REHABILITATION OF LOWER LIMB AMPUTEES OF THE ELDERLY

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GERIATRIC REHABILITATION

General Aspects

Identify the correct diagnosis !

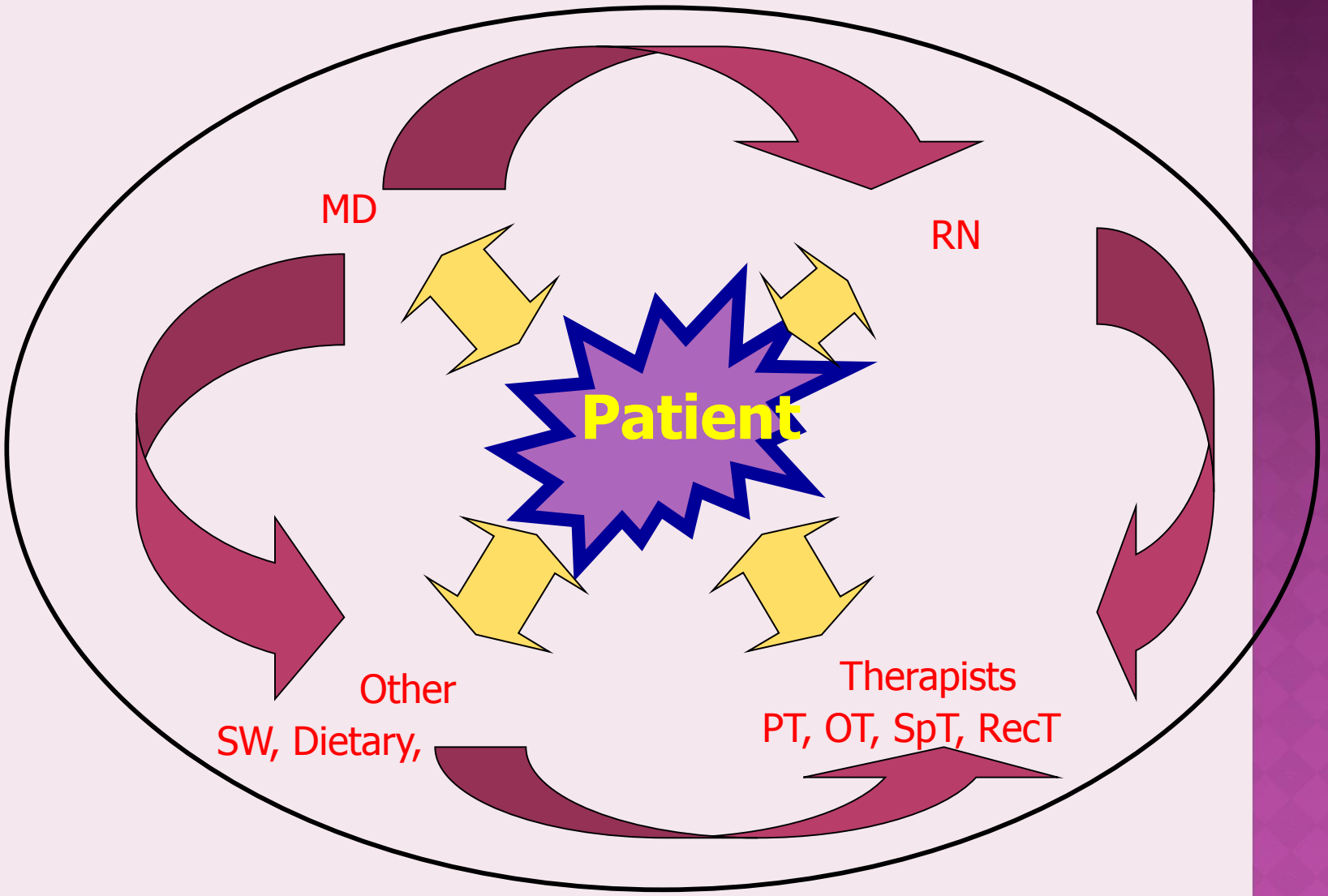
Assess for comorbidities

Involve the patient (& family)

Team approach to care

(*A*,*B*,*C*,…) Prevent complications

GERIATRIC REHABILITATION



GERIATRIC REHABILITATION

Prevent complications ***A B C*** s

A Aspiration, Anorexia, inActivity

B Bedsores,

C Constipation, Contractures, Cognition

D DVTs, Depression, DUs

E Else: infections (UTI, Pneumonia), pain

GERIATRIC REHABILITATION

Specifics

Joints

Elective replacements

Fractures

Stroke

General Medical Problems

Lower Limb Amputation

HOW TO DETERMINE REHABILITATION POTENTIAL FOR INPATIENT REHABILITATION

1/ Cognitive function: The patient must be able to retain new information learned in therapy (patients with moderate-to-severe dementia may be a poor rehab candidate)

2/ Medical status: The patient must have stable medical status with no contraindications to do exercise

3/ Motivation: The patient must have good motivation in order to benefit from rehabilitation (although lack of motivation due to depression is NOT contraindication)

4/ Social support: The patient have adequate social support to continue and complete rehabilitation

5/ Economic resources: The patient must have appropriate health insurance and/or private funds to receive rehabilitation

HOW TO DETERMINE REHABILITATION POTENTIAL FOR INPATIENT REHABILITATION

6/ Others:

a. The patient must be able to tolerate therapy for **3 hours/ day,**

6 days/week

b. The patient requires **at least two different therapies**

(physical therapy , occupational therapy, speech therapy)

c. The patient must be evaluated by rehabilitation specialists

(physical therapy, occupational therapy, speech therapy)

in the hospital as soon as medically stable

HIP FRACTURES
OUTCOME AT 1 YEAR

40% cannot walk independently

60% require assistance with ADL

80% need help with IADL.

FUNCTIONAL RECOVERY S/P HIP FX

Percentage Able to Perfrom

Independent Function	Before	6 months after
•Dress	86	49
•Transfer	90	32
•Walk across a room	75	15
•Walk half a mile	41	6

JAGS 1992;40(9):863.

Stroke

700,000 strokes/ year

Recurrence rate 7-10% annually

STROKE *DIAGNOSIS:*

Etiology (hemorrhage, thrombotic, embolic)

Developing interventions in acute phase

Location (frontal, posterior, left *vs* right)

May be factor in deficits and treatments needed

Coordinated care improves outcomes.

Recovery: Proximal to distal

Flaccid to spastic to recovery

STROKE

Rehabilitation is complex due to the variety of causes and residual deficits

Recovery and time needed to reach maximal recovery affected by the number of deficits.

Hemiparesis, hemianopsia & sensory deficits are less likely to ambulate (I) and will require a longer time than those with hemiparesis only

GENERAL MEDICAL/ DECONDITIONING

Dx:

Comorbidities:

Complications:

Hazards of Hospitalization

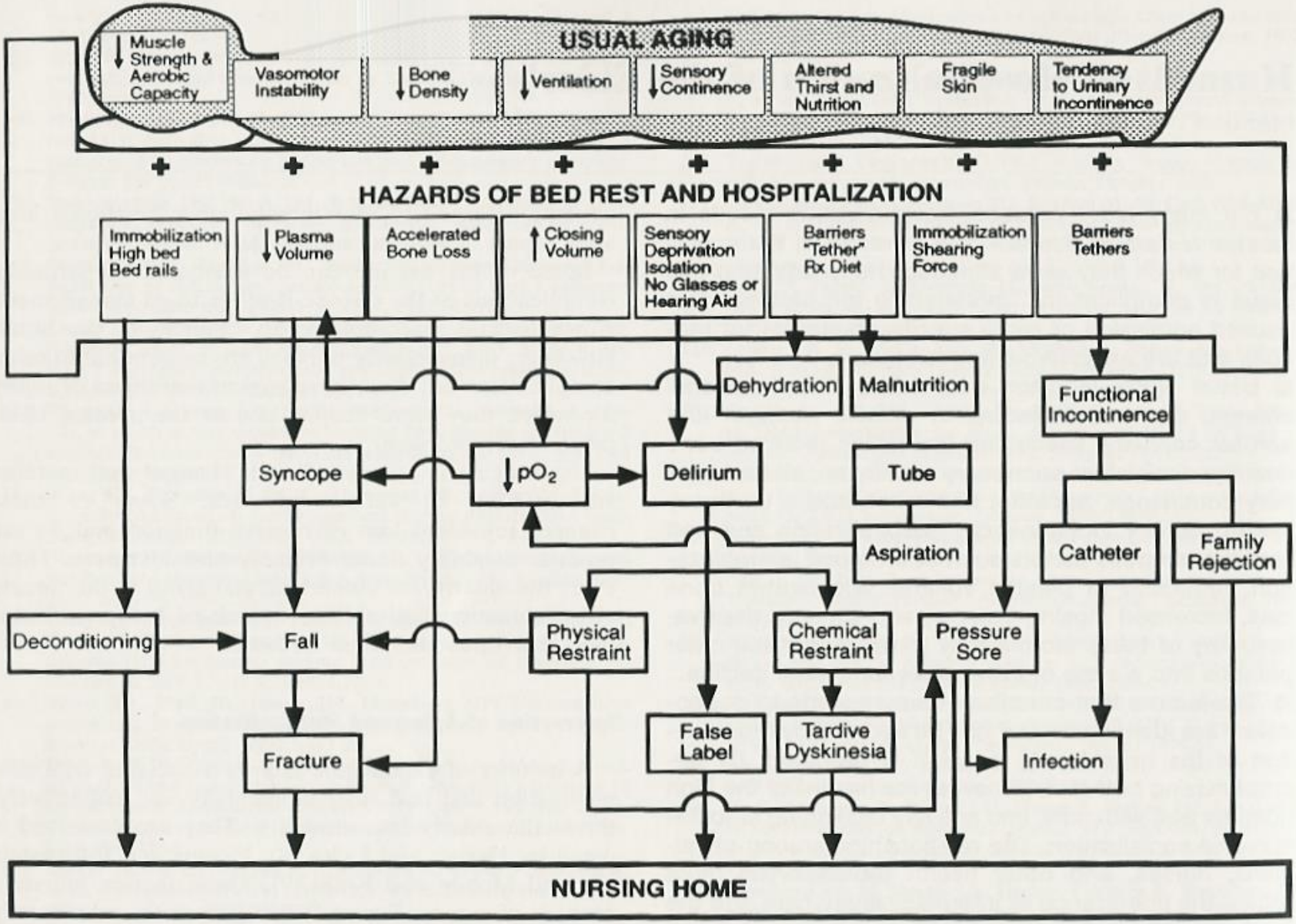


Figure 1. The cascade to dependency.

AMPUTATION

Peripheral arterial disease

Affects 20% adults in Europe and North America

In the UK 500-1000/million PAD, 1-2% require amputation

LLA 8-15% in people with diabetes with up to 70% dying <5 years of surgery

Hospital inpatient data - 5,498 FCE (2009/10), & 530 deaths in England alone

Previous reports indicate mortality is high reflecting age and comorbidites

AMPUTATION

Wide geographic variation in the number of amputations carried out

Peri-operative cardiac complications are the leading cause of morbidity & mortality following surgery

Previous guidelines

VSGBI

Diabetes UK

BACPAR

GEOGRAPHY

Likely reasons for an amputation depend on location.

In USA & Europe circulatory disease, cancer and infection are the leading causes.

In Africa the most likely causes are industrial, vehicular, or a war related accidents – again infection is a problem.

GEOGRAPHY

Amputations are usually the result of complications of diabetes, peripheral arterial disease, trauma, and malignant tumours; and are often complicated by infection

Diabetes complications are commonly acknowledged as the leading cause of the global amputation burden and contribute to between 25% (in Italy and Japan) and 90% (in American Indians) of all amputations. In the UK and Europe diabetes accounts for around 40 - 64% of amputations .

Peripheral arterial disease is a contributing cause for between 16 – 100% of global amputations , and a primary cause (without diabetes or non-diabetes) for 18 – 58% of amputations in the UK and European countries .

Amputations related to trauma result in between 0 – 57% of all global amputations and trauma appears to be the primary cause of 2 – 13% of UK and European amputations /

Malignant tumours are a contributing cause of up to 14% of amputations and a primary cause of between 2 – 3% of amputations in the UK and Europe .

Infections contribute to anywhere between 4 -100% of all amputations, however infections are typically preceded by the above conditions

STATISTICS IN ISRAEL

The absolute number of **diabetes-related amputations** increased by 14.7%, and the incidence decreased by 9.1%, from 27.5 to 25.0 per 10,000 people with diabetes, during the study period ($P > 0.2$ for both).

Nondiabetes-related amputation incidence decreased from 13.6 to 11.9 per 100,000 people without diabetes (0.97 decrease by year [0.93–1.00]; $P = 0.059$). The relative risk of an individual with diabetes undergoing a lower extremity amputation was 20.3 in 2004 and 21.2 in 2008, compared with that of individuals without diabetes.

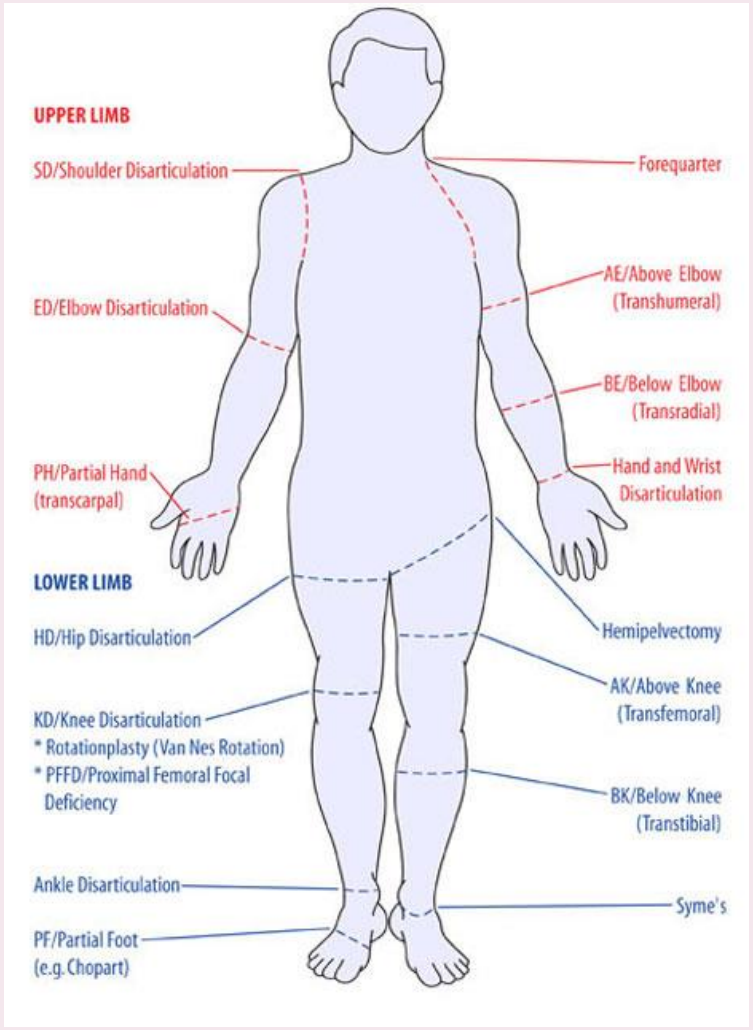
STATISTICS IN ISRAEL

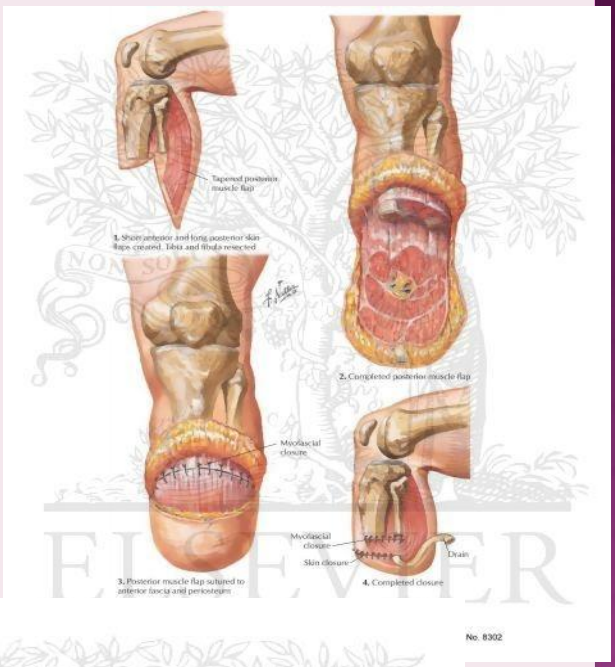
Rates of contralateral limb amputation are high and predicted by renal disease, atherosclerosis, and atherosclerosis with diabetic neuropathy.

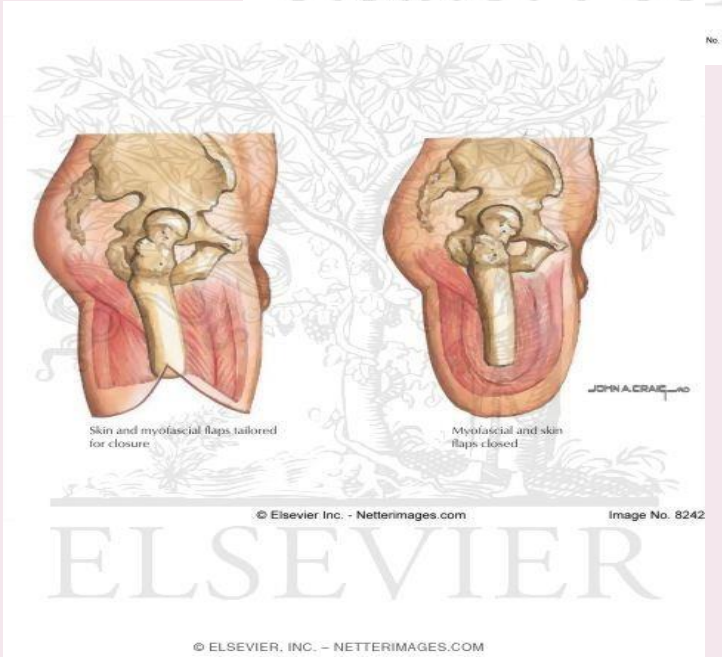
Physicians and patients should be alert to the high risk of subsequent amputation in the ***contralateral leg***. All patients, but particularly those at increased risk, should undergo close surveillance and counseling to help prevent subsequent amputations in their contralateral lower extremity.

The fate of the contralateral limb, however, has not been well described in the literature. **Published rates of amputation in the contralateral limb vary from 2.2% to 19.8% over periods from 12 months to 10 years.**

TYPE OF AMPUTATIONS







REHABILITATION

Rehabilitation of lower limb amputees encompasses the ***pre-amputation, postoperative, pre-prosthetic and prosthetic rehabilitation stage***

Medical rehabilitation should by all means be accompanied by an adequate psychological and social rehabilitation in the line with the bio-psychosocial model, so as to attain the ultimate goal of each and every rehabilitation, that is to say, ***a successful reintegration of an amputee into an everyday life that resembles the style and quality of the pre-amputation daily living as much as possible***

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Pre-operative rehabilitation stage

Access to multidisciplinary teams and a multiprofessional pathway of care

Pain management

Clinical care of the patient

Optimisation of comorbidities, including diabetic control

Peri-operative care

The scheduling of surgery, including priority and cancellations

Seniority of clinicians (surgery and anaesthesia)

Operation undertaken

Antibiotic prophylaxis, venous thromboembolism prophylaxis

Diabetes control

Anaesthetic care

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Post operative rehabilitation stage

- Postoperative patient care and local monitoring of the wound healing process

- Pain management

- Prevention of joint contracture both when it comes to the amputated and unaffected leg

- An adequate residual limb treatment so as to speed up the wound healing process, alleviate pain and aid in residual limb formation; the process shell be facilitated by virtue of leg elevation and gradual pressurizing of the residual limb on the occasion of its dressing

- Psychological support

Contractures

- may occur at the time of surgery or postoperatively from lack of activity and prolonged sitting or wheelchair ambulation
  - Prevented by
    - avoiding over tightening of the muscles and appropriate postoperative positioning maintained.
      - prolonged sitting with the hip and knee flexed should be avoided
      - TRANSFEMORAL : lie in the prone position multiple times during the day to stretch the hip musculature
    - gentle passive stretching,
    - Exercises to strengthen the muscles controlling the joint
  - Managed by:
    - Increased ambulation at knee joint
    - Prosthetic modification
    - Wedging casts or surgical release(severe fixed contracture)

Prevention of deformities cont...

- Exercise to counteract the deformity:
  - Strong isometric quadriceps ex – BKA
  - Hip extensor & add isometric ex – high AKA
  - Hip extensor & abd isometric ex – low AKA
  - Progression is made to free active & resisted stump ex.
  - Stump board – in BKA – stump should be rest on board when sitting in wheelchair.
  - Prolong sitting with knee flex should be avoided.

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Post operative rehabilitation stage

By the end of this rehabilitation stage, the attained level of the patient s functional capacities should be assessed, including the current mobility level (his/her ability or inability of prosthetic ambulation and out-of-bed transfer), the level to which the patient has learned to cope with everyday activities and self-management

1/ Amputee Mobility Predictor (AMP)

2/ Functional Independence Measure (FIM)

3/ Two - or Six-Minute Walk Test

4/ Timed-Up and Go Test (TUG)

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Pre – prosthetic rehabilitation stage

A preparatory stage tailored to prepare the patient for the prosthetic device provision

- This stage starts once the surgical wound is healed and is completed once the prosthetic device has been delivered and the pertaining rehabilitation has been started

- The target of this stage is the preparation of the residual limb for the acceptance of the prosthesis and at the conditioning of the patient and his/her preparation for the strains to be expected with prosthetic rehabilitation via physical and kinesitherapy

REHABILITATION OF THE ELDERLY

Endurance testing tools that have proven efficient at the point of admission into the rehabilitation centre are: the Six-Minute Walk Test and The Functional Independence Measure (FIM)

Walking abilities are best tested should he patient walk on a flat surface for 6 minutes, while the 2-Minute or shorter Walk Test has been proven an unreliable mobility indicator

The most reliable indicator and predictor to be established at the rehabilitation admission point us the patient s ability to walk without assistance, using only an aiding devise (either crutches or a walker); therefore, the pre-prosthetic stage of rehabilitation carried out under the patient s roof or in a nursing home under the supervision of a physiotherapist aims to capacitate the patient to attain the above goal

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Pre - prosthetic rehabilitation stage

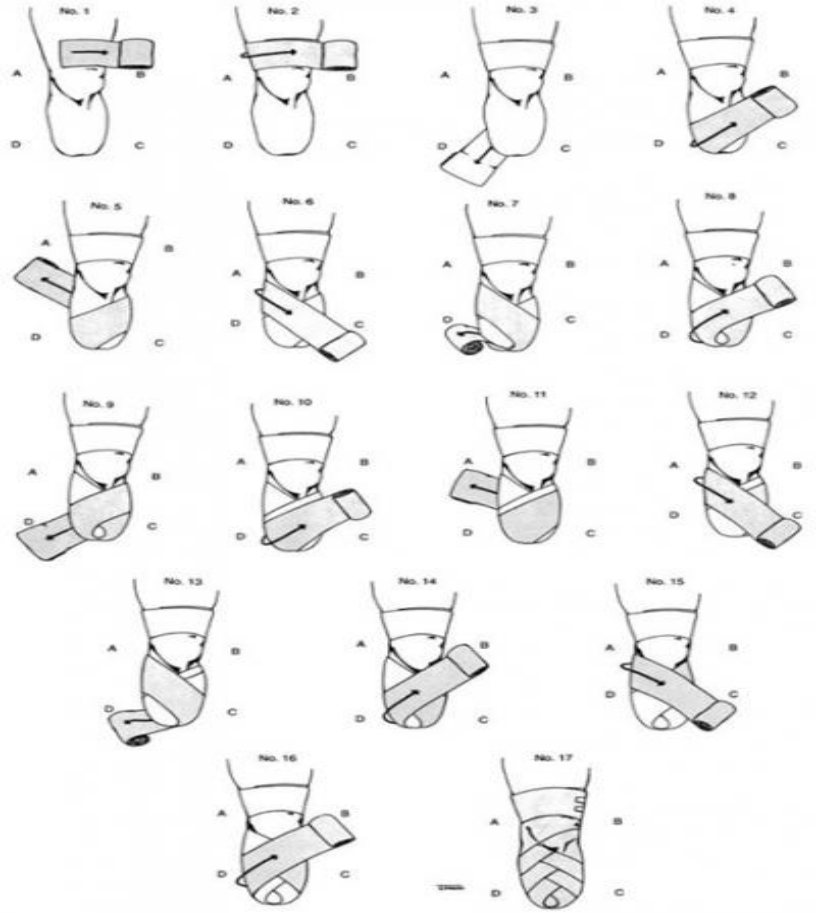
Preparation of residual limb for the acceptance of the prosthetic device by using ***elastic dressing, plaster dressing, a semi - hard polyethylene coating or a compressive elastic or silicone socket***

Trans - tibial amputee - cylindrical shape

Trans - femoral amputee - conical shape

Posttraumatic oedema and hematoma are expected to regress within 15-20 days post amputation

TRANS - TIBIAL AND TRANS - FEMORAL BANDAGING



AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Prosthetic rehabilitation stage

Focused on the selection, fabrication and application of the prosthetic device, as well as on the pertaining rehabilitation and prosthetic ambulation mastering

The application of the prosthesis after the surgery scar healing, overall health stabilisation, mastered verticalisation and preferably also mastered aided ambulation (with the aid of crutches or a walker) on a 30 meter track

In cases of blood flow insufficiencies an ideal timing of the prosthetic rehabilitation launch would be 5-6 weeks following amputation

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Prosthetic rehabilitation stage

The provision of a prosthetic device is underpinned by the following principles:

1. Early – stage provision of the prosthetic device (4-5 weeks post surgery)
2. A modular system – based fabrication of the prosthetic device
3. A full contact – bearing use
4. An individual approach to prosthetic device provision planning and implementation

MOBILITY SCALE (FUNCTIONAL LEVELS DEFINED BY THE CENTERS FOR MEDICARE AND MEDICAID SERVICES)

Table 1.
Definitions for Medicare Functional Classification Level.

K-Level*	Functional Description	Foot Description
0	Does not have ability or potential to ambulate or transfer safely with or without assistance, and prosthesis does not enhance quality of life or mobility.	Not eligible for prosthesis.
1	Has ability or potential to use prosthesis for transfers or ambulation on level surfaces at fixed cadence. Typical of limited and unlimited household ambulator.	External keel, SACH foot, or single-axis ankle/foot.
2	Has ability or potential for ambulation with ability to traverse low-level environmental barriers such as curbs, stairs, or uneven surfaces. Typical of limited community ambulator.	Flexible-keel foot and multi-axial ankle/foot.
3	Has ability or potential for ambulation with variable cadence. Typical of community ambulator who has ability to traverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic use beyond simple locomotion.	Flex-foot system, energy storing foot, multi-axial ankle/foot, dynamic response, or flex-walk system or equal.
4	Has ability or potential for prosthetic ambulation that exceeds basic ambulation skills, exhibiting high impact, stress, or energy levels. Typical of prosthetic demands of child, active adult, or athlete.	Any ankle/foot system appropriate.

*K is arbitrary letter assigned by Health Care Financing Administration to this classification system.
SACH = solid ankle cushion heel.

TYPES OF PROSTHETIC

Transtibial Prosthesis replaces a leg missing below the knee. Such amputees can regain normal movement more readily than those with a transfemoral amputation - retaining the knee allows for easier movement.

Transfemoral Prostheses replaces a leg missing above the knee. Such amputees can have a very difficult time regaining normal movement. A transfemoral amputee must use approximately 80% more energy to walk than a person with two whole legs.

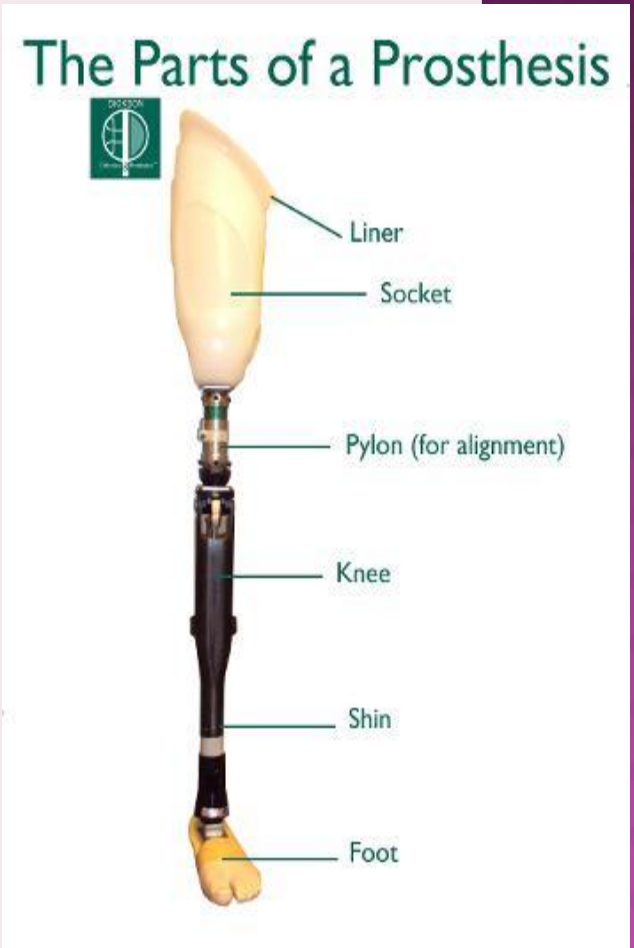
Transradial Prostheses replaces an arm missing below the elbow. Two main types of prosthetics are available. Cable operated limbs work by attaching a harness and cable around the opposite shoulder of the damaged arm. Alternative is myoelectric arms – muscle sensing.

Transhumeral Prosthesis replaces an arm missing above the elbow. Such amputees experience some of the same problems as transfemoral amputees, due to the similar complexities associated with the movement of the elbow. Mimicking the correct motion with an artificial limb is very difficult.

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Prosthetic rehabilitation stage

THE PARTS OF THE PROSTHESIS



FUNCTIONAL REHABILITATION GOALS ATTAINMENT FOLLOWS THE SUBSEQUENT ALGORITHM:

1. Mastering of proper prosthesis donning and doffing
2. Prosthesis –aided standing and sitting exercises, prosthetic ambulation exercises that make use of parallel bars
3. Prosthetic ambulation on an even surface (outside parallel bars) with the aid of crutches or a walker
4. Sitting in a chair and getting up + prosthetic transfers
5. Traversing minor barriers during prosthetic rehabilitation
6. Climbing stairs
7. Prosthesis – on falling and getting up scenarios (younger age)
8. Prosthetic ambulation in a natural environment
9. Getting in and out of a car scenarios
10. Prosthesis – on and prosthesis – of activities (younger age)

AGENDA AND COURSE OF THE LOWER LIMB AMPUTEES REHABILITATION PROGRAMME

Successful rehabilitation is perceived as an opportunity to improve the chances for regaining " normal " ambulation

In cases of primary prosthetic appliance provisions, the duration of the prosthetic rehabilitation of ***trans - tibial amputees*** approximates to **4 - 6 weeks**, while in ***trans - femoral amputees*** the expected duration of this rehabilitation stage is roughly **6 - 8 weeks.**

In cases of ***bilateral amputation*** , the length of rehabilitation is prolonged, ***bilateral trans - femoral amputation*** its up to **3 months**

In cases of recurrent (secondary) prosthetic device provision , the average length in - hospital stay equals to **7-14 days**

Rehabilitation in out - patient settings is possible as well

REHABILITATION OF THE ELDERLY

Represent the majority of lower limb amputee population

- This population is characterised by multiple morbidities (e.g. vascular insufficiency, coronary heart disease, diabetes, neuropathies..), degenerative changes of the locomotive system and consequential ambulation kinematics disturbances, as well as by overall deterioration of functional and mental/somatic capacities

- Risk factors – hypertension, diabetes, hypercholesterolaemia and smoking

- The successfulness of prosthetic device supply, especially in above knee amputees, strongly depends on co-morbidities and cardiac strain capacities

REHABILITATION OF THE ELDERLY

Prosthetic ambulation implies an increased cardiac straining and an increased energy consumption

In ***trans - tibial amputees*** the above cardiac strain and energy consumption increases approximate to 40%, in ***trans - femoral amputees*** to 80%, while in ***bilateral AKA*** the increase of up to 200%

THE OUTCOMES OF THE PROSTHETIC REHABILITATION OF AN AMPUTEE

1 / mastered prosthetic ambulation, deemed as an excellent rehabilitation outcome

2 / mastered prosthetic ambulation aided with crutches or a walker, deemed as a favourable rehabilitation outcome

3/ aided ambulation making no use of a prosthesis, but rather of crutches, deemed as a poor rehabilitation outcome

4 / wheel-chair ambulation, deemed as the poorest rehabilitation outcome

THE SUCCESS OF THE PROSTHETIC REHABILITATION AND ITS FUNCTIONAL OUTCOME

May be quantitatively and qualitatively assessed using a spectrum of standardized tools:

- The Timed Up and Go Test
- Timed Walk Test
- The Amputee Mobility Predictor
- The Locomotor Capabilities index
- The Functional Independence Measurement
- The Barthel Index
- Prosthetic Evaluation Questionnaire
- The Orthotics and Prosthetics User Survey

Conclusion

Based on the clinical experience and literature sources, it can be concluded that prosthetic rehabilitation at elderly underpinned by good clinical practice, entrusted with interdisciplinary team that follows the guidelines for contemporary prosthetic rehabilitation and carried out in patients who had high-quality amputation surgery , may vouch for the successful provision of a prosthetic appliance.


THANK
YOU