

# How does geriatric rehabilitation work?



Dr. Derrick K. S. Au  
Hospital Chief Executive  
Kowloon Hospital &  
Hong Kong Eye Hospital



# Definitions and focus



# Definition

- “Geriatric rehabilitation is an important emerging field in rehabilitation.”
- It may be defined as “evaluative, diagnostic, and therapeutic interventions whose purpose is to restore functional ability or enhance residual functional capability in elderly people with disabling impairments.”
- This definition is focused on professional interventions.

Jennie L Wells et al. State of the Art in Geriatric Rehabilitation. Part I: Review of Frailty and Comprehensive Geriatric Assessment. Arch Phys Med Rehabil 2003; 84:890-897.



# Definition?

- “The term rehabilitation is subject to the interpretation of the user (thereby) risking unintended, and often unappreciated, differences in strategic aims across the ever-expanding stakeholder interests.”

Rowena D. Plant (2002). In: *Rehabilitation of the older person – a handbook for the interdisciplinary team*, p. 53.



# An enabling process

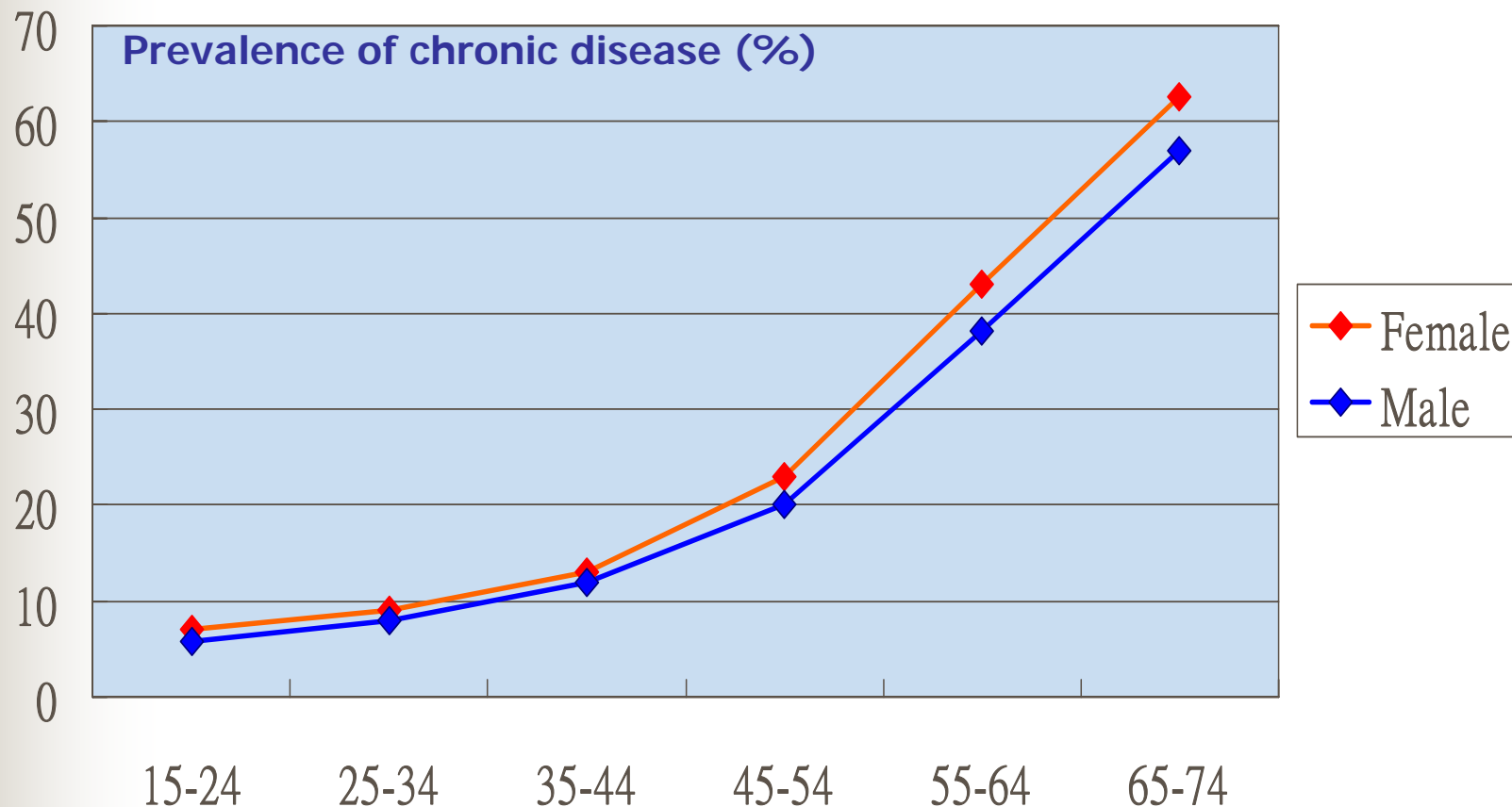
- Minimize the negative impact of the primary disorder
- Maximize (physical, psychological and social) functional activities
- Based on good assessment of where the elderly person is now (in terms of functioning), where they wish to be, and how team members and agencies can contribute to achieve the goals and meet the needs



# Why special

- Restoring functional capabilities of the geriatric patients require special considerations:
  - Acute on chronic problems
  - Vulnerability to complications (low reserve)
  - Interacting factors (drugs / co-morbidity / cognitive and physical impairments etc)
  - Frailty

## Chronic diseases is 5x more common in elderly people aged 65 & over than in young adults aged 25-34



Source: Building a Healthy Tomorrow (Discussion Paper on the Future Service Delivery Model for our Health Care System). HMDAC consultation paper, p.8, July 2005. (ADAPTED)



# Focus

- Elderly persons are vulnerable to functional decline by –
  - Cumulative functional sequelae of diseases
  - Negative effects of acute hospitalization
  - Deconditioning

Gary S Clark, Hilary C. Siebens (1988) In: *Rehabilitation Medicine – Principles and Practice*, p. 654-5.





# Medicines and rehabilitation

- Postural hypotension – alpha-blockers, antiarrhythmics, antipsychotics, nitrates, tricyclic antidepressants.
- Beta-blockers – effect on HR and BP.
- Anticoagulants – injury caution.
- Insulin requires rotation of injection sites away from exercise body parts.
- Scheduling may help, e.g. patients on parkinsonism drugs / pain medications / antipsychotics / diuretics.



# Polypharmacy

- Age and cumulative use
- Co-morbidities
- Prescribing cascade
- Failure to discontinue drugs with minimal therapeutic effect
- Multiple prescribing physicians
- Multiple filling pharmacies
- Self-medication

Carole B. Lewis, Jennifer M. Bottomley. (2008) *Geriatric Rehabilitation – A Clinical Approach*, p. 140.



# Frailty

- “Frailty is the clinical state that makes the medical management and rehabilitation of the elderly complex.”
- Its definition has evolved over the years from description of dependence on others, to a dynamic model with multidimensional construct.
- Frailty may also be seen as the loss of functional homeostasis – e.g. elderly patients faring poorly in hospitalization

Jennie L Wells et al. State of the Art in Geriatric Rehabilitation. Part I: Review of Frailty and Comprehensive Geriatric Assessment. Arch Phys Med Rehabil 2003; 84:890-897.



# Frail elderly understood in terms of exercise capacity

- minimal aerobic power compatible with full independence is about 12-14 ml/[kg.min], or about 3.5 - 4 METs
- this level of aerobic power allows performing most light ADL without fatigue (ADL: ~ 5 -7 ml/[kg.min])
- Capacity of healthy elderly: 24-28 ml/[kg.min], or about 7 - 8 METs

Roy J. Shephard (1997) In: *Clinical Exercise Testing and Prescription – Theory and Application*, p. 81.



# Deconditioning, reconditioning, and exercise



# Disuse

- With disuse, decline in strength is easily evident; with chronic disuse, there is cardiovascular endurance decline
- Usual daily activities does help to maintain strength, though it does not have training effect in cardiovascular endurance.

# Immobilization – an extreme cause of deconditioning

- Rapid loss of muscle strength at 2-3% per day (i.e. 25-30% in 2 weeks)
- Contractures caused by flexor muscles collagenous adhesions and poor positioning
- Dependent edema
- Increased risk of DVT
- Decreased lung volumes
- Situational incontinence





# Re-conditioning

- Cardiovascular training is effective but should be supervised, at least initially
- Community exercises like Tai Chi improves lower leg strength, balance, psychological well-being, but is not very effective for improving cardiovascular endurance
- Combined with some resistive exercises can further enhance strength



# Aerobic exercise prescription for elderly

Prescription	Active Elderly	Sedentary Elderly
HRmax	60–80%	40–60%
Duration	20 min	10 min
Frequency	3x / week	5x / week
Period	14 weeks	14 weeks

- Start with low intensity
- Intervalize - shorter exercise duration
- Keep total session time at > 30 min



# Training threshold for the elderly

- Is there a lower threshold below which there is no benefit effect at all?

(Editorial. Dose of Exercise and Health Benefits. Arch Intern Med, 157:153-4, Jan 27,1997.)

- “For unconditioned elderly, submaximal exercise even at 40-50% max HR can benefit.”
- This is also the rationale for reconditioning training in patients with chronic renal failure or congestive heart failure.



# Sensible advice

- Do not insist on extensive preliminary medical evaluation (e.g. stress test) – it may give the impression that the proposed exercise regimen is dangerous.
- Exception: elderly intending to embark on very strenuous training, or attain high level of competition.
- Fast-walking is practicable and ‘pleasant-tiredness’ is a simple rule of thumb.
- Advice on warm-up and cool-down (particularly for elderly on anti-hypertensives).

Roy J. Shephard (1997) In: *Clinical Exercise Testing and Prescription – Theory and Application*, p. 85-6.

# Is exercise safe for the elderly?

	Relative Risk of Sudden Death	
Age	Moderate Exercise	Strenuous Exercise
20-39	2.5	10.0
40-49	3.6	13.1
50-69	2.5	5.3

Vuori et al. (1982) adapted by Roy J. Shephard (1997) In:  
Clinical Exercise Testing and Prescription – Theory and Application, p. 81.



# Myths, barriers, and problems



# ‘Low motivation’

- Interaction between ‘depression’, ‘low motivation’, ‘poor rehabilitation potential’ need to be carefully considered.
- Lopez MA, Mermelstein RJ (1995) showed in a controlled study that a cognitive-behavioral approach can improve rehabilitation outcome. The intervention group received verbal persuasion, role modeling, and physiologic feedback to improve motivation.



# How to motivate

Guthrie and Harvey (1994)

- Give information to reduce threat and restore control
- Provide choice and participation in goal setting
- Attend to social and emotional needs
- Discourage families from being over-protective
- Create a therapeutic culture of optimism and hope
- Provide positive role models, e.g. patients with a similar injury or disease who have achieved success

Rebecca Jester. (2007) *Advancing Practice in Rehabilitation Nursing*, p.4.



# Functionally orientated nursing care

“Orem’s self-care nursing model (1980) may be the key”

- Prepare patients adequately with aids
- Allow time and prompting
- Slow clear and audible instructions
- Teach simplest method for task
- Teach to repeat task in same manner
- Ensure walking at least part of the way
- Give psychological support and feedback
- Avoid too much help
- Avoid using chairs with wheels /routine bed-rest/  
restrainers

David Kennie (1994). Perioperative care - the tunnel of rehabilitation. In: D I Rowley, B Clift (eds.) *Skeletal Trauma in Old Age*. Chapter 3.





# ‘Demented’

- Studies by Goldstein FC et al (1997) and Diamond et al (1996) have challenged the notion that demented people cannot functionally improve with rehabilitation
- 38% of severely demented people with hip fracture can still be discharged home after rehabilitation

Jennie L Wells et al. State of the Art in Geriatric Rehabilitation. Part II: Clinical Challenges. Arch Phys Med Rehabil 2003; 84:898-903.



# Motor function and fall prevention in cognitively impaired elderly

- Review of 11 RCTs
- Physical training in cognitively impaired elderly had only limited effectiveness with respect to reduction of falls
- Conflicting results for walking speed

Hauer K et al; Effectiveness of physical training on motor performance and fall prevention In cognitively impaired older persons: A systematic review. Am J Phys Med Rehabil 2006; 85:847-857.



# Geriatric hip fracture in patients taking steroid

- 796 patients, 36 with either oral (n=23) or inhaled (n=13) corticosteroids
- The study found that after hip fracture, neither the functional recovery nor the LOS were significantly affected by the current treatment with corticosteroids.

Di Monaco M et al; A Functional recovery and length of stay after hip fracture in patients Taking corticosteroid. Am J Phys Med Rehabil 2004; 83:633-639.



# Recurrent hip fracture

- 333 patients with first hip fracture; 39 with second contralateral hip fracture
- Outcome measure: LOS and Barthel Index
- No significant prolonged rehabilitation LOS in elderly patients with previous contralateral hip fracture
- Functional recovery similar

Di Monaco M et al; Functional recovery and length of stay after recurrent hip fracture. Am J Phys Med Rehabil 2002; 81:86-89.



# Immediate vs graduated weight bearing policy

- NWB-TDWB-PWB-FWB?
- Even if weight bearing is graduated by using measuring devices in shoe or walking stick (Engel et al. Arch. Phys. Med. Rehabil. 1983; 64:386-8), it is difficult to keep at other times.
- Even using bedpans and leg-raising exercise can stress the hip anyway.
- Weight bearing at about 2 weeks do not increase complications (Andrews K. 1987), and may reduce AVN.

David Kennie (1994). Perioperative care - the tunnel of rehabilitation. In: D I Rowley, B Clift (eds.) *Skeletal Trauma in Old Age*. Chapter 3.



# Research in geriatric rehabilitation



# Notes on Research in Geriatric Rehabilitation

- Research and publications in ‘geriatric’ and ‘rehabilitation’ boomed in the 1990’s; the year 2002 saw the same number of publications in these two areas as were seen for the entire decade from 1960-69.
- Achievements:
  - Well founded theoretical model for geriatric disability
  - Growing body of data on the epidemiology of geriatric disability and basic research on age-related physiology
  - Well validated measures for key rehabilitation outcomes making methodologically rigorous appraisal possible

Helen Hoenig, Hilary Siebens. Research Agenda for Geriatric Rehabilitation; Am J Phys Med Rehabil 2004; 83(11):858-66.



# Research Agenda - Knowing what we don't know

- Define the disabling impact of stratified groups
- Define the optimal timing of input according to the underlying disablement process (e.g. catastrophic vs. progressive)
- Identify the critical factors responsible for the better outcomes
- Develop novel methods to improve coordination of care both before and after rehabilitation
- Examine the cost-benefit trade-offs of using less costly paraprofessionals, streamlined teams
- Identify which conditions potentially best treated with a team approach vs. single provider.
- Examine the benefits of different types of exercise for the same condition
- Develop and test novel assistive technology with focus on devices that may increase independence or reduce caregiver strain.
- Determine the short and long-term benefits that older persons gain from commonly prescribed assistive technological devices

Helen Hoenig, Hilary Siebens. Research Agenda for Geriatric Rehabilitation; Am J Phys Med Rehabil 2004; 83(11):858-66.





# Knee osteoarthritis: NSAID vs Exercise

- 63 in exercise group, 58 NSAIDs group
- Outcome measure: JKOM (Japanese Knee Arthritis Measure), SF-36, WOMAC (Western Ontario and McMaster Universities Arthritis Index)
- No significant differences overall; NSAID slightly better in JKOM outcome

Doi T et al; Effect of home exercise of quadriceps on knee osteoarthritis compared with Nosteroidal antiinflammatory drugs: a randomized controlled trial. Am J Phys Med Rehabil 2008;87:258-269.



# Home visits for patients with fall

- Home visit from an occupational therapist and an ergotherapist to assess homes for environmental hazards and recommend modifications
- Falls and hospitalization for falling decreased; death decreased
- Both groups had loss of dependence in 12 months, significant in control group

Pardessus V et al; Benefits of home visits for falls and autonomy in the elderly: A randomized Trial study. *Am J Phys Med Rehabil* 2002; 81:247-252.



# Taiji – therapeutic benefits

- A critical review of >200 published reports, 17 controlled clinical trials judged to meet methodological standard
- Improves QoL, physical function (activity tolerance, cardiovascular function, pain management, balance, risk of fall reduction, immune response, flexibility, strength and kinesthetic sense).
- Cardiovascular: intensity equivalent to 48-57%  $HR_{max}$  only, but does improve  $O_2$  peak (10%) and peak work (12%) at one year.

Klein P J, Adams WD; Comprehensive therapeutic benefits of Taiji: A critical review. Am J Phys Med Rehabil 2004; 83:735-745.



# Home rehabilitation for COPD

- 32 patients with moderate COPD
- 12 week programme (lower limb; upper limb; education; regular phone contact by PT for advice and monitoring)
- 28 completed programme, improved in exercise tolerance (Maximum effort tolerated for 1 minute;  $VO_2Max$ )
- No increase in QOL indices (SF-36)

Ferrari M et al; Minimally supervised home rehabilitation improves exercise capacity and Health status in patients with COPD. Am J Phys Med Rehabil 2004; 83:337-343.



# Nursing intervention after stroke

- 73 patients in Rx group, 82 patients in Control group
- Nursing intervention: structured, Orem's model
- Guidebook, each topic addresses common post-stroke problems, contains goals, how to achieve, and feedback form
- E.g. affect domain focused on creating mutual trust between patient and caregiver
- Better outcome in terms of FIM, IADL, GDS, Self-esteem and Self perception of health

Nir Z, Zolotogorsky Z, Sugarman H: Structured nursing intervention versus routine rehabilitation after stroke. *Am J Phys Med Rehabil* 2004; 83:522-529.



# Wheelchair design

- Tilting the wheelchair system and back recline by 10 degrees increase the biomechanical efficiency of self propulsion by 10% for the elderly user
- Tilting the back recline alone does not increase efficiency

Aissaoui et al; Biomechanics of manual wheelchair propulsion in elderly: System tilt and Back recline angles. Am J Phys Med Rehabil 2002; 81:94-100.



# Adherence to exercise in elderly with chronic low back pain

- 126 subjects with LBP and had physical therapy, 89 recruited by questionnaire method
- 6-week PT program of exercise and advice to remain active
- 2-year follow up
- % of patients who performed at least some exercise increased from 49% to 72%

Mailloux J, Finno M, Rainville J: Long-term exercise adherence in the elderly with chronic low back pain. *Am J Phys Med Rehabil* 2006;85:120-126.



# Outcome toolkit – assessment tools selected

- SMAF (French, for Functional Autonomy Measurement System): SMAF-ADL; SMAF-IADL; SMAF-mobility; SMAF-social
- ILP (French, for Individual Leisure Profile-satisfaction)
- TUG (Timed Up and Go)
- BBT (Box and Blocks Test)
- NPRS (Numeric Pain Rating Scale)
- GWBS (General Well-Being Scale)
- 3MS (The Modified Mini-Mental Scale)
- Montgomery Borgatta Caregiver Burden Scale

Demers L et al; Assembling a toolkit to measure geriatric rehabilitation outcomes. Am J Phys Med Rehabil 2005;84:460-472.





# Tools to assess geriatric assessment outcome

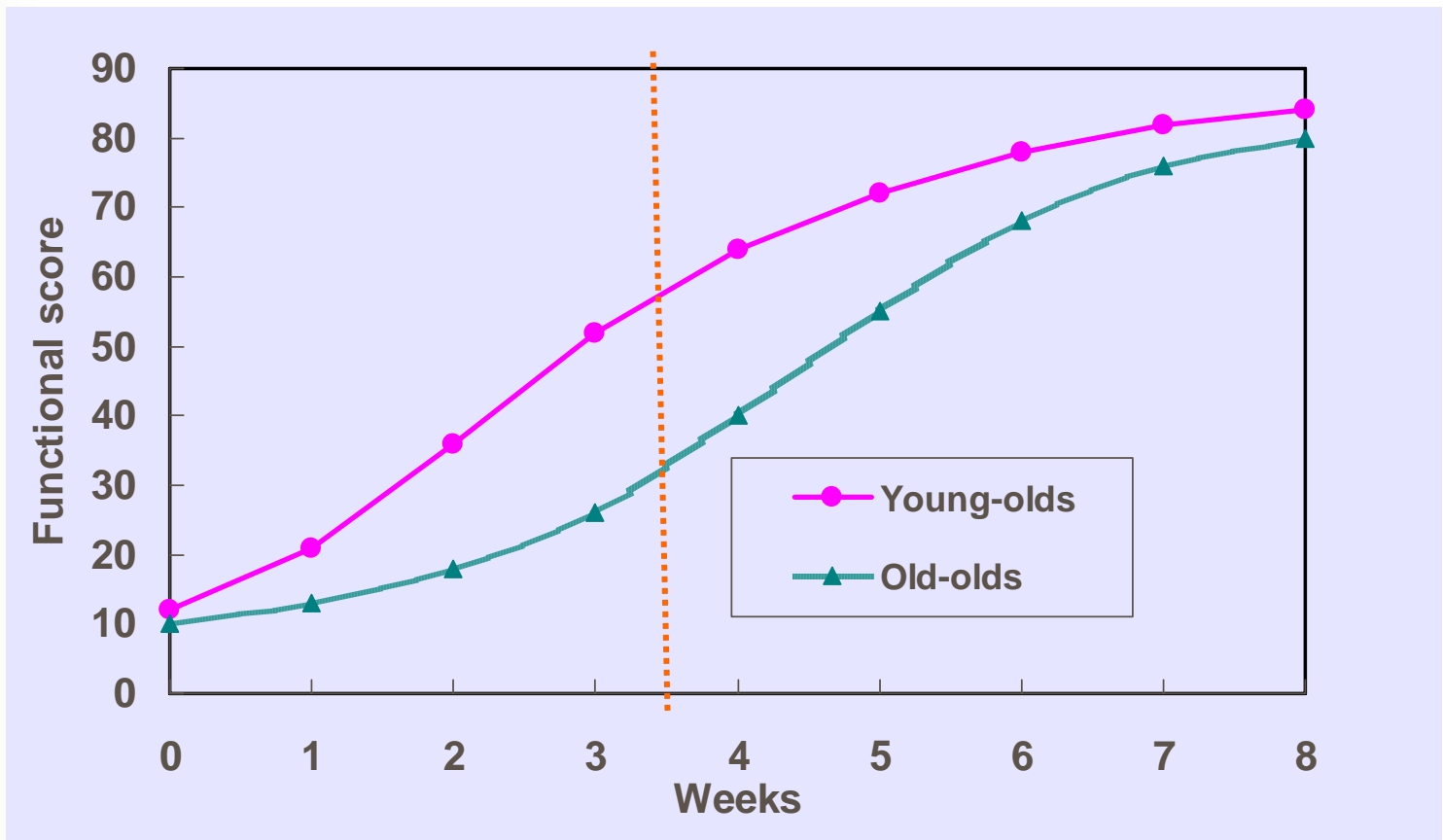
- 4 outcome domains (Mobility / Basic Daily Living / Independent Living / Leisure ), for each, consider 4 functioning domains (Physical / Psychological / Social / Caregiver and resources)
- Toolkit – full assessment requires 2 sessions, 30-90 minutes each
- In research development stage

Demers L et al; Assembling a toolkit to measure geriatric rehabilitation outcomes.  
Am J Phys Med Rehabil 2005;84:460-472.



The question of efficiency  
and length of stay (LOS)

# Poor potential?





# Length of stay (hip fracture, US, 1980s)

- Fitzgerald JF et al 1988 showed that the outcome of elderly with hip fracture has declined with compression of LOS since the introduction of a new payment system in 1983. The acute care stay fell from 21.9 days in 1981 to 12.6 days in 1986; during this time, the proportion of patients discharged to nursing homes rose from 38% to 60%, discharge walking distance fell from 27 to 11 m, and PT sessions decreased from 7.6 to 6.3
- As a result of the shorter LOS, the model of skilled nursing homes emerged.

Jennie L Wells et al. State of the Art in Geriatric Rehabilitation. Part II: Clinical Challenges. Arch Phys Med Rehabil 2003; 84:898-903.



# Length of stay (hip fracture, current)

- Targeting patients for early inpatient rehabilitation is effective. (Munin et al 1998)
- Early discharge with outpatient rehabilitation or day hospital were found to be appropriate. (Papaioannou et al 2001)
- GORUs (Geriatric orthopedic rehabilitation units) and MARUs (Mixed geriatric and rehabilitation units) do not shorten LOS but may have better outcome for the more disabled patients.

Jennie L Wells et al. State of the Art in Geriatric Rehabilitation. Part II: Clinical Challenges. Arch Phys Med Rehabil 2003; 84:898-903.



# Appropriate early discharge

- “Early discharge is ‘easy’ if clinicians choose to ignore the distress and risk to patients and the inconvenience and burden to carers.”
- “Appropriate early discharge, on the other hand, are influenced by multiple factors.”

David Kennie (1994). Perioperative care - the tunnel of rehabilitation. In: D I Rowley, B Clift (eds.) *Skeletal Trauma in Old Age*. Chapter 3.



# Early discharge and H-at-H schemes for geriatric hip fracture

- They can work in appropriately selected subgroups with intensive post-discharge community support [Cedar and Thorngren (1982); Sikorski et al (1985); Prior et al (1988)]
- Claimed 55% to 72% patients eligible.
- Disputed by Kennie (1988) - retrospectively applied the recommended criteria to a series of 144 female hip fracture patients aged 65+ and found 9.7% already discharged rapidly anyway; formal introduction of rapid transit program will only add 14.5% (those with no exclusion criteria) or 7.6% (if allows one exclusion criteria)

David Kennie (1994). Perioperative care - the tunnel of rehabilitation. In: D I Rowley, B Clift (eds.) *Skeletal Trauma in Old Age*. Chapter 3.



# Clinical policies facilitating early discharge

- Active perioperative care
- Functionally orientated nursing care
- Therapy intensity
- Active medical social work input
- Immediate vs graduated weight bearing policy
- Medical / geriatric input

David Kenzie (1994). Perioperative care - the tunnel of rehabilitation. In: D I Rowley, B Clift (eds.) *Skeletal Trauma in Old Age*. Chapter 3.





A surprising piece of finding on LOS and efficiency...

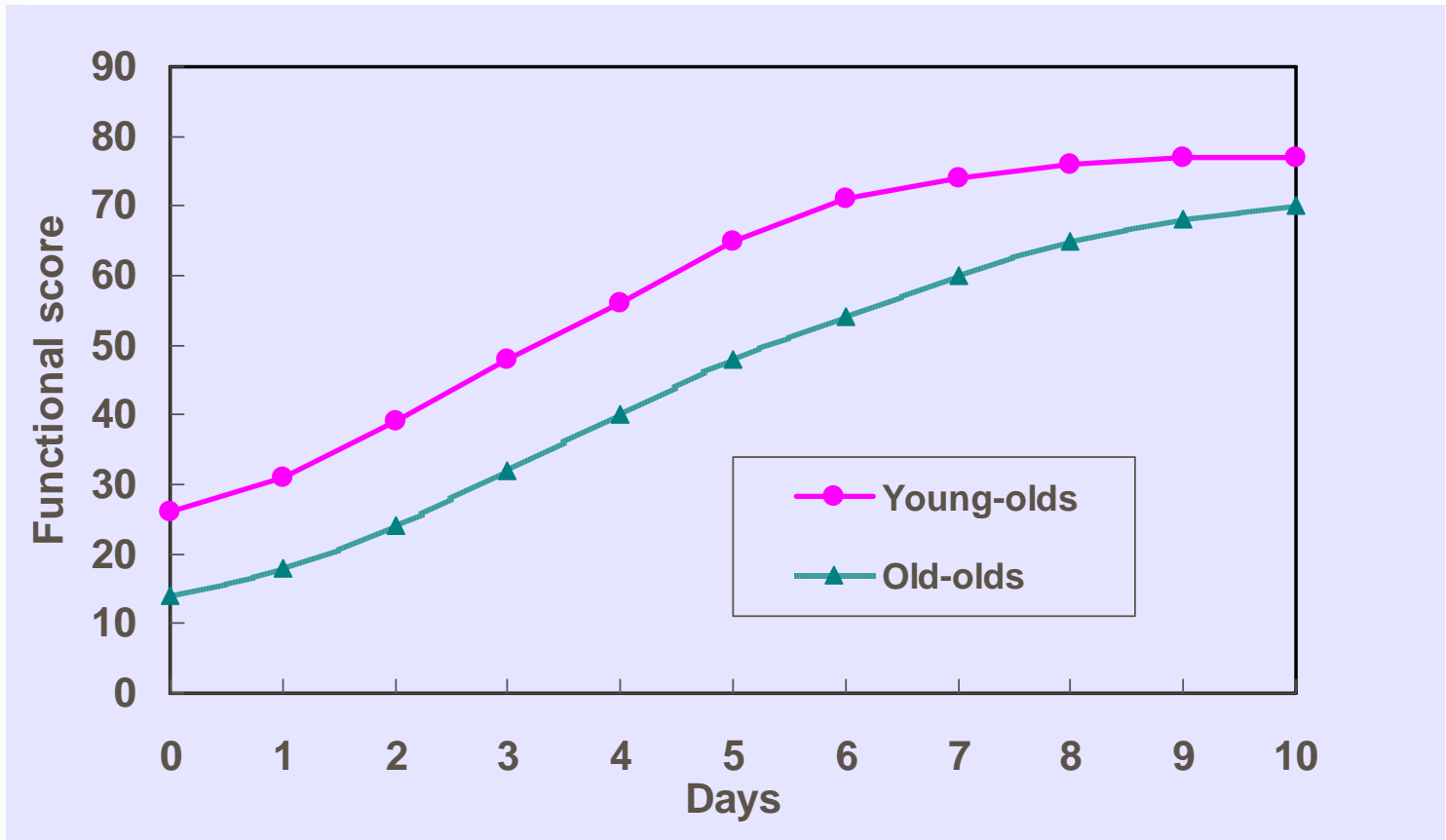


# Outcome in Total Knee Arthroplasty – age factor

- LOS is longer in patients >70years compared with the younger group (10.6 vs 8.8 days)
- FIM-efficiency similar
- FIM gain in older female group is **more** than in younger female group (not observed in male groups)

Vincent KR et al; Outcomes in total knee arthroplasty patients after inpatient rehabilitation: Influence of age and gender. Am J Phys Med Rehabil 2006; 85:482-489.

# TKR outcome – schematic illustration





In summary...



# Take home messages

- ‘Geriatric rehabilitation’ may mean different thing to different people, but it is of growing importance anyway
- We don’t know enough about geriatric rehabilitation, nor how it best work, but we do know quite a bit how it can work well, and quite a lot how it may work better
- What would probably make it work:
  - Focus on good assessment of function
  - Pay attention to frailty, drugs and co-morbidities
  - Motivate, encourage independence, set goals
  - Prevent disuse, do not immobilise (as far as possible)
  - Prescribe exercise with initially supervised training
  - Bring knowledge from different disciplines to work together
  - Evaluate outcome



Thank you for your attention