

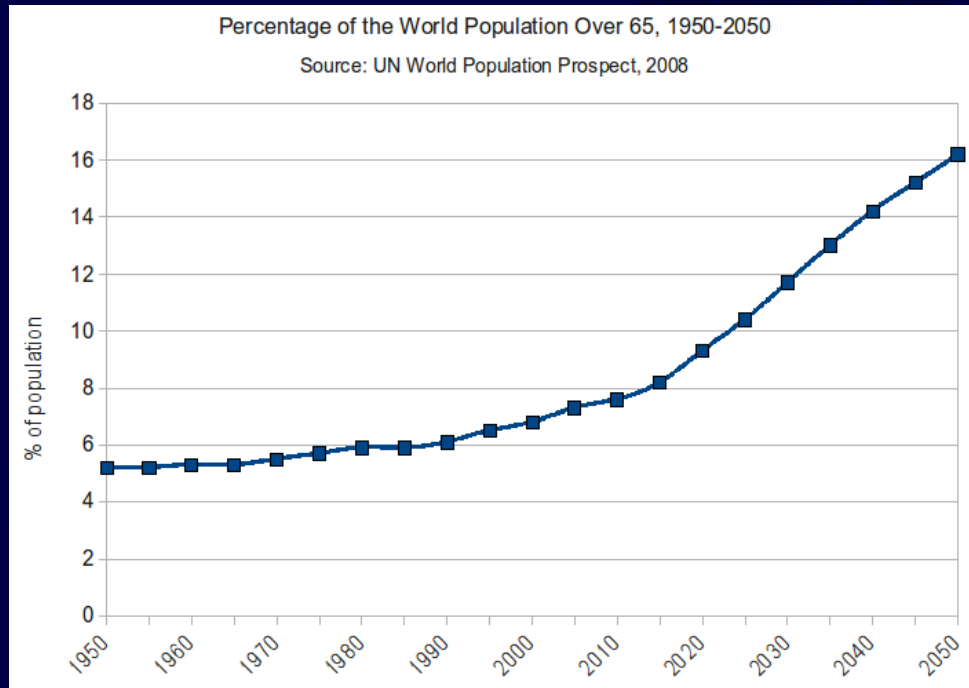
Epidemiology, Diagnosis, Prevention and Management of Osteoporotic Fractures

**Hassan R. Mir, MD, MBA, FACS
Associate Professor**

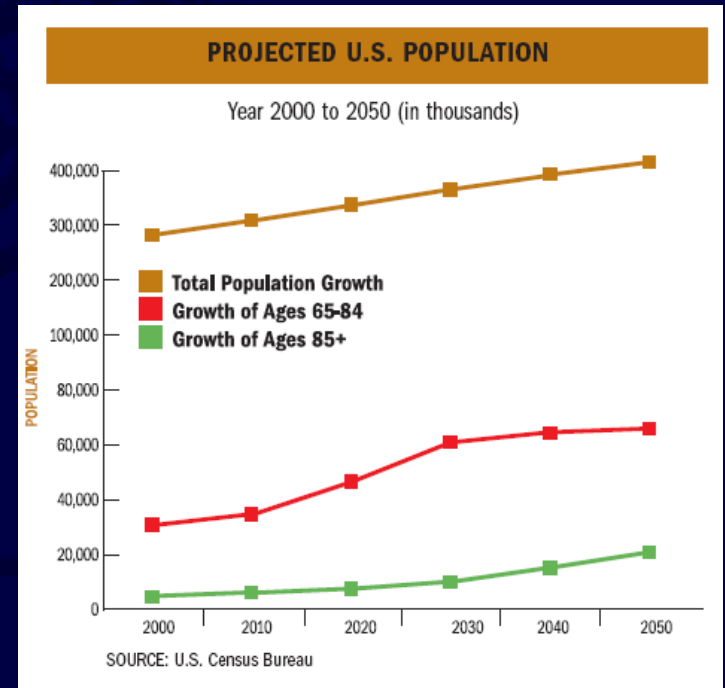
**Created March 2004; Kenneth Egol, MD
Revised February 2010; Revised May 2015**

Demographics

- Population is Aging



WORLD



USA

Initial Evaluation

- Thorough H&P
- Focus on:
 - PMH
 - Meds
 - PSH and Response
 - DNR / DNI
- Functional Status Pre-Op
- Social History



Co-Morbid Conditions

- Cardiac, Pulmonary
- Diabetes
 - Wound Infection, Delayed Healing
- PVD
- Decubitus Ulcers
 - Infection Risk
- Nutrition



Initial Evaluation

- Physical Examination
 - Skin/Soft Tissues
 - Vascularity
- Labs, CXR, EKG
- Films – Bone Quality
- Consent – Competent?
- Goals of Care



Treatment Goals

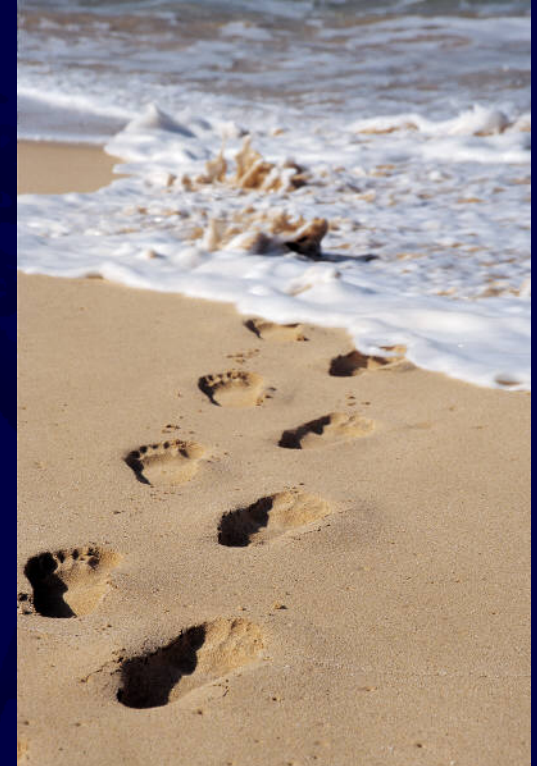
- Restore Pre-Injury Level of Function
- Social Assistance Post-op



Non-Operative Care?

Consider when:

- Moribund/Terminal Patient
- Refusal of Consent
- Futility of Surgery
- Patient Would Not Survive Procedure

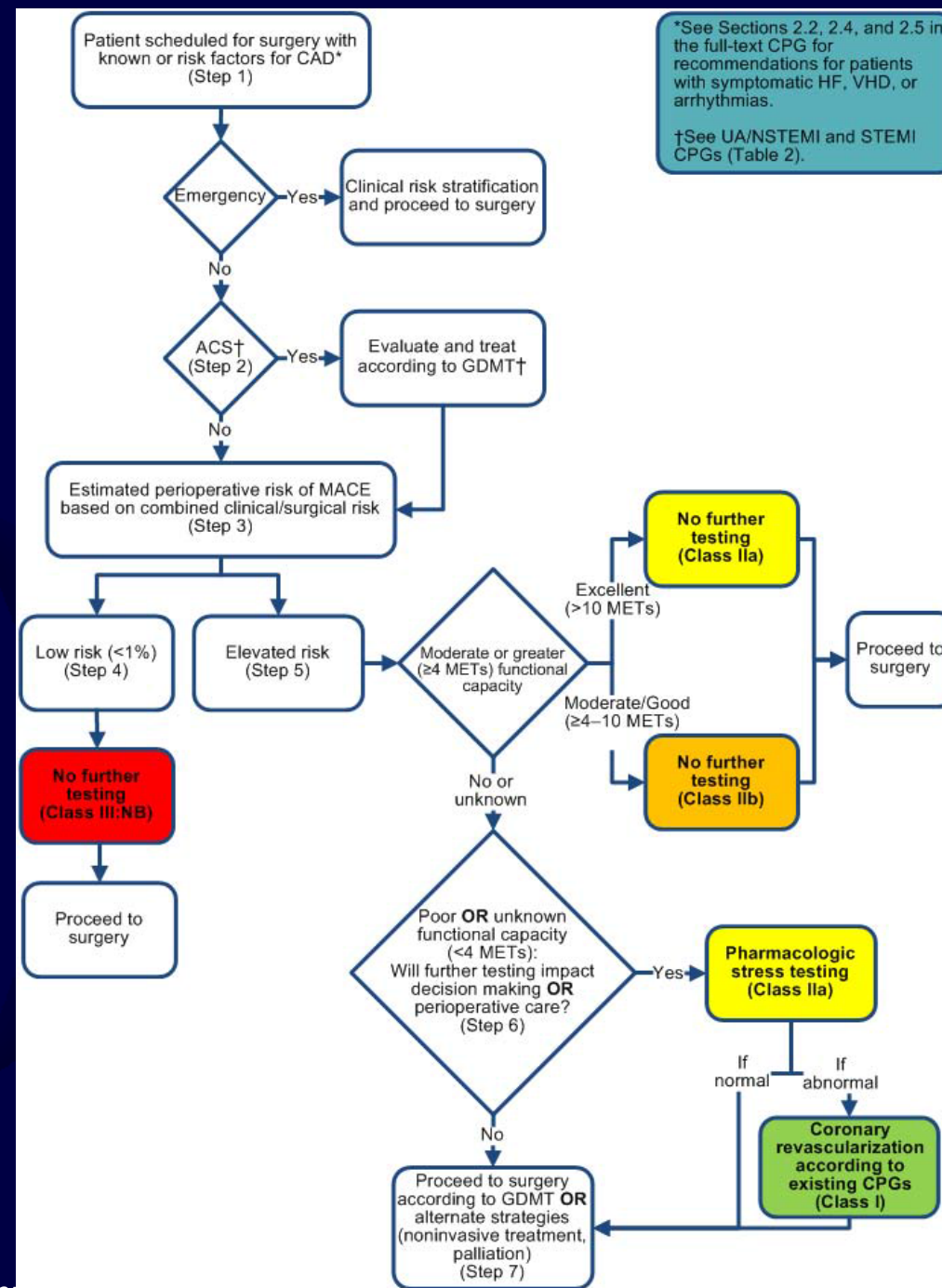


Medical Clearance

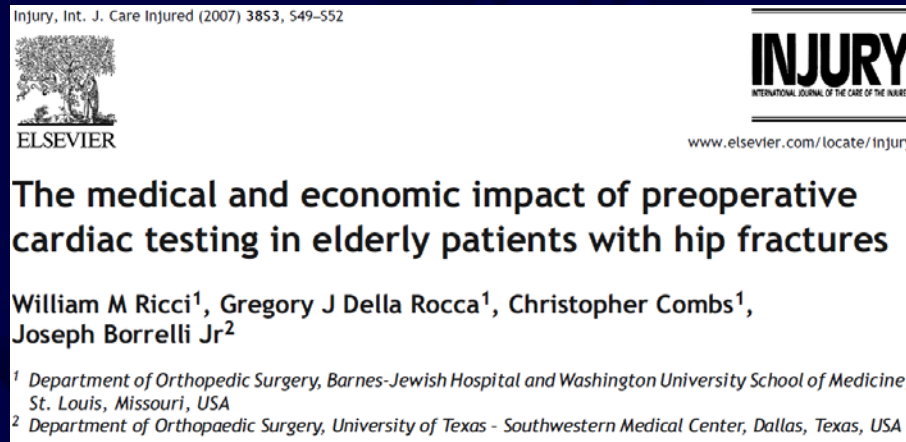
- Based on Stability
- Patient Optimized
- Testing Required?
- Perioperative Care
- Type of Anesthesia



Fleisher LA, et al. 2014 ACC/AHA Perioperative Guideline



Cardiac Testing



- 253 Patients
 - 35 (15%) had Preop Cardiac Testing
 - Stress Thallium or Echo
 - Testing Due to New Dx (EKG, CHF) in 16 Patients

Cardiac Testing

- Conclusions
 - Preop Cardiac Testing
 - In 48% Did Not Lead to New Medical Tx.
 - In 52%, Recommendations were only made for Medical Management of Previously Known Cardiac Disease.
 - No changes in Perioperative Orthopaedic or Medical Management
 - Significant Delay to Surgery. (3.3 vs 1.9 days, $p < 0.001$)
- Extrapolated to 250,000 US Annual Hip Fxs
 - Preop Cardiac Testing of 15% Would Cost nearly \$47,000,000 annually.

ASA Classification

Physical Status	Description
1	Normal healthy patient
2	Patient with mild systemic disease
3	Patient with severe systemic disease that is limiting but not incapacitating
4	Patient with incapacitating disease which is a constant threat to life
5	Moribund patient not expected to live more than 24 hours
6	A declared brain-dead patient whose organs are being removed for donor purposes
*Add E for emergency procedures	

ASA Score

The Journal of Arthroplasty Vol. 25 No. 6 Suppl. 1 2010

American Society of Anesthesiologist Physical Status Score May Be Used as a Comorbidity Index in Hip Fracture Surgery

Kristian Bjorgul, MD, PhD,*† Wendy M. Novicoff, PhD,* and
Khaled J. Saleh, MD, MSc, FRCS (C)‡

- ASA →
Survival
 - Class 1 – 8.5y
 - Class 2 – 5.6y
 - Class 3 – 3.5y
 - Class 4 – 1.6y

ASA Score

ORIGINAL ARTICLE

OTA HIGHLIGHT PAPER

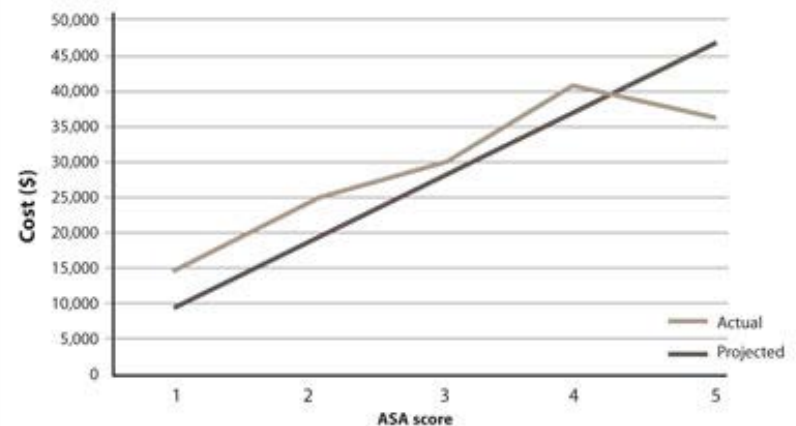
Patient Variables Which May Predict Length of Stay and Hospital Costs in Elderly Patients With Hip Fracture

Anna E. Garcia, BSPH, J. V. Bonnaig, BS,† Zachary T. Yoneda, BS,* Justin E. Richards, MD,‡
Jesse M. Ehrenfeld, MD, MPH,‡ William T. Obrensky, MD, MPH,‡ A. Alex Jahangir, MD,‡
and Manish K. Sethi, MD‡*

J Orthop Trauma • Volume 26, Number 11, November 2012

- ASA → LOS
– ↑ 1 ASA ↑ 2.053 Days
- ASA → Cost
– ↑ 1 ASA ↑ \$9300

Actual and projected cost vs. ASA score



*Projected cost assumes a female patient, without comorbid conditions other than ASA classification, in a non-elective case.

Source: Sethi MK.

Patients on Anticoagulation

- **ASA/Plavix**
 - Ok to Operate with No Delay

ORIGINAL ARTICLE

J Orthop Trauma • Volume 24, Number 6, June 2010

The Use of Clopidogrel (Plavix) in Patients Undergoing Nonelective Orthopaedic Surgery

Jason A. Nydick, DO,* Eric D. Farrell, MD,† Andrew J. Marcantonio, DO,‡ Eric L. Hume, MD,† Robert Marburger, RN,† and Robert F. Ostrum, MD†



■ ASPECTS OF CURRENT MANAGEMENT

A review of the use of common antiplatelet agents in orthopaedic practice

J Bone Joint Surg [Br]
2010;92-B:1186-91.

P. F. Dineen,
R. J. Curtin,
J. A. Harty

From Cork
University Hospital,
Wilton, Cork,
Republic of Ireland

Antiplatelet agents are widely prescribed for the primary and secondary prevention of cardiovascular events. A common clinical problem facing orthopaedic and trauma surgeons is how to manage patients receiving these agents who require surgery, either electively or following trauma. The dilemma is to balance the risk of increased blood loss if the antiplatelet agents are continued peri-operatively against the risk of coronary artery/stent thrombosis and/or other vascular event if the drugs are stopped. The traditional approach of stopping these medications up to two weeks before surgery appears to pose significant danger to patients and may require review.

This paper covers the important aspects regarding the two most commonly prescribed antiplatelet agents, aspirin and clopidogrel.

Patients on Anticoagulation

- **Coumadin**
 - IV Vit K vs FFP
 - Depends on Comorbidities and Response
 - May need bridging with LMWH



Patients on Anticoagulation

- **Direct Thrombin Inhibitor**
 - Dabigatran
- **Factor Xa Inhibitors**
 - Rivaroxaban
 - Apixaban
- **Difficult to Monitor/Reverse**
 - Currents Tests are Surrogates Only
 - No Antidotes
 - Highly Variable Strategies
 - Currently Wait Out (48-72 Hrs) if not Emergent

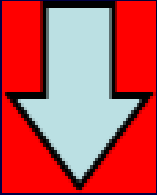


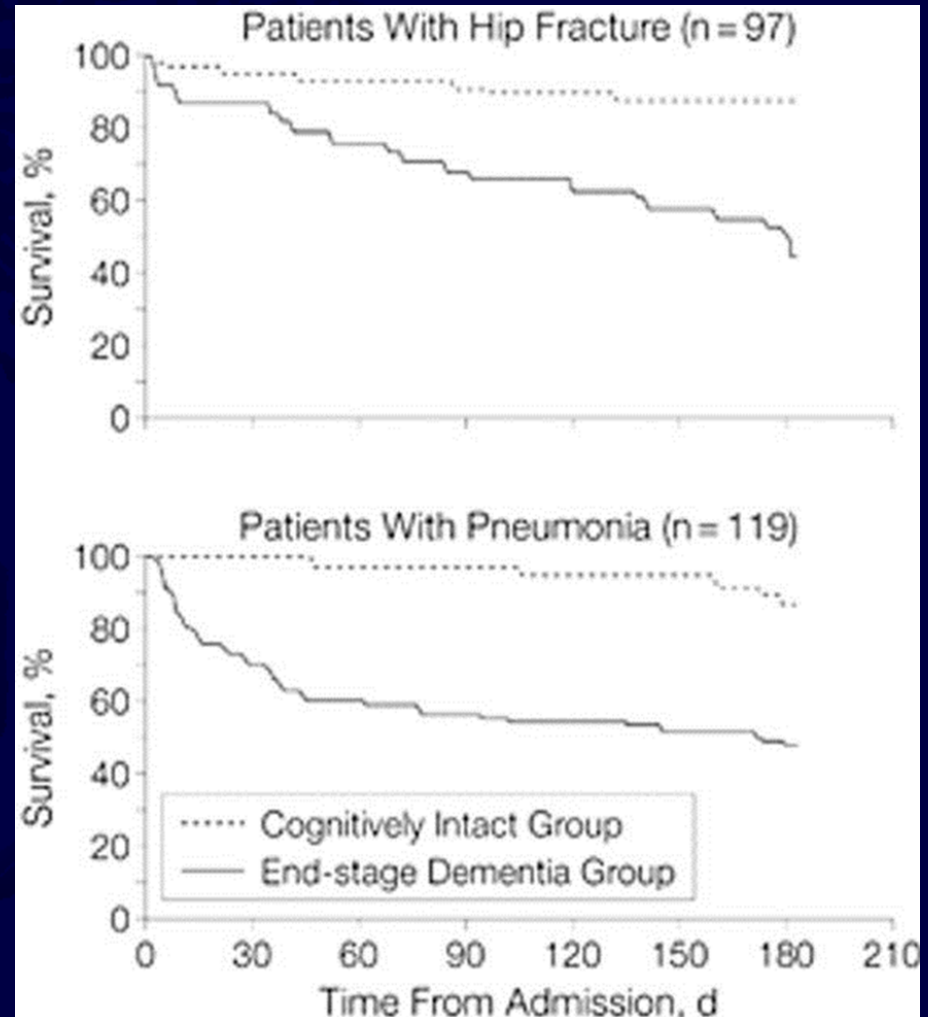
Cognitive Function

- **Dementia**
 - Afflicts > 5 million Americans
 - Most secondary to AD followed by Multi-Infarct
- **Prevalence**
 - 60-65 years ~ 1/100
 - >90 years ~ 50/100
- **Ability to Consent, Rehab, Comply**
- **Fall Risk**



Clinical Ramifications of Cognitive Decline

- Higher Incidence of Delirium
- 
- Higher Mortality and Morbidity



Morrison: JAMA July 5, 2000

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Osteoporosis - Scope of the Problem

- 50% Caucasian Women will Fracture
- Most Serious Outcome - Hip Fracture
- 10-20% Excess Mortality at 1 year
- 25% Long Term NH Care
- Only 1/3 Regain Independence
- Psychological and Social Issues
- ↓ Quality of Life

Definitions

- **Insufficiency Fracture**

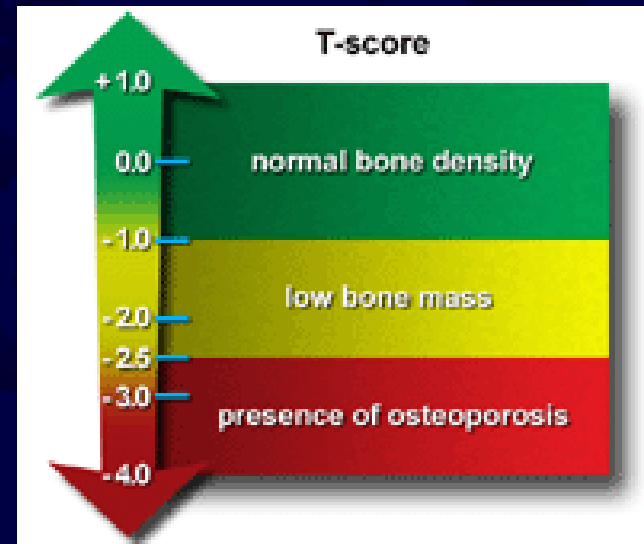
Bone Fails with Normal WB

- **Fragility Fracture**

Fall from a Standing Height or Less

Diagnosis - **DEXA BMD**

- Relationship (SD) to Norms
- **T-Score** - Reference Standard
 - Comparison to “young normal” adult same sex
- Z-Score
 - Comparison to age matched adult same sex



Orthopaedic Diagnosis - Osteoporosis

- **Clinical Presentation**
 - Presence of Insufficiency or Fragility Fracture
- **Bone Mineral Density (BMD)**
 - 2.5 SD Below the Young Adult Average Value (T)

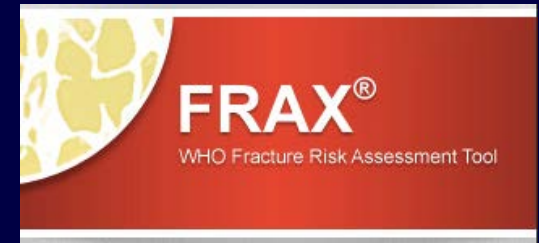


Further Diagnosis - Osteoporosis

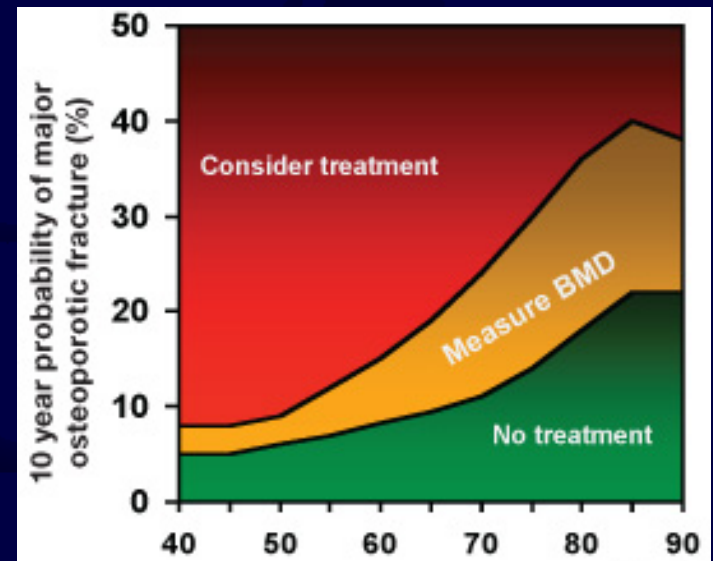
- **Labs Can Help R/O Secondary Causes**
 - CMP, Serum Thyrotropin, Protein Electrophoresis, PTH, Vitamin D, Urine Calcium, Cortisol
- Clinical Utility of Biochemical Markers still Not Proven



FRAX



- Developed by WHO
 - Incorporates Risk Factors + BMD
 - Age, Sex, Ht, Wt, Family Hx, Previous Fx, Steroids, Smoking, EtOH, Secondary Causes, RA
- 10-yr Fracture Risk (%)
 - Hip
 - Other Major Fracture
- Online Tool



Pathophysiology - Osteoporosis

- Imbalance in Removal/Replacement of Ca
- Not an Organic Matrix or Mineralization Defect
- Loss of Trabecular Plates, Cortical Thinning
- Structural Weakening

“Mechanical Problem”

Surgical Issues - Osteoporosis

- Difficult Fracture Fixation
 - Poor Screw Purchase
 - Excessive Bowing (Distal Nail Penetration)
- Immobilization or Minimal WE → Bone Loss
- Autogenous Bone Graft Not as Useful



Surgical Timing

Injury, Int. J. Care Injured 40 (2009) 692–697



Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury



Review

Timing of surgery for hip fractures: A systematic review of 52 published studies involving 291,413 patients

Sameer K. Khan *, Sanjay Kalra, Anil Khanna, Madhan M. Thiruvengada, Martyn J. Parker

Department of Trauma & Orthopaedics, Peterborough and Stamford Hospital NHS Foundation Trust, United Kingdom

- Conflicting Results Regarding M/M being Increased or Unaffected by Delaying Surgery
- Early Surgery **<48 Hrs** Reduces Hospital Stay
 - May also Reduce Complications and Mortality

Surgical Timing

Clin Orthop Relat Res (2011) 469:1188–1196

DOI 10.1007/s11999-010-1530-2

CLINICAL RESEARCH

Mortality After Distal Femur Fractures in Elderly Patients

**Philipp N. Streubel MD, William M. Ricci MD,
Ambrose Wong BS, Michael J. Gardner MD**

- 92 Patients
- Delay Greater than 4 days Increases the 6-month and 1-year Mortality Risks versus <48 Hours to Surgery

Surgical Timing

Eur J Trauma Emerg Surg (2011) 37:539–548
DOI 10.1007/s00068-011-0137-y

REVIEW ARTICLE

Polytrauma in the elderly: specific considerations and current concepts of management

R. Dimitriou · G. M. Calori · P. V. Giannoudis

- **Different Story in Polytrauma**
 - Elderly Patient with 3 or More Comorbid Conditions have a Worse Survival Rate if Treated within 24 Hrs
 - Need to **Individualize** Treatment Plan
 - Pre-Existing Activity, Disease, Reserve, Injuries

High Energy Trauma

- 6 x Greater Mortality for Elderly Polytrauma
- >65 yo Patient has 50% Mortality with ISS>20
- 24 - 44yo Patient has 50% Mortality with ISS>40



Choice of Anesthesia

Osteoporos Int (2010) 21 (Suppl 4):S555–S572

DOI 10.1007/s00198-010-1399-7

REVIEW

Neuroaxial versus general anaesthesia in geriatric patients for hip fracture surgery: does it matter?

T. J. Luger • C. Kammerlander • M. Gosch •
M. F. Luger • U. Kammerlander-Knauer • T. Roth •
J. Kreutziger

- Literature Search of Pubmed and Cochrane (1967-2010)
- 56 references, covering 18,715 patients with hip fracture

Choice of Anesthesia

- Conclusions:
 - **Spinal Anesthesia**
 - Significantly Reduced Early Mortality, Fewer DVT, Less Acute Postop Confusion, Fewer MI, Fewer Pneumonia, Fewer Fatal PE, Less Postop Hypoxia.
 - **General Anesthesia**
 - Less Hypotension, Fewer CVA
 - Data suggests that Regional Anesthesia is preferred, but the limited evidence does not permit definitive conclusion for mortality or other outcomes.

Surgical Treatment Principles

- Plan for Possible Future Surgeries
 - Incisions
 - Implants
- Reduction
 - Gentle
 - Indirect
 - Impaction - \uparrow Stability



Surgical Treatment Principles - Osteoporosis

- Fixation
 - Length
 - IM Nails, Long plates
 - Augmentation
 - Biologic Cements, Graft, Struts
 - Angular Stability
 - Locked screws with plates/nails
 - Arthroplasty
 - Shoulder, Elbow, Hip, Knee
- Allow WB if Possible



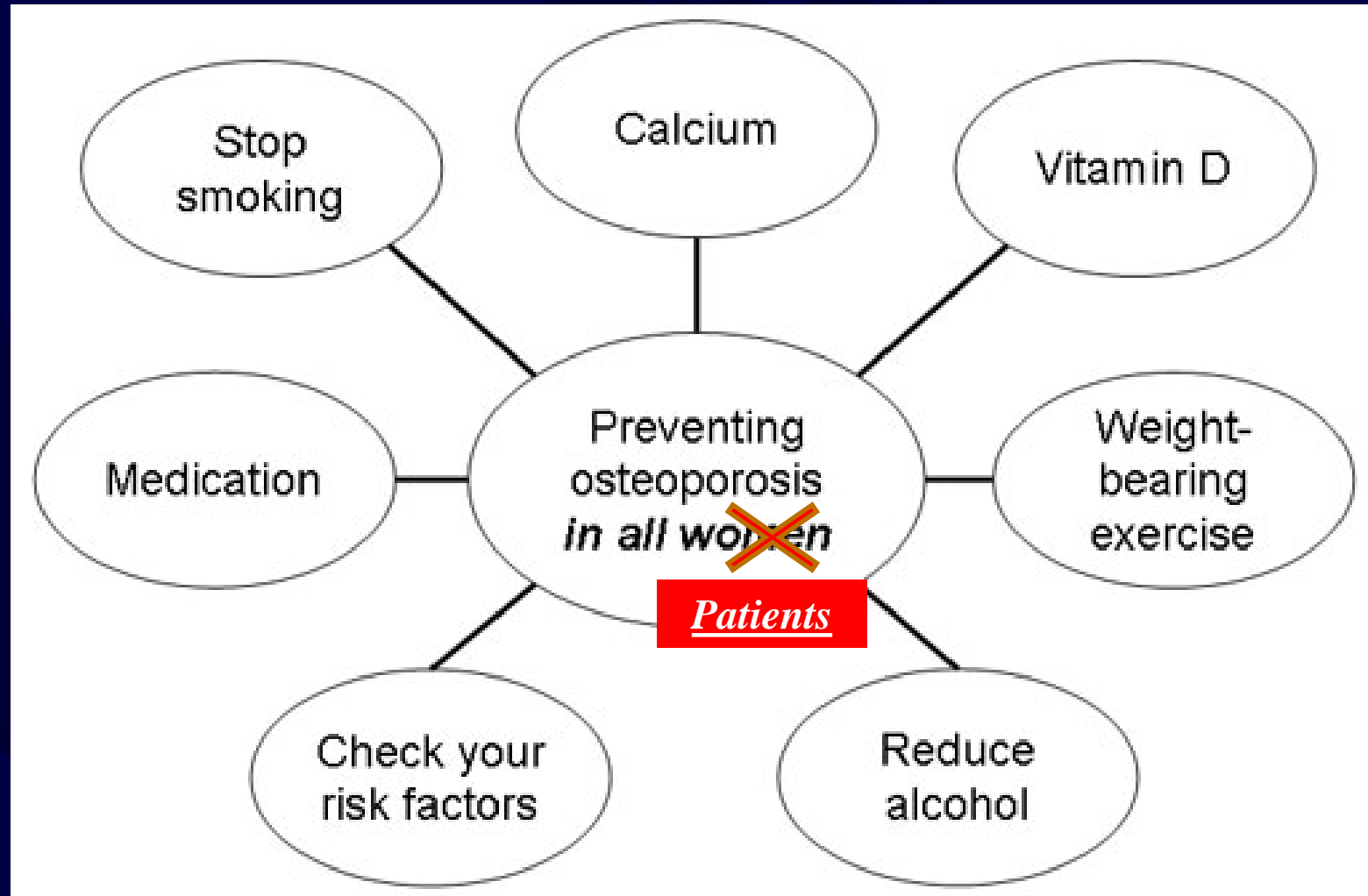
Recognition - Osteoporosis

- Ortho Often the First to See
- Assure All at Risk Patients Have F/U
- Develop a System in Your Hospital
 - Synthes Geriatric Program
 - AOA Own the Bone

Fractures Beget Fractures

- Risk of future fractures increases 1.5 - 9.5 fold following initial fracture
- History of fragility fracture is more predictive of future fracture than bone density

Treatment - Osteoporosis



Treatment - Osteoporosis

- Address Risk Factors
 - Avoid EtOH and Tob
- Ensure Nutrition
 - Ca (1200mg)
 - 600 mg po BID
 - Vitamin D (>1500 IU)
 - Other Nutrients
 - Magnesium
 - Silicon
 - Vitamin K
 - Boron



Exercise and Rehab

- Improve Strength, Endurance, Posture
- Maintain Bone Density
- Prevent Falls
- 30 Minutes Moderate Intensity Daily
- Post Fracture Rehab May Reduce Future Fracture



Fall Prevention

- Discuss with Family
 - Medications
 - Balance and Strength Training
 - Correct Vision
 - Walking Aids
- Fall Proofing the Home
 - Poor Lighting
 - Throw Rugs
 - Pets



Treatment - Osteoporosis

- Indication for Pharmacologic Intervention
 - T-score < -2.5 without other Risk Factors
 - T-score < -1.0 – 2.5 with other Risk Factors
 - Fragility Fx
 - FRAX Score Hip Fx 10-yr Risk >3%
 - FRAX Score Other Major Fx 10-yr Risk >20%



Pharmacological Therapy

- Anti-Resorptive Drugs
 - Hormonal Replacement Therapy:
Estrogen/Progestin
 - **Bisphosphonates:**
**Alendronate, Ibandronate,
Risendronate, Raloxifene, Zoledronic
Acid**
 - Selective Estrogen Receptor Modulators:
Raloxifene
 - Calcitonin
- Bone Forming Drugs
 - Teriparatide
 - Recombinant Parathyroid Hormone

Bisphosphonates

- Long T1/2
- Side-Effects
 - GI
 - Jaw Osteonecrosis (Rare)
- Atypical Fractures
 - Risk with Long term use
 - Assess Both femurs
 - Difficult to heal
- Must weigh risks of use against huge benefits of other Fx Prevention
 - Hip, wrist, spine



Conclusions

- Osteoporosis: ↑ Prevalence – Recognition is Key
- Need Effective Tx to ↓ Fx Rate
 - Nutrition
 - Exercise
 - Fall Prevention
 - Medications
 - Assure Follow Up
- Surgical Improvements Help

Conclusions

Careful Consideration of Pre-op, Intra-op, and
Post-op Factors Unique to Geriatric Population
Necessary to Obtain Goal of Long Term
Functional Recovery

