The Role Of Education In Prevention Of Diabetic Neuropathy

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Diabetes Statistics … Did you Know…?

Around 15% of diabetic patients experience foot ulcer once in their lifetime

The most common type of neuropathy is diabetic neuropathy, developing in around 50% of Type 1 and Type 2 diabetic patients.

The overall prevalence of neuropathy in type 2 diabetics in Iran, based on meta-analysis was reported to be 56.5%

Prevalence and interrelationships of foot ulcer, risk-factors and antibiotic resistance in foot ulcers in diabetic populations (2020) : DOI: 10.4239/wjd.v11.i3.78
Prevalence of neuropathy in patients with type 2 diabetes in Iran (2021) 133:222–228 https://doi.org/10.1007/s00508-020-01784-w

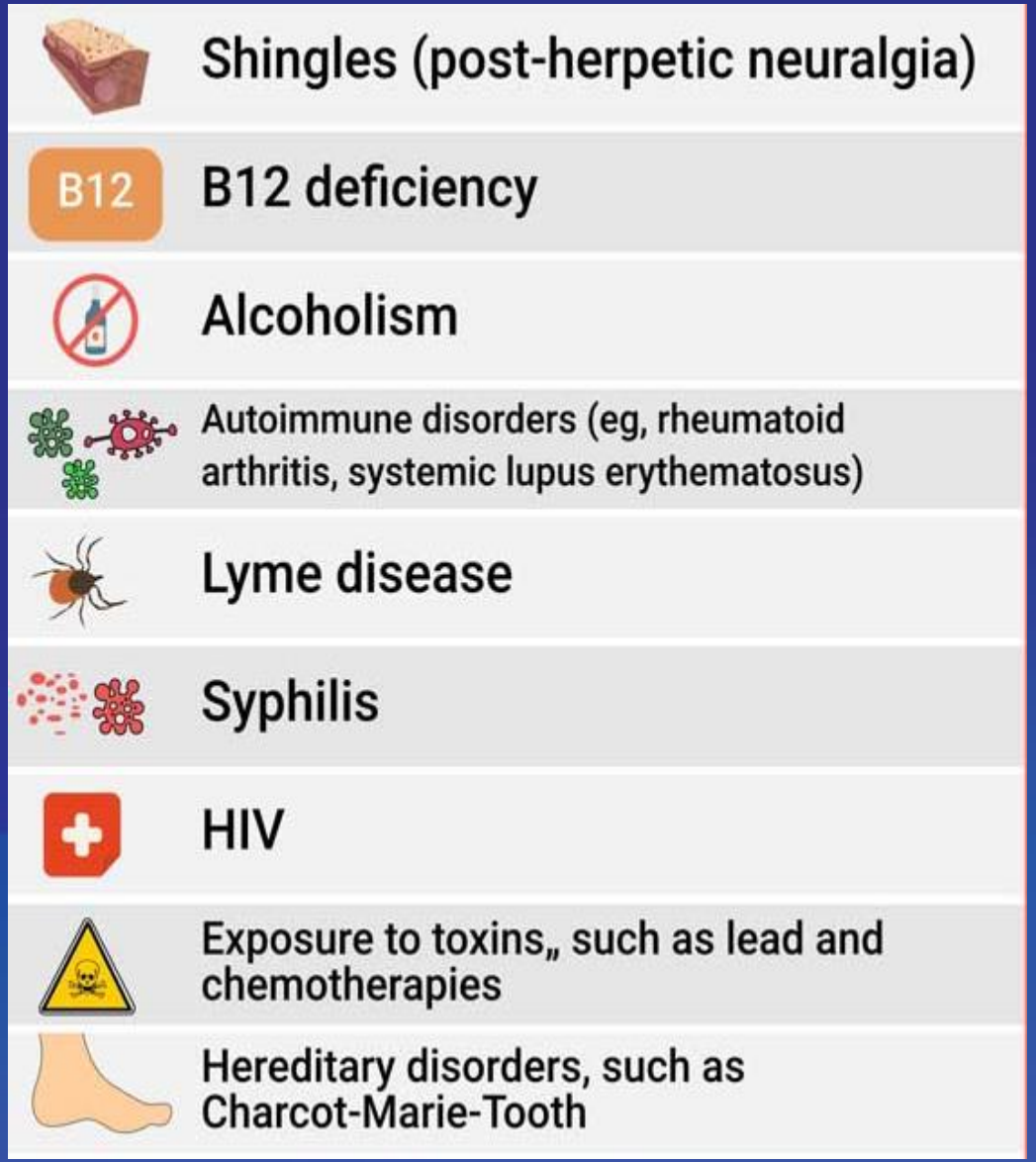
Diabetes Statistics … Did you Know…?

www.diabetes.co.uk

Definition of Diabetic Neuropathy

- Nerve damage and dysfunction secondary to diabetes mellitus type 1 or 2 .

- Diabetic Neuropathy is diagnosis of exclusion .

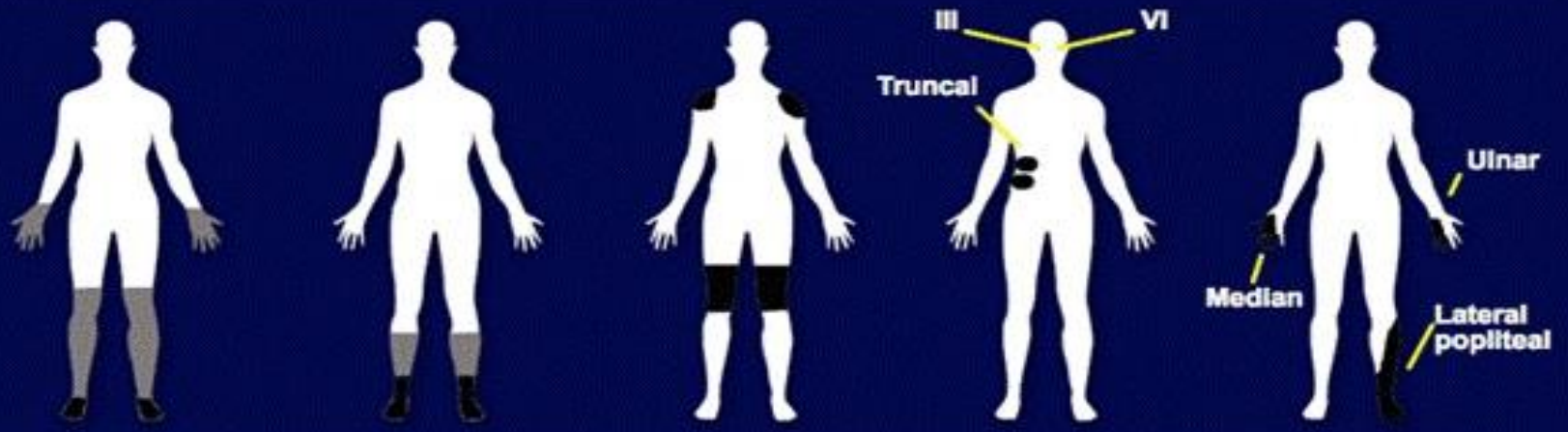


Standards of Medical Care in Diabetes (ADA 2021)

Classification of Diabetic Neuropathy

- Symmetric polyneuropathy
- Autonomic neuropathy
- Polyradiculopathy
- Mononeuropathy

Diabetic Neuropathies



Large-fiber neuropathy	Small-fiber neuropathy	Proximal motor neuropathy	Acute mono neuropathies	Entrapment
Sensory loss: 0 – +++ (touch vibration) Pain: + – +++ Tendon reflex: N – ↓↓↓ Motor deficit: 0 – +++	Sensory loss: 0 – + (thermal allodynia) Pain: + – +++ Tendon reflex: N – ↓ Motor deficit: 0	Sensory loss: 0 – + Pain: + – +++ Tendon reflex: ↓↓ Proximal motor deficit: + – +++	Sensory loss: 0 – + Pain: + – +++ Tendon reflex: N Motor deficit: + – +++	Sensory loss in nerve distribution: + – +++ Pain: + – ++ Tendon reflex: N Motor deficit: + – +++

N, normal

Diabetic Neuropathies :Aaron Vinik, MD, PhD, FCP, MACP, FACE(Last Update: February 5, 2018)

Diabetic Neuropathies

Large-fiber neuropathy

Sensory loss: 0 – +++
(touch vibration)
Pain: + – +++
Tendon reflex:
N – ↓↓↓
Motor deficit: 0 – +++

N, normal

Diabetic Neuropathies :Aaron Vinik, MD, PhD, FCP, MACP, FACE(Last Update: February 5, 2018)

Diabetic Neuropathies

Small-fiber neuropathy

Sensory loss: 0 – +
(thermal allodynia)
Pain: + – +++
Tendon reflex: N – ↓

Motor deficit: 0

Diabetic Neuropathies :Aaron Vinik, MD, PhD, FCP, MACP, FACE(Last Update: February 5, 2018)

Diabetic Neuropathies

Proximal motor neuropathy

Sensory loss: 0 – +

Pain: + – +++
Tendon reflex: ↓↓

Proximal motor deficit: + – +++

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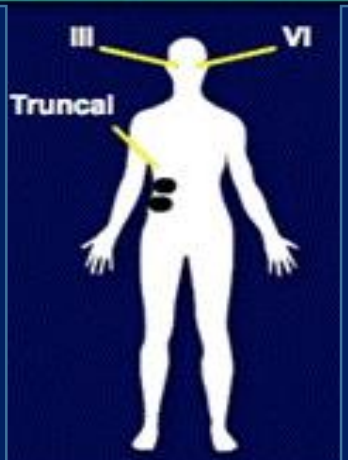
Diabetic Neuropathies



Acute mono neuropathies

Sensory loss: 0 – +

Pain: + – +++
Tendon reflex: N

Motor deficit: + – +++

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Diabetic Neuropathies

Entrapment

Sensory loss in nerve distribution: + – +++
Pain: + – ++
Tendon reflex: N

Motor deficit: + – +++

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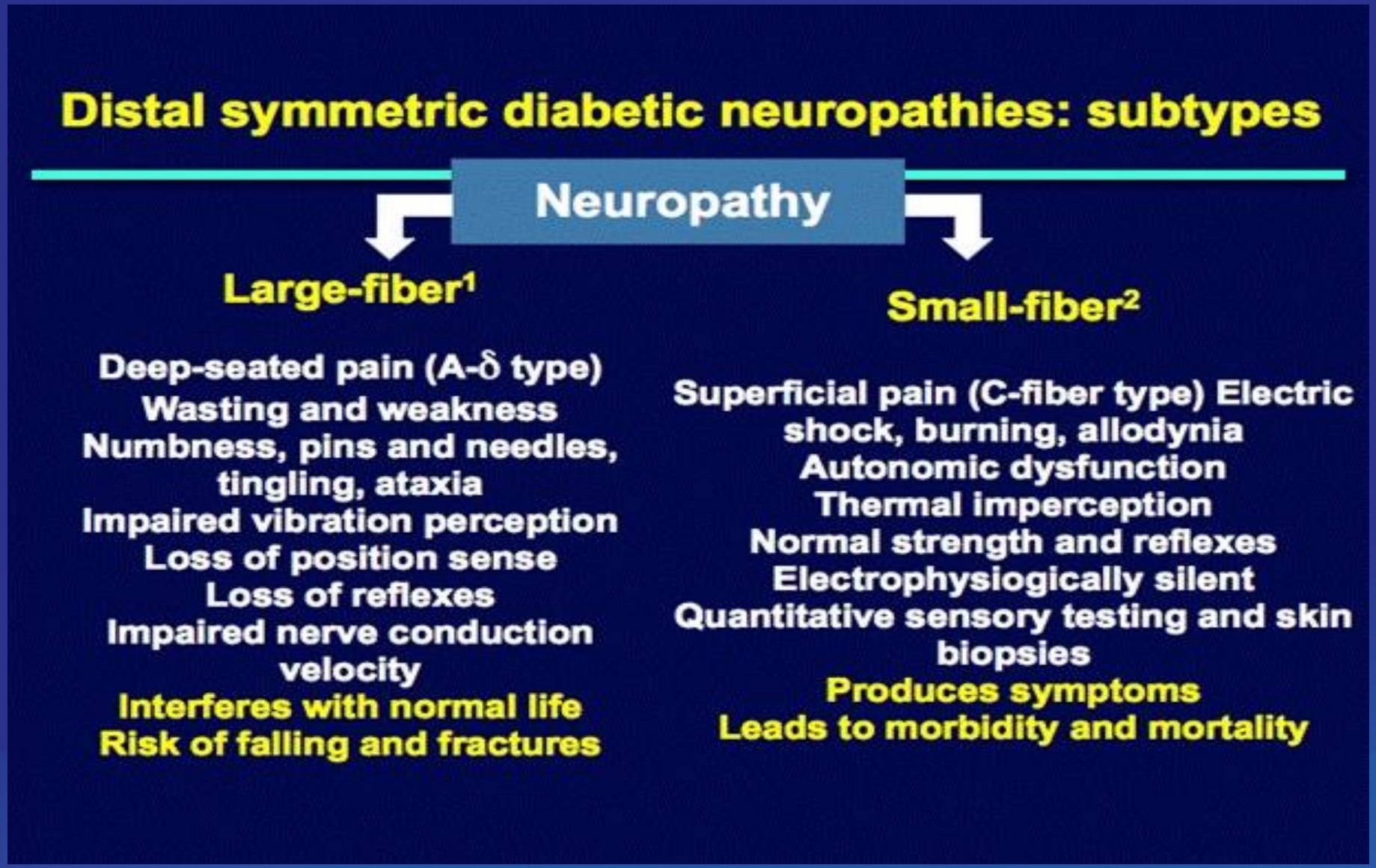

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Diabetic Autonomic Neuropathy

- Hypoglycemia unawareness
- Resting tachycardia
- Orthostatic hypotension
- Gastroparesis
- Constipation
- Diarrhea
- Fecal incontinence
- Erectile dysfunction
- Neurologic Bladder
- Sudomotor dysfunction
- Increased or decreased Sweating

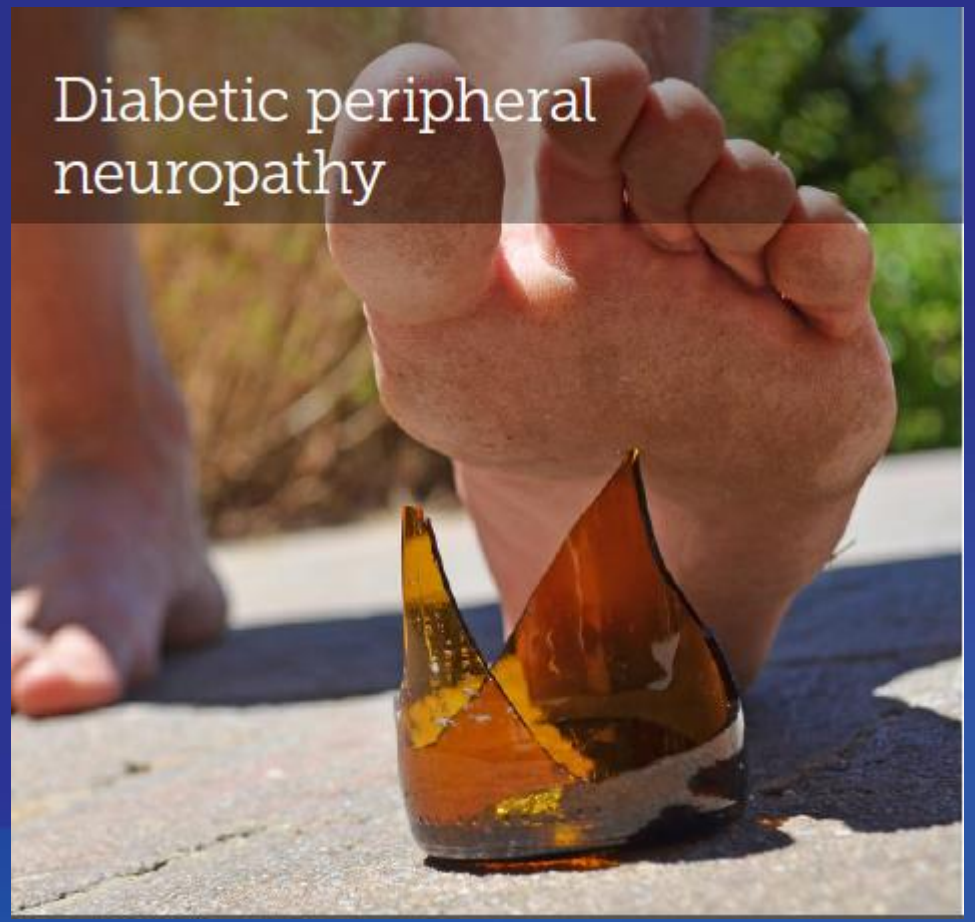
Standards of Medical Care in Diabetes (ADA 2021)

Diabetic peripheral neuropathy (DPN)

Peripheral neuropathy is the most common form of diabetes-related neuropathy.

It affects the distal nerves of the limbs, particularly those of the feet.

Primary risk factor for the development of diabetic foot ulcers.



IDF Clinical Practice Recommendations on the Diabetic Foot – 2017

The Clinic Visit: “ My feet hurt”

Up to 50% of patients

Burning pain

Electrical or stabbing sensations

Paresthesia

Hyperesthesia

A deep aching pain

IDF Clinical Practice Recommendations on the Diabetic Foot – 2017

The Clinic Visit: “ My feet hurt”

Confirm the presence of peripheral neuropathy

- Identify a typical history
- Confirm typical Exam finding

Identify an Etiology

- Focused history on common risk factors
- Targeted workup

Treatment

- Treat the cause (if possible)
- Treat neuropathic pain (when present)

Table 2—*Essential features of history*

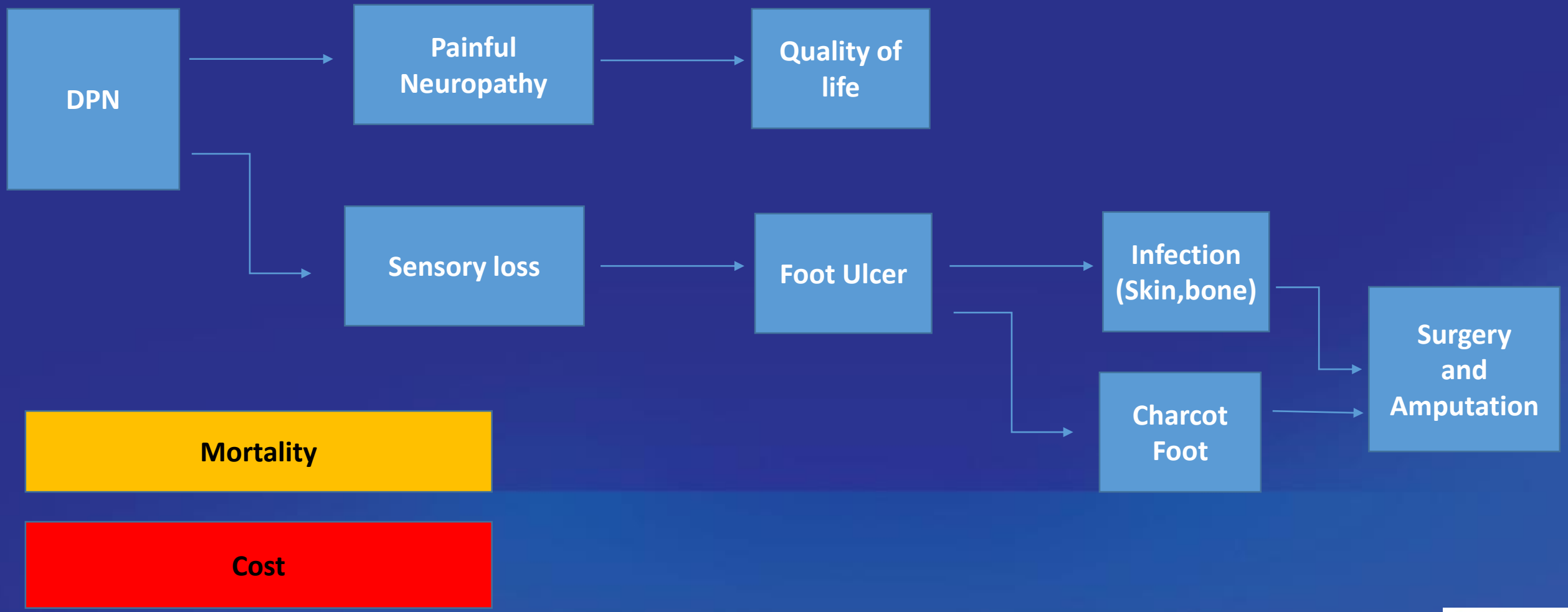
Past history
- ulceration
- amputation
- Charcot joint
- vascular surgery
- angioplasty
- cigarette smoking

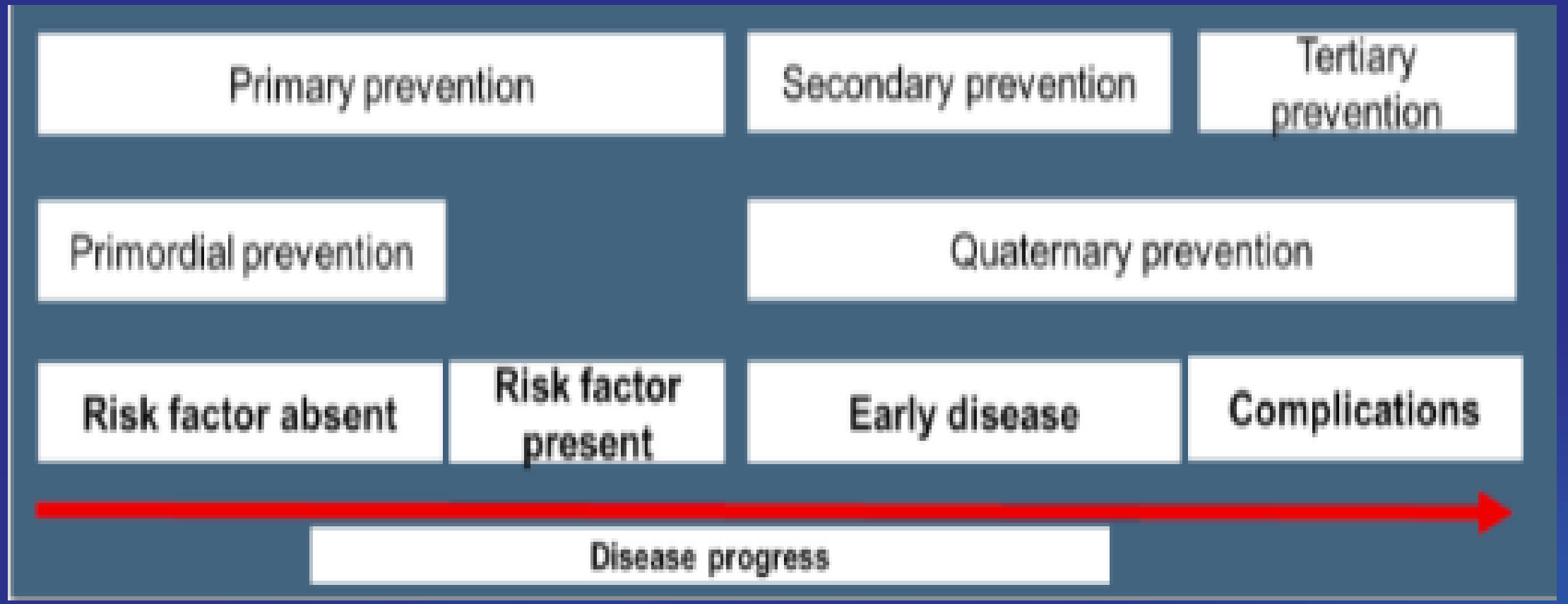
Neuropathic symptoms
- positive (e.g., burning or shooting pain, electrical or sharp sensations, etc.)
- negative (e.g., numbness, feet feel dead)

Vascular symptoms
- claudication
- rest pain
- nonhealing ulcer

Other diabetes complications
- renal (dialysis, transplant)
- retinal (visual impairment)

Comprehensive Foot Examination and Risk Assessment (2008)


DPN
Painful Neuropathy
Quality of life
Sensory loss
Foot Ulcer
Infection (Skin,bone)
Surgery and Amputation
Charcot Foot
Mortality
Cost


Primary prevention
Secondary prevention
Tertiary prevention
Primordial prevention
Quaternary prevention
Risk factor absent
Risk factor present
Early disease
Complications
Disease progress

Type/level of prevention	Aim of measures
Primordial	Control of single risk factors
Primary	Prevention of disease
Secondary (early)	Identification of the disease in its early asymptomatic stage
Tertiary (late)	Prevention of disease complications
Quaternary	Prevention of unfounded or harmful medical activities

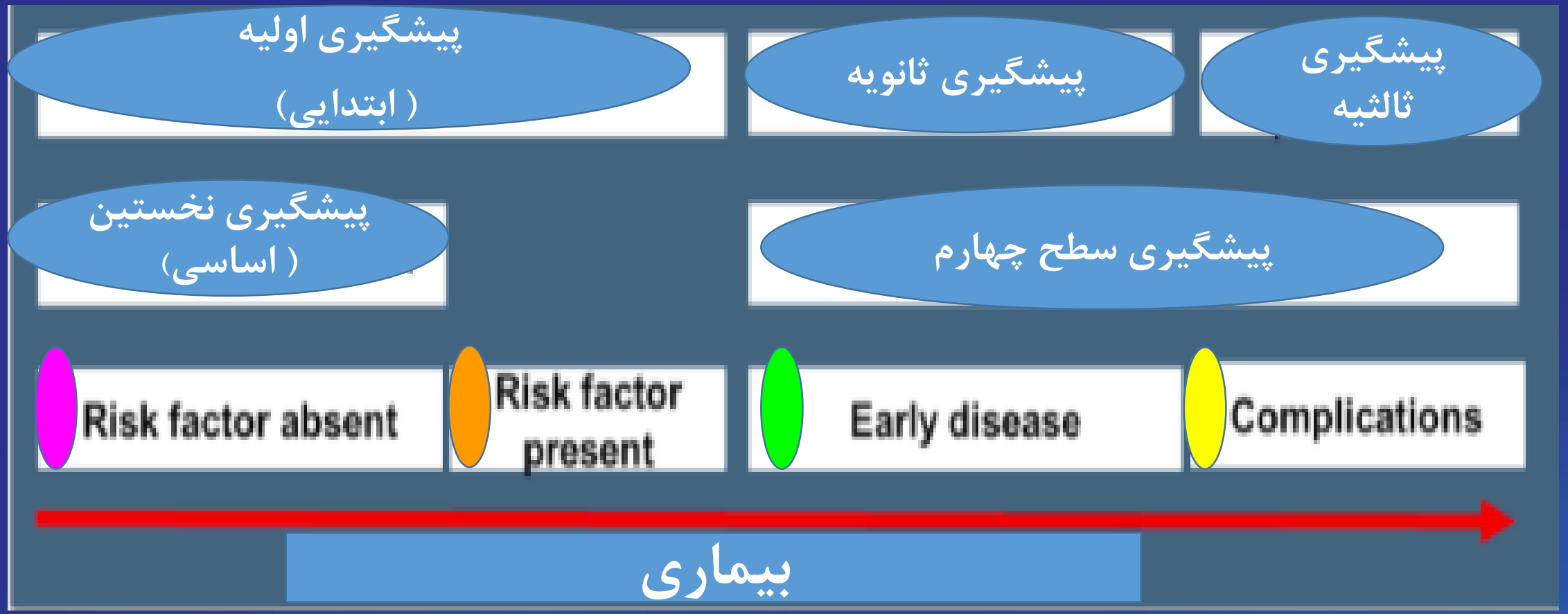
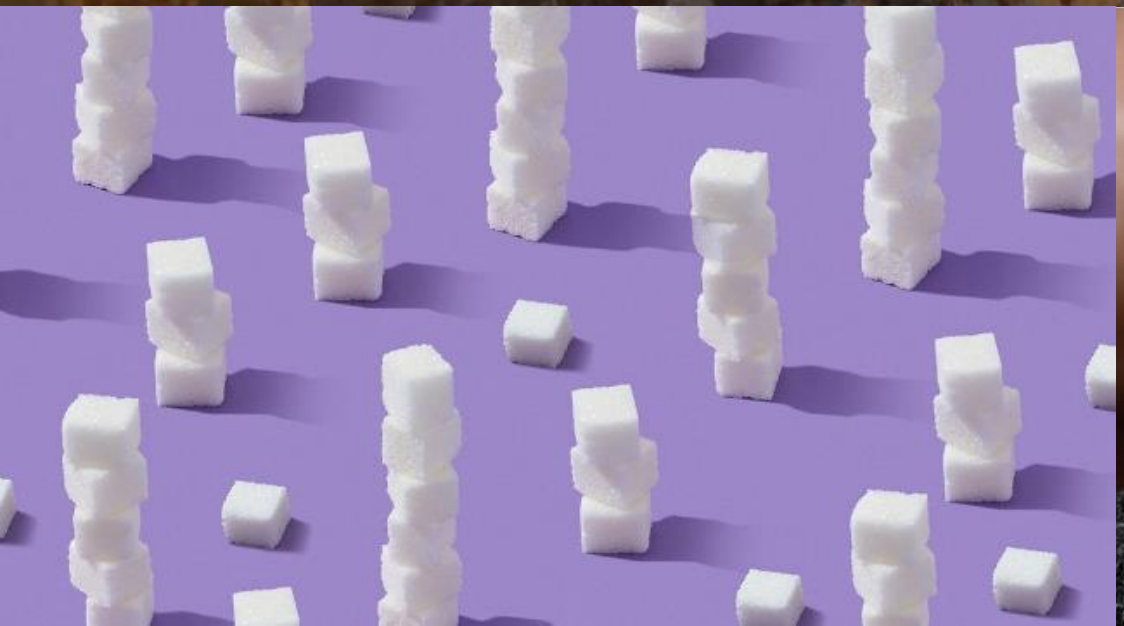

پیشگیری اولیه
(ابتدایی)
پیشگیری ثانویه
پیشگیری ثالثیه
پیشگیری نخستین
(اساسی)
پیشگیری سطح چهارم
Risk factor absent
Risk factor present
Early disease
Complications
بیماری

Table 1—*Risk factors for foot ulcers*

- Previous amputation
- Past foot ulcer history
- Peripheral neuropathy
- Foot deformity
- Peripheral vascular disease
- Visual impairment
- Diabetic nephropathy (especially patients on dialysis)
- Poor glycemic control
- Cigarette smoking

Comprehensive Foot Examination and Risk Assessment (2008)


Lifestyle
Smoker
Physical activity
Level 1
Level 2
Total score: needs attention
105
Blood sugar test
Glucose 105
A1c 6.0
You
100
120
Normal
Pre-diabetes
Diabetes
23
Blood pressure
Systolic 164
Diastolic 102
105 mg/dL
You
240
High




Eating a healthy diet
Exercising regularly
Reaching a healthy weight
Avoiding smoking
Limiting alcoholic beverages
Managing your stress level

Table 3—*Key components of the diabetic foot exam*

Inspection
Dermatologic
• skin status: color, thickness, dryness, cracking
• sweating
• infection: check between toes for fungal infection
• ulceration
• calluses/blistering: hemorrhage into callus?
Musculoskeletal
• deformity, e.g., claw toes, prominent metatarsal heads, Charcot joint (Fig. 1)
• muscle wasting (guttering between metatarsals)
Neurological assessment
10-g monofilament + 1 of the following 4
• vibration using 128-Hz tuning fork
• pinprick sensation
• ankle reflexes
• VPT
Vascular assessment
• foot pulses
• ABI, if indicated

Comprehensive Foot Examination and Risk Assessment (2008)

How to do a 3-minute diabetic foot exam

This brief exam will help you to quickly detect major risks and prompt you to refer patients to appropriate specialists.

What to ask (1 minute)[5,12]

Does the patient have a history of:

- previous leg/foot ulcer or lower limb amputation/surgery?
- prior angioplasty, stent, or leg bypass surgery?
- foot wound requiring more than 3 weeks to heal?
- smoking or nicotine use?
- diabetes? (If yes, what are the patient's current control measures?)

Does the patient have:

- burning or tingling in legs or feet?
- leg or foot pain with activity or at rest?
- changes in skin color, or skin lesions?
- loss of lower extremity sensation?

Has the patient established regular podiatric care?

How to do a 3-minute diabetic foot exam (2014)

How to do a 3-minute diabetic foot exam

This brief exam will help you to quickly detect major risks and prompt you to refer patients to appropriate specialists.

What to look for (1 minute)[5,15,16]

Dermatologic exam:

- Does the patient have discolored, ingrown, or elongated nails?
- Are there signs of fungal infection?
- Does the patient have discolored and/or hypertrophic skin lesions, calluses, or corns?
- Does the patient have open wounds or fissures?
- Does the patient have interdigital maceration?

Neurologic exam:

- Is the patient responsive to the Ipswich Touch Test?

Musculoskeletal exam:

- Does the patient have full range of motion of the joints?
- Does the patient have obvious deformities? If yes, for how long?
- Is the midfoot hot, red, or inflamed?

Vascular exam:

- Is the hair growth on the foot dorsum or lower limb decreased?
- Are the dorsalis pedis and posterior tibial pulses palpable?
- Is there a temperature difference between the calves and feet, or between the left and right foot?

How to do a 3-minute diabetic foot exam (2014)

How to do a 3-minute diabetic foot exam

This brief exam will help you to quickly detect major risks and prompt you to refer patients to appropriate specialists.

TABLE 3

What to teach (1 minute)[5,15,45]

Recommendations for daily foot care:

- Visually examine both feet, including soles and between toes. If the patient can't do this, have a family member do it.
- Keep feet dry by regularly changing shoes and socks; dry feet after baths or exercise.
- Report any new lesions, discolorations, or swelling to a health care professional.

Education regarding shoes:

- Educate the patient on the risks of walking barefoot, even when indoors.
- Recommend appropriate footwear and advise against shoes that are too small, tight, or rub against a particular area of the foot.
- Suggest yearly replacement of shoes—more frequently if they exhibit high wear.

Overall health risk management:

- Recommend smoking cessation (if applicable).
- Recommend appropriate glycemic control.

How to do a 3-minute diabetic foot exam (2014)

Diabetic peripheral neuropathy

Type 2 Diabetes

At Diagnosis

Type 1 Diabetes

5 years After Diagnosis

At least Annually thereafter

Standards of Medical Care in Diabetes (ADA 2021)

Does the patient have any:		
		
Numbness and tingling in the feet?	Burning sensation? Is it worse at night or at rest?	Pain in the feet or legs when walking that is limiting mobility?
		
Leg or foot symptoms when mobile relieved immediately with sitting or bending forward?	History of foot ulcers?	Swelling in the feet or legs?
		
Are the feet hot or cold?		

IDF Clinical Practice Recommendations on the Diabetic Foot – 2017

Screen for dysfunction = Predict future risk of Complication

Small fiber Function

Pinprick and temperature sensation

Large fiber Function

vibration perception and 10g monofilament

Protective Sensation

10 g monofilament

Standards of Medical Care in Diabetes (ADA 2021)

10g (5.07) Semmes-Weinstein monofilament

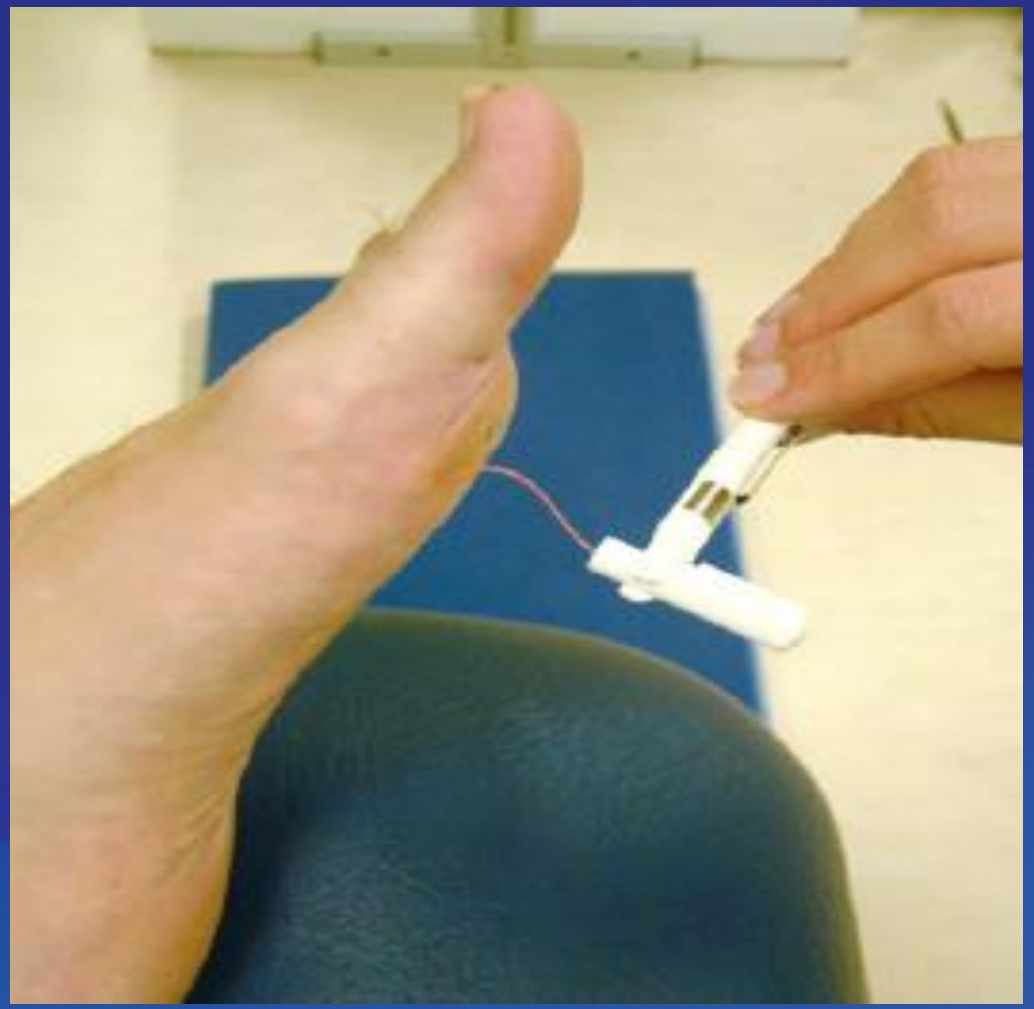
- First apply the monofilament on the patient's hands (or elbow or forehead) to demonstrate what the sensation feels like.

- Test three different sites on both feet

- Ensure the patient can not see whether or where the examiner applies the filament.

- Apply the monofilament perpendicular to the skin surface with sufficient force to cause the filament to bend or buckle.

- The total duration of the approach -> skin contact -> and removal of the filament should be approximately 2 seconds.



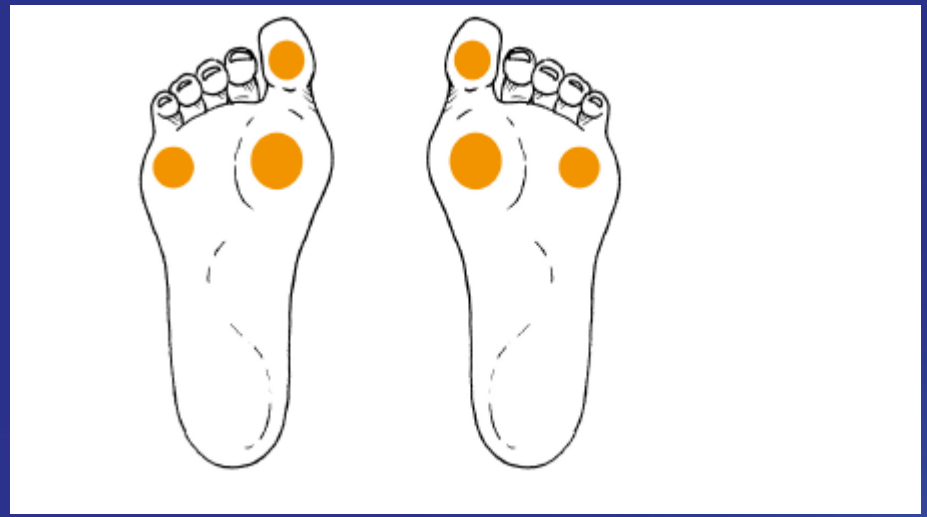
The International Working Group on the Diabetic Foot (2019)

10g (5.07) Semmes-Weinstein monofilament

- Do not apply the filament directly on an ulcer, callus, scar or necrotic tissue.

- Do not allow the filament to slide across the skin or make repetitive contact at the test site.

- Press the filament to the skin and ask the patient whether they feel the pressure applied ('yes'/'no') and next where they feel the pressure (e.g., 'ball of left foot'/'right heel).



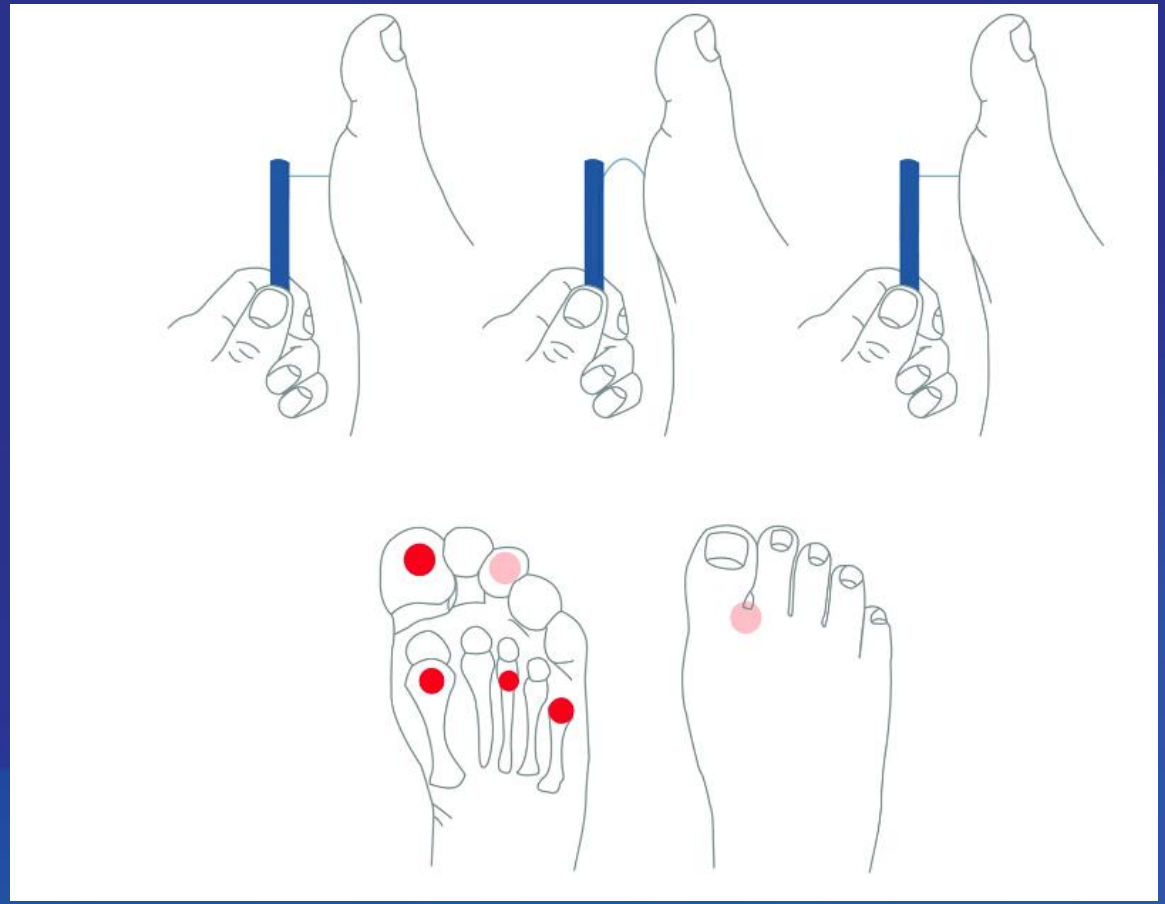
The International Working Group on the Diabetic Foot (2019)

10g (5.07) Semmes-Weinstein monofilament

- Repeat this application twice at the same site, but alternate this with at least one 'mock' application in which no filament is applied (a total of three questions per site).

- Protective sensation is: present at each site if the patient correctly answers on two out of three applications; absent with two out of three incorrect answers.

- Encourage the patients during testing by giving positive feedback.



The International Working Group on the Diabetic Foot (2019)

10g (5.07) Semmes-Weinstein monofilament

Monofilaments tend to lose buckling force temporarily after being used several times on the same day, or permanently after long duration use.

Depending on the type of monofilament, we suggest not using the monofilament for the next 24 hours after assessing 10-15 patients and replacing it after using it on 70-90 patients.

The International Working Group on the Diabetic Foot (2019)

128 Hz Tuning fork

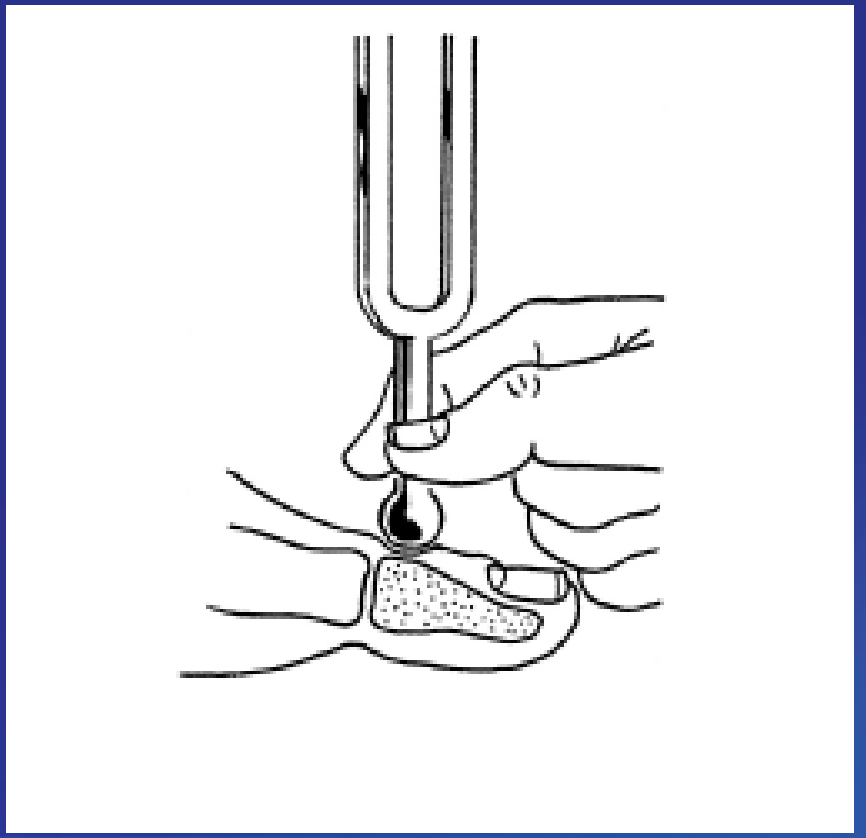
- First, apply the tuning fork on the patient's wrist (or elbow or clavicle) to demonstrate what the sensation feels like.

- Ensure the patient can not see whether or where the examiner applies the tuning fork.

- Apply the tuning fork to a bony part on the dorsal side of the distal phalanx of the first toe (or another toe if the hallux is absent).

- Apply the tuning fork perpendicularly, with constant pressure.

- Repeat this application twice, but alternate this with at least one 'mock' application in which the tuning fork is not vibrating.



The International Working Group on the Diabetic Foot (2019)

128 Hz Tuning fork

- The test is positive if the patient correctly answers at least two out of three applications, and negative if two out of three answers are incorrect.

- If the patient is unable to sense the vibrations on the toe, repeat the test more proximally (e.g., malleolus, tibial tuberosity).

- Encourage the patient during testing by giving positive feedback.

The International Working Group on the Diabetic Foot (2019)

Light touch test

This simple test (also called the Ipswich Touch test) can be used to screen for loss of protective sensation (LOPS), when the 10 gram monofilament or 128 HZ tuning fork is not available.

The test has reasonable agreement with these tests to determine LOPS, but its accuracy in predicting foot ulcers has not been established.

The International Working Group on the Diabetic Foot (2019)

Light touch test

- Explain the procedure and ensure that everything is understood
- Instruct the subject to close the eyes and to say yes when they feel the touch
- The examiner lightly sequentially touches with the tip of hers/his index finger the tips of the first, third, and fifth toes of both feet for 1–2 s
- When touching, do not push, tap, or poke
- LOPS is likely when light touch is not sensed in ≥ 2 sites

The International Working Group on the Diabetic Foot (2019)

Test temperature sensation

Test temperature sensation with Tip-Therm or test tubes, one with cold water (5-10°C) and one with warm water (35 to 45°C).

Put on the dorsum of the patient's foot directly on the skin and ask the patient what they feel.

Grade the temperature sensation testing as normal, weak or loss of temperature sensation.

Please remember that temperature sensation is lost in conjunction with pain sensation (small, unmyelinated nerves) so if the patient has lost temperature sensation then pain is also usually lost.

آموزش به بیمار مبتلا به دیابت

در شروع تعیین کنید آیا بیمار مبتلا به دیابت قادر است روزانه پای خود را ارزیابی کند.

اگر پاسخ منفی است، با او در خصوص این که چه کسی میتواند در این مورد به او کمک کند، صحبت کنید.

کسی که اگر دچار اختلال دید دائمی باشد نمیتواند به خوبی از عهده این کار بر آید.

The International Working Group on the Diabetic Foot (2019)

آموزش به بیمار مبتلا به دیابت

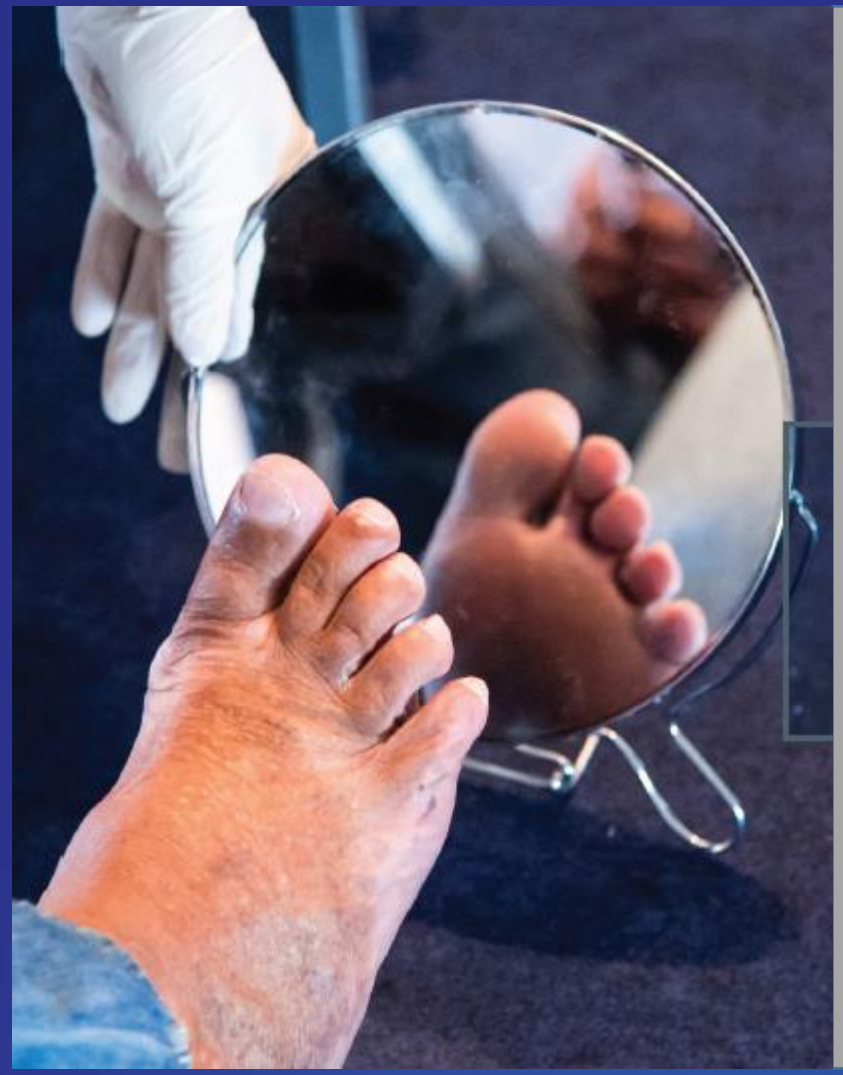
پاهای خود، خصوصا بین انگشتان پاها را روزانه بررسی کند .

از پا برهنه راه رفتن، راه رفتن با کفش بدون جوراب، یا با دمپایی های با کفی نازک تر از استاندارد، در منزل یا بیرون از منزل خودداری کنند.

از پوشیدن کفش های تنگ با لبه های باریک و درزهای غیرمعمول بپرهیزند.

The International Working Group on the Diabetic Foot (2019)

آموزش به بیمار مبتلا به دیابت



از مواد شیمیایی یا چسب های میخچه جهت برداشتن میخچه یا پینه استفاده نکرده و به ارائه دهندگان مراقبت بهداشتی -درمانی مربوطه مراجعه کند .

از کرم های مرطوب کننده جهت نرم کردن پوست خشک استفاده کرده، لای انگشتان پا را چرب نکند.

ناخنهای پا را به شکل مستقیم کوتاه کند.

به بیمار آموزش داده شود که برای معاینات پا به طور منظم به ارائه دهندگان مراقبت بهداشتی درمانی مراجعه کند .

The International Working Group on the Diabetic Foot (2019)

THE FOOT CARE GUIDE

THE 9-STEP DAILY FOOT CARE GUIDE FOR PEOPLE WITH DIABETES

1. WASH YOUR FEET EVERY DAY WITH LUKE WARM WATER AND SOAP.

2. DRY YOUR FEET WELL, ESPECIALLY BETWEEN THE TOES.

3. MOISTURISE YOUR FEET, BUT NOT BETWEEEN THE TOES.

4. CHECK YOUR FEET FOR BLISTERS, CUTS OR SORES.

5. KEEP YOUR TOENAILS AT A REASONABLE LENGTH.

6. WEAR CLEAN SOCKS THAT AREN'T TOO BIG OR SMALL.

7. KEEP YOUR FEET WARM AND DRY WITH SHOES THAT FIT COMFORTABLY.

8. NEVER WALK BAREFOOT INDOORS OR OUTDOORS.

9. EXAMINE YOUR SHOES FOR THINGS THAT MIGHT HURT YOUR FEET.

گروه	خطر زخم	ویژگی ها	بازه زمانی غربالگری
۰	بسیار کم	عدم وجود LOPS و PAD	هر سال یک بار
۱	کم	وجود LOPS یا PAD	هر ۶ ماه یک بار
۲	متوسط	وجود LOPS + وجود PAD یا وجود LOPS + دفورمیته پا یا وجود PAD + دفورمیته پا	هر ۳ تا ۶ ماه یک بار
۳	بالا	وجود LOPS یا PAD و یا یک یا چند مورد زیر: وجود نوروپاتی محیطی و سابقه زخم پا یا آمپوتاسیون اندام تحتانی و بیماری کلیه مرحله انتهایی	هر یک تا ۳ ماه یک بار

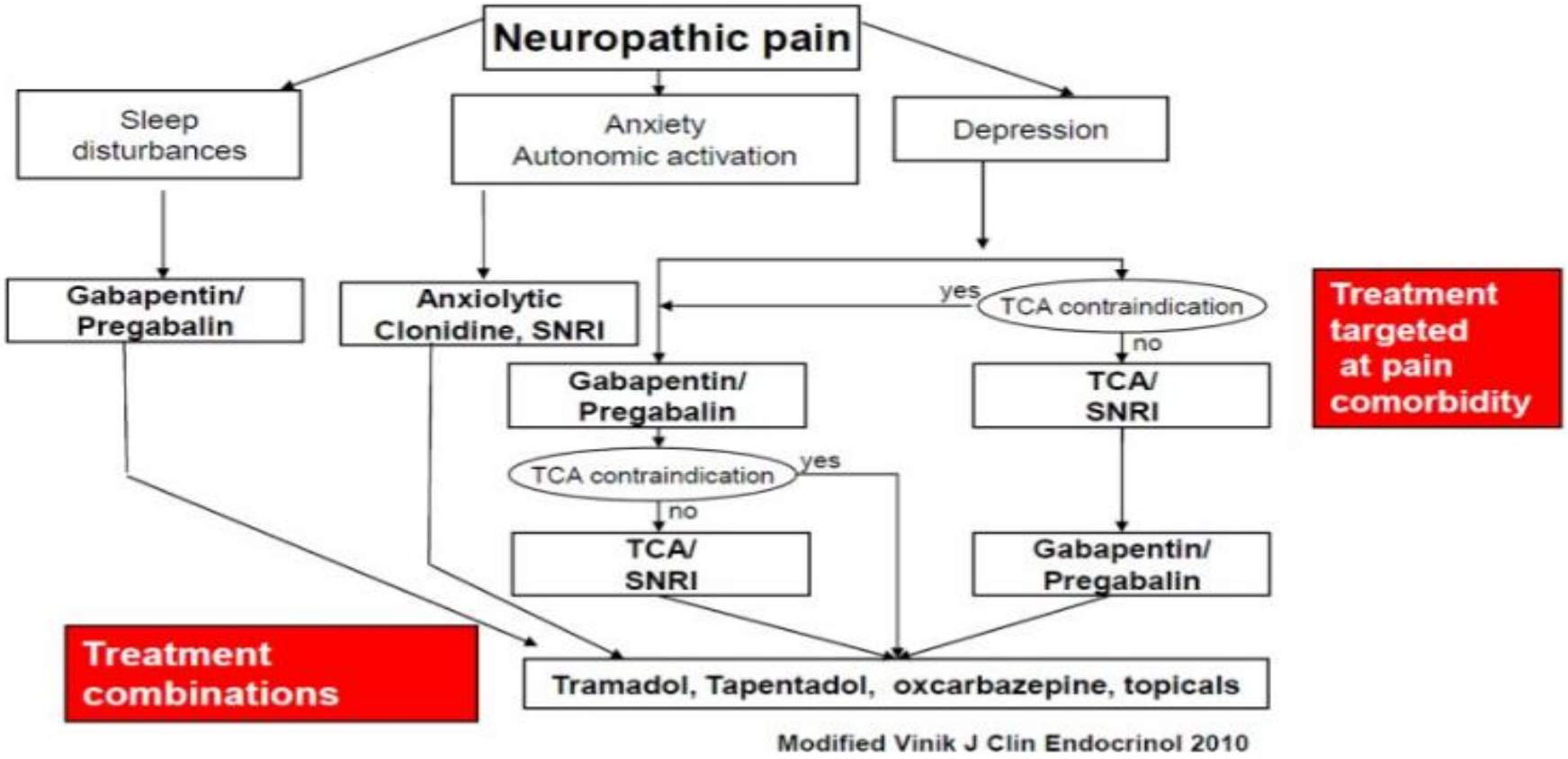
The International Working Group on the Diabetic Foot (2019)

Table 4—*Risk classification based on the comprehensive foot examination*

Risk category	Definition	Treatment recommendations	Suggested follow-up
0	No LOPS, no PAD, no deformity	• Patient education including advice on appropriate footwear.	Annually (by generalist and/or specialist)
1	LOPS ± deformity	• Consider prescriptive or accommodative footwear. • Consider prophylactic surgery if deformity is not able to be safely accommodated in shoes. Continue patient education.	Every 3–6 months (by generalist or specialist)
2	PAD ± LOPS	• Consider prescriptive or accommodative footwear. • Consider vascular consultation for combined follow-up.	Every 2–3 months (by specialist)
3	History of ulcer or amputation	• Same as category 1. • Consider vascular consultation for combined follow-up if PAD present.	Every 1–2 months (by specialist)

Comprehensive Foot Examination and Risk Assessment (2008)

Treatment Algorithm: After Exclusion of Non-Diabetic Etiologies and Stabilization of Glycemic Control



Diabetic Neuropathies :Aaron Vinik, MD, PhD, FCP, MACP, FACE(Last Update: February 5, 2018)

Treatments for Symptomatic Diabetic Polyneuropathy Pain-Dosing and Side Effects

Drug Class	Drug	Dose	Side Effects
Tricyclics	Amitryptyline	50-150 QHS	Somnolence, dizziness, dry mouth, tachycardia,
	Nortriptyline	50-150 QHS	constipation, urinary retention, blurred vision
	Imipramine	25-150 QHS	Confusion
	Desipramine	25-150 QHS	
SSRIs	Paroxetine	40 QD	Somnolence, dizziness, sweating, nausea, anorexia,
	Citalopram	40 QD	diarrhea, impotence, tremor
SNRIs	Duloxetine	60 QD	Nausea, somnolence, dizziness, anorexia
Anticonvulsants	Gabapentin	300-1200 TID	Somnolence, dizziness, Confusion, ataxia
	Pregabalin	50-150 TID	Somnolence, confusion, edema, weight gain
	Carbamazepine/ Oxcarbezepine	Up to 200 QID	Dizziness, somnolence, Nausea, leukopenia
	Topiramate	Up to 400 QD	Somnolence, dizziness, ataxia, Tremor
Opioids	Tramadol	50-100 BID	Nausea, constipation, HA Somnolence
	Oxycodone CR Tapentadol ER	10-30 BID Up to 500 QD	Somnolence, nausea, constipation, HA Constipation, nausea, somnolence, dizziness
Topical	Capsaicin	0.075% QID	Local irritation
	Lidocaine	0.04% QD	Local irritation
Injection	Botulinum toxin		None

Diabetic Neuropathies :Aaron Vinik, MD, PhD, FCP, MACP, FACE(Last Update: February 5, 2018)