osteoporosis

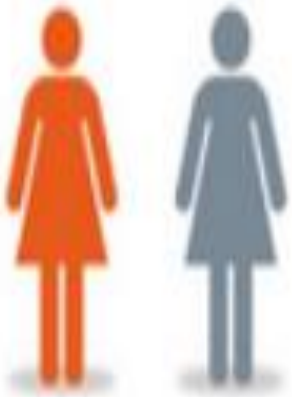
Therapeutics 1

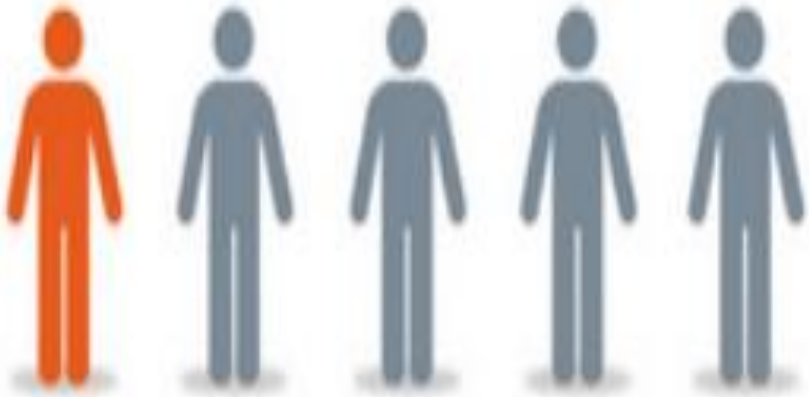
STOP OSTEOPOROSIS

Healthy, strong bones

Osteoporosis, brittle bones

Who it affects





1 in 2 Women **1 in 5 Men**

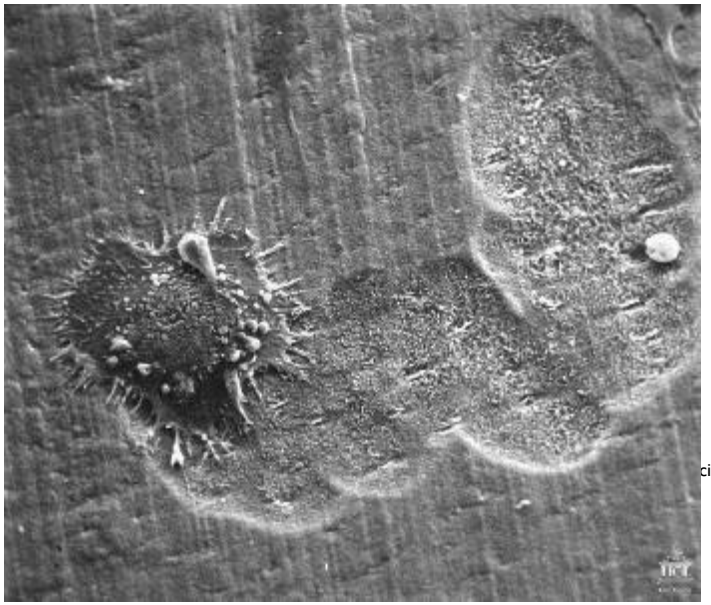
People over the age of 50, **who will break a bone** mainly as a result of poor bone health.

Source: The National Osteoporosis Society (NOS)

osteoporosis

The challenge to clinicians:

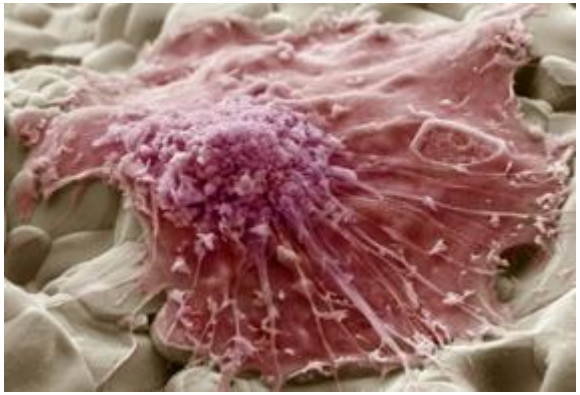
- Identify patients at high risk for fracture
- Prevent first fracture



ciety 2015-2016

Osteoclast dissolving bone

Osteoblast
(on an artificial surface in a lab)



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الهرمونات التي تنظّم استتباب الكالسيوم في الدم

PTH

- يتحفّز إفرازه بنقص مستويات شوارد الكالسيوم في الدم.
- يعمل على زيادة ارتشاف العظم.
- يؤدي إلى زيادة عود امتصاص الكالسيوم في الكلية.
- زيادة الامتصاص المعوي للكالسيوم.
- نقص عود امتصاص الفوسفات في الكلية.

Calcitonin

- يتحفّز إفرازه بزيادة مستويات شوارد الكالسيوم في الدم.
- يعمل على انقاص ارتشاف العظم.

Vitamin D

- يتحفّز إفرازه بنقص مستويات شوارد الكالسيوم في الدم ↑/ PTH / نقص فوسفات الدم.
- يعمل على زيادة ارتشاف العظم.
- يؤدي إلى زيادة عود امتصاص الكالسيوم والفوسفات في الكلية.
- زيادة الامتصاص المعوي للكالسيوم والفوسفات.

Risk factors

Modifiable

- BMD
- Alcohol
- Weight <20kg m2
- Smoking
- Physical inactivity
- Co-existing disease: eg Diabetes, RA, Epilepsy, Gastrointestinal /Endocrine disease
- Pharmacological

Non modifiable

- Age
- Gender
- Ethnicity
- Previous fragility fracture
- Family history osteoporosis / parental hip fracture
- Early menopause
- BMD

2010 Guidelines for Bone Density Testing

Screening

- All women age 65 and older[1,2]
- All men age 70 and older[1]

Test postmenopausal women and men >50 if[1]:

- Fracture after age 50
- Clinical risk factors for osteoporosis
- Conditions/medications associated with bone loss
  - COPD, RA, hyperparathyroidism, celiac disease, IBD
  - Oral glucocorticoids, anticonvulsants, proton pump inhibitors, SSRIs, aromatase inhibitors

1. Adapted from National Osteoporosis Foundation. *Clinician's Guide to Prevention and Treatment of Osteoporosis.* Washington, DC: National Osteoporosis Foundation; 2013. Available at: http://www.nof.org/hcp/clinicians-guide. Accessed September 13, 2013.
2. US Preventive Services Task Force. *Ann Intern Med.* 2002;137:526-528

FRAX®

Statistically robust fracture risk prediction tool developed by the WHO for world-wide use

Combines BMD + clinical risk factors to predict fracture risk better than either alone

Predicts the 10-year probability of major osteoporotic fracture

- Hip, spine, wrist, or humerus

Use when the decision to treat is uncertain

FRAX® WHO Fracture Risk Assessment Tool

Home | Calculation Tool | Paper Charts | FAQ | References | English

Welcome to FRAX®

The FRAX® tool has been developed by WHO to evaluate fracture risk of patients. It is based on individual patient models that integrate the risks associated with clinical risk factors as well as bone mineral density (BMD) at the femoral neck.

Dr. John A Kanis
Professor Emeritus, University of Sheffield

The FRAX® models have been developed from studying population -based cohorts from Europe, North America, Asia and Australia. In their most sophisticated form, the FRAX® tool is computer-driven and is available on this site. Several simplified paper versions, based on the number of risk factors are also available, and can be downloaded for office use.

The FRAX® algorithms give the 10-year probability of fracture. The output is a 10-year probability of hip fracture and the 10-year probability of a major osteoporotic fracture (clinical spine, forearm, hip or shoulder fracture).

FRAX Desktop Application

Click here to view the applications available

Web Version 3.8

View Release Notes

Links

www.iofbonehealth.org

www.nof.org

NATIONAL OSTEOPOROSIS FOUNDATION

www.jpof.or.jp

www.esceo.org

ESCEO

FRAX® WHO Fracture Risk Assessment Tool

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Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: US (Caucasian) Name/ID: About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: Date of Birth: Y: M: D:
2. Sex ○ Male ○ Female
3. Weight (kg)
4. Height (cm)
5. Previous Fracture ● No ○ Yes
6. Parent Fractured Hip ● No ○ Yes
7. Current Smoking ● No ○ Yes
8. Glucocorticoids ● No ○ Yes
10. Secondary osteoporosis ● No ○ Yes
11. Alcohol 3 or more units/day ● No ○ Yes
12. Femoral neck BMD (g/cm^2)

Select BMD

Clear Calculate

Weight Conversion

Pounds → kg

Convert

Height Conversion

Inches → cm

Convert

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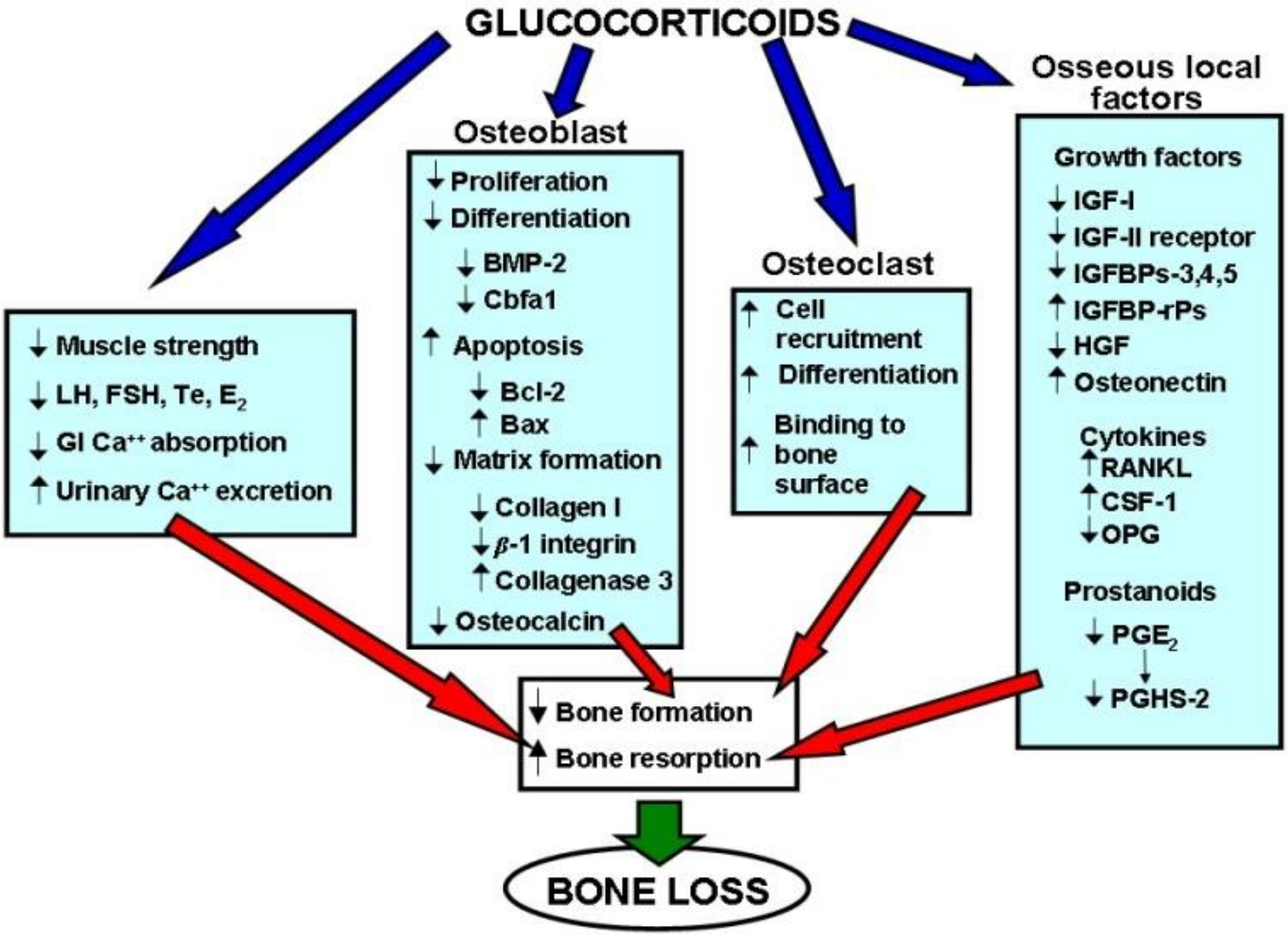
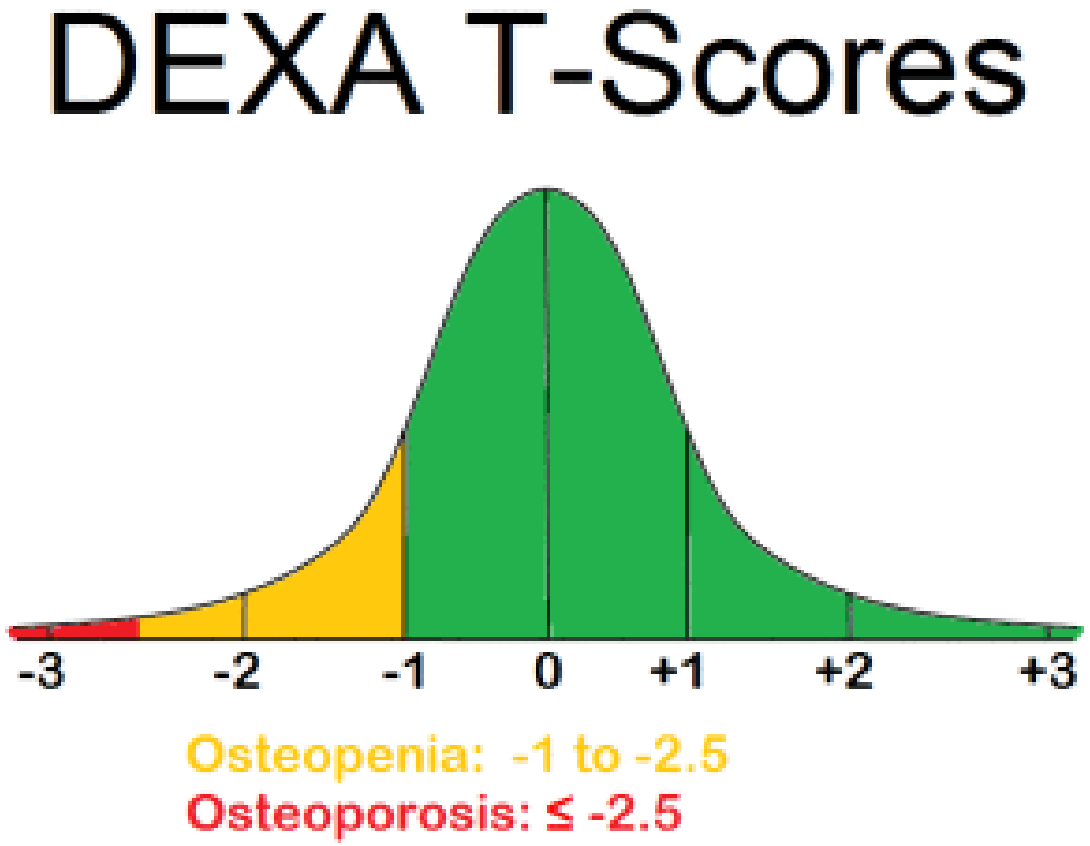
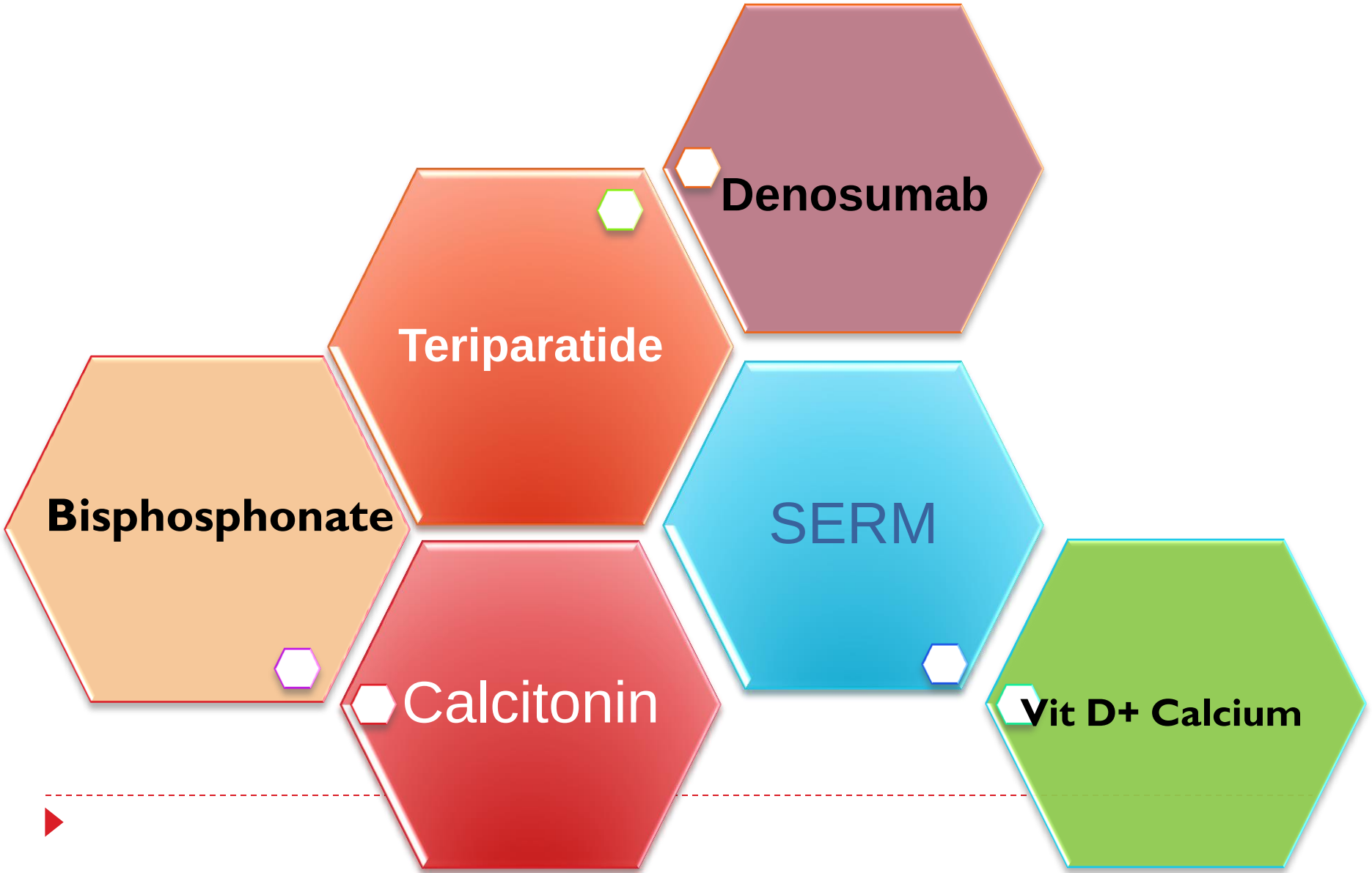

GLUCOCORTICOIDS
Osteoblast
↓ Proliferation
↓ Differentiation
↓ BMP-2
↓ Cbfa1
↑ Apoptosis
↓ Bcl-2
↑ Bax
↓ Matrix formation
↓ Collagen I
↓ β-1 integrin
↑ Collagenase 3
↓ Osteocalcin
Osteoclast
↑ Cell recruitment
↑ Differentiation
↑ Binding to bone surface
Osseous local factors
Growth factors
↓ IGF-I
↓ IGF-II receptor
↓ IGFBPs-3,4,5
↑ IGFBP-rPs
↓ HGF
↑ Osteonectin
Cytokines
↑ RANKL
↑ CSF-1
↓ OPG
Prostanoids
↓ PGE2
↓ PGHS-2
↓ Muscle strength
↓ LH, FSH, Te, E2
↓ GI Ca++ absorption
↑ Urinary Ca++ excretion
↓ Bone formation
↑ Bone resorption
BONE LOSS

Diagnosis

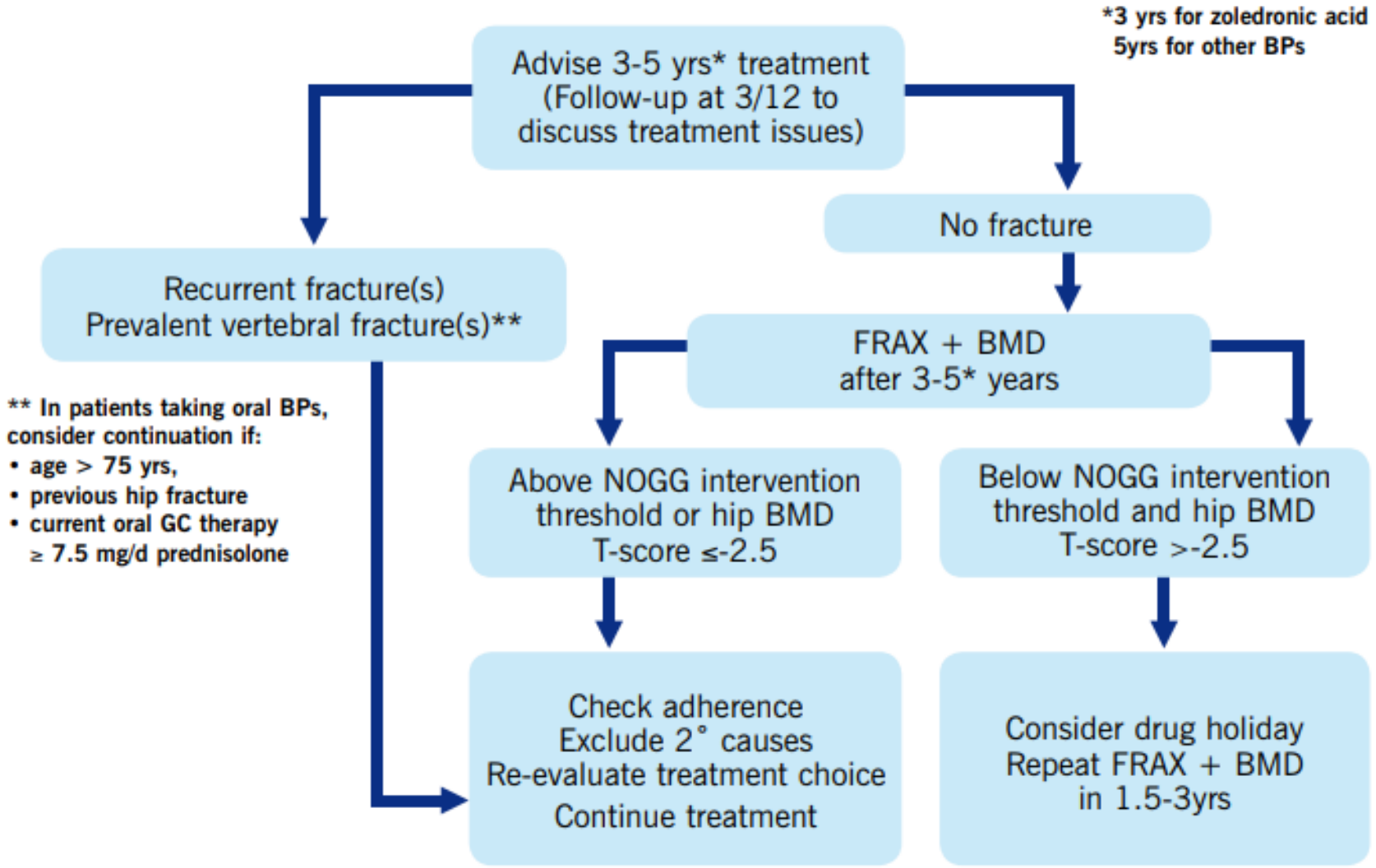


NICE accredited
www.nice.org.uk/accreditation
IOF
International Osteoporosis Foundation

الزمر العلاجيّة



Bisphosphonates: algorithm for long-term treatment monitoring



BPs bisphosphonates

Compston et al 2014

Case study

- **Day 1** 76-year-old Mrs MG attended A&E following a fall at her care home, where she had been living for the past 2 years. She had a 5-year history of becoming increasingly dependent on others to assist with activities of daily living, and had shown signs of developing dementia, with increasing memory loss and wandering, for which her general practitioner (GP) had prescribed haloperidol 500 micrograms twice daily.
- Three years earlier, Mrs MG had been diagnosed as suffering from polymyalgia rheumatica (PMR), for which she had been initially prescribed prednisolone orally 10 mg daily. This had been reduced to 5mg daily after 1 year. She had now been taking this dose for 2 years. She had been a heavy smoker, smoking some 20–30 cigarettes per day, but had stopped completely nearly 10 years ago. She only drank alcohol socially.
- Her drug history on admission was as follows:

_ Prednisolone 5 mg orally daily _ Haloperidol 500 micrograms orally twice daily

_ Nitrazepam 5 mg orally every night

- **Q1** What is the appropriate dose of prednisolone for the treatment of PMR?
- On examination, Mrs MG was found to be small-framed, 1.62 m tall and weighing 49 kg. Blood biochemistry showed that her urea and electrolyte levels were normal. X-ray revealed a fracture to the right radius (Colles'fracture). She was discharged with a plaster cast and a prescription for cocodamol 30/500 capsules one or two to be taken every 4–6 hours. She was referred to the multidisciplinary falls clinic.

- Q2 What factors might have contributed to her fall?

- Q3 Do you agree with the prescribing of co-codamol 30/500 capsules for analgesia?

- Q4 What risk factors does Mrs MG have for osteoporosis?

- Q5 How could the diagnosis of osteoporosis be confirmed?

- Day 5 Mrs MG attended the multidisciplinary falls clinic at the local hospital outpatient department for a full assessment, which included a review of her medication by a pharmacist. An X-ray was taken of her lower spine, which revealed that she had previously suffered three crush fractures of her lumbar vertebrae.

- Q6 Outline the key points of a pharmaceutical care plan for Mrs MG.
- Q7 What changes would you make to her existing therapy?
- Q8 What drug treatment options can be considered for her osteoporosis?
- Q9 Which would you recommend for this patient and why?
- Q10 What non-pharmaceutical interventions should be recommended for Mrs MG?

- Mrs MG was started on alendronate 10 mg tablets and Adcal-D3 (calcium and vitamin D tablets). The falls clinic pharmacist stopped the haloperidol and switched the co-codamol to separate paracetamol and codeine tablets. Her medication at this time was:

_ Prednisolone enteric-coated tablets 5 mg daily

_ Nitrazepam tablets 5 mg every Night

_ Paracetamol tablets 500 mg on or two every 4–6 hours (up to eight tablets in 24 h)

_ Codeine tablets 30 mg one every 4 hours if required

_ Alendronate tablets 10 mg daily

_ Adcal-D3 tablets two daily

- Day 14 Mrs MG attended the sleep clinic. The pharmacist stopped the nitrazepam, and provided her carers with advice about sleep hygiene and how to manage her wandering if it became a problem.

A prescription was issued for:

- _ Temazepam tablets 10 mg one every night if required

- Month 3 Mrs MG was seen again in the falls clinic. Her carers reported that she was sleeping well and her wandering was manageable during the day, but that she was experiencing problems swallowing both the alendronate and the calcium tablets.

- Q11 What changes would you recommend to her therapy?

Month 6 The community pharmacist from the pharmacy that dispensed medicines for the care home visited the home to conduct medicines use reviews (MURs) for the residents. During the consultation with Mrs MG and her carers, the pharmacist identified that Mrs MG was still experiencing problems swallowing the alendronate tablets.

- Her medication at this time was:

_ Prednisolone enteric-coated tablets 2.5 mg daily

_ Temazepam tablets 10 mg one every night if required

_ Paracetamol tablets 500 mg one or two every 4–6 hours (up to water daily eight tablets in 24 h).

_ Codeine tablets 30 mg on every 4 hours if required

_ Alendronate tablets 70 mg weekly (on the same day each week)

_ Calfovit D3 sachets one sachet daily

- Q12What changes would you recommend to Mrs MG's therapy?
- Q13 How long should treatment for osteoporosis be continued?
- Q14 How effective is treatment with a bisphosphonate and/or calcium and vitamin D at reducing the risk of fractures?