

FALLS

A CASE-BASED APPROACH

Wednesday September 20th
CMT Regional Study Day

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Addenbrooke's Hospital

Objectives

- ▣ Develop a structured approach to a patient presenting with a fall
- ▣ Risk stratify who can go home and who needs follow up
- ▣ Examine the interventions proven to reduce the risk of future falls

Falls are important

- ▣ Admissions and readmissions
- ▣ Fractures and head injuries
- ▣ Poor quality of life
- ▣ Institutionalisation
- ▣ But often approached with nihilism...

Presentations

- ▣ “Found on the floor”
- ▣ “Collapse ? cause”
- ▣ Unable to mobilize
- ▣ “Mechanical fall”



Objective

“Develop a structured approach to a patient presenting with a fall”

Falls risk factors

- ▣ Intrinsic
- ▣ Extrinsic

Intrinsic risk factors

drugs

dementia

orthostatic hypotension

previous falls

arrhythmias

cerebrovascular disease

oedema/CCF

specific neurological disease

myopathy

sensory impairment – especially visual

poor foot care

Which of these can we
realistically modify?

Intrinsic risk factors

drugs *****

dementia

orthostatic hypotension **

previous falls

arrhythmias **

cerebrovascular disease

pain and limited joint movement *

oedema/CCF ***

specific neurological disease **

myopathy ***

sensory impairment – especially visual - *

poor foot care ***

Extrinsic factors

▣ Syncope ??

Which of these can we realistically modify?

▣ Illness

- Delirium
- Sepsis
- Hypotension
- Hypoxia
- Progressive serious illness

▣ Environmental

- Ice, pavements, hospitals

Extrinsic factors

- ▣ Syncope ??

- ▣ Illness ***
 - Delirium **
 - Sepsis ***
 - Hypotension ***
 - Hypoxia ***
 - Progressive serious illness *

- ▣ Environmental
 - Ice, pavements, hospitals **

Objective

“Risk stratify who can go home and who needs follow up”

Case 1

- ▣ 88 yo man
- ▣ “Collapse ? cause”
- ▣ “Memory problems”, hypertension, “shuffling gait”, ckd (GFR 30), dvts, long term warfarin

Medication

- ▣ bisoprolol 1.25mg
- ▣ indapamide 2.5 mg
- ▣ lisinopril 10 mg
- ▣ simvastatin 20 mg
- ▣ warfarin
- ▣ amlodipine

Vent. rate 77 bpm
 PR interval 170 ms
 QRS duration 96 ms
 QT/QTc 376/425 ms
 P-R-T axes 55 -25 58

Normal sinus rhythm
 Normal ECG

o.c.p.

Collapse ? cause

87 ♂

(N) Sinus Rhythm

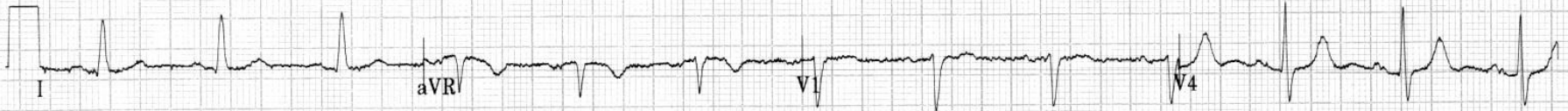
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 05 OCT 2015
 IN SCANNING

Referred by:



- ▣ Lying BP 156/59
- ▣ Standing BP 140/56

- ▣ AMT 3/4
 - Age 87
 - DOB Yes
 - Place Yes
 - Year No

- ▣ INR 3

- ▣ Bloods normal except creat 160, K 5.8

Case 1

▣ Intrinsic risk factors ?

▣ Extrinsic risk factors ?

Can he go home?

FEDS follow up 4 days later

- ▣ Lying BP 143/58 mmHg (pulse 72)
Immediate standing 113/42 (pulse 80),
1 minute standing 106/47
2 minute standing of 111/43 (pulse 84)

- ▣ MMSE 20/30
(7/10 orientation, 1/5 attention, 1/3 recall, 8/9 language)

[A]



[L]

[P]

C40
W80

H40s

Early FEDS/HOT/Falls Clinic

- ▣ More accurate detection of OH
- ▣ More time to diagnose dementia
- ▣ Bone protection started
- ▣ Relieve family anxiety
- ▣ Ability to signpost local falls services, memory services, voluntary service referrals

Case 2

- ▣ 90 yo woman
- ▣ 5am, fell and blacked-out on going back to bed, head and wrist injury
- ▣ Type 2 diabetic on insulin, hypertension, eczema, hard of hearing

Medication

- ▣ NOVOMIX 30 bd
- ▣ Doxazosin 2mgs bd
- ▣ Macrogol
- ▣ Paracetamol
- ▣ Simvastatin 20mg
- ▣ Amlodipine 5 MG
- ▣ BETNOVATE cream
- ▣ FUCIBET 0.1% + 2% cream
- ▣ levothyroxine 100 MCG
- ▣ losartan 100mg

Vent. rate 78 bpm
 PR interval 178 ms
 QRS duration 92 ms
 QT/QTc 398/453 ms
 P-R-T axes 70 41 70

Normal sinus rhythm
 Normal ECG



Technician:
 Test ind:

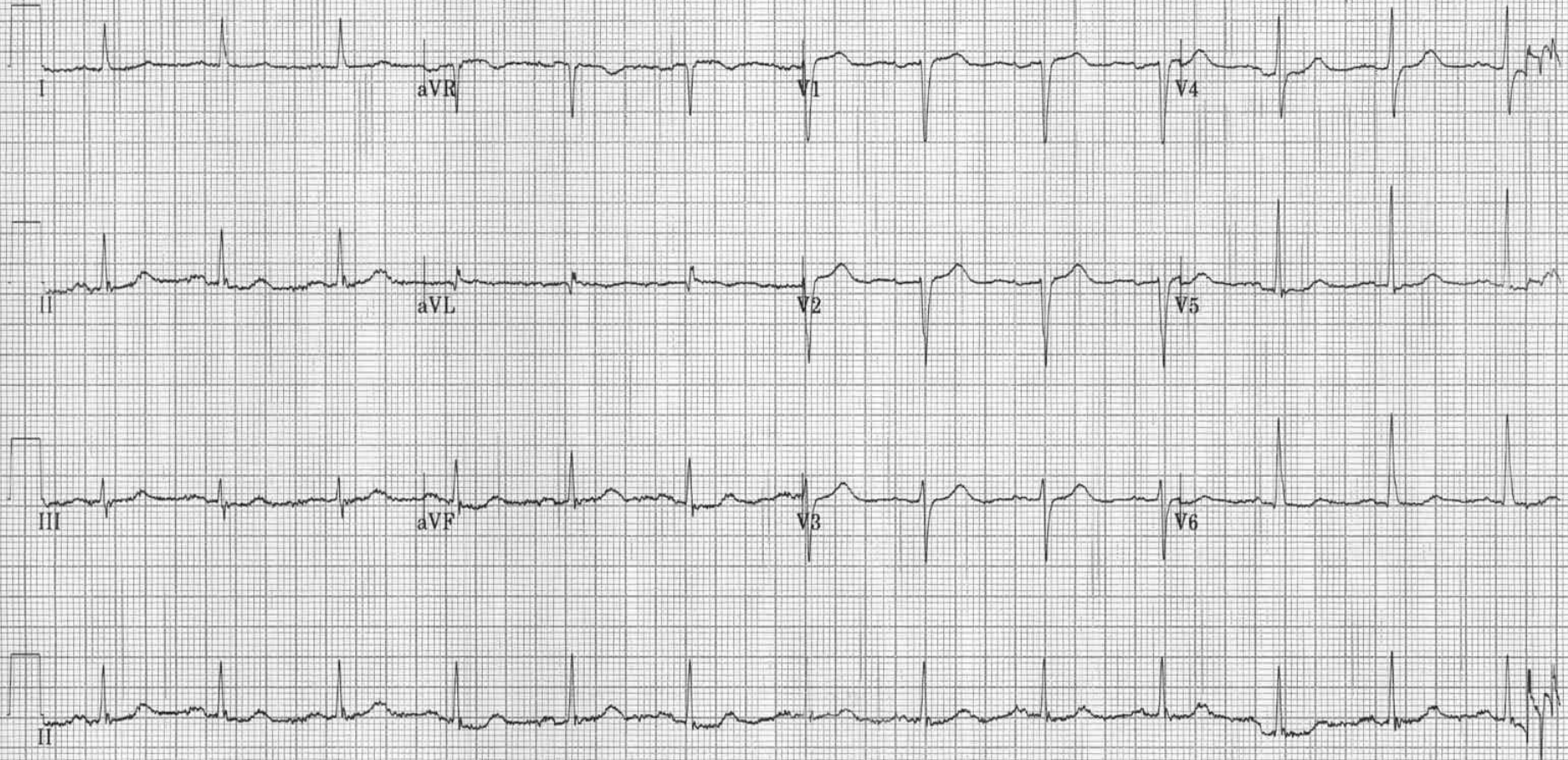


Referred by:

X10
Chest Pain

Unconfirmed

See nil acute





MRN: 1223

C23
W4

Other information

- ▣ Urine dip positive
- ▣ Wcc, crp normal
- ▣ All bloods normal
- ▣ Glucose 8
- ▣ CXR normal
- ▣ Ct head “normal”

Case 2 summary

- ▣ Intrinsic risk factors ?
- ▣ Extrinsic risk factors ?

Can she go home?

Admitted

- ▣ Lying and standing bp – requested 4 times
- ▣ Doxazocin and amlodipine stopped but bp > 200 mmsHg
- ▣ Losartan reduced to 50mg and prescribed in the evening, amlodipine restarted
- ▣ Home with tds care 3 days later

Objective

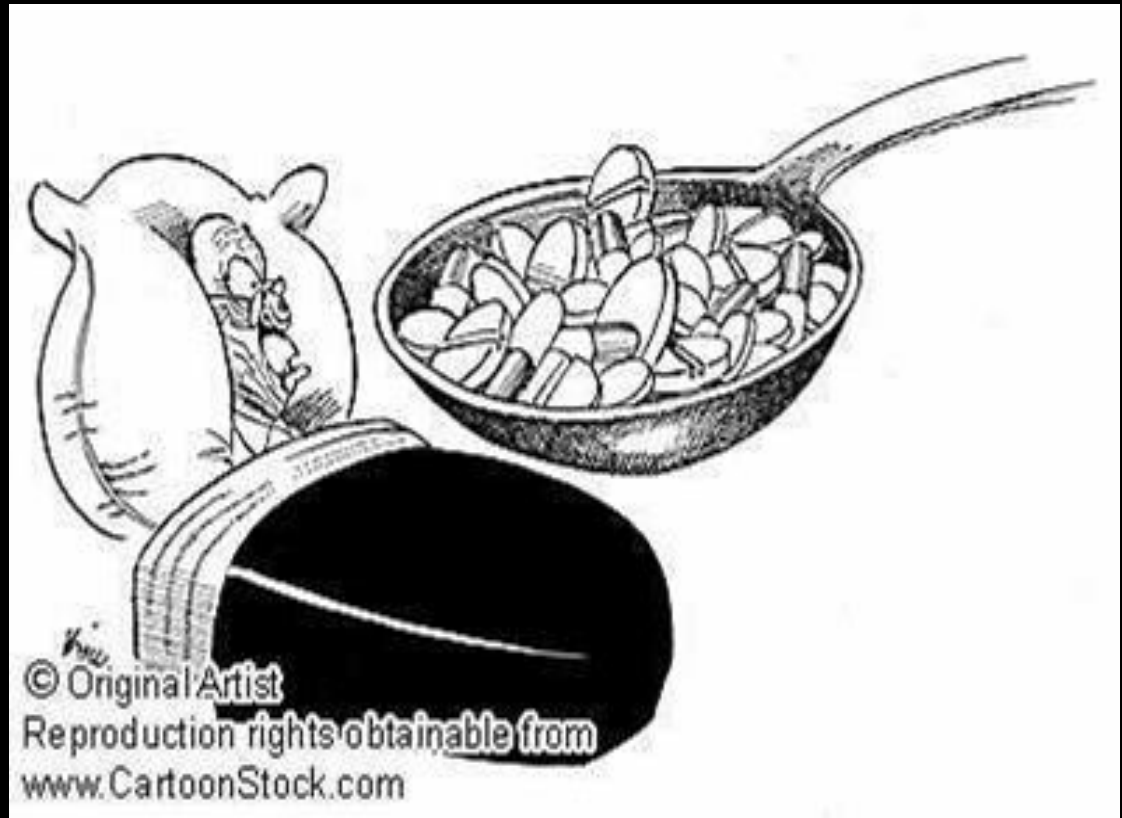
“Examine the interventions proven to reduce the risk of future falls”

Falls in the elderly
If you could only do 4 things?

- ▣ Review their medication!!
- ▣ Diagnose and manage postural hypotension
- ▣ Physio assessment
- ▣ Prescribe calcium and vitamin D

Adjust Medications

- ▣ Drugs with anticholinergic burden
- ▣ Drugs that may cause or aggravate OH



Drugs associated with Falls

- ▣ Psychotropic drugs – SSRIs, sedatives
- ▣ Analgesics
- ▣ Antihypertensives
- ▣ Antihistamines, antiemetics, antimuscarinics

ORTHOSTATIC HYPOTENSION IN THE OLDER PATIENT



Orthostatic Hypotension - Definition

- ▣ Reduction of
 - at least 20mmHg of systolic blood pressureor
 - at least 10mmHg of diastolic blood pressure

within 3 minutes of standing*

(* or head-up tilt to at least 60°)

OH in the elderly

- ▣ 16.2% of all > 65 yo community dwellers
- ▣ 30% of > 75 yos

Rutan et al, 1992, Hypertension

- ▣ > 50% of institutionalized elderly males

Masaki et al, Circulation, 1998

- ▣ > 67% of hospitalised elderly patients

Weiss et al, Arch Int Med, 2002

Causes of Orthostatic Hypotension

1. Hypovolaemia

2. Drugs

3. Autonomic failure

Central

Peripheral

OH in the Elderly - causes

- Susceptible to volume depletion
- Polypharmacy and sensitivity to adverse effects
- Long standing hypertension
- Physiological changes with aging
 - baroreflex sensitivity
 - heart rate responses and non-compliant ventricles
 - α 1-adrenergic vasoconstriction
 - parasympathetic tone
 - renin, angiotensin, aldosterone

SH-OH is common in the elderly

- ▣ Impaired baroreflex buffering of BP
- ▣ Inappropriate natriuresis
- ▣ Residual high sympathetic tone acting on hypersensitive postsynaptic adrenoreceptors

Shannon, Hypertension, 1997



Non-pharmaceutical intervention

▣ ADJUST MEDICINES

▣ Education

- ▣ Avoid precipitants
- ▣ Get up cautiously, slowly, in stages
- ▣ Increase water intake (1.5-2l/day)
- ▣ Reduce venous pooling with exercises/stockings
- ▣ Increase salt intake (6-10g/day)
- ▣ Elevate head of bed
- ▣ Exercise

ORTHOSTATIC HYPOTENSION IN THE ELDERLY

Pharmaceutical Intervention

Fludrocortisone

- Synthetic mineralocorticoid analog
- Increases renal sodium reabsorption
- 0.1 g/day up to 0.3 mg/day
- Titrate until mild oedema
- Oedema, low K, supine hypertension, headaches, ccf
- May need long term k supplementation

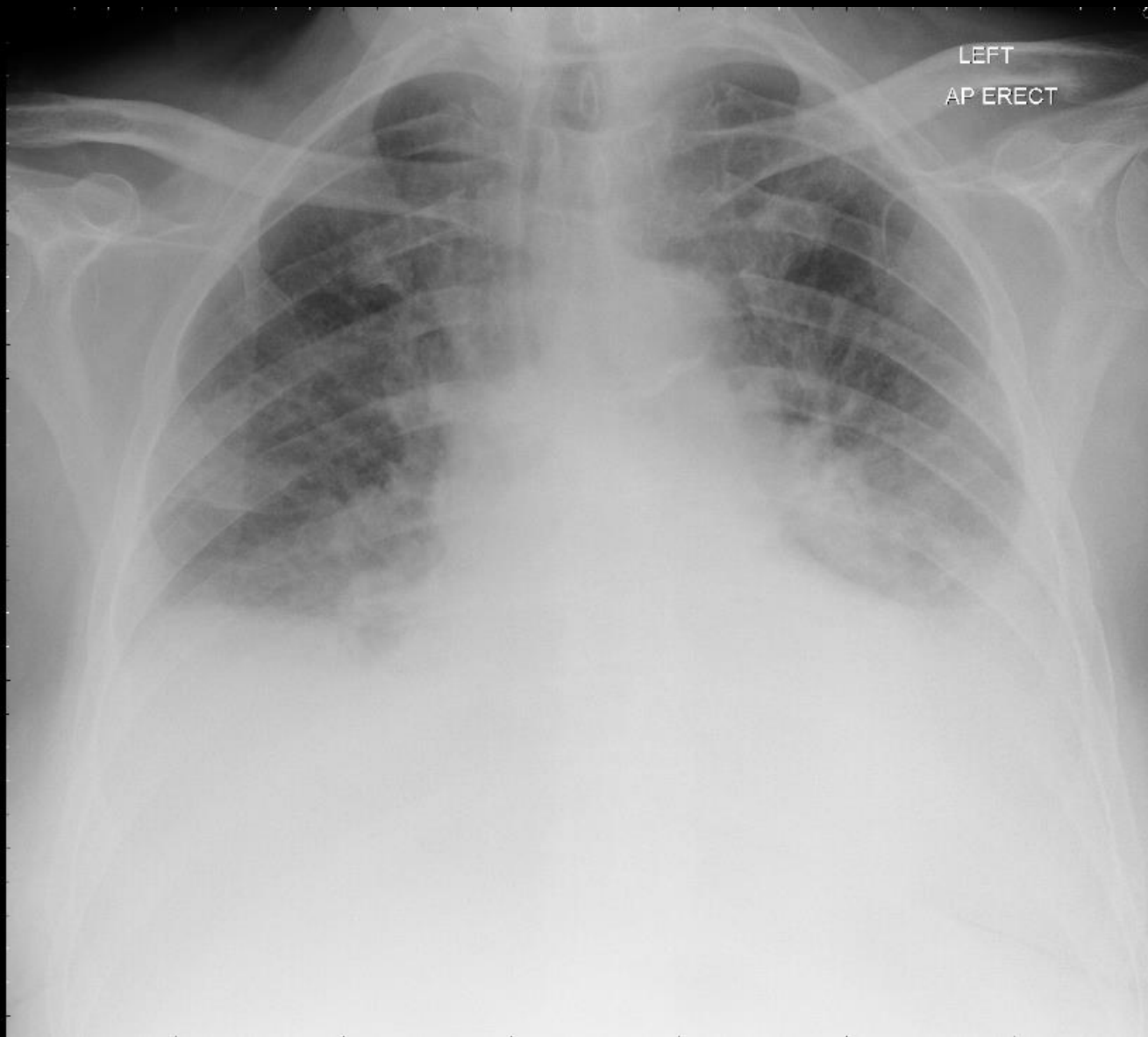
Fludrocortisone

- ▣ Successful treatment of orthostatic hypotension with 9-alpha-fluorohydrocortisone.

Hickler et al, NEJM, 1959

- ▣ 9-Alpha-fluorohydrocortisone in the treatment of postural hypotension in diabetic autonomic neuropathy

Campbell et al, (n=6) Diabetes, 1975



Fludrocortisone in the treatment of hypotensive disorders in the elderly

Raja M Hussain, Shona J McIntosh, Joanna Lawson, Rose Anne Kenny

Table 2 Adverse events in 38 of 64 patients treated with fludrocortisone

<i>Adverse event</i>	<i>No of patients</i>	<i>Mean duration (mth) of treatment</i>	<i>Mean dose (μg)</i>	<i>No of patients withdrawn</i>
Cardiac failure	7	7	93	7
Systolic hypertension	4	5	75	4
Stroke	1	2	100	1
Depression	3	4	100	3
Hypokalaemia	8	8	100	0
No benefit	2	3	75	2
Deaths	13	7	92	0

Midodrine

- ▣ Short acting peripheral alpha agonist
- ▣ Begin with single 2.5 mg dose
- ▣ Up to 10mg
- ▣ Work for 2-3 hrs
- ▣ Best given prn, 30-45 mins before upright
- ▣ Not if remaining seated or supine
- ▣ Avoid evening doses

SYSTEMATIC REVIEW

Efficacy of treatments for orthostatic hypotension: a systematic review

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Table 2. Commentary on effect on postural drop and symptoms, comparing active arm to placebo arm [28–64]

Treatment	Studies (n)	Patients (n)	Effect on postural drop (active versus placebo)	Effect on symptoms (active versus placebo)	GRADE quality of evidence [27]
Amesinium [28]	1	12	Worsened	?	Moderate (§)
Camphor-crataegus berry compound (CCC) [29, 30]	2	86	No effect No effect	? Variable effect	Very low (**, †)
Clonidine [31]	1	23	Minor improvement	?	Very low (**, §)
Compression bandages [32]	1	21	Significant improvement	Significant improvement	Very low (**, §)
Dihydroergotamine (DHE/DHE Plus) [33–37]	5	178	Significant improvement Minor improvement Minor improvement Insufficient data No effect	Significant improvement Minor improvement No effect No effect ?	Very low (**, †, ‡, §)
Dihydroxyphenylserine (L-DOPS/ra-DOPS) [38–42]	5	270	No effect/minor improvement Minor improvement Insufficient data No effect	? No effect Variable effect Minor improvement	Very low (*, †, ‡, §)
Fludrocortisone [43, 44]	2	19	No effect Insufficient data Insufficient data	? ? ?	Very low (*, †, §)
Glypessin [45]	1	7	Worsened	?	Very low (**, §)
Indomethacin [46, 47]	2	34	Significant improvement Significant improvement	? ?	Low (*, §)
Midodrine [48–51]	4	292	Worsened No effect No effect Worsened	Variable effect Minor improvement No effect Variable effect	Very low (*, †, ‡, §)
Nitroglycerine [31]	1	23	No effect	?	Very low (**, §)
Norfenefrine [44]	1	13	Insufficient data	?	Low (*, §)
Octinoxide [52]	1	9	Worsened	?	Moderate (§)
Oxilofrine [53]	1	59	Significant improvement	Variable effect	Moderate (*)
Pacing [54]	1	6	Insufficient data	No effect	Very low (**, §)
Pindolol [55, 56]	2	18	Insufficient data No effect	Minor improvement No effect	Low (*, §)
Potassium chloride [57]	1	10	Significant improvement	Significant improvement	Low (*, §)
Pyridostigmine [58, 59]	2	89	Worsened No effect	? Worsened	Very low (**, †)
Sleeping head-up [60]	1	100	Minor improvement	No effect	Moderate (*)
Xamoterol [61]	1	11	Worsened	?	Moderate (§)
Yohimbine [59, 62–64]	3	55	Significant improvement Significant improvement Minor improvement (only diastolic BP given)	Minor improvement No effect (both worsened) Minor improvement	Very low (**, †, ‡, §)

Other interventions

- ▣ Community falls programmes – gait and balance exercise programme
- ▣ Early cataract surgery
- ▣ Assistive technology
- ▣ Podiatry

Other issues

- ▣ Suspected syncope
- ▣ Bone protection
- ▣ Falls prevention in hospitals

Suspected Syncope

- ▣ Accurate postural BP measurement
- ▣ ECG (24 hour tape has low yield if “normal-ish” ecg)
- ▣ Cardiac risk factors
- ▣ ECHO if have a murmur
- ▣ If highly suspicious - carotid hypersensitivity (tilt-table) or REVEAL

Bone Protection

The screenshot shows a mobile browser displaying the FRAX WHO Fracture Risk Assessment Tool website. The status bar at the top shows 'Virgin 3G', '17:47', and a battery icon. The browser address bar shows 'University of Sheffield'. The website header is red with 'FRAX® WHO Fracture Risk Assessment Tool' and a navigation menu with 'Home', 'Calculation Tool', 'Paper Charts', 'FAQ', and 'References'. The main content area features a 'Welcome to FRAX®' section with a paragraph about the tool's development by WHO, a portrait of Dr. John A Kanis, and a paragraph about the FRAX models. A sidebar on the right lists 'FRAX Desktop App', 'Web Version 3.9', and 'Links'. A statistics box shows '1322029 Individuals with fracture risk 1st June 2011'. The footer includes copyright information for the WHO Collaborating Centre for Metabolic Bone Diseases, University of Sheffield, UK, and a list of supported languages. The bottom of the screen shows a mobile navigation bar with back, forward, share, and other icons.

●●● Virgin 3G 17:47


University of Sheffield

FRAX® WHO Fracture Risk Assessment Tool

Home Calculation Tool Paper Charts FAQ References

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 App
Click here to view the applications available

Web Version 3.9
View Release Notes

Links
www.iofbonehealth.org
www.nof.org
www.iof.or.jp
www.esceo.org

FRAX available as iPhone App
View in iTunes

1322029
Individuals with fracture risk
1st June 2011

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English | Arabic | Bengali | Chinese Simplified | Chinese Traditional | Croatian | Czech | Danish | German | Dutch | Estonian | Finnish | French | Greek | Icelandic | Indonesian | Italian | Japanese | Korean | Lithuanian | Norwegian | Polish | Portuguese (Portugal) | Portuguese | Romanian | Russian | Swedish | Slovak | Spanish | Thai | Turkish

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Website Design Sheffield by Rich

Calculation Tool

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

Country: **UK** Name/ID:

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

9. Rheumatoid arthritis No Yes

10. Secondary osteoporosis

11. Alcohol 3 or more units/day

12. Femoral neck BMD (g/cm²)
 Select BMD

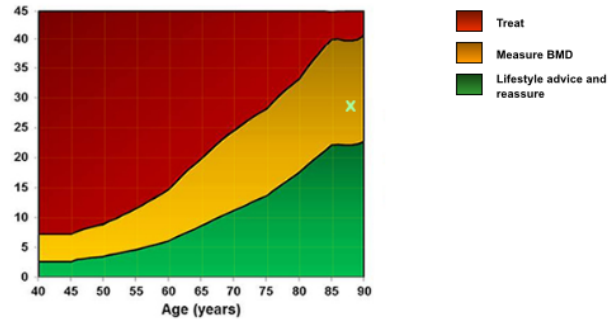
Print tool and

Risk factors

For the clinical risk factors a yes or no response is a then a "no" response is assumed. See also [notes on ris](#)

The risk factors used are the following:

Age	The model accepts ages between 40 and 90. If ages above are entered, the programme will cor
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Assessment threshold - Major fracture**10 year probability of major osteoporotic fracture (%)**

NOGG recommends treatment in this patient without the need for a BMD measurement, particularly if a scan is clinically inappropriate or unfeasible.

Interpretation

Following the assessment of fracture risk using FRAX® in the absence of BMD, the patient may be classified to be at low, intermediate or high risk.

- Low risk – reassure, give lifestyle advice, and reassess in 5 years or less depending on the clinical context.
- Intermediate risk - measure BMD and recalculate the fracture risk to determine whether an individual's risk lies above or below the intervention threshold.
- High risk - can be considered for treatment without the need for BMD, although BMD measurement may sometimes be appropriate, particularly in younger postmenopausal women.

NB - These thresholds are for guidance only and the final decision to assess BMD or to initiate therapeutic intervention lies with the individual clinician.

Management

- For a more detailed description of investigations, supportive measures and treatments, please refer to the Executive Summary
- No trials have been designed and powered to detect differences in the magnitude of fracture reduction between different treatments

Falls in hospital

- ▣ DME ward ideally but not always possible
- ▣ Falls risk assessment



Summary - Objectives

- ▣ Develop a structured approach to a patient presenting with a fall
- ▣ Risk stratify who can go home and who needs follow up?
- ▣ Examine the interventions proven to reduce the risk of future falls

Questions and Suggestions

