

# NON-INVASIVE TESTS FOR EXAMINATION OF DIABETIC FOOT AMONG HEMODIALYSIS PATIENTS

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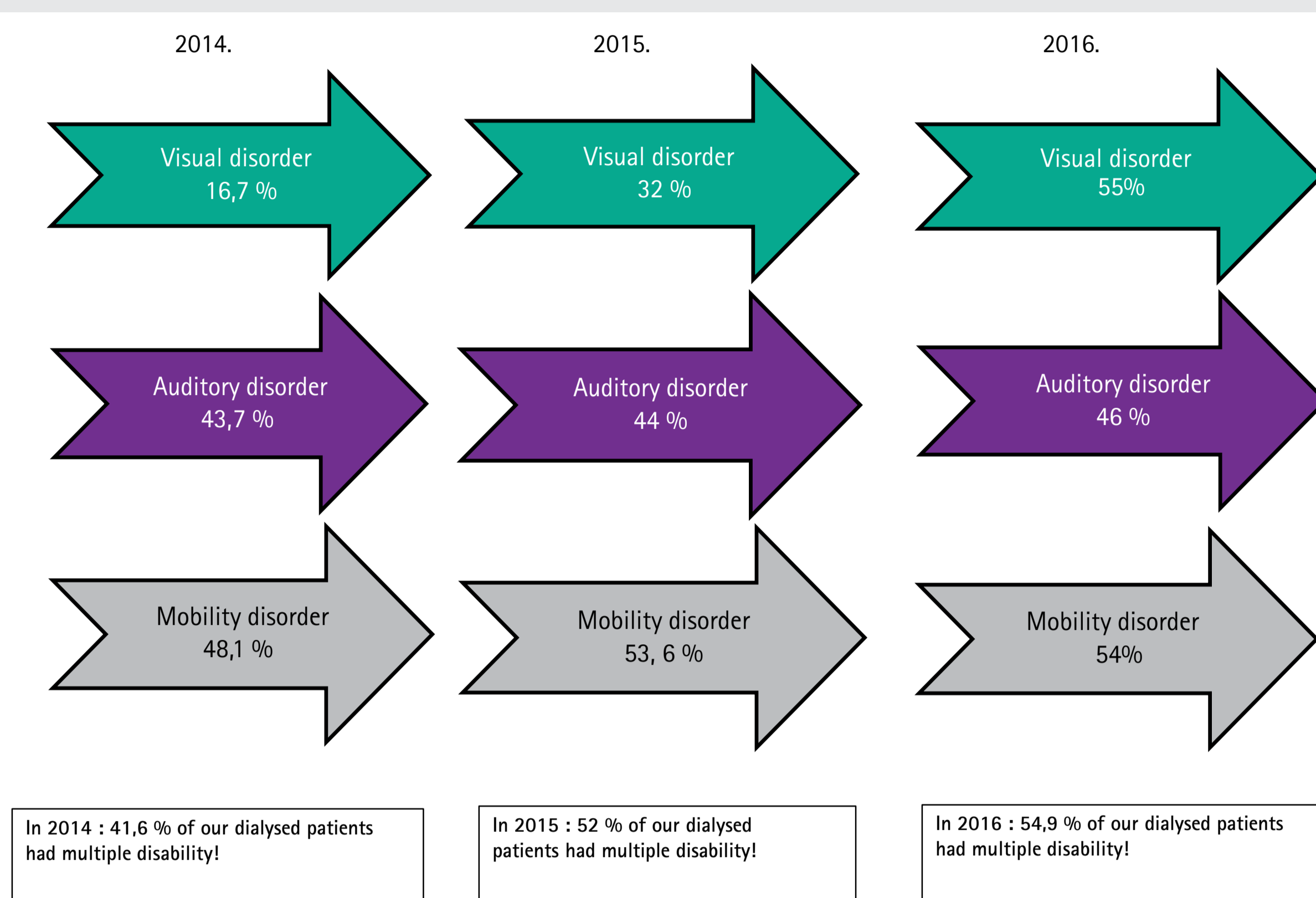
## INTRODUCTION

Patients at our dialysis station have been monitored according to the development of disability for several years, assessing the causes of disability our attention was centered upon lower extremity neuropathy and vascular status. Peripheral lower extremity arterial disease (PAD) is part of general atherosclerosis, the probability in hemodialysis patients is growing also with tobacco use, hypertension, diabetes mellitus and hyperlipidemia. The significance of correlation with subsequent mortality is proven, hence a variety of disability surveys, detection and treatment of PAD and neuropathy at the same time could help patients achieving a better quality of life.

## MATERIALS

Parameters	male	female
Number of patients	53	72
Mean age / years /	66,9	68,8
Vintage of dialysis / years /	3, 6	4, 2
Patients with diabetes mellitus / n /	42	21
Non-diabetic patients / n /	30	32

## Disability global

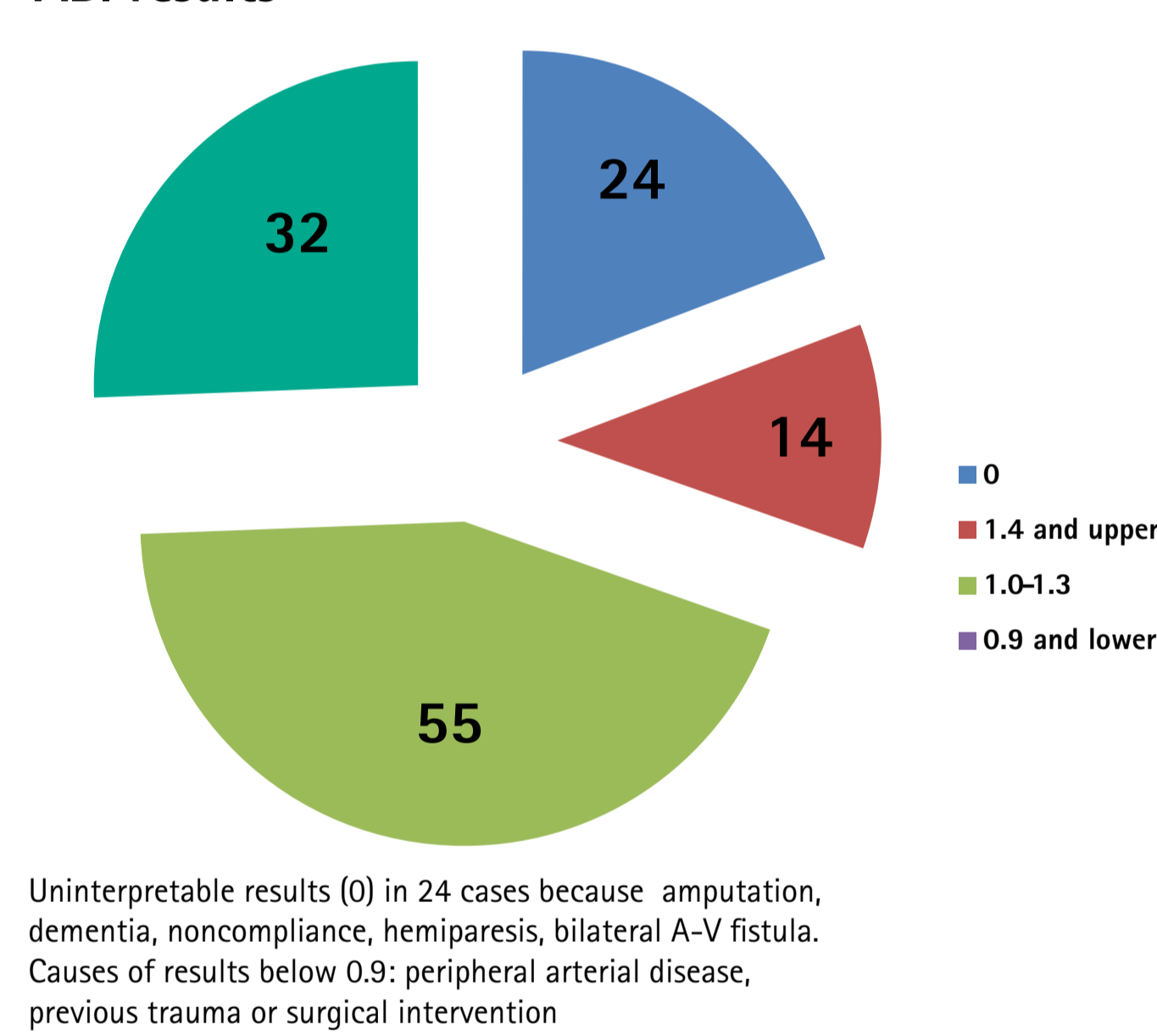


## METHODS 1

### Ankle-brachial index (ABI):

With the participants in the supine position, trained health staff used an 8.1-MHz Doppler probe to perform the examination following a standard operation protocol. The ABI was calculated by dividing the ankle mean systolic blood pressure by brachial mean systolic blood pressure in the same side. The presence of PAD was defined as an ABI < 0.9 in either side, normal range is 1.0-1.3. Decreasing ABI may be a signal for progression of PAD. Significance of ABI value result can be limited in case of diabetes.

### ABI results

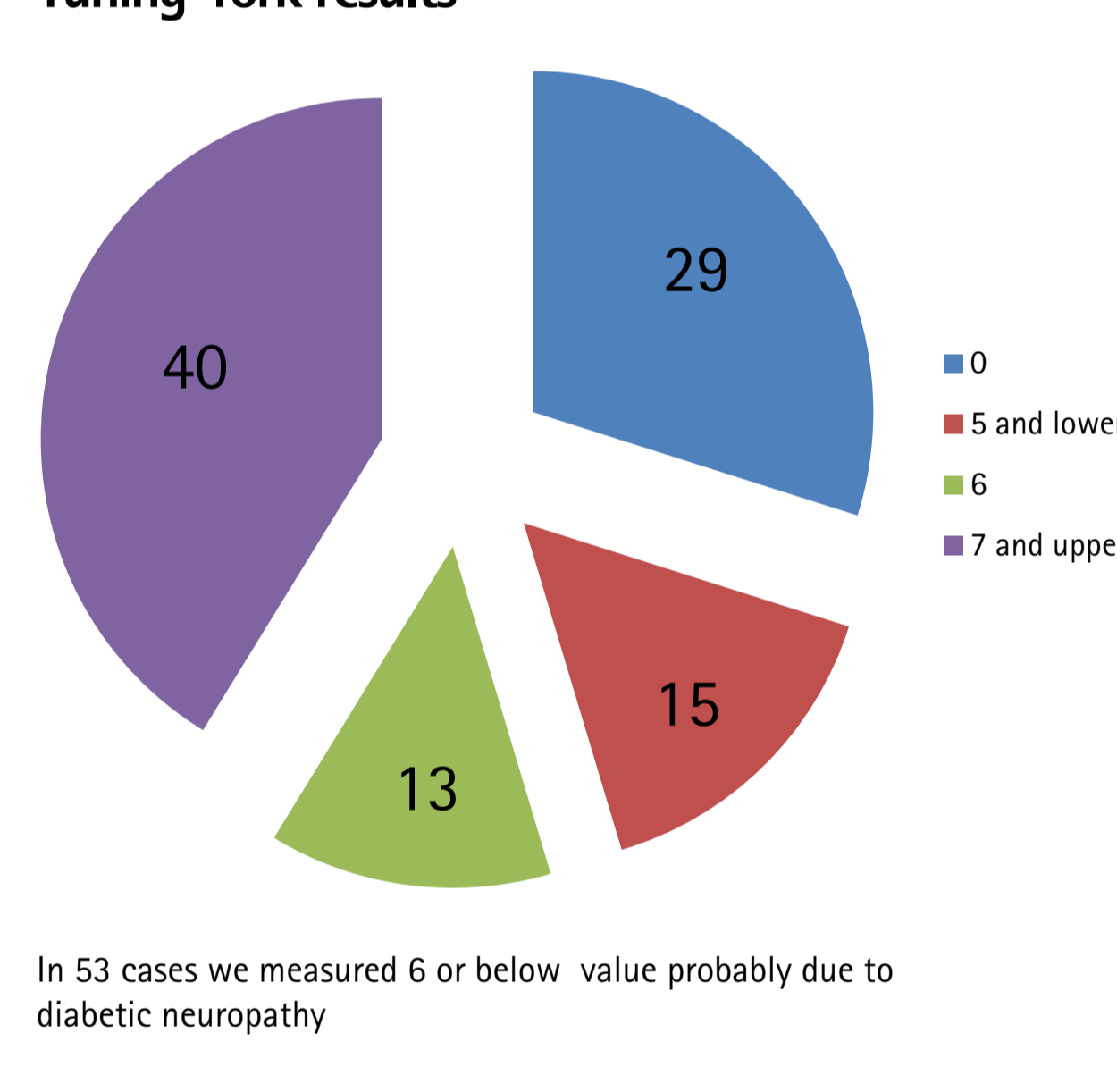


## METHODS 2

### Calibrated tuning-fork vibration test

Sensory neuropathy can be detected by a simple method, using 128Hz tuning-fork placed on the great toe. We should the calibrated tuning-fork struck, and then set in the bone surface. It results extension of both arms 1-8 of numbers "splits" and then get again in merge position along with the vibration sense gradual attenuation. The patients indicate how long they can feel the vibration. In case of severe sensory nerve damage they feel the vibrations for a short time, the result of a calibrated tuning fork tests have given a low value. Nerve damage typically means 5 or below, value 6 is the lower normal limit.

### Tuning-fork results

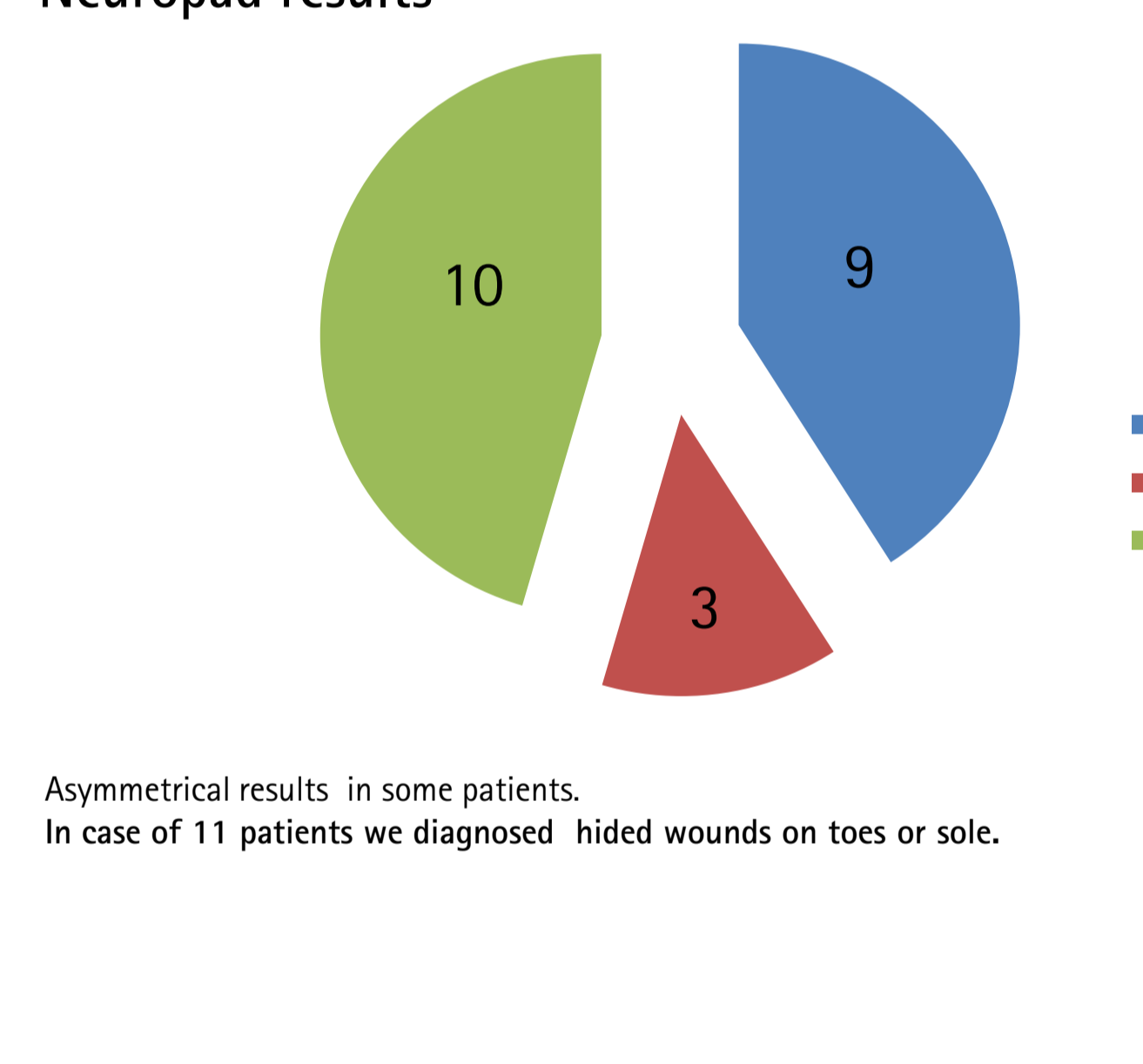


## METHODS 3

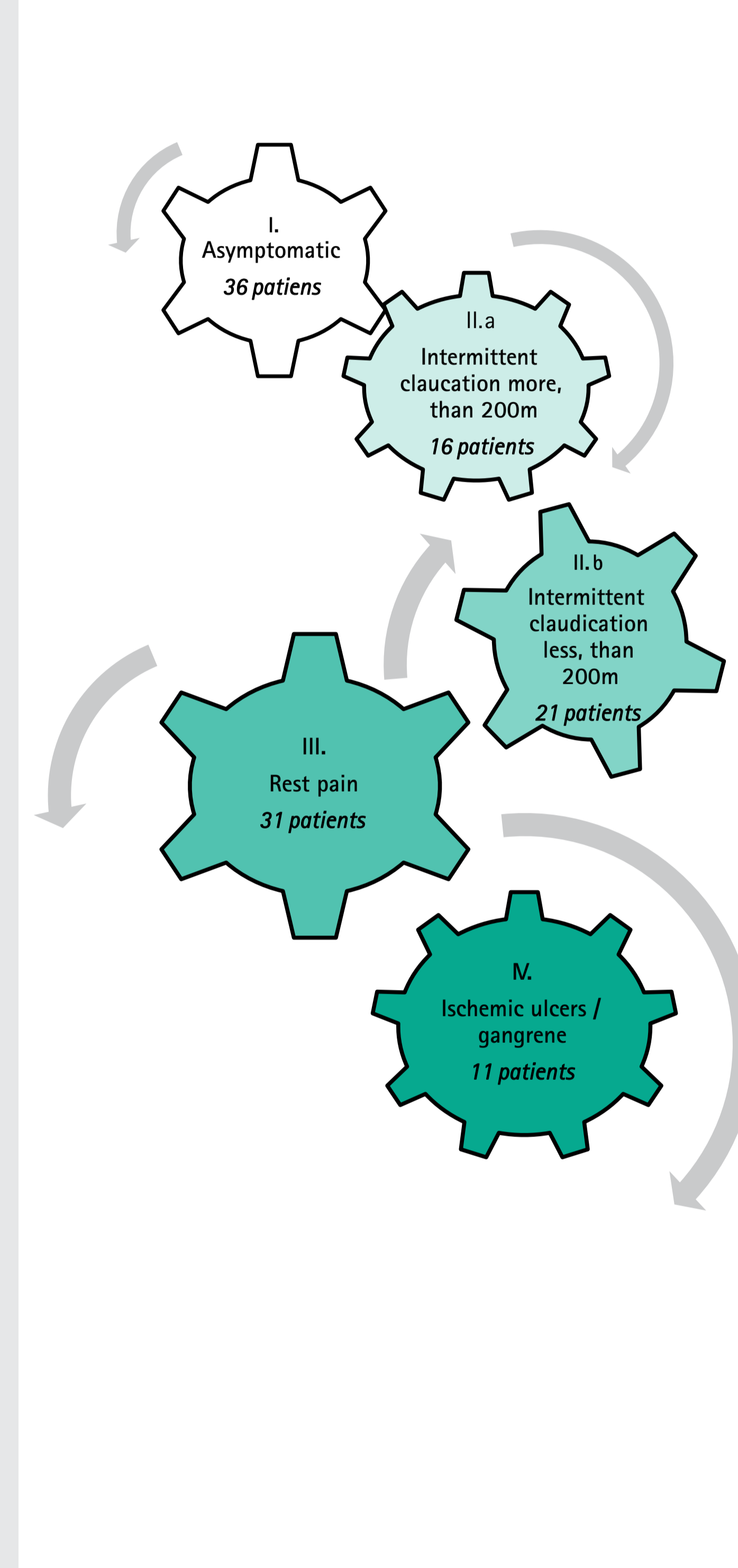
### Neuropad test

Sudomotor dysfunction as part of the „diabetic foot syndrome“ can be evaluated by the Neuropad test even in early stadium. Indicator material was applied to both soles at the level of the first through second metatarsal heads. The color change was defined complete, as the whole area got from blue into uniform smooth pink and in default of change in some minutes signifies lack of sudomotor nerve function. The third result is the intermedier change with partial abnormality. Results are not representative of neuropathy status in case of allergy (chrome, nickel, cobalt) and local skin diseases.

### Neuropad results



## Fontaine scale



## CONCLUSION

- Screening patients at risk with the described simple, reliable, visual, non-invasive methods, within seconds in nursing competence, allows timely care by modifying treatment
- The three mentioned diagnostic methods should become the daily routine
- The disease even milder phase diagnosed, we can more easily influence it into the right direction
- We can prevent onset of lower extremity soft tissue infection, septic conditions, amputations.
- We can improve the survival rate of dialysed patients, may lessen patient with multiple disabilities.
- Directing the patient attention towards foot care, we can make more efficient education on this subject.

## EVERYDAY PRACTICE 1

### Prevention of neuropathic complications

#### The first step in preventing is the reduction of risk factors!

- smoking should be given up
- blood pressure should be checked regularly, and corrected accordingly
- Regularly check your blood lipid levels, if necessary, proper diet should be followed
- It is most important to moderate salt consumption
- Blood sugar level should be measured several times a day, in case of out of target range values, to care for the glucose metabolism disorders
- Regular exercise, physical activity is about 30-60 minutes a day; walking, riding as you like
- Efforts should be made to achieve an optimum body weight
- Proper medicaments intake

#### Targeted foot care (temperate warm water + emollients + cotton socks + good shoes)

- If you are diabetic you should test your feet daily in depth; any small wound needs medical care (that can be the starting point for leg ulcers)
- Avoid overstraining of the lower limbs
- If you travel a lot, move the legs periodically

## EVERYDAY PRACTICE 2

- Wash your feet every day with warm water and non-irritant soap. It is important to keep your toes clean in public. Avoid rubbing the skin while toweling, especially between the toes.
- Explore the legs daily! Observe any change (blisters, cracks, bruises, etc.). Monitor the color and temperature of legs. Use a mirror to examine the corners!
- Every day, apply linseed oil cream, body lotion on feet to prevent dryness and cracking, but avoid wound and interdigital region.
- Take advantage of professional pedicure help in case of calluses, nail growing abnormalities, cracked heels, don't operate alone.
- When you notice the smallest wounds, abnormal skin lesions, consult a doctor immediately.
- Vasoprotective creams are available in pharmacies to improve venous circulation and reduce unpleasant symptoms such as heaviness or pain.
- Keep the wound as clean as possible! Manage and exchange bandages according to specifications. Ask for professional help!
- It is important that patients take their medicaments accurately.
- Diet as offered!
- Exercise regularly!
- Wear comfortable shoes!
- Use a mild compression bandage in case of venous circulation disturbances

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