



Pharmacotherapy of Osteoporosis

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Gout Gout breaks Usain Bolt's under-20 200m mark record.

Gout completes the track in **19.67seconds** at on **12th April, 2026**

Australian Athletics
olympics
Championship, **Sydney**



At the end of this session students will

be able to learn

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- About Osteoporosis
- Burden of disease
- Epidemiology
- Ethnicity
- Risk factor
- Mechanism of development
- Features of disease
- Investigation
- Common drugs with their pharmacokinetics and pharmacodynamics
- Newer drug
- Future development of drugs

- **Osteoporosis** is a systemic skeletal disorder characterized by **reduced bone density** and **deterioration bones microstructure** leading to bone fragility and fracture.
- It is often asymptomatic until fracture occurs.

Burden of osteoporosis

- By 2050, the worldwide incidence of hip fracture in men is projected to increase by 310% and 240% in women, compared to rates in 1990.
- In the year 2050, it is estimated that over 50% of global osteoporotic fractures will occur in Asia. Key risk factors include diet, lack of physical activity, and long-term use of certain medications, such as glucocorticoids.

Burden of disease

- ➔ Osteoporosis takes a huge personal and economic toll. In Europe, the disability due to osteoporosis is greater than that caused by cancers.
- ➔ Most hip fractures in Asia will occur in China, where the incidence of hip fracture will rise from 411,000 in 2015 to an estimate of more than 1 million in 2050.

Some facts

80% cases of osteoporosis are women

1 in 2 women having fractures after menopause

20% bone density lose in 5-7 years after the age of 50 years

Epidemiology(Across the world)

- Osteoporosis estimated to affect 200 million Women worldwide(IOF,2026)
- Asian ancestry have greater prevalence rate.
- According to study published in Bangladesh medical journal, 12-15% women over the age of 50 have osteoporosis.(BMJ,2020)
- The prevalence is particularly high among in postmenopausal women 20-25%.

Bar diagram showing prevalence of osteoporosis in Bangladesh

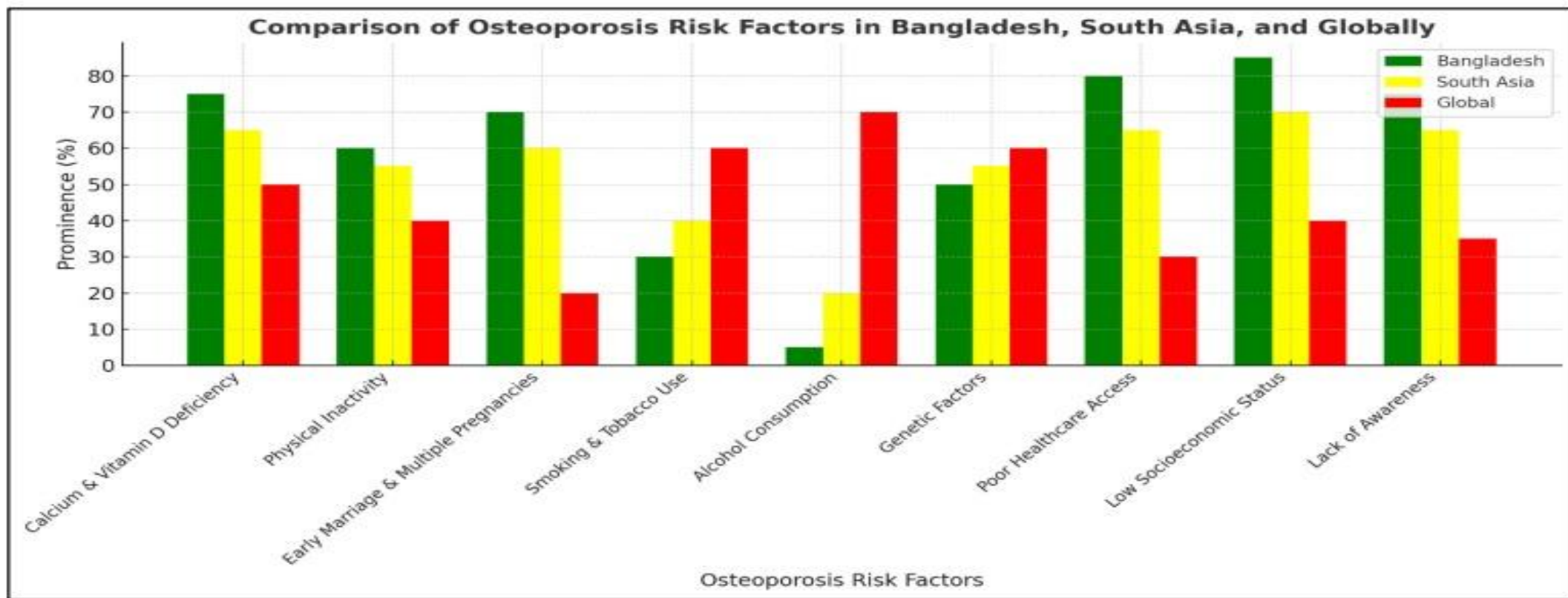


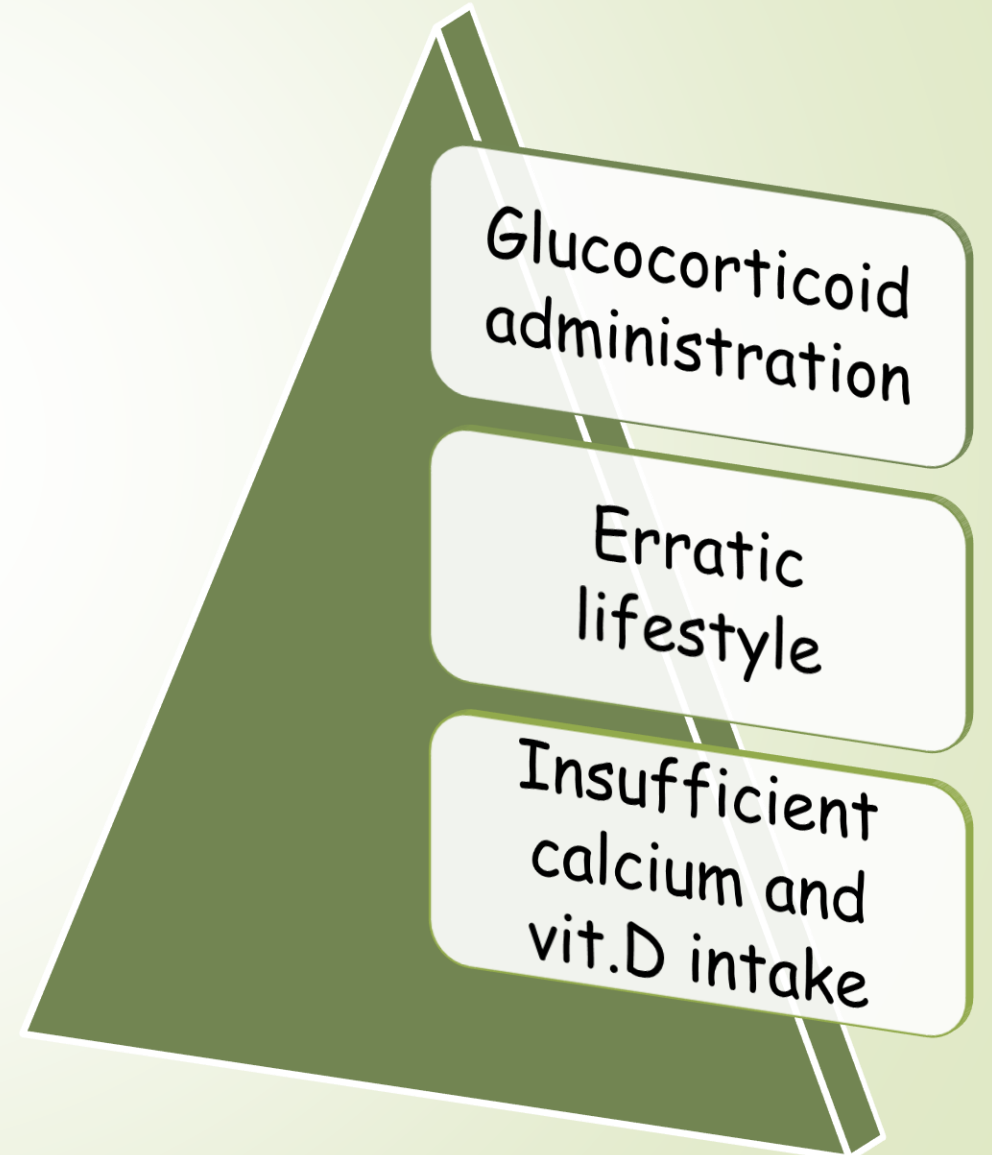
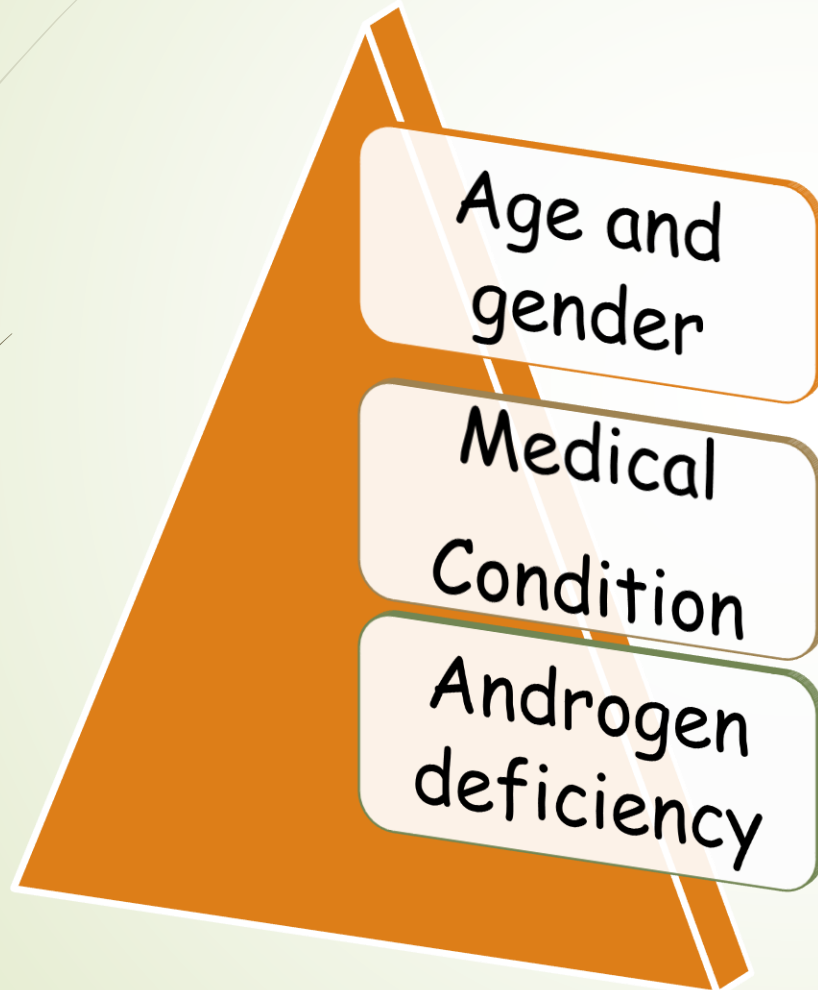
Figure 7: Comparison of Osteoporosis Risk Factors in Bangladesh, South Asia, and Globally

Ethnicity

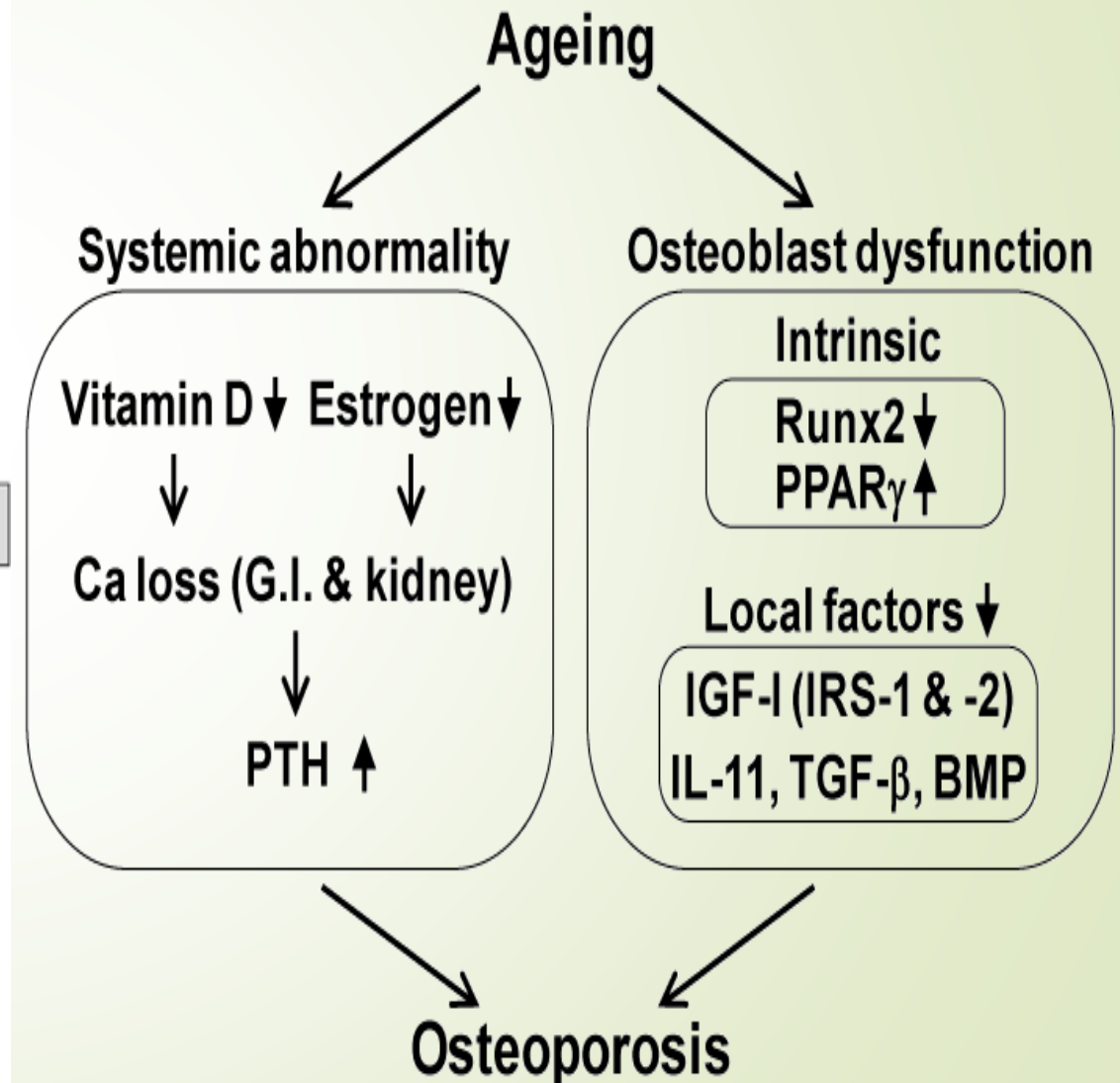
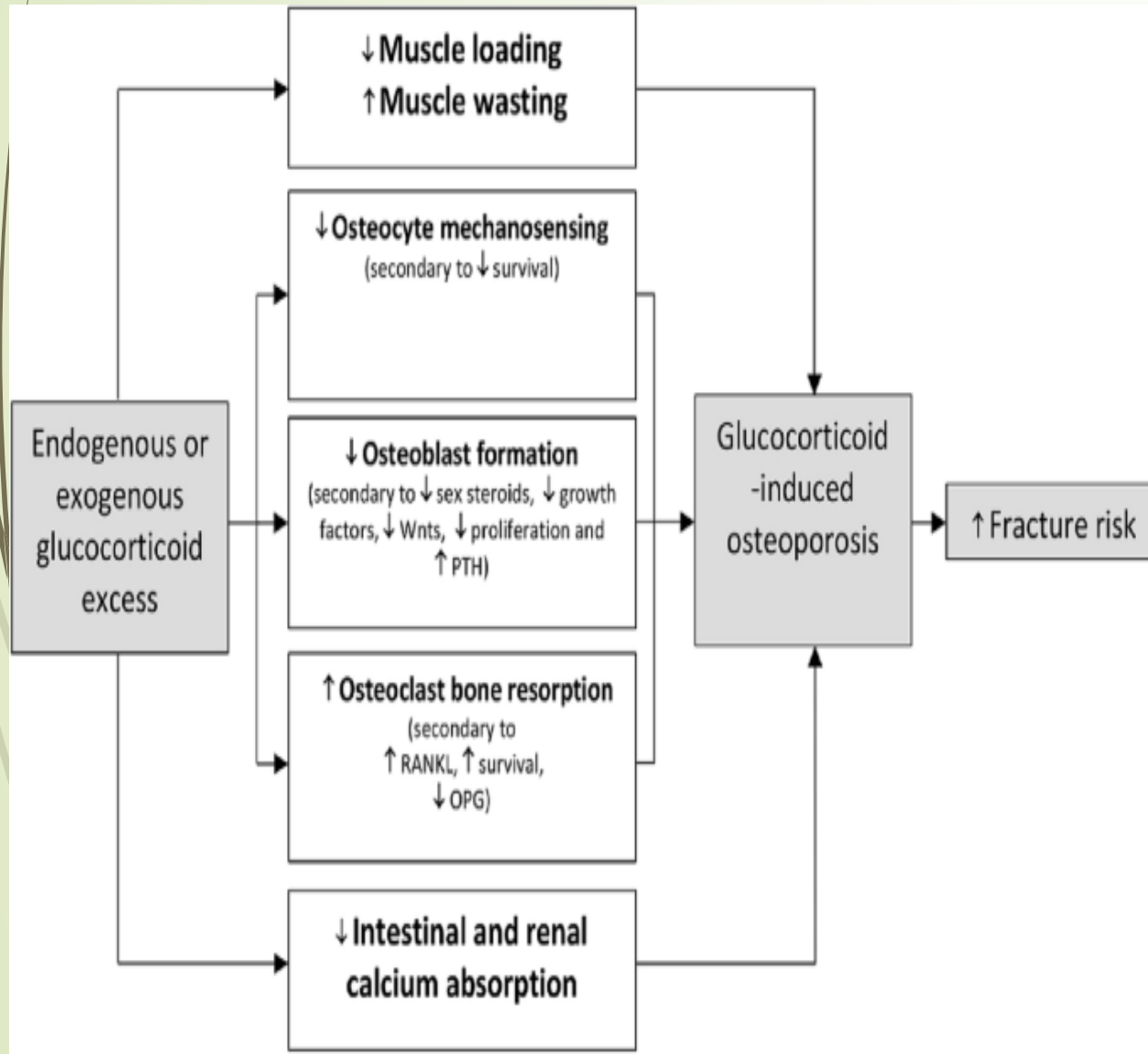
- Worldwide the prevalence of osteoporosis is increasing.
- With rapid ageing of population and lifestyle style changes incidence of osteoporosis is increasing.

Risk factor

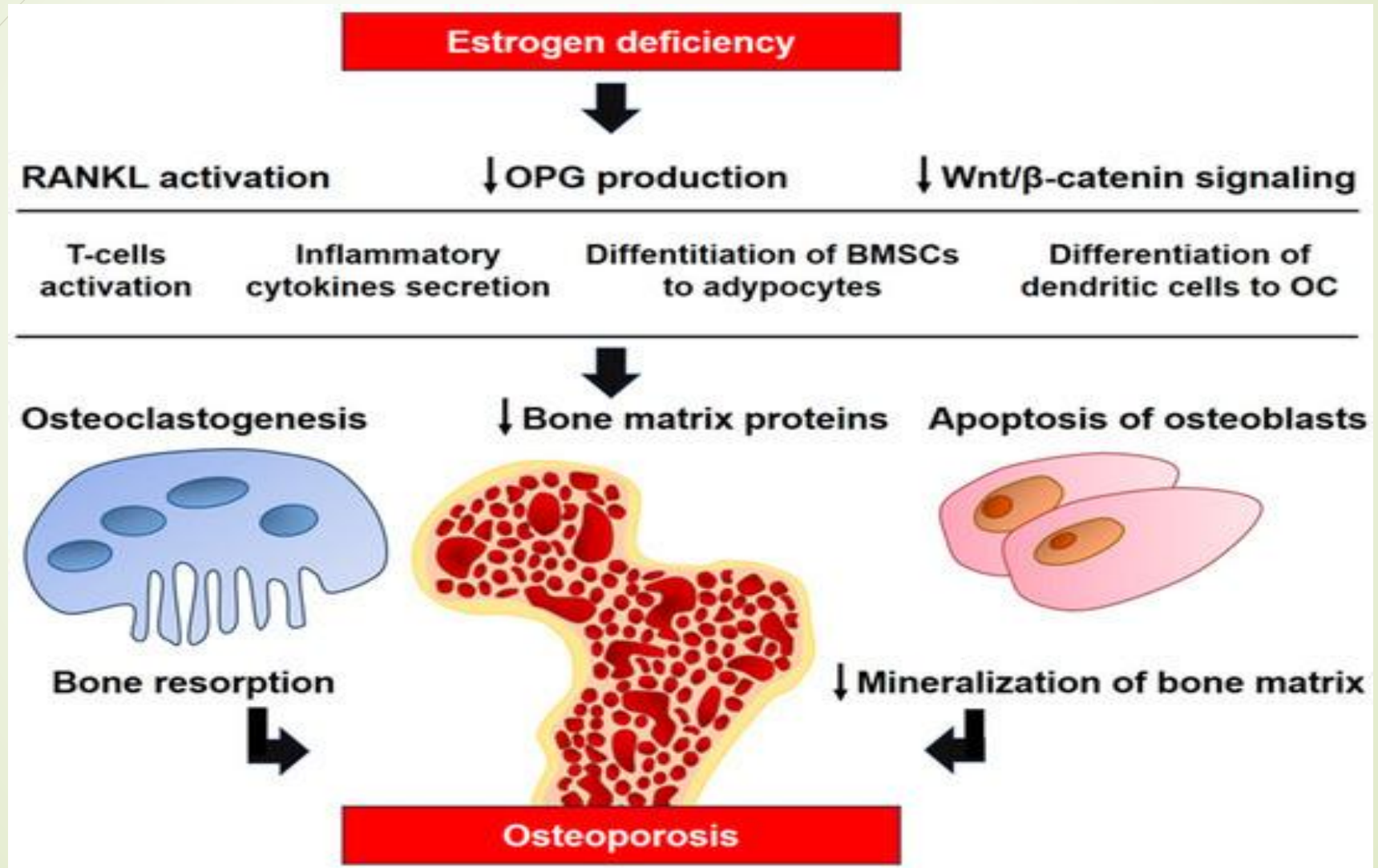
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Pathophysiology



Pathophysiology



Clinical features

Symptoms of Osteoporosis



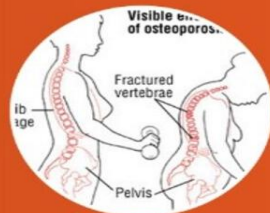
Back Pain

Caused by a fractured or collapsed vertebra.



Stooped Posture

A forward bending of the spine.



Loss of Height

Over time, people may lose height due to vertebral compression.



Bone Fractures

Occurring more easily than expected, especially in the hip, wrist, or spine.

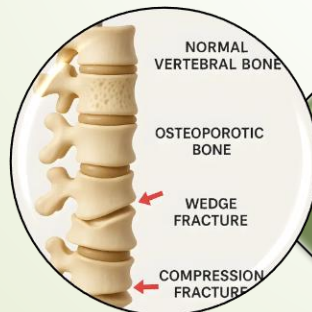
Risk assessment



Post menopausal women
and men ≥ 50 years



Longterm glucocorticoid
therapy (>7.5 mg daily
for 3 months)



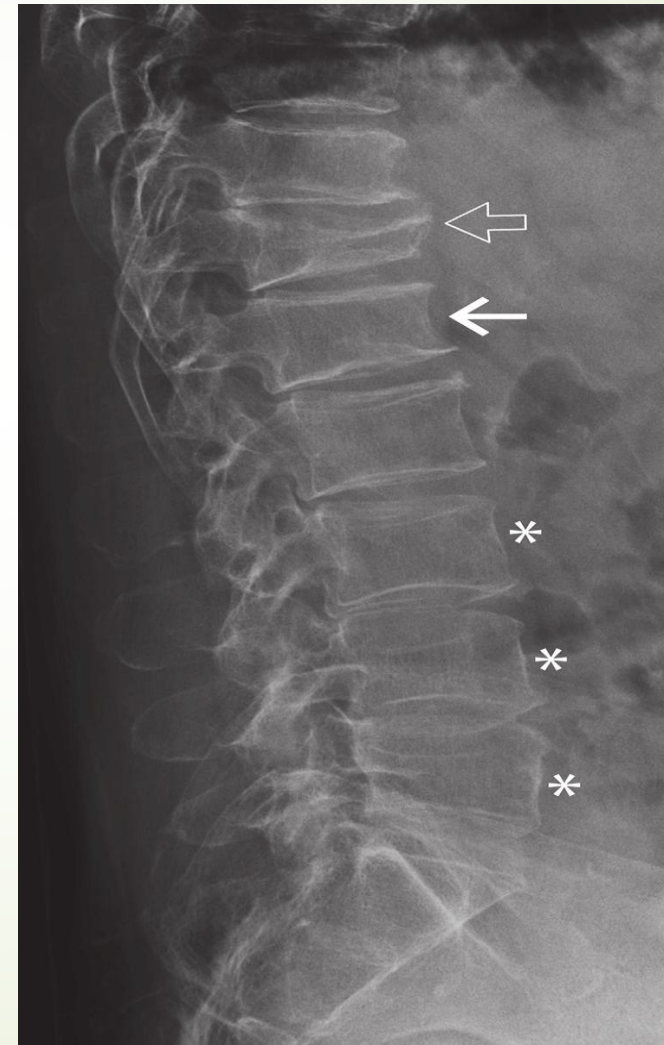
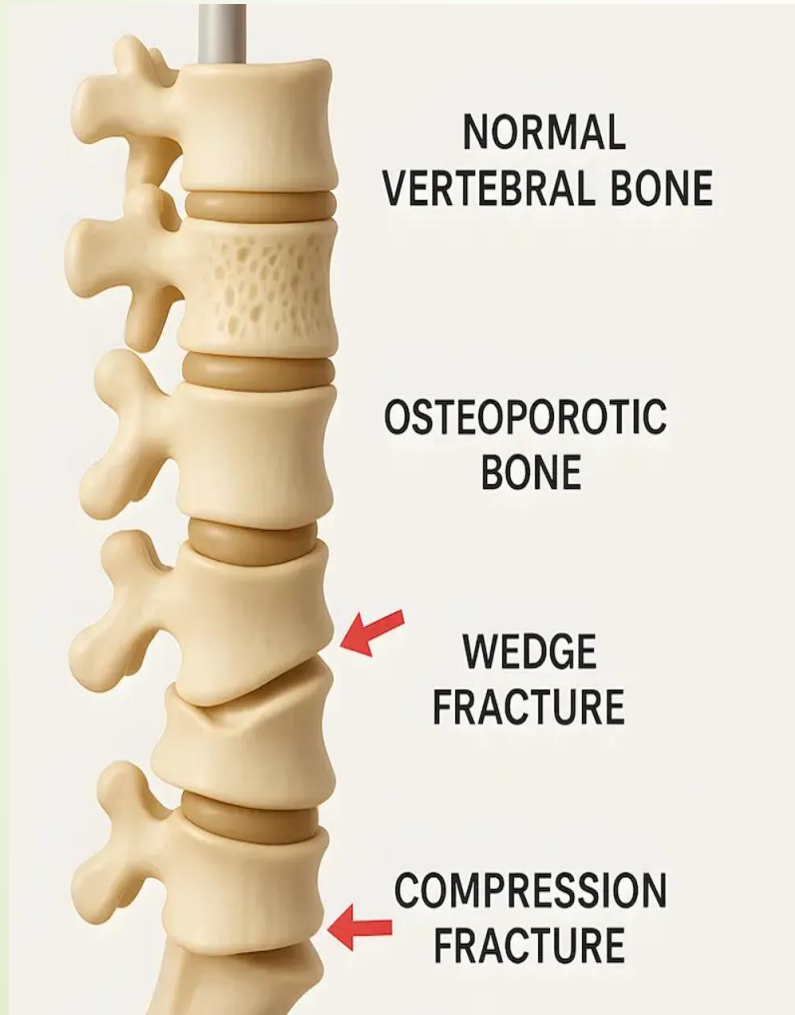
History of fractures and
condition affecting bone
health (RA, Hyperthyroidism)

Diagnostic testing

- DEXA scan: to measure mineral density of bone.
- T score interpretation:
 - ≥ 1.0 - Normal
 - 1 to -2.5 = Osteopenia
 - ≤ -2.5 = Osteoporosis

Additional test: S. calcium, Vit-D level, thyroid function, Renal /liver function test to rule out secondary causes.

X-ray of lumbosacral spine



Management

- Lifestyle modifications:
- Adequate Calcium and vitamin D intake:
Calcium: **1200mg/day**
vitamin D: **800-1000IU/day**
- Regular weight bearing and resistance exercise
- Smoking cessation and limit alcohol intake
- Fall prevention strategies in older adults.

Pharmacological management

T-score \leq 2.5

H/O
fragility
fracture

High fracture risk

Glucocorticoid
use \geq 7.5 mg/day for
3 months or more

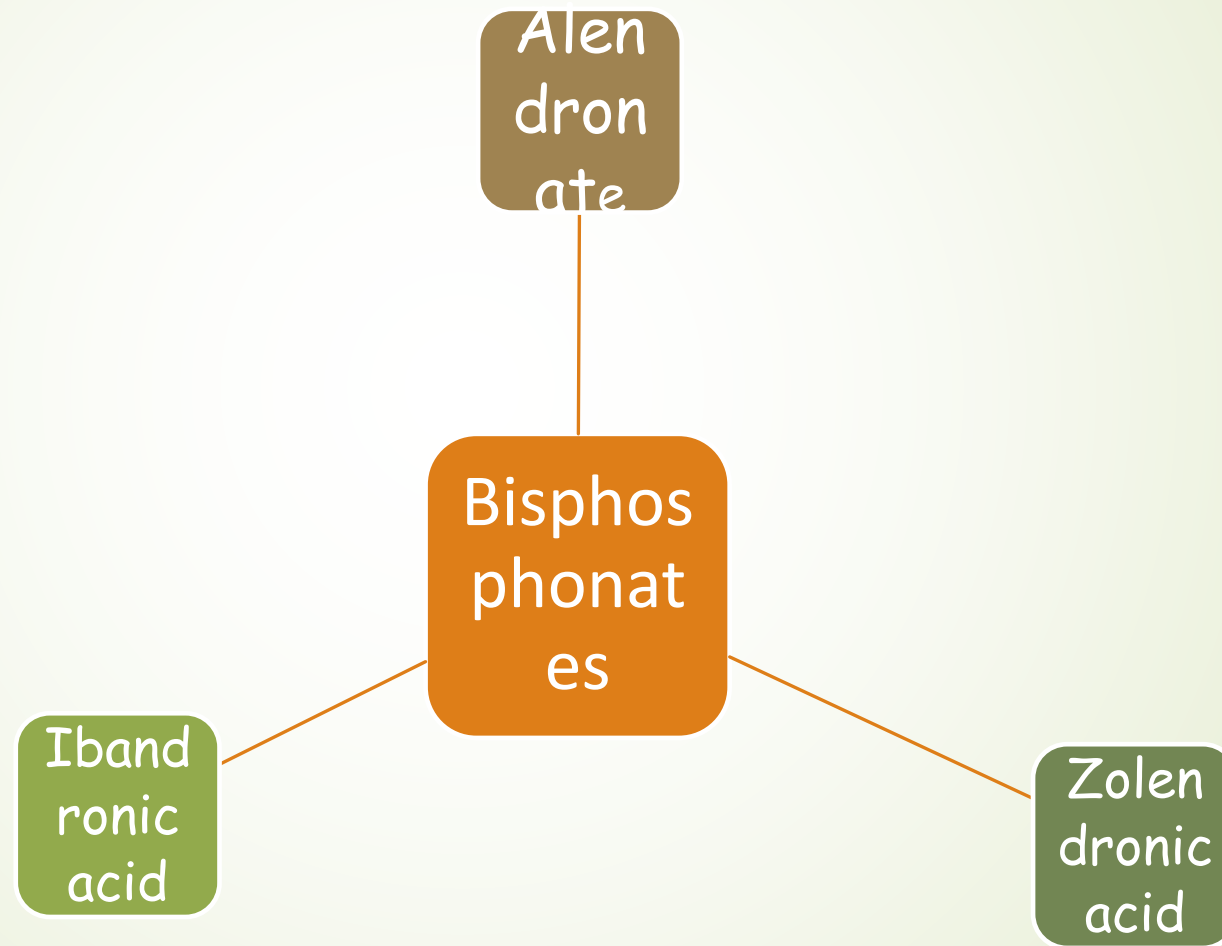
Stepwise management

First line
Bisphosphonate

Second line
RANKL
inhibitor
(DENOSUMAB)

Third line
SERMs
PTH
analogue
Monoclonal
antibody

Bisphosphonate



Formulations



Oral formulation (Alendronate, Risedronate and Ibandronate)

- Take full glass of water on an empty stomach and remain upright position for 30-60 mins

IV formulation (Zoledronic acid, Once yearly)
(Ibandronate, Every 3 monthly)

Bisphosphonate con't

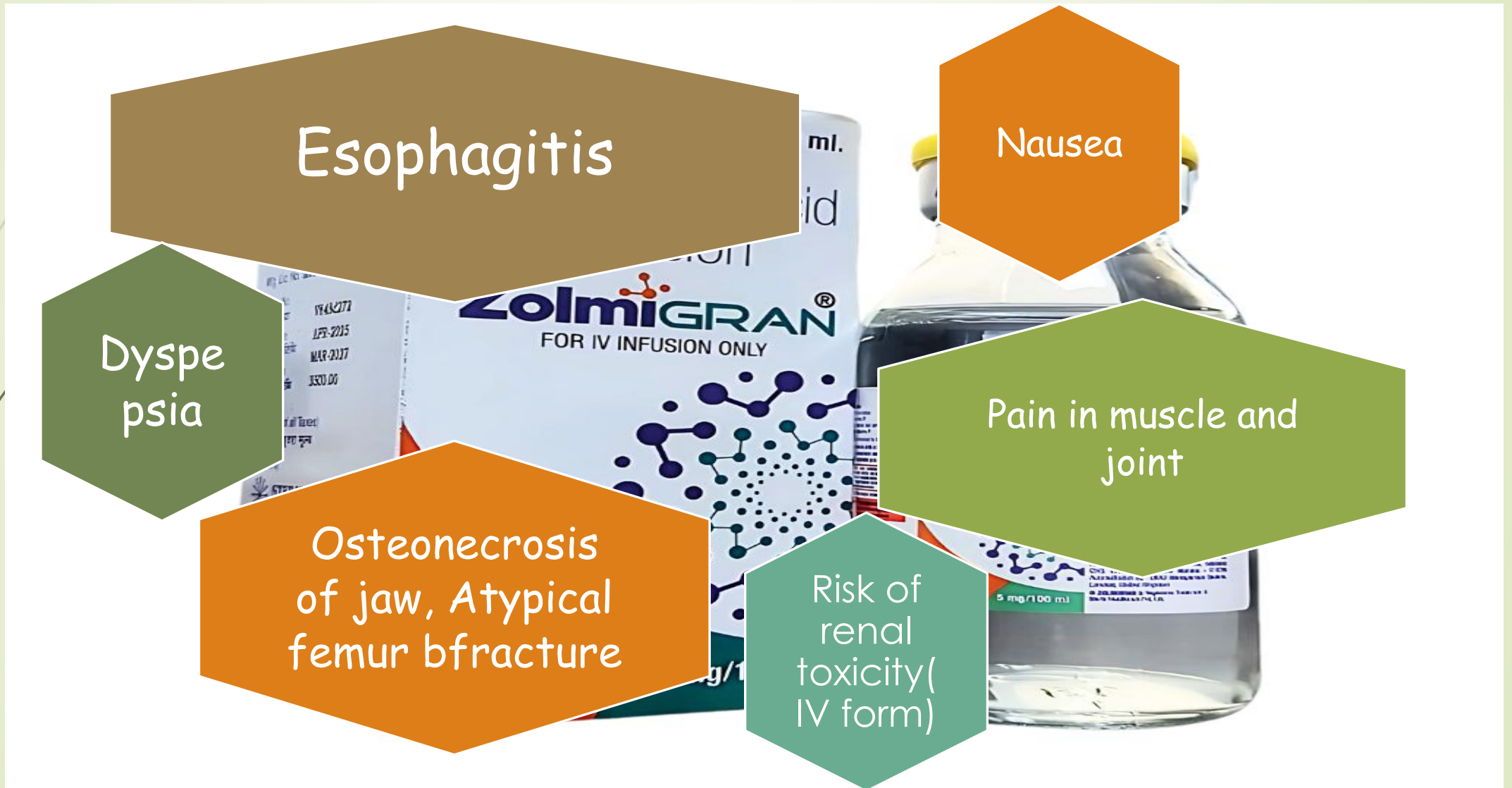
➔ Mechanism of action: Inhibition of **Osteoclast** mediated bone resorption.

➔ Use:

1. First line treatment of **osteoporosis** in postmenopausal women
2. **Glucocorticoid induced** osteoporosis
3. **Paget's disease** of bone
4. **Hypercalcaemia** of malignancy



Adverse effect



Contraindications

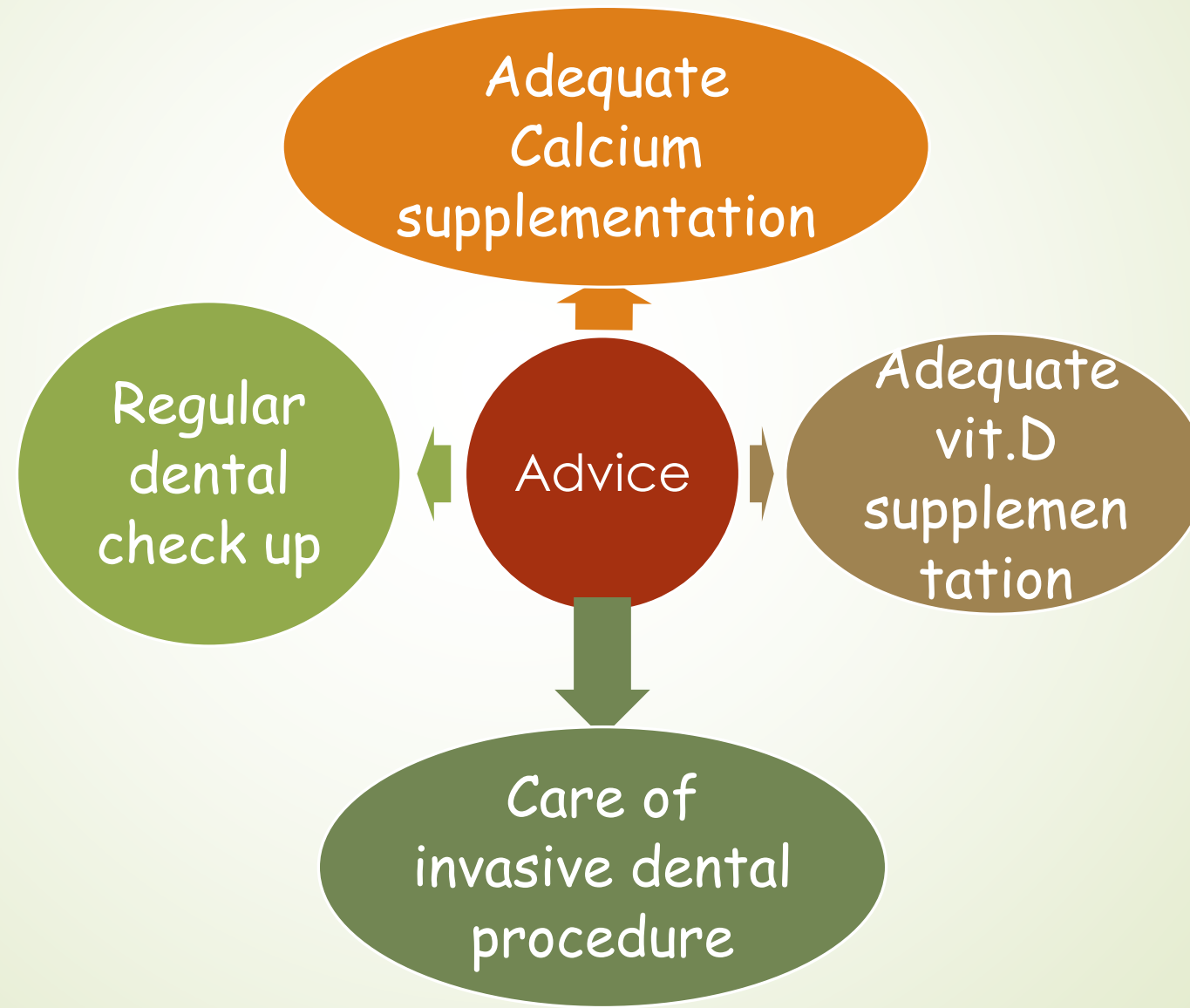
Esophageal disorders(
Stricture,
Achalasia)

Hypocalc
aemia

Severe renal
impairment(eG
FR \leq 30-
35ml/min)



Specific advice for bisphosphonates



Denosumab (The RANK ligand inhibitor)



- Indication:
- When bisphosphonates are contraindicated and adverse effects develops.
- Postmenopausal women having risk of fracture
- Glucocorticoids induced osteoporosis
- Bone loss due to Prostate cancer or aromatase inhibitor in breast cancer

Denosumab Side effects



Hypocalcaemia

Dermatitis

Musculoskeletal
pain

Osteonecrosis
of jaw

Atypical femur
fracture

Contraindications

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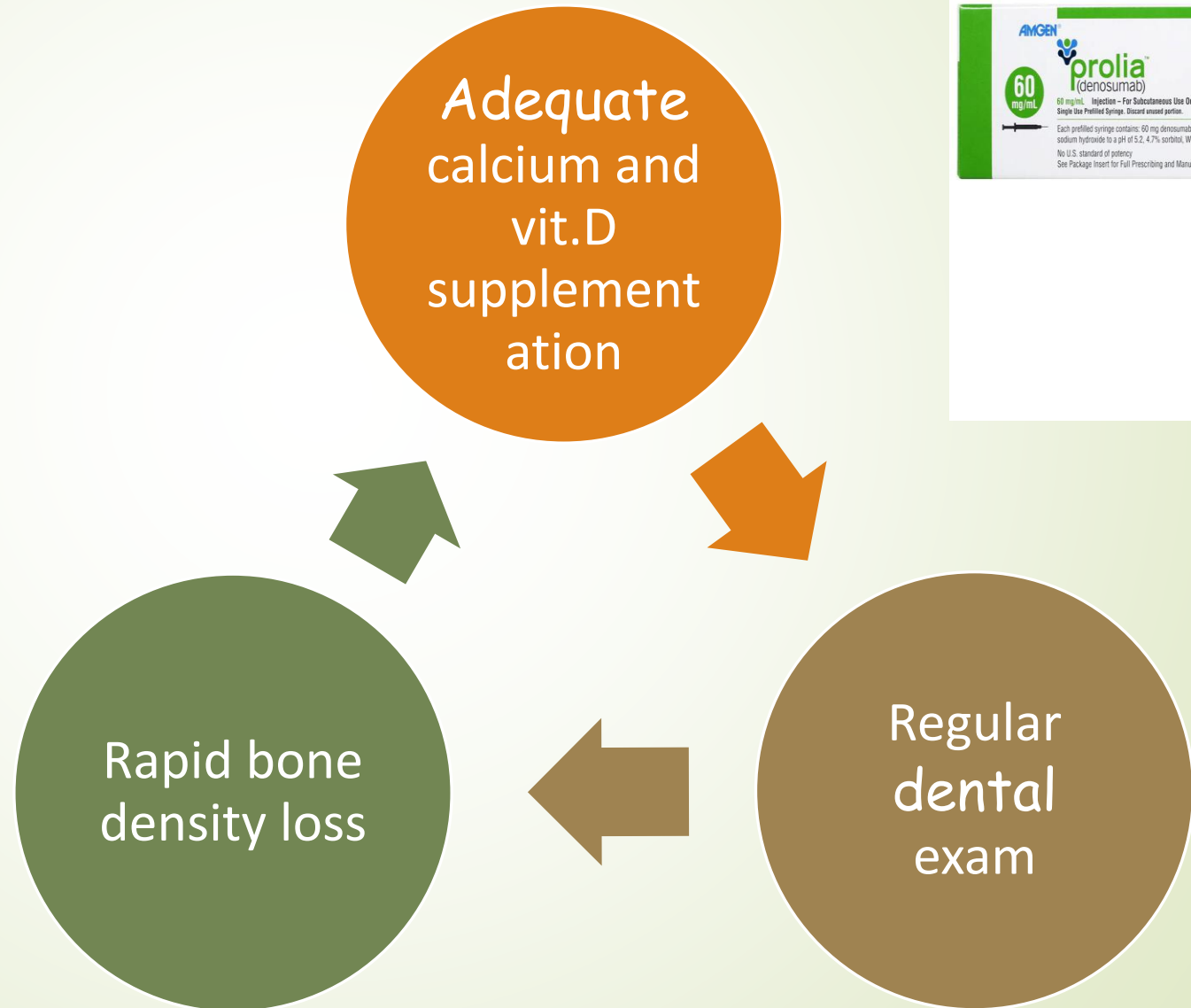
Hypocalcaemia

- **Must** correct hypocalcemia first then start treatment

Hypersensitivity reaction

- **Measure** if develops

Precaution



Selective estrogen receptor modulators(SERM)

- ➔ Raloxifene(60 mg/day, orally, once daily)
- ➔ Bazedoxifene
- ➔ Mechanism: SERMs acts as estrogen agonist on bone, reducing osteoclast activity and bone resorption



Indication



- Postmenopausal osteoporosis
- Breast cancer prevention

Side effects



- Hot Flush
- Leg cramps
- Increased risk of venous thromboembolism
- Increase risk of stroke

Specific notes for SERMs

- They are most effective against vertebral fracture prevention and used in women who are at risk for both osteoporosis and breast cancer
- They are not used as first line therapy but may suitable who are unable to tolerate others therapy or who are risk of breast cancer



Teriparatide(rPTH hormone)



- Mechanism: stimulates osteoblastic activity, leading to increase bone formation
- Indication: Severe osteoporosis
Glucocorticoid induced osteoporosis

S/C administration

Dose: S/C 20 mg daily for up to 2 years

Side effects of Teriparatide



Hypercalcaemia and hypercalciuria

Orthostatic hypotension

Nausea, Leg cramp

Osteosarcoma

Specific notes for Teriparatide



- Duration limited to 24 months due to potential osteosarcoma risk
- After 24 months, start with antiresorptive therapy (Bisphosphonates)
- Monitor calcium level periodically, especially in patients with renal failure

Romosozumab(monoclonal antibody)

- **Mechanism:** It is a monoclonal antibody that inhibit sclerostin, a protein that inhibits bone formation.
- Thus, inhibiting sclerostin, Romosozumab **increase bone formation** and reduces bone resorption.

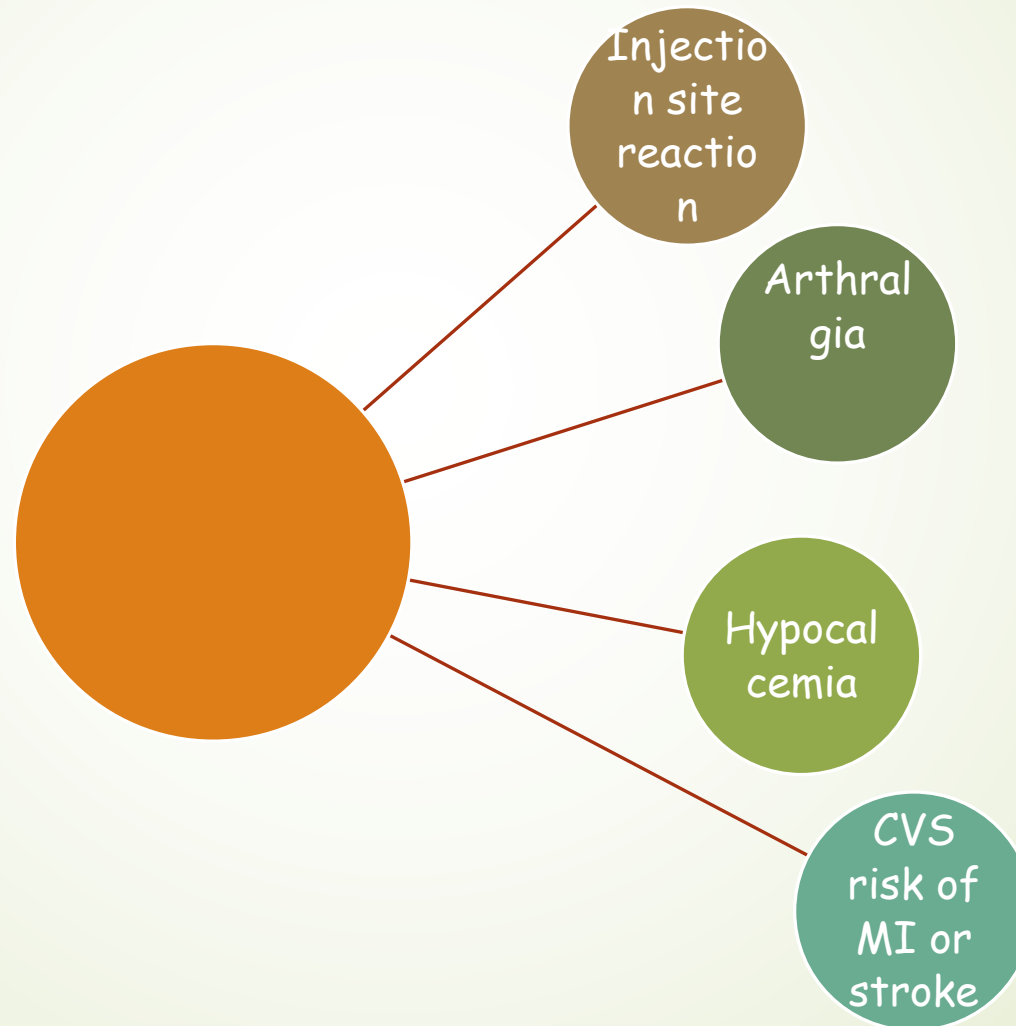


Romosozumab con't

- **Indication:** Severe osteoporosis in postmenopausal women who have risk of fracture, especially those who fail and can not tolerate other treatments
- **Route of administration:** S/C (210 mg) once daily for 12 months.



Romosozumab con't



Specific notes Romosozumab

Treatment is limited for 12 months, excess use decrease efficacy

Follow up with antiresorptive therapy after discontinuation

Adequate supplementation of calcium and vit.D to mitigate hypocalcemia risk

Surgery

- Arthroplasty and internal fixation
- Vertebroplasty
- Hip replacement
- Knee replacement
- Joint replacement



Future drugs development

- NELL-1 based therapy
- Cathepsin K inhibitors
- CCN3
- Denosumab biosimilars



WORLD
OSTEOPOROSIS
DAY, OCTOBER 20

THEME:
"Step Up For Bone Health"



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DAY



Keynote message

