



UNIVERSITATEA DE STAT DE MEDICINĂ ȘI FARMACIE  
"NICOLAE TESTEMIȚANU" DIN REPUBLICA MOLDOVA

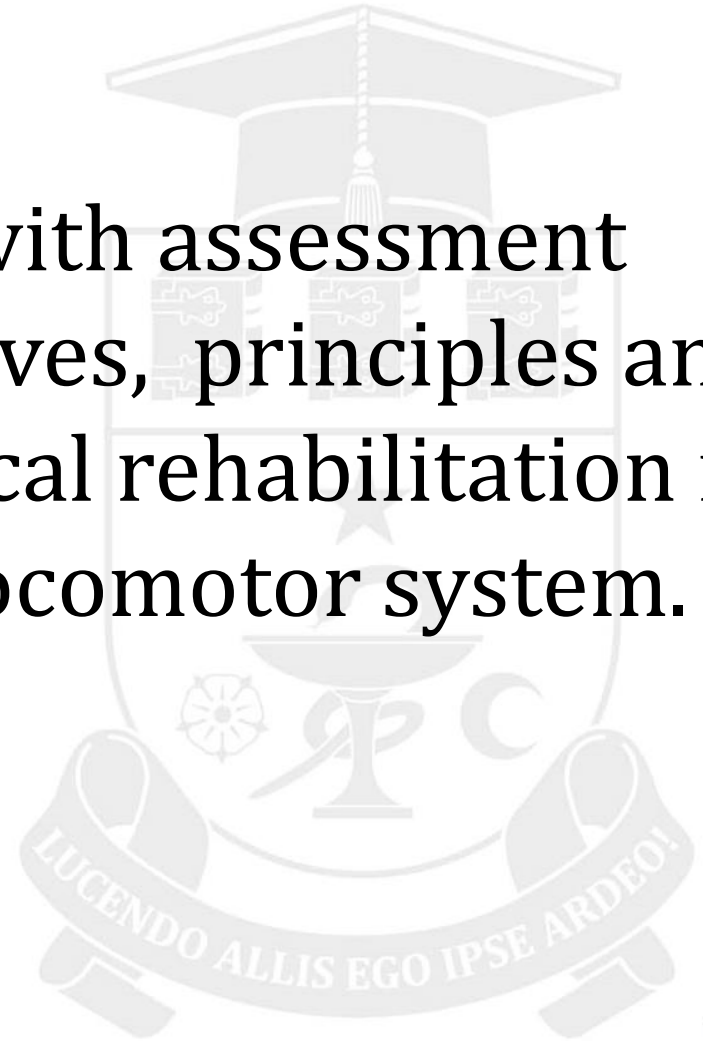
# Musculoskeletal Rehabilitation

Department of Medical Rehabilitation, Physical  
Medicine and Manual Therapy



# *The purpose of the lesson*

Aknolegment with assessment techniques, objectives, principles and the means of medical rehabilitation in diseases of the locomotor system.



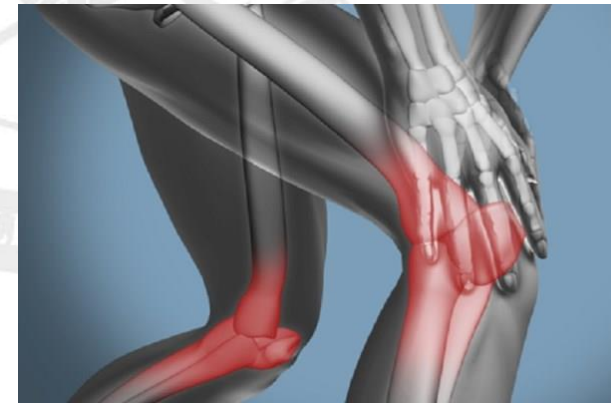


# *The objectives of the lesson*

- The knowledge of the clinical and functional methods of global and analytical evaluation of the myo-osteo-articular system
- The selection of optimal methods and means in the functional recovery of the various pathologies of the osteo-articular system
- The knowledge of the principles of multidisciplinary approach to locomotor system disorders and elaboration of adapted rehabilitation programs



- The increase in the number of accidents of various etiologies (road, work, sports, aggression) has increased the frequency of traumatic injuries of the locomotor apparatus.
- 33% of the population is affected by rheumatological suffering.
- Arthrosis is the most common rheumatological disorder.





# *The locomotor system*

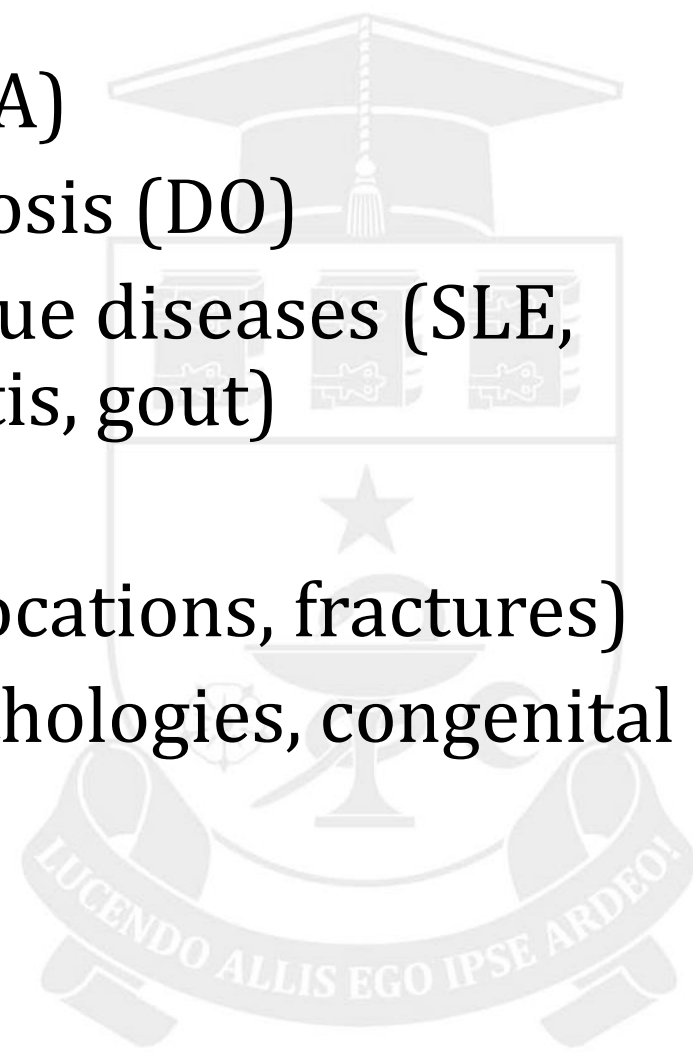
- Human motility, walking, balance, coordination, etc. is only possible through the functional collaboration of 3 anatomically and functionally integrated systems (nervous, muscular, osteoarticular).
- The activity of the three systems / devices is reflected in the modern vision through the concept of the "**neuro-mio-arthro-kinetic apparatus**".





# *Diseases that can benefit from the rehabilitation program*

- Rheumatoid arthritis (RA)
- Deformation osteoarthritis (DO)
- Systemic connective tissue diseases (SLE, dermatosis / polymyositis, gout)
- Osteoporosis (OP)
- Traumatic injuries (dislocations, fractures)
- Orthopedic-scoliosis pathologies, congenital dysplasia, etc.
- Limb amputations





# *Evaluation of the osteo-articular system*

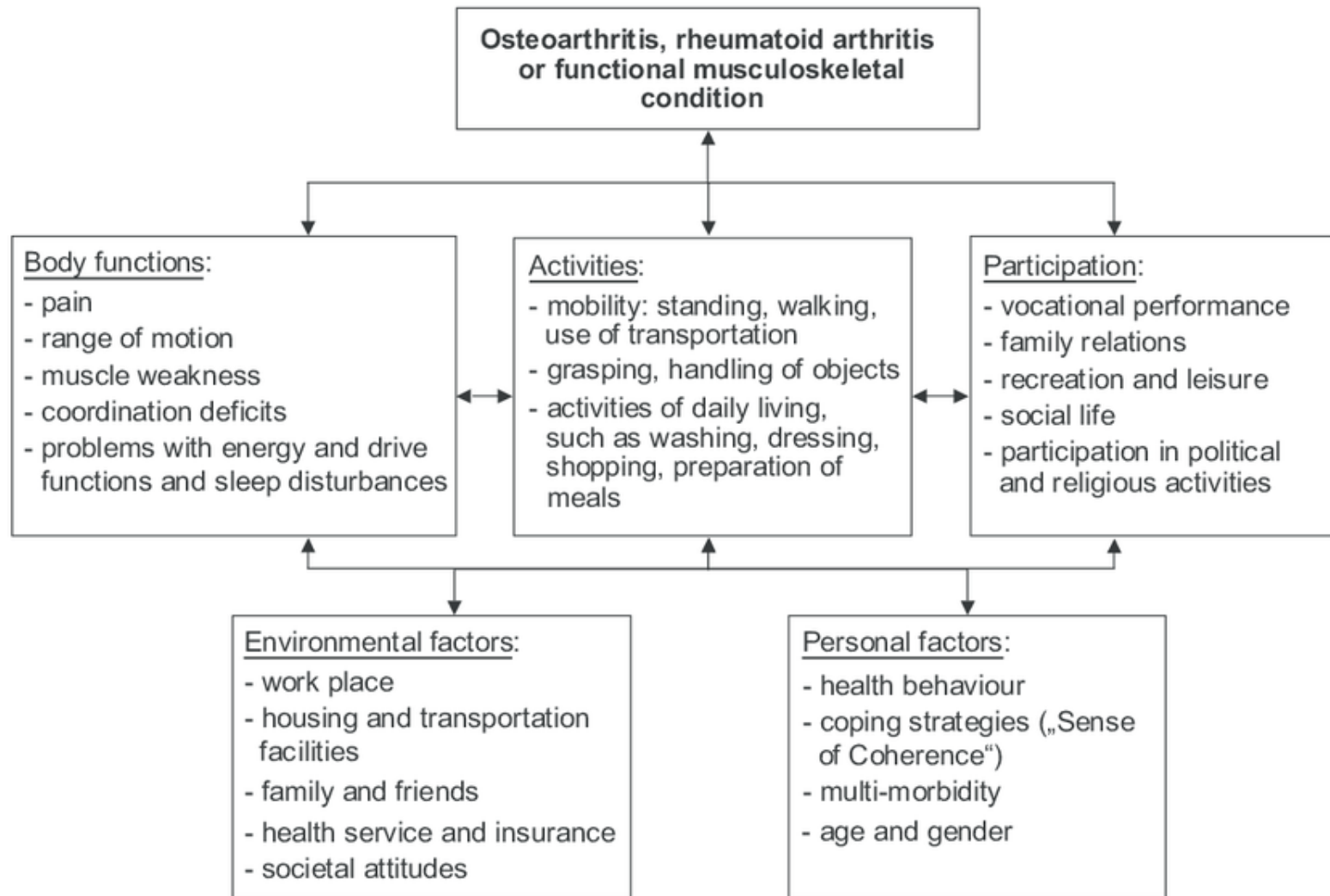
**Evaluation:** Basic means in establishing  
the functional diagnosis

-subjective-accusative, anamnestic data

-objective data



# Applied ICF Osteoarthritis







# *Subjective signs*

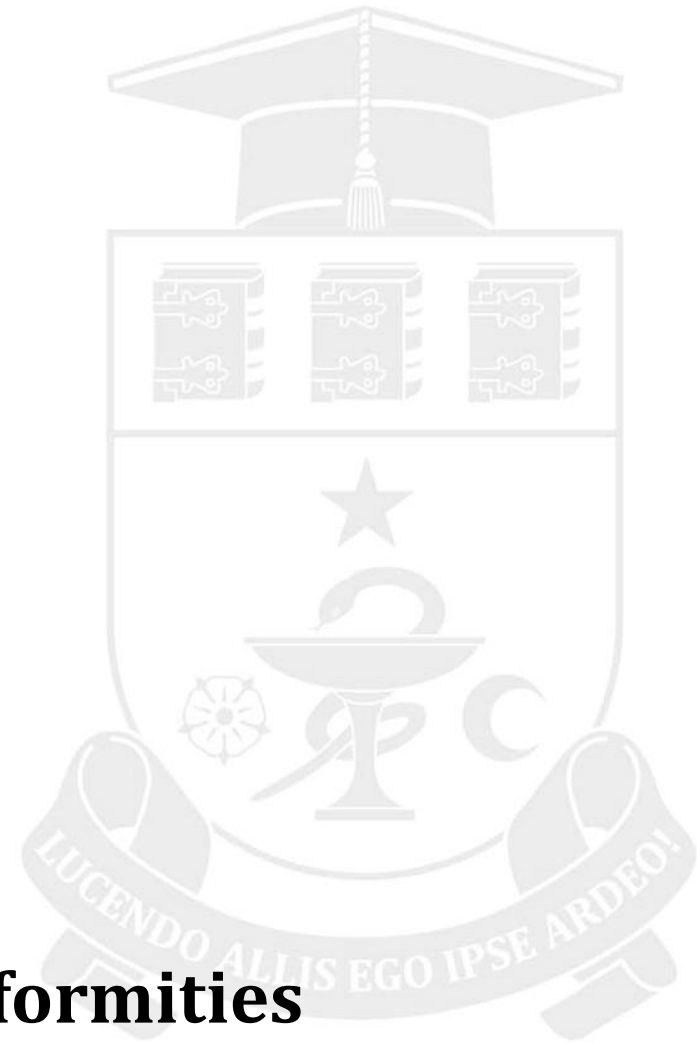
## **1. The pain**

- Location;
- The quality;
- The challenging factors;
- Soothing factors;
- Irradiation;
- Severity;
- Intensity.

## **2. Functional deficiency**

- Partial;
- Total .

## **3. Vicious attitudes and deformities**





# *Anamnestic exam*

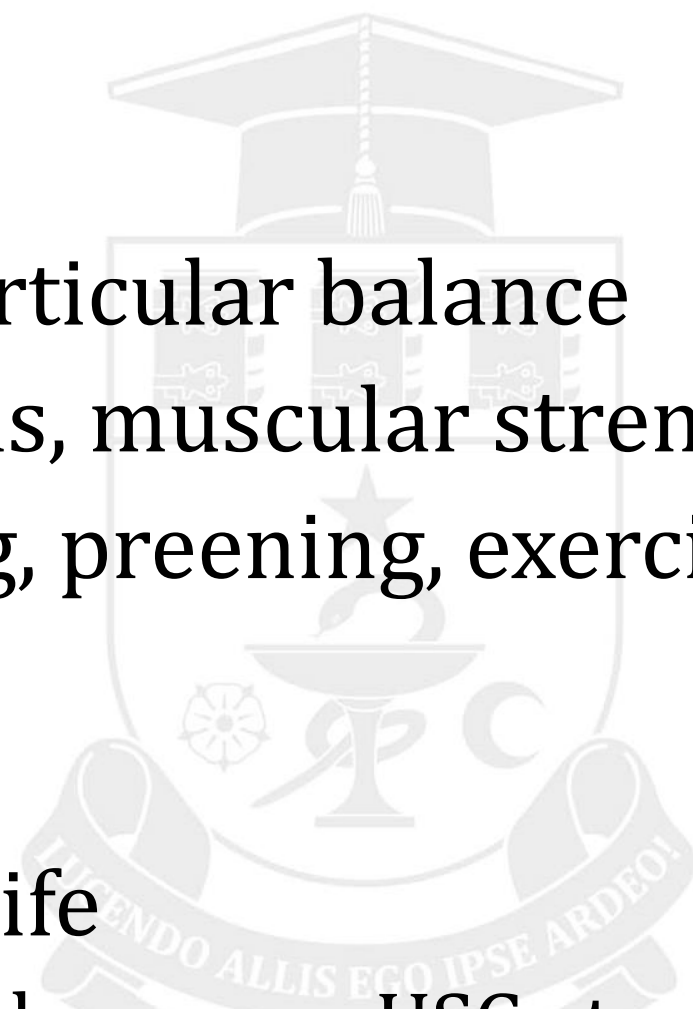
- Main accusations (pain, functional limitations)
- Uni / multi articular / segmental damage
- Acute, slow, chronic symptomatic progression
- Mechanism of lesion production
- Conditions of exacerbation and diminution
- Signs and Symptoms associated
- Level of involvement in daily activities
- Previous treatments





# *Objective exam*

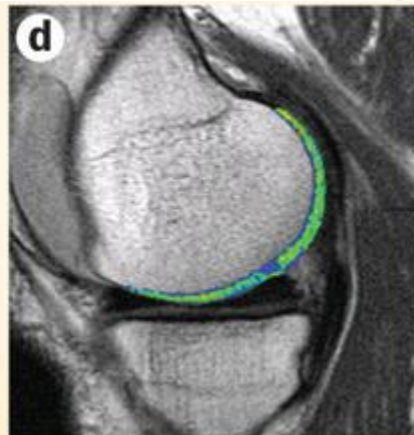
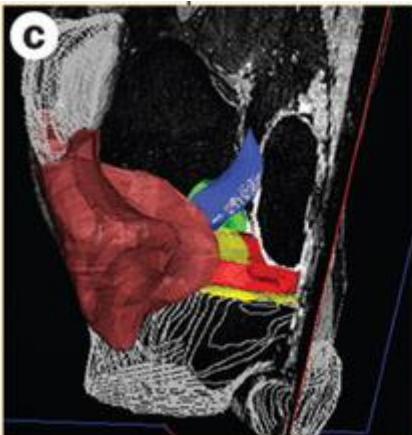
- Inspection
- Palpation
- Articular mobility - articular balance
- Muscle balance (tonus, muscular strength)
- Evaluation of walking, preening, exercise capacity
- Specific tests
- ADL tests, quality of life
- Imaging evaluations, arthroscopy, USG.etc.





# *Paraclinic exam*

- Rx - (osteophytosis, osteotomy, osteoporosis, erosion)
- USG joint - soft articular structures
- CT / 3D reconstructions
- MRI - informative for bones, soft tissues
- Arthroscopy - direct view of the articular cavity





# *Somatoscopy - Inspection*

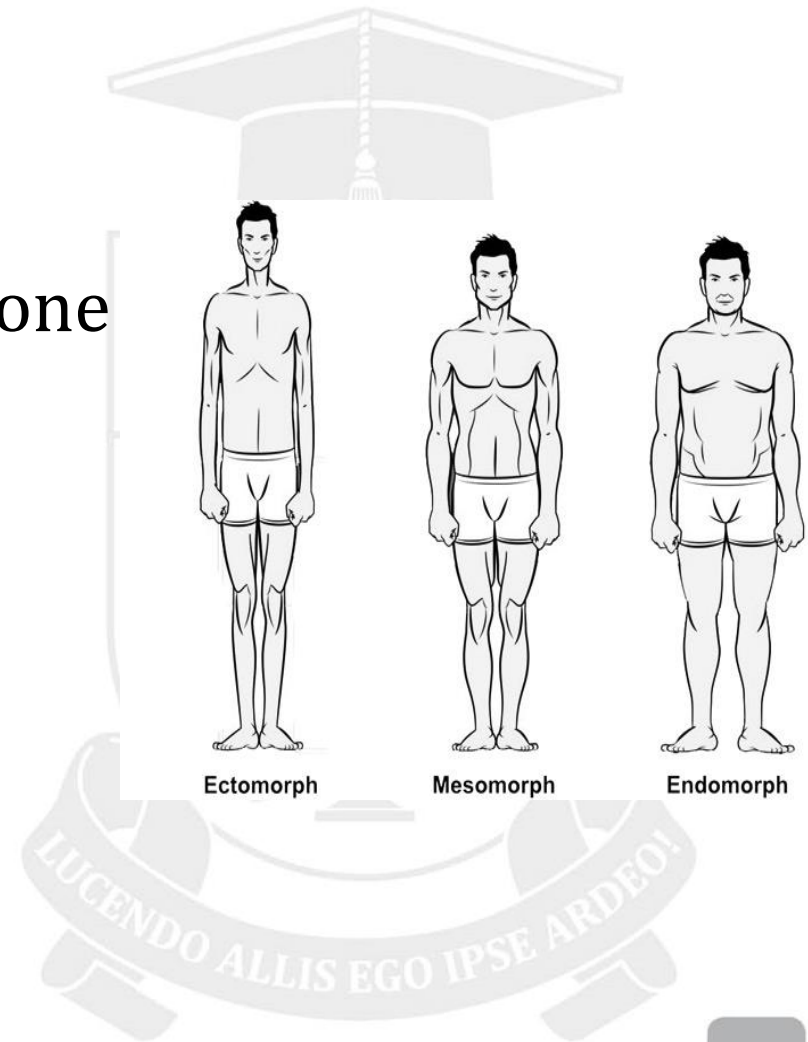
*visual inspection of the global and segmental alignment of the front, rear and profile body in a static and dynamic state (walking)*

- **Subjective** - no measuring and control instruments.
- **Objective (somatometry)** - measurement of some benchmarks and calculation of the anthropometric indices.



# *Global Assessment / Inspection*

- ✓ the constitutional type
- ✓ general attitude / posture
- ✓ the way the movement is done
- ✓ the stereotype of walking
- ✓ coordination and balance
- ✓ the ability to execute the movements



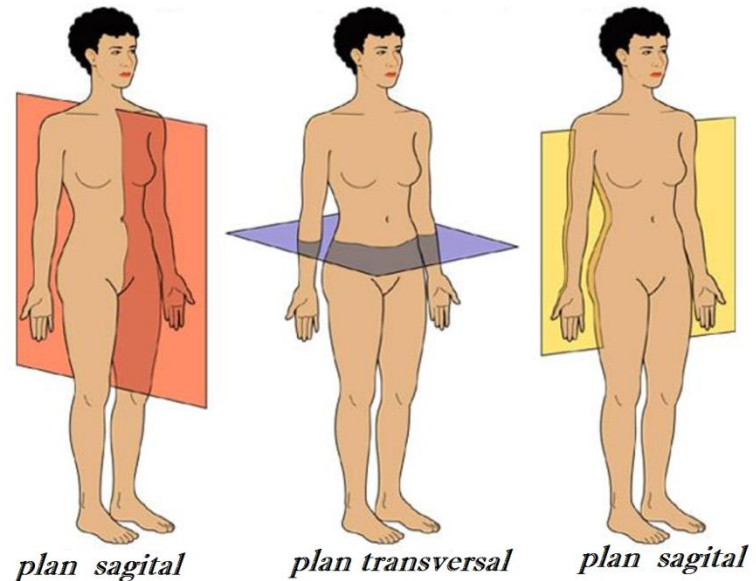


# *The somatoscopic*

Assessment of alignment (three dimensional structural proportionality) in the plans:

- Frontal
- Sagittal
- Transverse

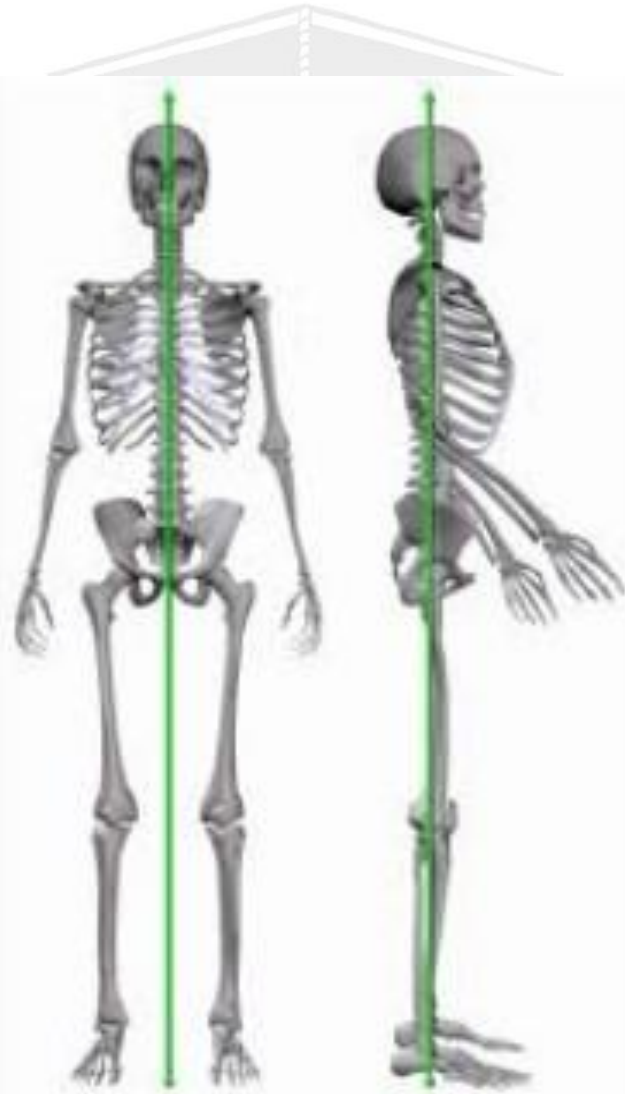
## *Planuri de miscare*







# *Evaluation of symmetry of osteo-articular marks*



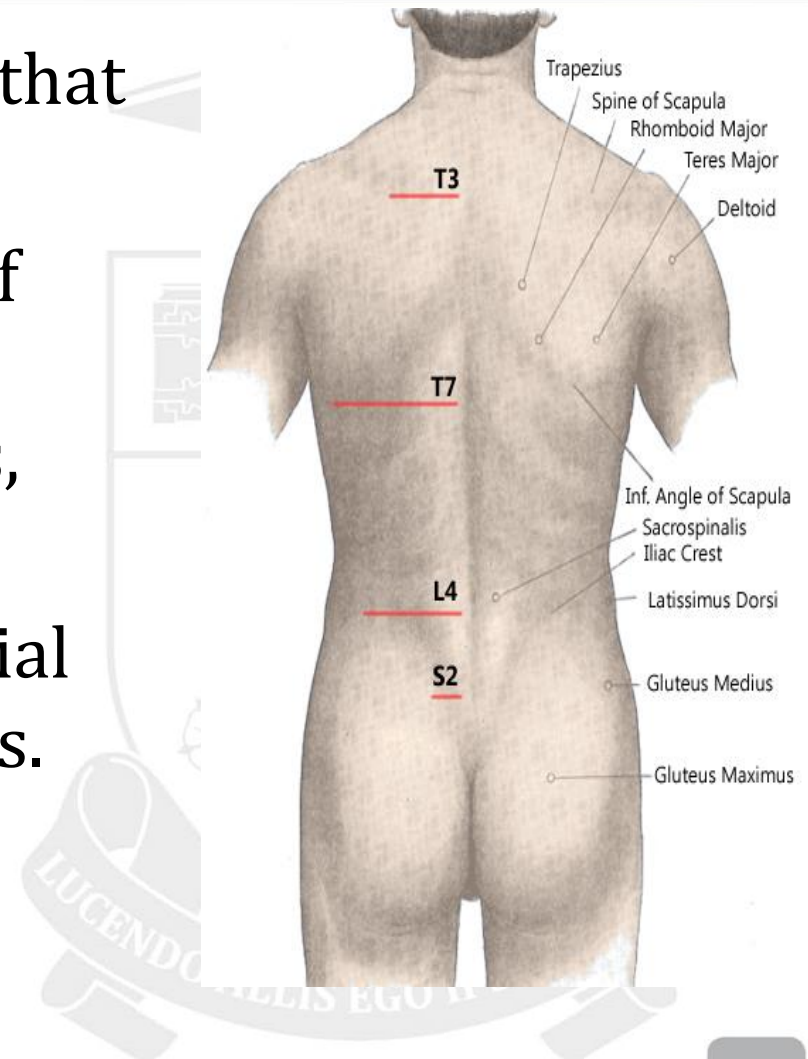




# Exam from the back

Axis of symmetry of the body that is passing through:

- Vertex, thoracic apophyses of vertebrae, interfusion fold, internal femoral epicondyles, maleole;
- Vertical equidistant to - medial relief of heels, legs and thighs.

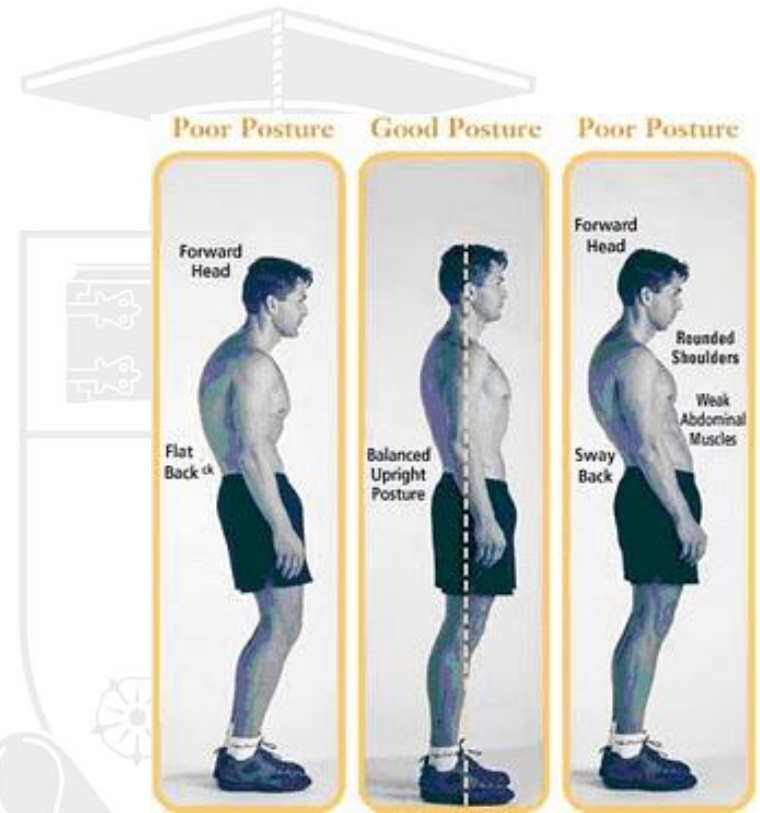




# Profile review

The axis of symmetry of the body passes through:

- Vertex;
- Ear lobe;
- Shoulder joint;
- Big femur trochanter;
- Slightly ahead of median knee;
- Slightly ahead of the lateral male;
- At the level of skin projection of the intertwine of the metatarsian joint.





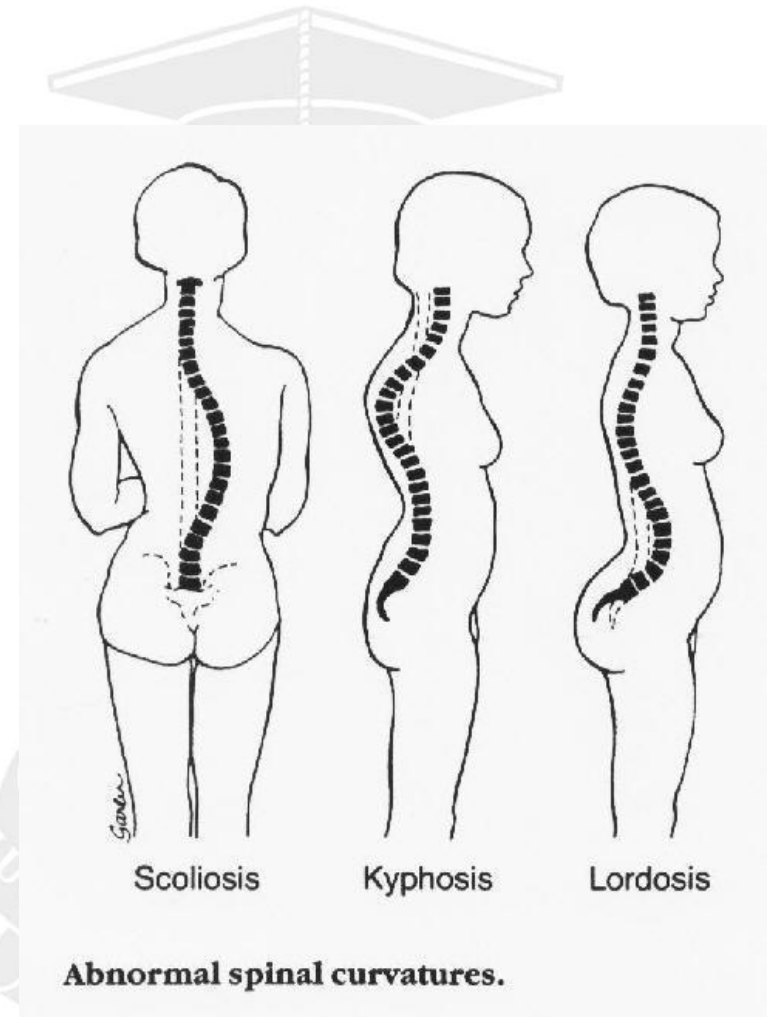
# Profile review (sagittal)

## Physiological curves:

- Kyphosis;
- Lordosis.

## Pathologies:

- Hyperlordosis;
- Hyperkyphosis;
- Flatten.





# Postures

**LOOK AT YOUR POSTURE... OTHERS DO**



**Correct Posture**



**Hollow Back**



**Flat Pelvis**



**Slumping Posture**



**Military Posture**



**Round Shoulders**



**Correct**



**High Shoulder**



**High Hip**



**Head Tilt**



**Severe Scoliosis**



# *Analytical evaluation*

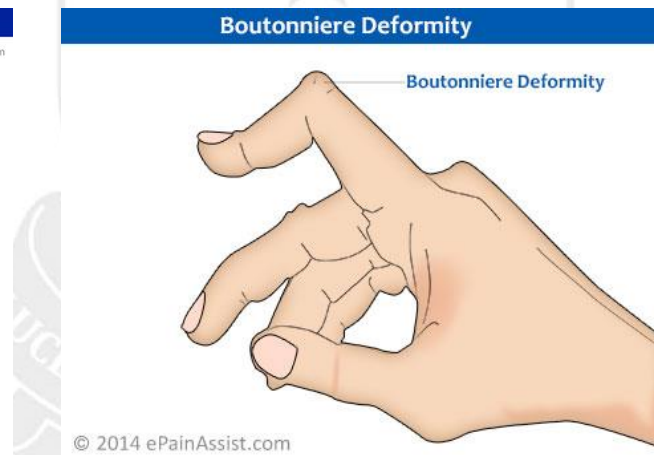
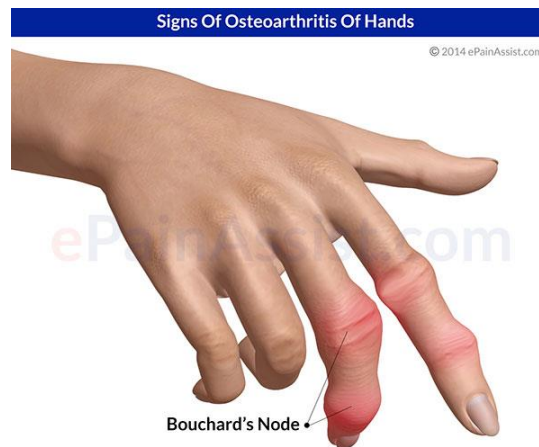
- ✓ The mechanical axis of the lower and upper limbs;
- ✓ Deviations in frontal and sagittal plane (valgum, varum, flexum, recurvatum etc.);
- ✓ Physiological curves of the spine;
- ✓ Deviations in the sagittal plane (accentuating / rectifying the curves - hyperlordosis, lordosis, chest) and frontal (scoliosis)





# Analytical evaluation

- Bumps or joint deformities;
- Hypotrophy / muscle atrophy, muscle contraction;
- Changes in the color of the skin adjacent to the affected joint;
- The presence of Raynaud phenomenon, skin lesions, and etc.





# *The palpation*

- Careful palpation locates the headquarters of pain and irradiation;
- Palpation of bone and joint;
- Follows palpation of the subcutaneous tissue and muscle masses, noting the hypotonic groups, hypotonic, tendency to retractions, the existence of trophic disorders of venous origin;



# *Evaluation of articular balance*

Evaluating articular or articular joint amplitude consists in assessing the degree of mobility in a joint by analyzing the angles of movement in the possible anatomical directions in the corresponding planes and axes.





# *Joint assessment methods*

- a) direct, subjective assessment; măsurarea cu ajutorul pendulului sau (firului de plumb)
- b) measuring the distance between two points marked on the two segments that make up the angle of movement;
- c) executing two radiographs at the level of a maximum movement;
- d) goniometry;
- e) measuring with pendulum (lead wire).



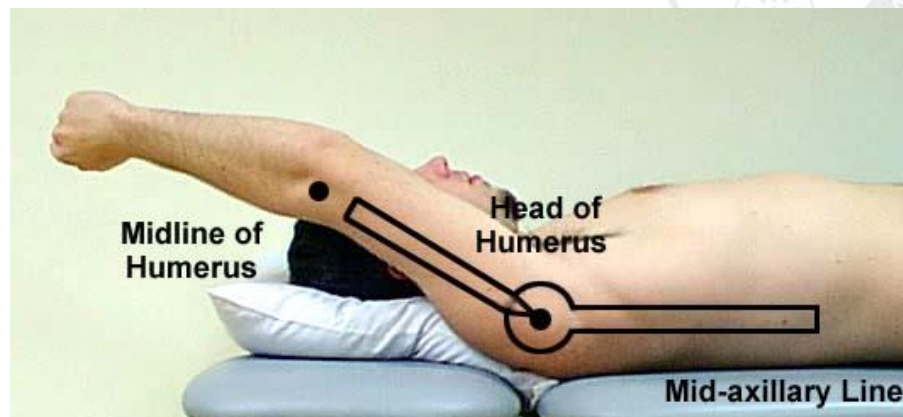
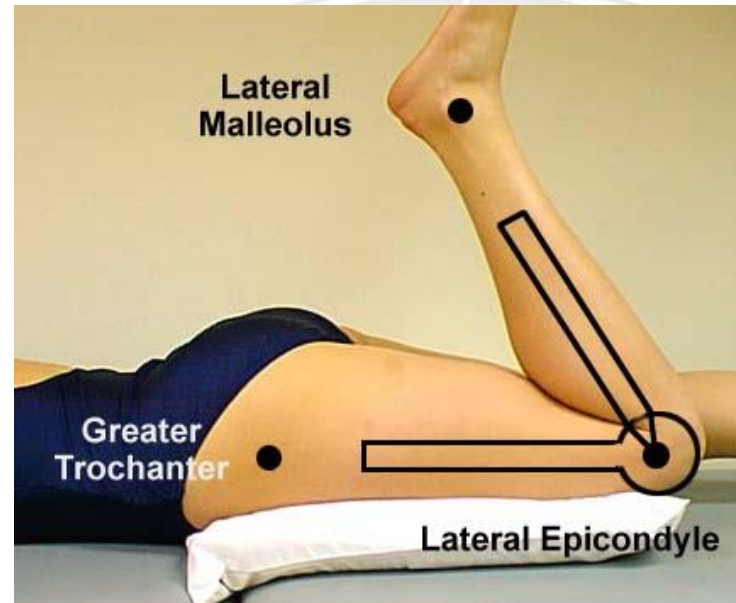
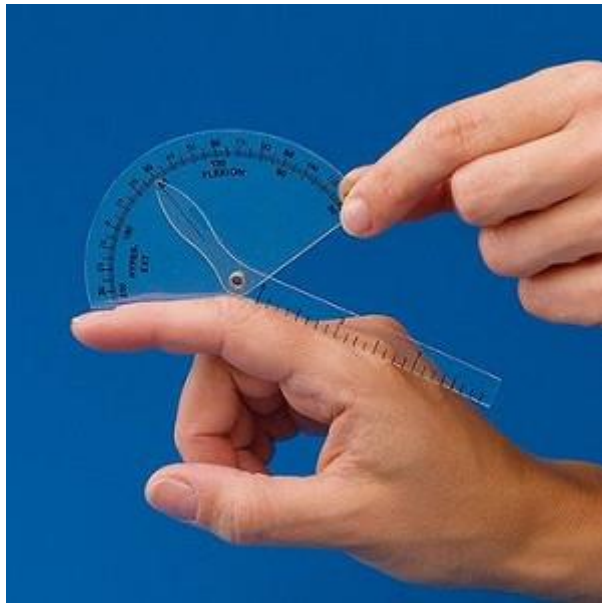
# *Key points of joint examination*

- Well-exposed area - no clothing;
- Inspect the articulation in detail. Detection of signs of inflammation, lesion (edema, hyperaemia, hyperthermia), deformation;
- Comparison with the opposite side;
- Good understanding of normal functional anatomy and articular biomechanics.





# Goniometry





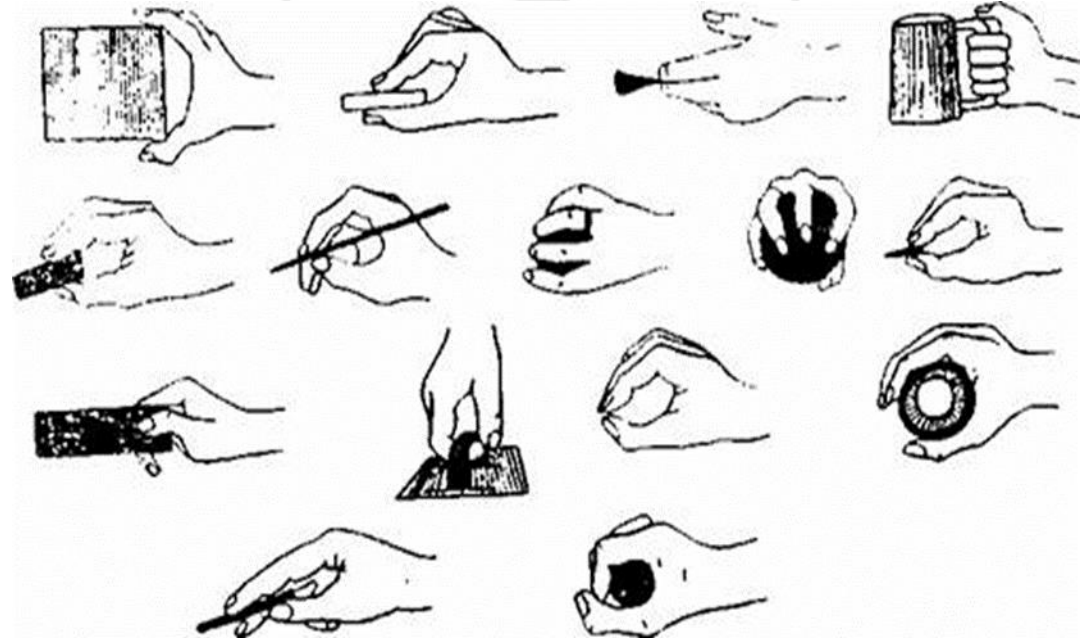
# Assessment of muscle strength

- 0: No visible muscle contraction
- 1: Visible muscle contraction with no or trace movement
- 2: Limb movement, but not against gravity
- 3: Movement against gravity but not resistance
- 4: Movement against at least some resistance supplied by the examiner
- 5: Full strength



# *Evaluation of the ability of grabbing*

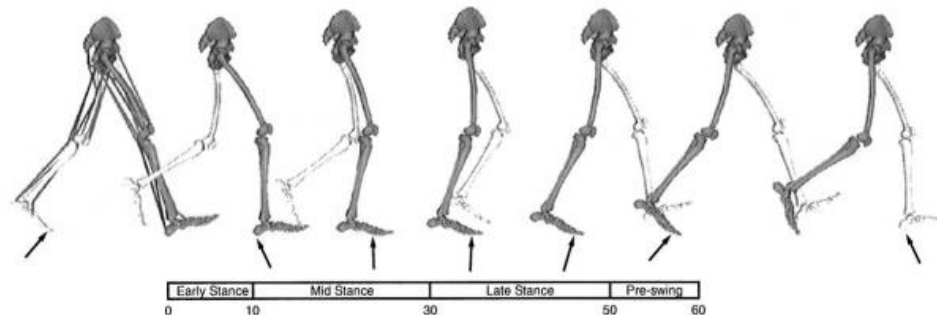
**Prehension** = a precise, adapted, conscious, or reflex gesture that, based on tactile, extero- and proprioceptive instantaneous information, is automated by repetition and determines optimal hand coordination for grip or grip





# Walking evaluation

- Kinetic analysis - forces developed during the course;
- Dynamic ENMG - Analysis of electrical activity of motor nerves and related muscles;
- Motion kinematic analysis;
- Visual analysis (classic by clinical or modern observations through computer-processed video recordings);
- Energy-metabolic and mechanical determinations (walking / physical exercise).







# Walking evaluation

- The assessment of walking is mainly done by the testator's observation that considers the type of walking of the patient.
- The subject is required to execute various ways of walking:
  - normal walk;
  - quick walk;
  - side walk;
  - tandem walk;
  - walking over small obstacles;
  - climbing;
  - climbing stairs.





# Walking evaluation

## Zebris system







# *Balance testing*

- The classic Romberg test, with eyes closed 20-30 sec., Legs glued. We appreciate the degree of swinging. Variants with one leg standing on one another
- The „half-seated" test is executed in two ways:
  - from the orthostatism as in Romberg we apply short push unannounced to the patient's sternum, back, pelvis, and appreciate stability;
  - identically, but we ask the patient to resist the force.



# *Evaluation of ADLs*

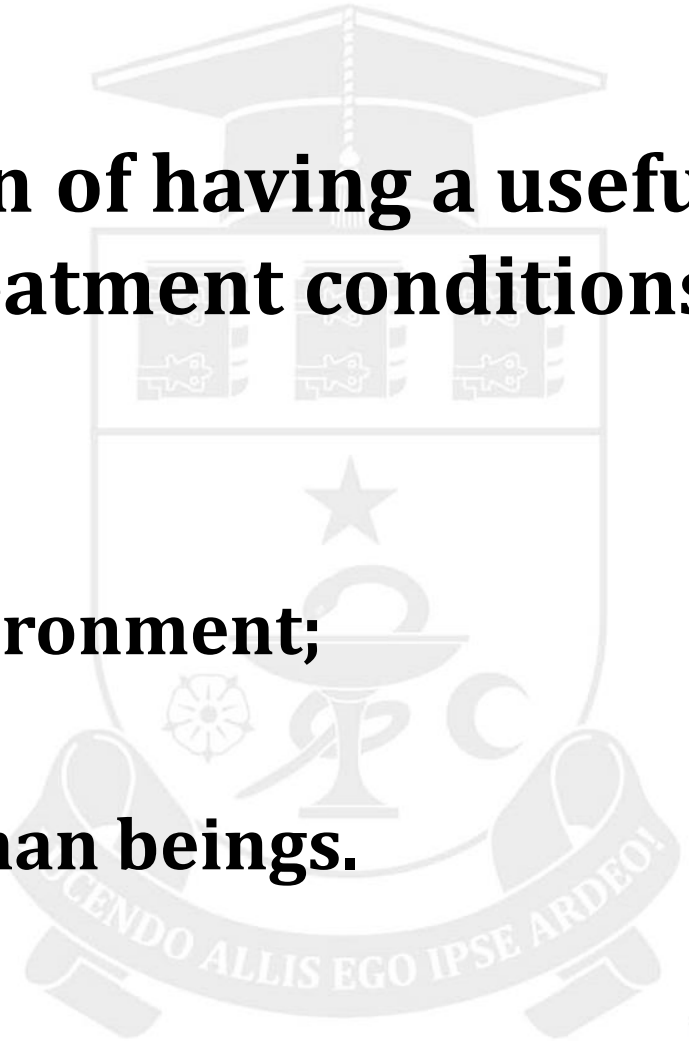
- ADLs, day-to-day human activities are the usual actions for any of us that we do for our own care and life.
- ADLs have no performance goals in any field. The possibility or not of doing ADLs divides individuals into "independent" and "addicted".
- The inability to achieve these ADLs may be temporary, undetermined by great disability.



# *The quality of life*

**the patient's perception of having a useful life in disease and treatment conditions.**

- **Health status;**
- **Contact with the environment;**
- **Financial issues;**
- **The rights of the human beings.**





# Questionnaires

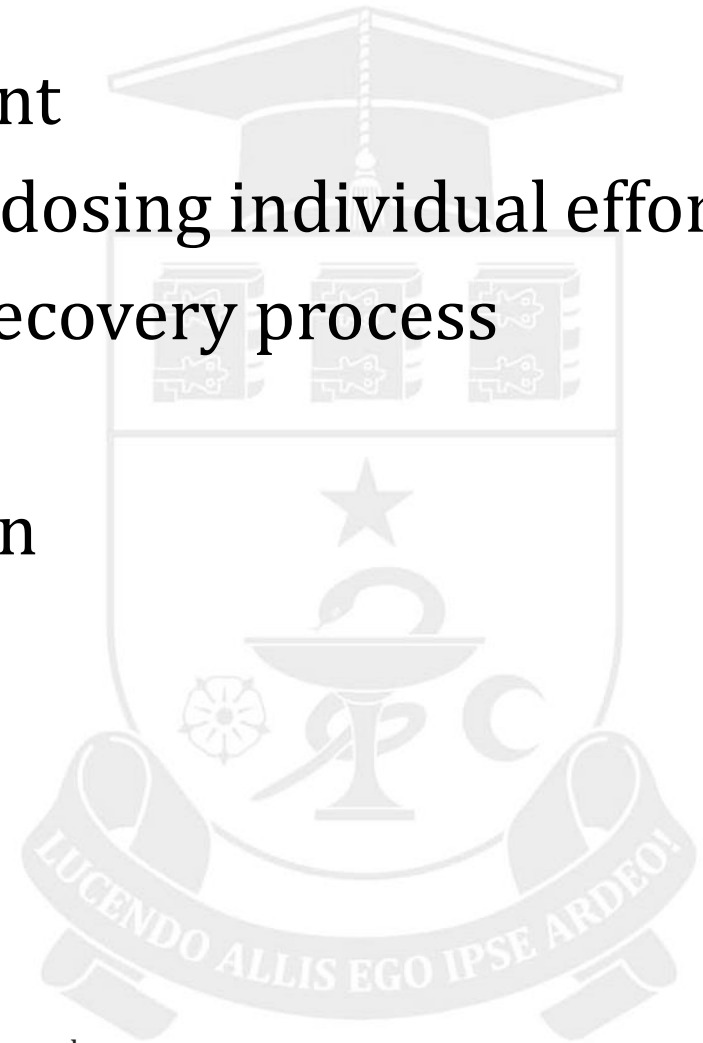
- generic for any disease (Sickness Impact Profile)  
SF-36
- specific (for a specific pathology)
- **HAQ** (Health Assessment Questionnaire),  
**WOMAC** (Western Ontario and McMaster Universities Arthritis Index)





# Principles of recovery

- Early initiation of treatment
- Choosing the method and dosing individual effort
- The inconsistency of the recovery process
- Staging
- Active patient co-operation
- Complexity





# Goals of rehabilitation program

- Fight against pain;
- Combating vicious, pathological positions;
- Stabilization of degeneration process;
- Restore partial or full motion;
- Recovering muscle strength;
- Compensation of the present functional difficulty;
- Development of ADL performance;
- Reintegration at work.





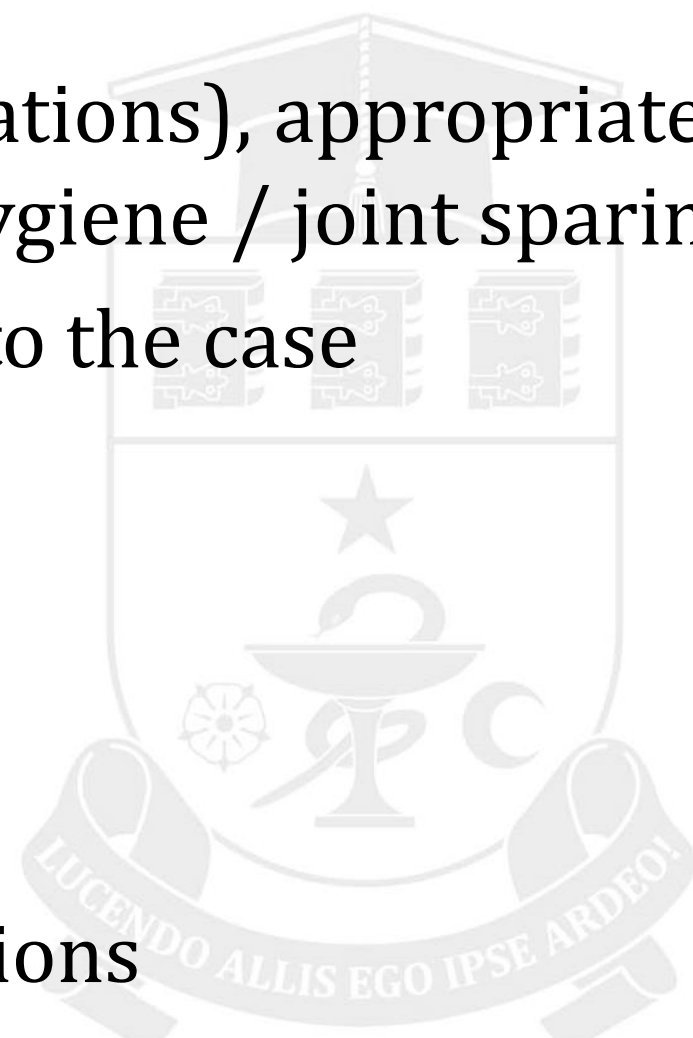
# *Clinical-functional defects*

- ***articular sequelae*** (rehabilitation of immobilized joints);
- ***muscle sequelae*** (hypotrophies, atrophies or retractions);
- ***bone sequelae*** (osteoporosis);
- ***general sequelae*** (decrease of cardiopulmonary capacity, general resistance).



# Rehabilitation includes:

- Rest (severe / exacerbations), appropriate orthopedic regimen, hygiene / joint sparing;
- Medication according to the case
- Physical Therapy
- Physiotherapy
- Orthotics / prostheses
- Gait assist devices
- Psychosocial interventions







# Physical therapy

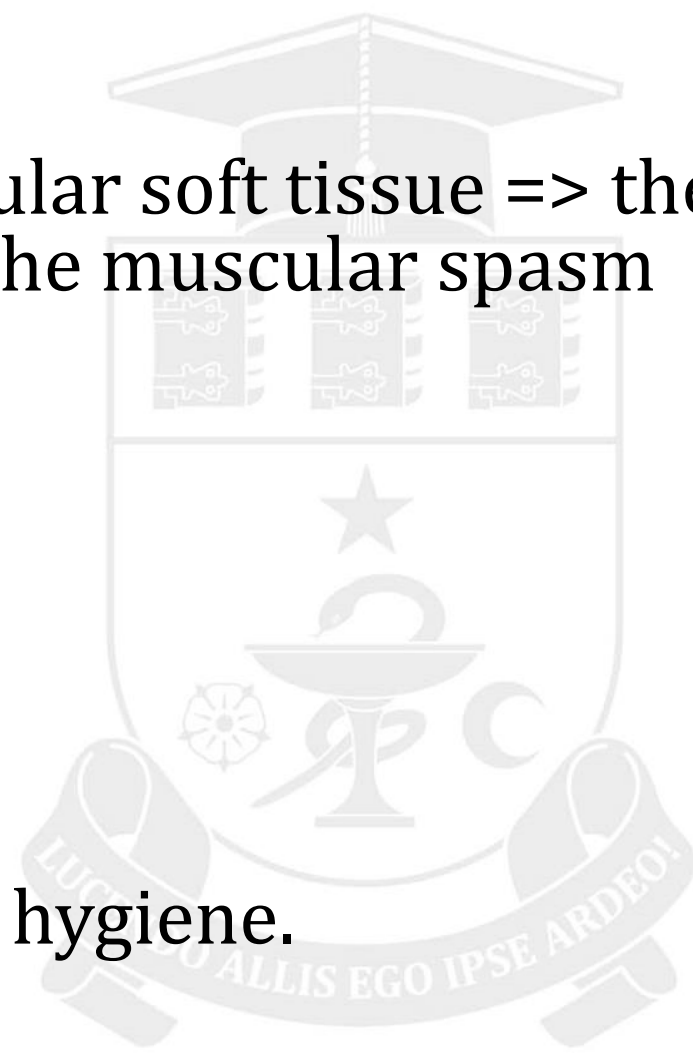
- Reduces pain syndrome and stiffness;
- Reduces muscle spasm;
- Increases the amplitude of movement;
- Increases muscle strength;
- Prevents articular / bone deformities;
- Increases functional capacity.





# *Methods of physical therapy*

- Treadmills in the periocular soft tissue => the joints are removed and the muscular spasm removed;
- Posture;
- Toning muscles;
- Relaxation;
- Articular Mobilizations;
- Restoring stability;
- Reeducation of articular hygiene.





# *Recovering articular mobility*



ENDO ALLIS EGO IPSE ARDEO!



# Massage

- Blood, lymphatic drainage
- Reduces adhesions between muscle fibers
- General / Local relaxation
- Decreases the level of pain





# Tractions

- Manual - made by certified specialists.
- Mechanical - assisted devices (free weight); monitored; Continuous / intermittent.
- More commonly in spinal disorders (cervical, lumbar)
- Requires a prudent assessment of contraindications





# Thermotherapy / Cryotherapy

- Methods: ice bag, gel packs, special devices,
- Sedative effect on sensitive fibers,
- Reduction of spasm and spasticity,
- Vasoconstriction - reducing edema,







# Thermotherapy / Heat

- Forms: superficial (infrared, external - paraffin, devices) and deep (short waves, microwave, ultrasound);
- Analgesic - Peripheral nerves, increased excitation threshold (pain);
- Anti-inflammatory - Vasodilation migration of leukocytes and O<sub>2</sub>, elimination of cytotoxins and pro-inflammatory factors;
- Relaxation and reduction of spasm;
- Mechanical / micromassage effects (ultrasound), biological, trophic.







# Electrotherapy

- In many cases (form of current, electromagnetic vector) there is no clinical evidence of the action-based mechanisms of action.
- The most commonly used are low and medium frequencies (ex. galvanic, interferential current, TENS).
- Main Effects: analgesic (low frequency stimulation on peripheral nerve fibers), facilitates muscle contractions.



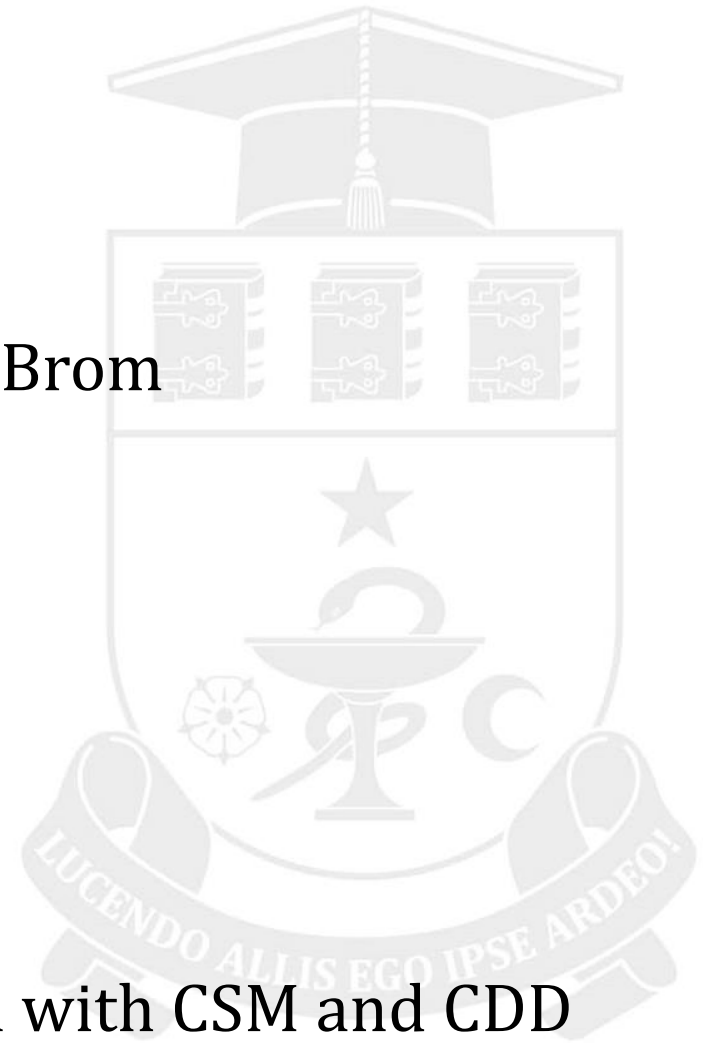


## Hydrotherapy:

- Radon baths
- Hydrogen sulfide baths
- Bathrooms with Iodine and Brom
- Baths with NaCl

## Thermotherapy:

- Paraffin
- Ozokerite
- Curative sludge
- Cryotherapy in combination with CSM and CDD





# Orthotics

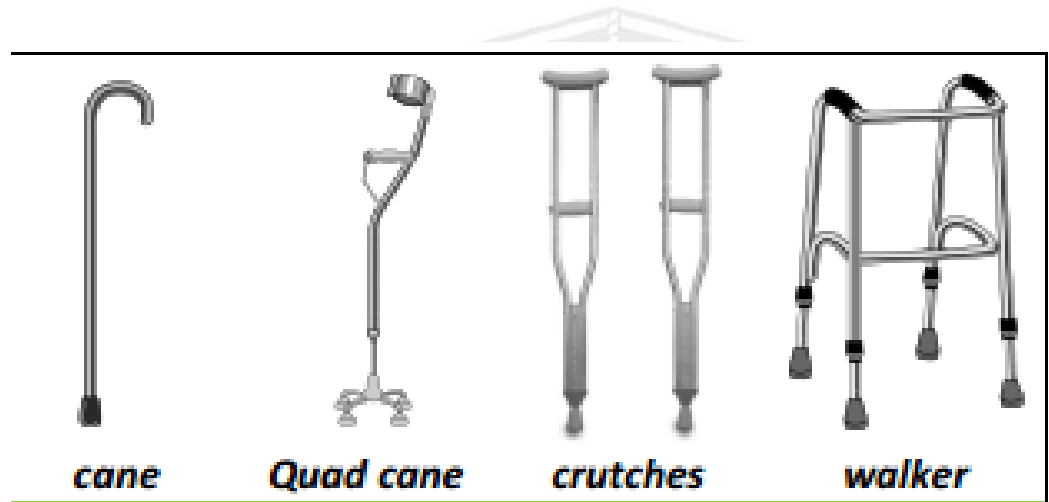
- Rest - decreases the demand for moving joints in motion.
- Corrective - prevents and corrects the formation of deformities / depositions.
- Functional - fixes the affected joints in a supportive position.





# Walking aids

- Simple cane
- Fourped cane
- Crutches
- Tri Walkers
- Rollators
- Walking frame
- Wheelchair
- Trolleys





# Prosthetics







# Conclusion

- The medical rehabilitation of patients suffering from the locomotor system requires a thorough, musculo-oste-articular and walking specific assessment, with the development of an individual recovery program that will include various recovery methods and techniques based on the functional concept of "neuro-mio-artro-kinetic device".



- Discussions....
- Questions?







# References

## **For practical lessons**

- Branddom R. L. *Physical and Rehabilitation Medicine*. Fourth edition. Bucharest, 2015, 1446 p.
- **Optional**
- Frontera W. R. *Essentials of Physical Medicine and Rehabilitation* Philadelphia 2001, 952 p.