ProFouND
Prevention of Falls Network for Dissemination

Robert-Bosch-Krankenhaus

# Prediction and Prevention of

# Falls and Fractures in High Risk Populations

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Definition of high risk populations

Prediction of falls in high risk populations

Prevention in high risk populations

# My definition of high risk populations

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Baseline risk of falls in CD persons age 50 - 65 yrs. 15-20 %

Baseline risk of falls in CD healthy older persons: 20 - 30 %

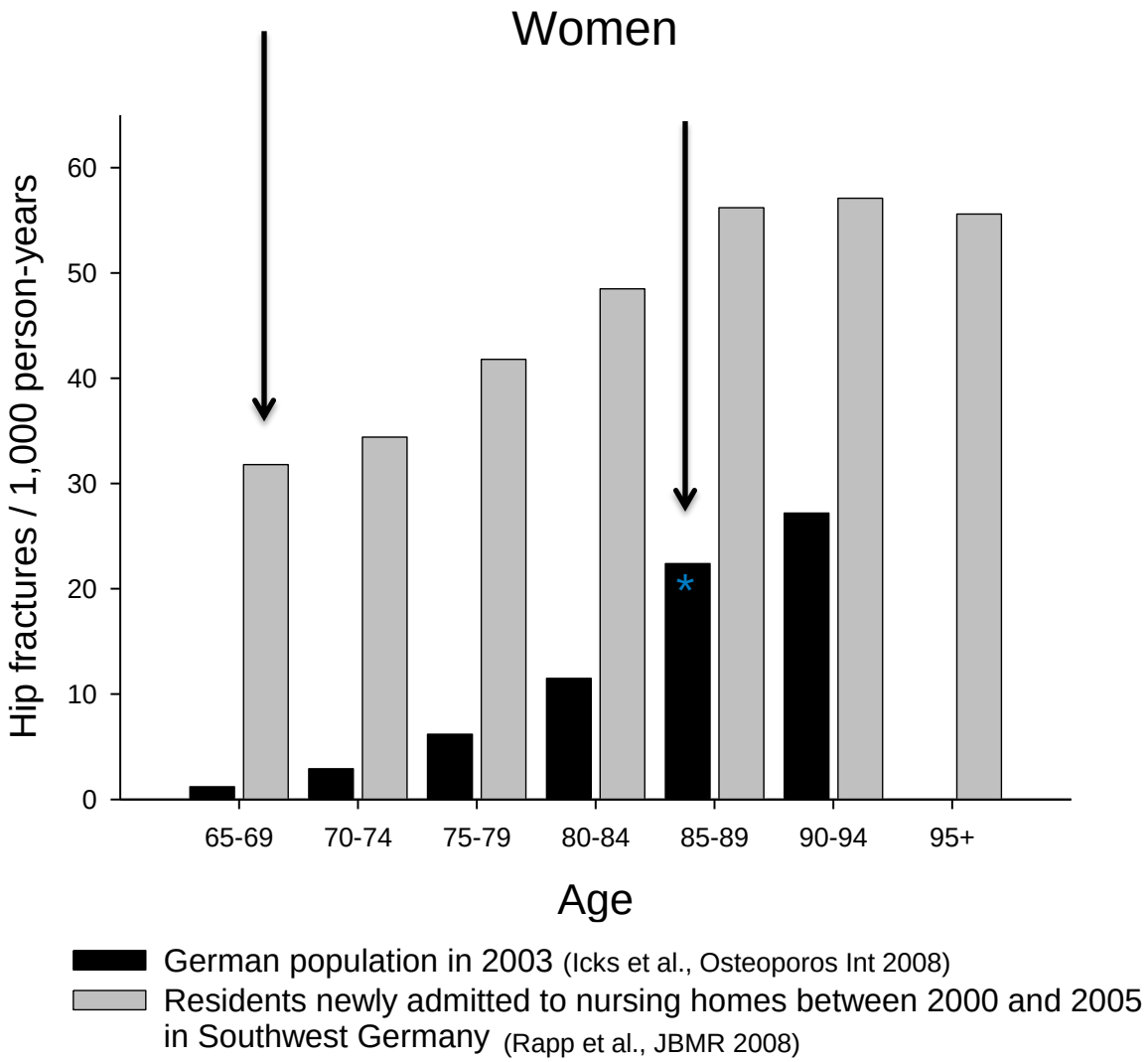
High risk populations:  > 40 %,

Recurrent fallers, post fracture

Annual (hip) total fracture rates > 2 %

# Hip fracture rates in Germany





# Distribution of hip fractures in Germany

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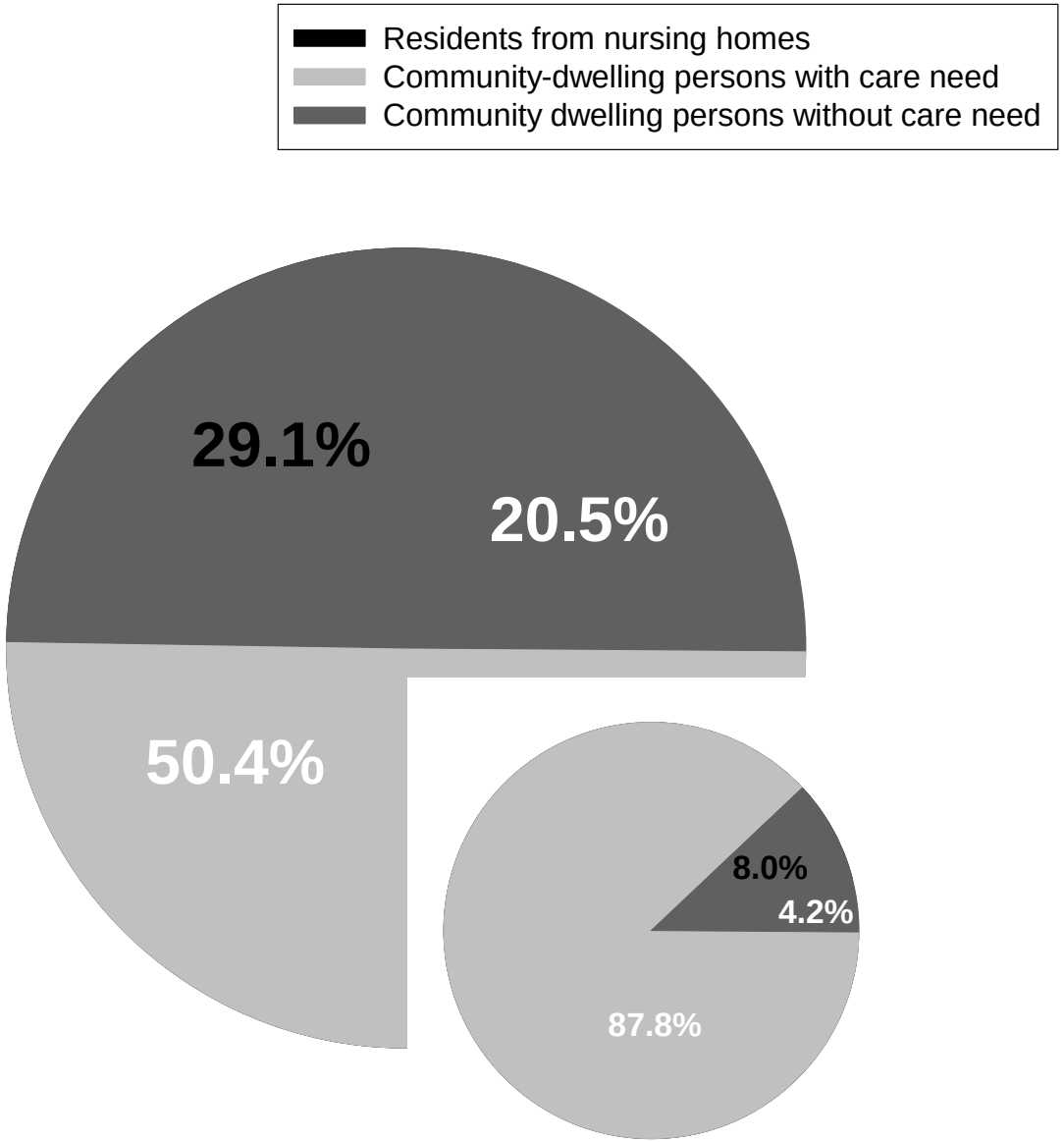


20 % of hip fractures occur in long-term care
e.g. 4 % of the population

30 % occur in home-care patients
e.g. 8 % of the population

50 % have no ADL care needs at time of the hip fracture
e.g. 88 % of the population

Priority setting

# Prediction: do we have the right models?

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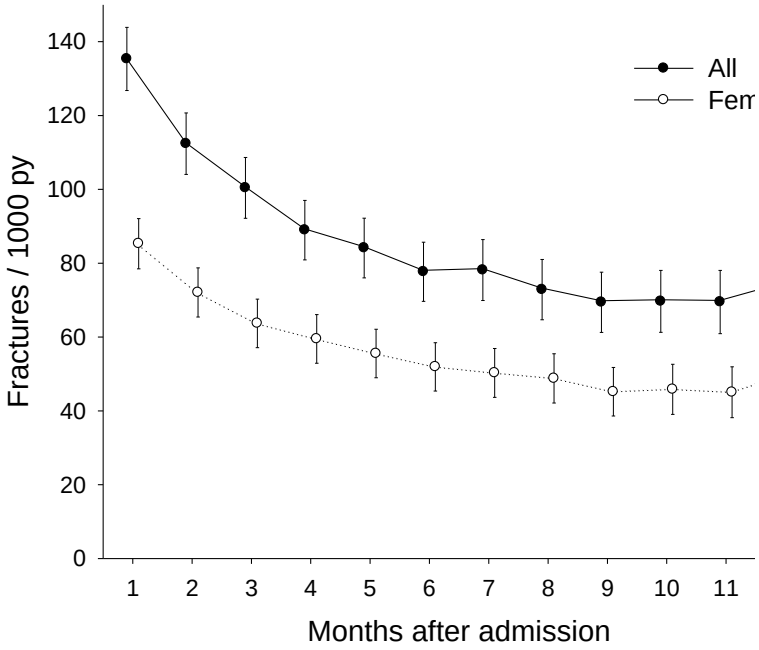
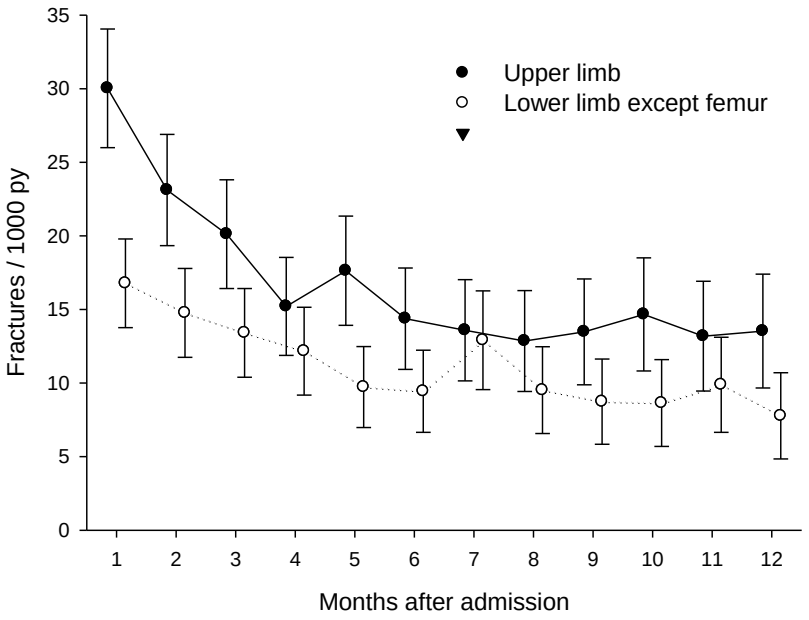
## Example: incidence rate of fractures after admission to a nursing home

All fractures combined and femoral fractures




Fractures of the upper limb and the lower limb (except femur)




Rapp et al., Osteoporos Int 2009

# Long term care and risk factors

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| Risk indikator (factor) | OR |
|---|---|
| Static balance (unstable standing) | x 1,7 |
| Dynamic balance (unsafe walking) | x 2,3 |
| Transfer difficulties | x 2,2 |
| Cognitive deficits, e.g. attention, execution | x 1,9 |
| Psychotropics such as tranquilizers | x 1,9 |
| Urge incontinence and nykturia | x 2,3 |
| Vision problems e.g cataract, AMD | x 1,6 |
| Recent fall | x 4 |

Kron et al. 2003

# Bavarian fall and fracture study (Rapp 2012)

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Database of > 70,000 falls

Serious falls were associated with

Higher age, female gender and better functional status.

Walking less common than transfers

Afternoon hours and weekends were more problematic

# A multiphase fall model

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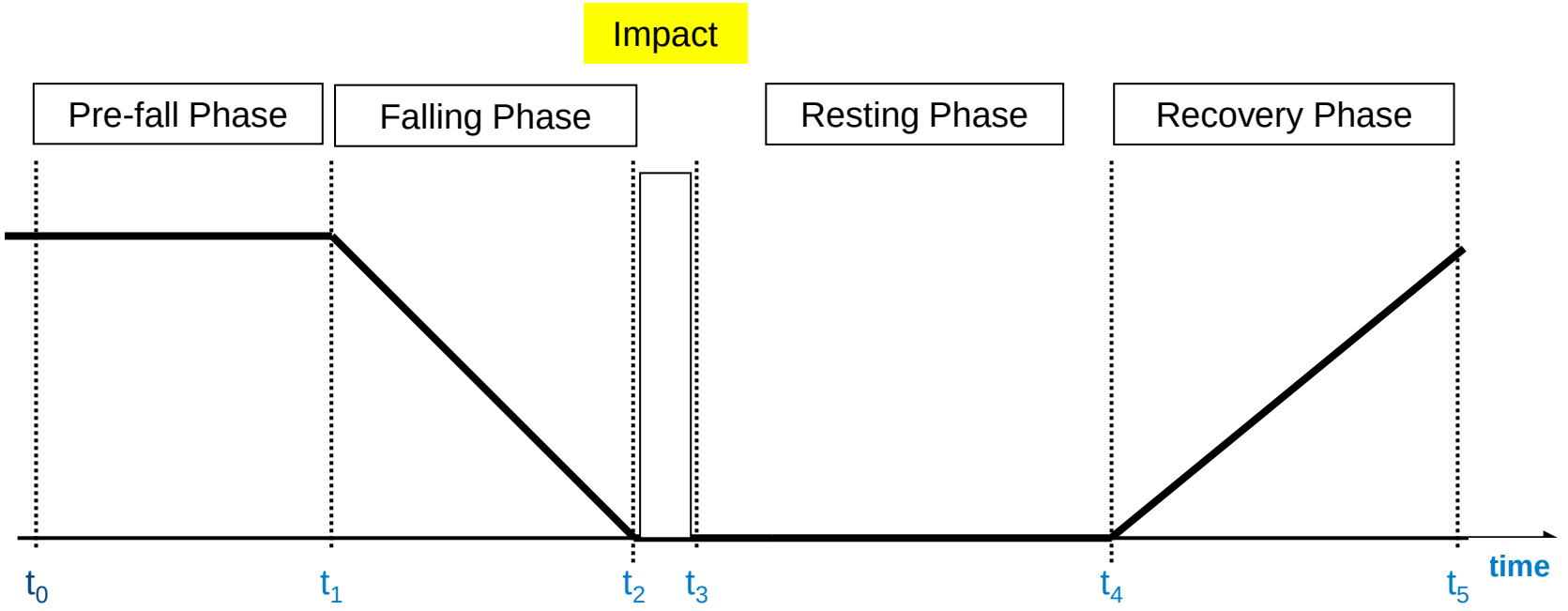


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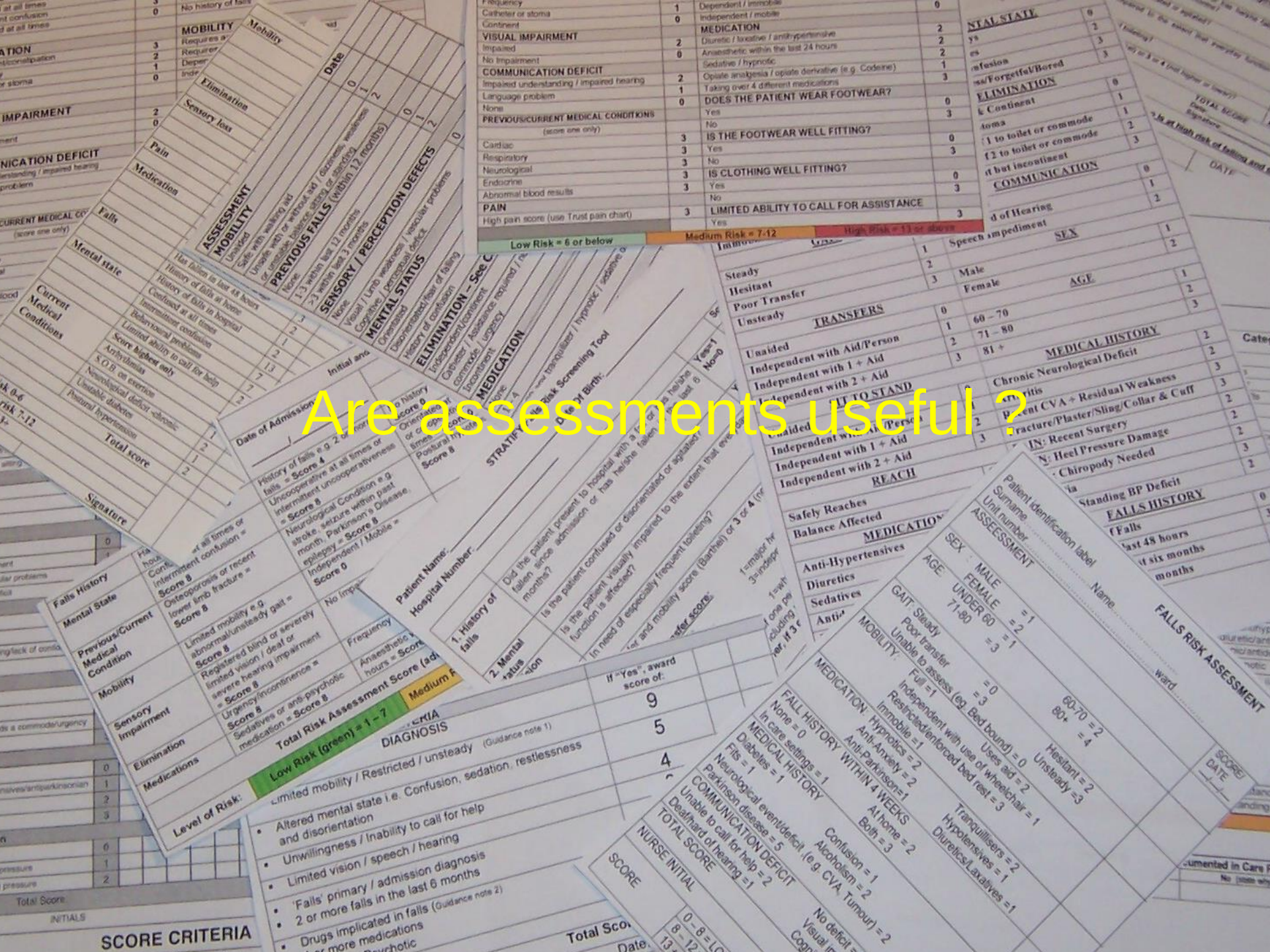
**Proposal for a multiphase fall model based on real-world fall recordings with body-fixed sensors**

„All models are wrong. The question is how wrong they are to still be useful.“


Are assessments useful ?

# Core messages of Cochrane Review (Cameron update 2013)

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- Multifactorial interventions by multiprofessional teams

  *Attitude and leadership
  *Approriate risk management and a culture of CIRS
  *Regular medication review

  Adapted exercise (but never alone!): UmDEx, Ulm exercise program

  Environmental adaptations and design
  Walking aid, wheelchair ergonomics and design
  *Vitamin D supplementation for walkers 800 IE / day

For definitions of multifactorial interventionen and multiprofessionals see Lambet al. Trials 2012)

* GCP

- Multifactorial Intervention

  Attitude and leadership
  Risk management and a culture of CIRS
  Regular medication review

  Action:  Exercise classes (2x week for aat least 3 month)

  Couseling on environment and ergonomics
  Inlcuding maintainance of walking aids
  Recommendations for Vitamin D

  Hip protector tool kit

- Medication review
  Start low, go slow (Hartikainen 2007, Leipzig 1999)
  Review after 4 Wochen aim to reduce / or stop if possible

- Monitor blood pressure and orthostasis (Shaw 2003)

# Service Use and Costs of Incident Femoral Fractures in Nursing Home Residents in Germany: The Bavarian Fall and Fracture Prevention Project ($BF_2P_2$)

*Sven Heinrich, MSc, Kilian Rapp, MD, MPH, Ulrich Rissmann, MSc, Clemens Becker, MD, and Hans-Helmut König, MD, MPH*

*Objectives:* Hip fractures are one of the most costly consequences of falls in the elderly. Despite their increased risk of falls and fractures, nursing home residents are often neglected in service utilization and costing studies. The purpose of this study was to determine service use, initial and long-term direct costs of incident femoral fractures in nursing home residents 65 years or older in Germany.

*Design:* An incidence-based, bottom-up cost-of-illness study aiming at measuring fracture-related direct costs from a payer perspective was conducted.

*Setting:* Nursing homes

*Participants:* The retrospective dataset included all insurants of a sickness fund (Allgemeine Ortskrankenkasse Bavaria), who were 65 years or older, resided in a nursing home, and had a level of care of at least one in the statutory long-term care insurance (n = 60,091).

*Measurements:* Incident femoral fractures (ICD-10, S72) in 2006 were followed until the end of 2008, incorporating service use and costs of inpatient care (up to 12 months after the initial hospitalization episode), nursing home care (until death or the end of 2008), and ambulatory care (pharmaceuticals, nonphysician providers, and medical supply within 3 months after the initial hospitalization episode). Additional costs for nursing home and ambulatory care were determined with a before/after design. Costs beyond the year 2006 were discounted with a rate of 5%. Sensitivity analyses on key parameters were performed.

*Results:* Overall mean direct costs of 9488 USD (SD ± 4453 USD, 2006) occurred for incident femoral fractures (n = 1525). This included inpatient care (90.2%), additional costs for nursing home care (7.1%), and ambulatory care (2.7%). Eighty-seven percent of the costs occurred for the initial hospitalization episode and 13% for long-term costs. After the index admission, 12.1% were admitted to a rehabilitation facility, 4.1% were rehospitalized within a year, and in 17.7% the level of care increased within 90 days after the end of the initial hospital episode. The share of residents with incident femoral fractures rehospitalized was significantly higher and costs for nonphysician providers were significantly lower for male residents.

*Conclusion:* Residents with femoral fractures used a wide range of health services. Our study underestimates the true costs to society in Germany. Efforts should be directed to economic evaluations of fall-prevention programs aiming at reducing fall-related fractures including femoral fractures. **(J Am Med Dir Assoc 2011; ■: ■–■)**

*Keywords: Initial costs; long-term costs; nursing home residents; femoral fracture; incidence-based; payer perspective*

# Effect of the fall prevention program on femoral fracture incidence (The Bavarian Fracture Prevention Study)

## Characteristics of the study population

| | Intervention group | Control group |
|---|---|---|
| Nursing homes | | |
| N | 256 | 893 |
| Number of beds | | |
| Mean (SD) | 94.4 (41.3) | 70.8 (43.7) |
| Study population | | |
| Gender | | |
| Male, n (%) | 2,892 (21.2) | 6,828 (21.6) |
| Female, n (%) | 10,761 (78.8) | 24,840 (78.4) |
| Age (years) | | |
| Mean (SD) | 84.3 (7.5) | 84.2 (7.7) |

# Exercise

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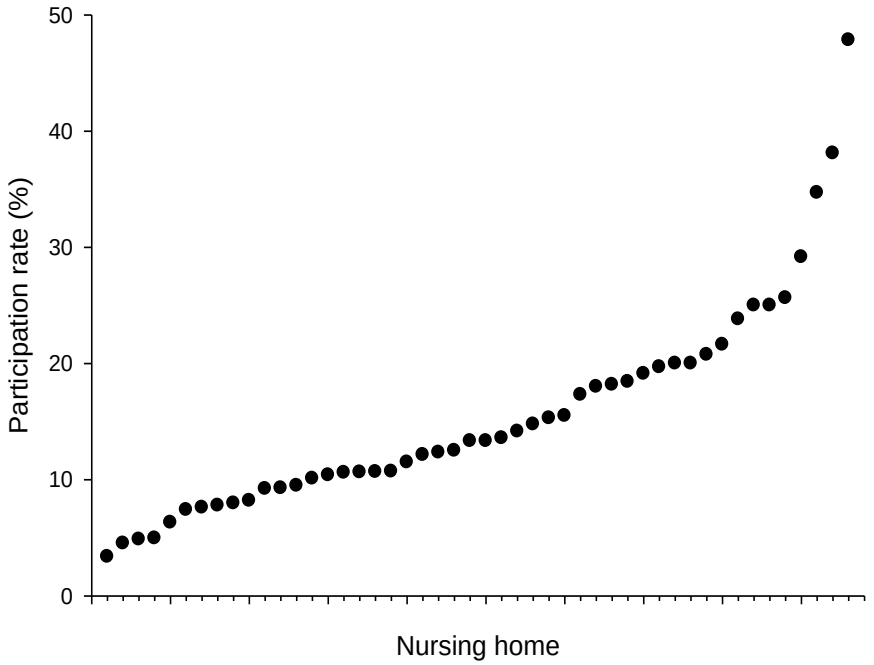
## subgroup of 49 Bavarian homes, 4,300 residents

### Participation rates by care homes




Median (Range): 13,5% (3,4-47,8)

### Predictors of participation

| | Odds ratio (95% CI) | |
|---|---|---|
| Gender | | |
| Women | 1.0 | |
| Men | 0.67 | (0,52-0,86) |
| Age (years) | | |
| <65 | 0,70 | (0,43-1,14) |
| 65-74 | 1,18 | (0,85-1,64) |
| 75-84 | 1.0 | |
| 85-94 | 0,76 | (0,60-0,96) |
| =95 | 0,52 | (0,32-0,85) |
| Recipient of welfare aid | | |
| No | 1.0 | |
| Yes | 0,65 | (0,51-0,84) |
| Level of care | | |
| 1 | 1.0 | |
| 2 | 0,32 | (0,25-0,41) |
| 3 | 0,05 | (0,03-0,09) |
| 0 | 1,10 | (0,85-1,44) |
| Mother tongue | | |
| German | 1.0 | |
| Other | 0,73 | (0,35-1,52) |

# Hip protectors

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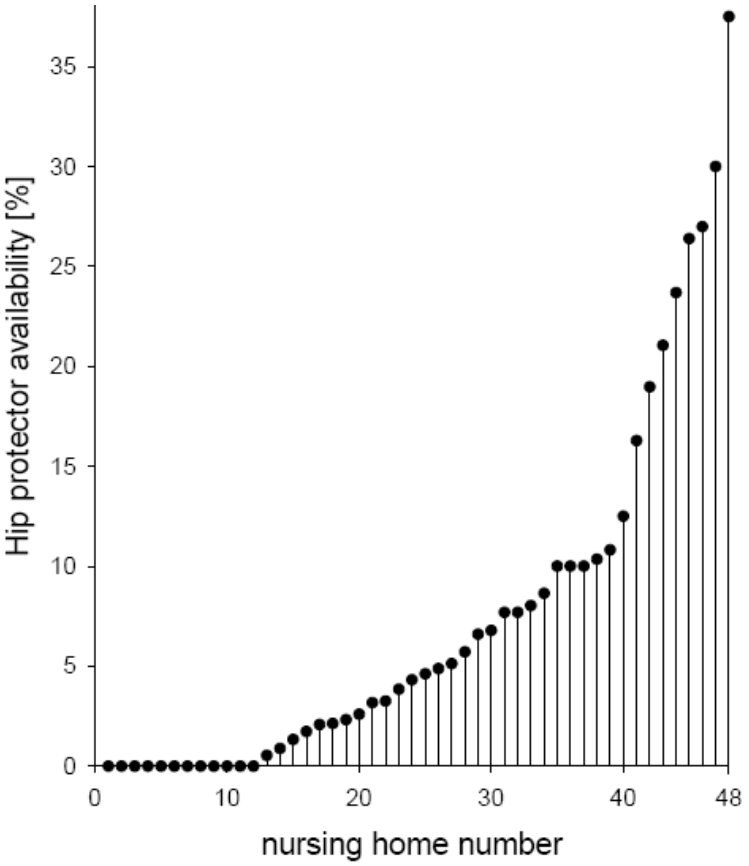
## Rates of HP availability by care homes




Klenk et al., Osteoporos Int, in press

## Predictors of HP availability

| | Hip protector availability (n=3,924) OR (95% CI)* | |
|---|---|---|
| | unadjusted | mutually adjusted |
| Sex (men vs. women) | **0.54 (0.39; 0.74)** | **0.59 (0.43; 0.83)** |
| Age | | |
| 65-74 years | **0.58 (0.37; 0.90)** | 0.79 (0.50; 1.24) |
| 75-84 years | 1.00 | 1.00 |
| 85-94 years | 1.21 (0.93; 1.58) | 1.14 (0.87; 1.50) |
| ≥95 years | 1.44 (0.93; 2.21) | 1.27 (0.82; 1.97) |
| Level of care | | |
| 0 | **0.30 (0.17; 0.52)** | **0.32 (0.18; 0.56)** |
| 1 | 1.00 | 1.00 |
| 2 | **1.32 (1.01; 1.72)** | 1.29 (0.98; 1.69) |
| 3 | **0.57 (0.40; 0.82)** | **0.55 (0.38; 0.79)** |
| Migration background | **0.26 (0.08; 0.85)** | **0.30 (0.09; 0.99)** |
| Recipient of welfare aid | **0.55 (0.41;0.74)** | **0.60 (0.44; 0.81)** |

* Odds ratio (OR) and 95% confidence interval (95% CI) for multilevel logistic regression analysis.

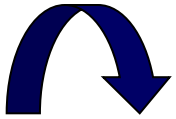
Absorption model

Shell model

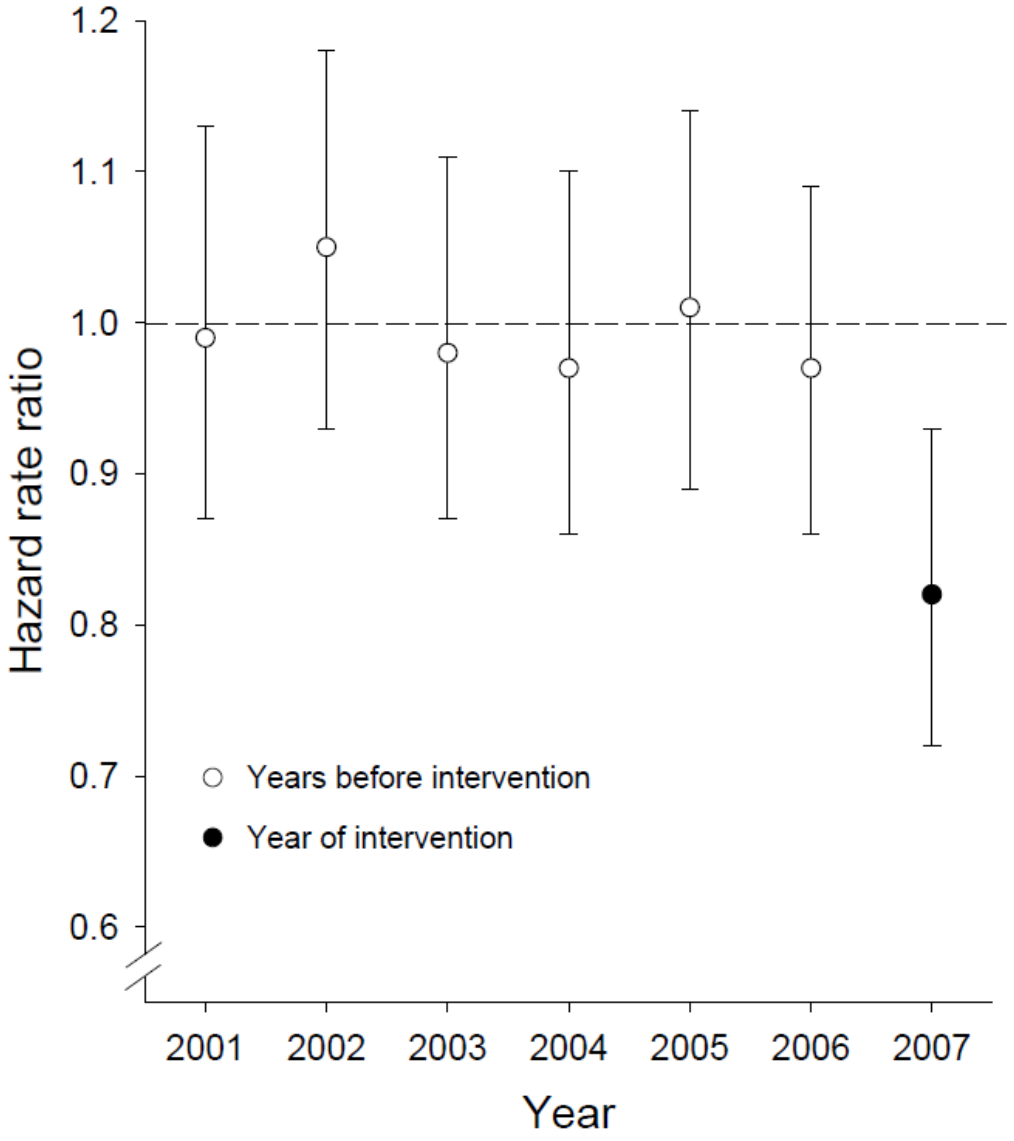
# Effect of the fall prevention program on femoral fracture incidence (The Bavarian Fracture Prevention Study)

| | Femoral fractures, n | Total person-years | Femoral fractures/ 1000 person-years | HR (95% CI)* |
|---|---|---|---|---|
| Fall prevention program | | | | |
| No (Control group) | 917 | 22,450 | 41.0 | 1.00 |
| Yes (Intervention group) | 331 | 9,882 | 33.6 | 0.82 (0.72-0.93) |

* Hazard rate ratio and 95% confidence interval adjusted for gender, age, number of beds (log) and level of care



First intervention year: reduction of hip fractures by 18 %




Relative risk of femoral fractures between residents from intervention and control homes in the years before the start of the intervention (2001-2006) and in the year of the intervention (2007)

# Conclusion

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- Fall prevetion should be part of a mobility and safety program
- Carefully read study to identify implementiaton gaps
- Falls and fall related injuries are partly preventable
  benchmark for hip fracture in
  LTC < 3% p.a.
  home care < 2% p.a.,
  independent community dwellers > 80 J. <1% p.a.
- Shared cost models (direct and indirect costs)
- Professional caregivers need empowerment and leadership
- Repressive methods are unjustified

# Considerations

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- New environment
- Fall prevention major topic immediately after admission
- Usage and ergonomics of walking aids
- Hip protectors
- Setting up the bedroom
- Ergonomics of furniture

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