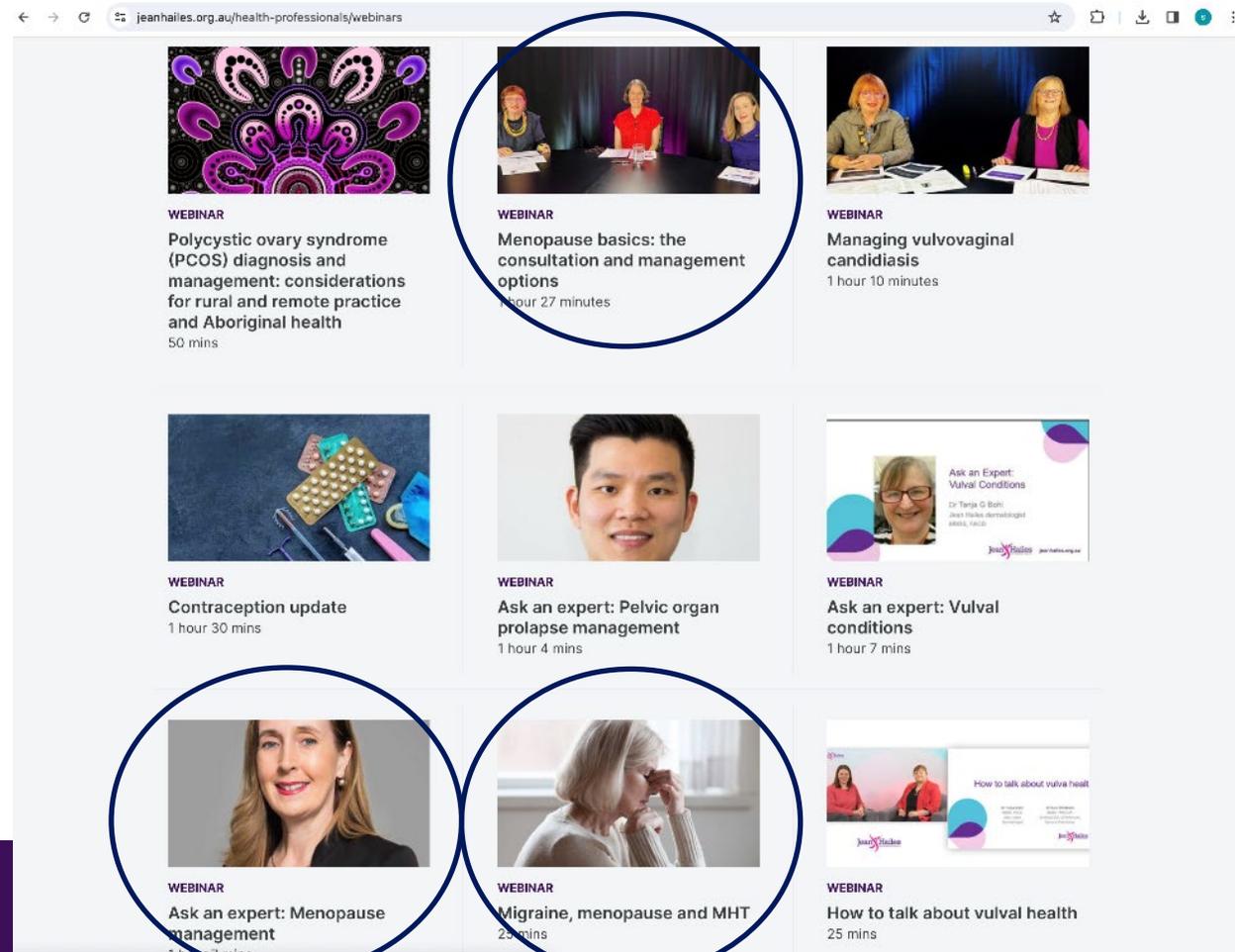
- Patient booklet; exercise and bone density
  - [hba-exercise-brochure.pdf](https://healthybonesaustralia.org.au/healthybonesaustralia/exercise-brochure.pdf)  
([healthybonesaustralia.org.au](https://healthybonesaustralia.org.au))

# Resources – Jean Hailes for Women’s Health

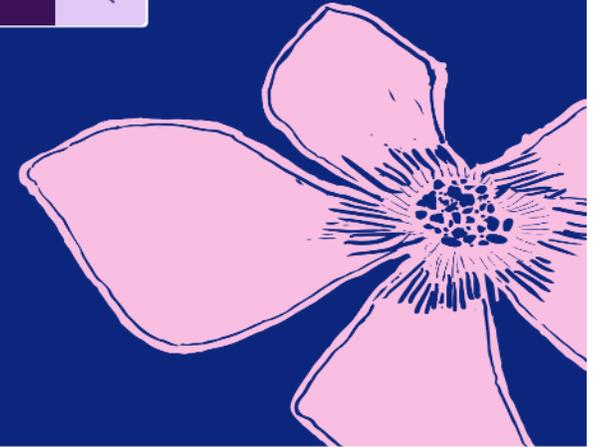
- Healthy bones
- Osteoporosis and osteopaenia
  - [Bone health for women | Jean Hailes for Women's health | Jean Hailes](#)



# Jean Hailes for Women's Health webinars



# Managing menopause



From late 2024, this course will be free for Health Professionals. To be notified, **register your interest**. We are unable to reimburse you if you choose to purchase the course.

This course aims to help general practitioners provide well-informed, up-to-date advice and treatment in the care and management of women during menopause.

Although the course has been designed for general practitioners, other health professionals are welcome to participate.

# Case Study Management – Helen

- Trial of daily oestrogen gel and progesterone capsule
- Vaginal moisturiser and lubricant
- Bone health measures
  - Maximise calcium in diet, 1300mg daily
  - Vitamin D3
  - Weight bearing exercise



## 3 month review

- Reduction in symptoms
- “I feel normal”

# Thank you