SEARCH MOP - Section 16
Michigan Neuropathy Screening Instrument (MNSI)
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16. Michigan Neuropathy Screening Instrument (MNSI)

16.1. BACKGROUND

The Michigan Neuropathy Screening Instrument (MNSI) is designed to screen for the presence of diabetic neuropathy. The MNSI is designed to be used in an outpatient setting by primary care or other providers. The first part of the screening instrument consists of 15 self-administered "yes or no" questions on foot sensation including pain, numbness and temperature sensitivity (see Appendix A for the patient screening instrument). A higher score (out of a maximum of 13 points) indicates more neuropathic symptoms. The questions were chosen from among those in the Neuropathy Screening Profile of Peter Dyck that showed the highest degree of specificity and sensitivity for diabetic neuropathy among normal subjects and those with a variety of neuromuscular disorders (Neurology, 36:1300-1308, 1986).

The second part of the MNSI is a brief physical examination involving 1) inspection of the feet for deformities, dry skin, hair or nail abnormalities, callous or infection, 2) semi-quantitative assessment of vibration sensation at the dorsum of the great toe, 3) grading of ankle reflexes and 4) monofilament testing (see Appendix A for the to be filled out by the health professional). Patients screening positive on the clinical portion of the MNSI (greater than 2 points on a 10 point scale) are considered neuropathic and referred for further evaluation.

16.2. EVALUATION OF THE MNSI

For the patient questionnaire, a higher score (out of a maximum of 13 points) indicates more neuropathic symptoms. Responses of "yes" to items 1-3, 5-6, 8-9, 11-12, 14-15 are each counted as one point. A "no" response on items 7 and 13 counts as 1 point. Item #4 is a measure of impaired circulation and item #10 is a measure of general anesthesia and they are not included in scoring. To decrease the potential for bias, all scoring information has been eliminated from the patient version of the questionnaire.

For the vibration sense, the examiner should generally be able to feel vibration from the hand-held tuning fork for 5 seconds longer on his distal forefinger than a normal subject can at the great toe (e.g., examiner's DIP joint of the first finger versus patient's toe). If the examiner feels vibration for 10 or more seconds on his or her finger, then vibration is considered reduced. Vibration is scored as 1) present if the examiner senses the vibration on his or her finger for < 10 seconds, 2) reduced if sensed for ≥ 10 or 3) absent (no vibration detection).

For the reflex test, an obtained reflex is graded as present. Reflexes elicited with the Jendrassic maneuver alone are designated "present with reinforcement". If the reflex is absent, even in the face of the Jendrassic maneuver, the reflex is considered absent.

For the monofilament test, eight correct responses out of 10 applications is considered normal: one to seven correct responses indicates reduced sensation and no correct answers translates into absent sensation.

A high score on the questionnaire, reduced/absent vibration sense, reduced/absent ankle reflexes, and reduced/absent sensation to the monofilament test are all indicators of neuropathic symptoms, and suggestive of Diabetic Neuropathy. Patients scoring greater than 2 points on a 10 point scale on the clinical portion of the MNSI are considered neuropathic and should be referred for further evaluation.

16.3. SUPPLIES

1) Patient questionnaire and examiner guide sheet (see Appendix A)
2) 128 Hz tuning fork
3) Reflex hammer
4) Monofilament

16.4. PROCEDURE

16.4.1. *History Questionnaire*

a. Explain the MNSI to the patient. The following script is suggested:

"The doctor has administered this test as part of your health evaluation. It measures the health of the sensory nerves in your skin. These are the nerves that detect sensations such as touch, pressure and temperature. The first part of this evaluation is a questionnaire that asks about the sensation in your feet. Answer the questions honestly and to the best of your ability."

b. Administer the attached questionnaire to the patient. Allow him/her as much time as needed to complete it. When the patient completes the exam, move on to the second part of the exam.

16.4.2. *Physical Exam: Inspection*

a. Explain the procedure to the patient. The following script is suggested:

"Thank you for completing the questionnaire. Now we'll move on to the physical exam. I'll use a tuning fork to test the vibration sense in your foot, and then a reflex hammer to test the reflexes in your ankle. Neither procedure is painful. Let me know if you have any questions about what I'm doing."

b. Inspect the patient's foot for evidence of excessively dry/cracked skin, callous formation, fissures, frank ulceration or deformities. Deformities include flat feet, hammer toes, overlapping toes, halux valgus, joint subluxation, prominent metatarsal heads, medial convexity (Charcot foot) and amputation. See pictures

in Appendix B for examples of Foot Abnormalities that should be recorded on the screening sheet. Photos not related to ulcers/infection will not be included in the MOP. Section 17.3.1 reviews what a staff member should do if a participant has an untreated ulcer or infection found during inspection of their feet. The research team member will recommend that the participant contact their provider/primary care physician for evaluation and treatment.

c. Record findings and subsequent information on the screening sheet. If there is a need to send the participant for urgent care, the research staff will document in the research chart the findings and recommendation.

16.4.3. *Vibration Sense*

a. Test vibration sensation bilaterally using a 128 Hz tuning fork. As a test, place the non-vibrating fork over the dorsum of the great toe on the boney prominence of the patient's DIP joint. Then strike the fork and place the vibrating instrument in the same location. Ask the patient if he/she can detect the difference between the vibrating and non-vibrating fork.

b. If the patient can discern vibration, ask him/her to close his/her eyes. Then strike the fork, and place the vibrating instrument on the great toe as indicated above. Ask the patient to tell you when he/she can no longer feel the vibration of the fork.

1. Count the time between when the patient ceases to feel the vibration and when you can no longer feel the vibration with your finger. Recall that feeling the vibration for 5 seconds longer than the patient is normal, where as feeling the vibration for >10 seconds indicates decreased vibration sense.

2. Repeat the procedure on the other great toe, and record your results.

16.4.4. *Reflex Test*

a. Test the ankle reflex using an appropriate reflex hammer (e.g. Trommer or Queen square). The patient should be in a relaxed, seated position with the foot dependent (e.g., resting against your leg). To obtain optimal muscle stretch, make sure the foot is passively supported and dorsiflexed.

b. Percuss the Achilles tendon directly.

c. If a reflex is obtained, it is graded as present. If the reflex is absent, ask the patient to perform the Jendrassic maneuver (i.e., hooking the fingers together and pulling). Reflexes elicited with the Jendrassic maneuver alone are designated "present with reinforcement." If the reflex is absent, even in the face of the Jendrassic maneuver, the reflex is considered absent.

d. Repeat procedure on the other ankle, and record your results.

16.4.5. *Monofilament Test*

a. For this examination, it is important to support the patient's foot (i.e., allow the sole of the foot to rest on a flat, warm surface).

b. Prestress the filament by applying it to the dorsum of your first finger 4-6 times.

c. Ask the patient to close his/her eyes. Apply the filament perpendicularly and briefly (<1 second) with an even pressure to the dorsum of the great toe midway between the nail fold and the DIP joint. Do not hold the toe directly. When the filament bends, the force of 10 grams has been applied.

d. Ask the patient to respond "yes" if he/she feels the filament. Recall that eight correct responses out of 10 applications is considered normal: one to seven correct responses indicates reduced sensation, and no correct answers translates into absent sensation.

e. Repeat the procedure on the other great toe, and record your results.

16.4.6. *Conclusion*

Thank the patient for his/her participation. The following script is suggested:

"Thank you for participating in this testing. The findings may or may not involve or benefit you directly, but are intended to improve the diagnosis and well being of adolescents with diabetes."

Addendum:

The MNSI is a validated assessment. The MNSI should be administered/performed whenever possible in the same manner and sequence in which the validation occurred. Therefore, it is preferable for the exam to be performed with the patient comfortably seated, with legs non-supported and hanging freely. The order of assessment is inspection, reflexes, vibration and monofilament. As reflexes are done with legs dependent, it is very simple to follow the assessment of reflexes with the vibration and monofilament tests, while the legs are still dependent. If there are circumstances that prohibit the patient from sitting for the examination, then the patient may lay on an examination table, with the legs supported for the inspection, vibration and monofilament tests. Care needs to be taken to make sure, especially during vibration testing, that the patient is attentive to and responding to vibration at the DIP joint of the great toe, and not to vibration felt at other points of the foot or leg.

Appendix A: MICHIGAN NEUROPATHY SCREENING INSTRUMENT

Patient version

A. History (To be completed by the person with diabetes)

Please take a few minutes to answer the following questions about the feeling in your legs and feet. Check yes or no based on how you usually feel. Thank you.

1.	Are your legs and/or feet numb?	☐ No	☐ Yes
2.	Do you ever have any burning pain in your legs and/or feet?	☐ No	☐ Yes
3.	Are your feet too sensitive to touch?	☐ No	☐ Yes
4.	Do you get muscle cramps in your legs and/or feet?	☐ No	☐ Yes
5.	Do you ever have any prickling feelings in your legs or feet?	☐ No	☐ Yes
6.	Does it hurt when the bed covers touch your skin?	☐ No	☐ Yes
7.	When you get into the tub or shower, are you able to tell the hot water from the cold water?	☐ No	☐ Yes
8.	Have you ever had an open sore on your foot?	☐ No	☐ Yes
9.	Has your doctor ever told you that you have diabetic neuropathy?	☐ No	☐ Yes
10.	Do you feel weak all over most of the time?	☐ No	☐ Yes
11.	Are your symptoms worse at night?	☐ No	☐ Yes
12.	Do your legs hurt when you walk?	☐ No	☐ Yes
13.	Are you able to sense your feet when you walk?	☐ No	☐ Yes
14.	Is the skin on your feet so dry that it cracks open?	☐ No	☐ Yes
15.	Have you ever had an amputation?	☐ No	☐ Yes

Total: _____

MICHIGAN NEUROPATHY SCREENING INSTRUMENT

To be completed by health professional

B. Physical Assessment

1. Appearance of Feet

	Right Foot	Left Foot
a. Normal	1 ☐ No 2 ☐ Yes	Normal 1 ☐ No 2 ☐ Yes
b. If no, check all that apply:		If no, check all that apply:
Deformities	1 ☐	Deformities 1 ☐
Dry skin, callus	1 ☐	Dry skin, callus 1 ☐
Infection	1 ☐	Infection 1 ☐
Fissure	1 ☐	Fissure 1 ☐
Other	1 ☐	Other 1 ☐
specify: _____		specify: _____

	Right Foot			Left Foot		
2. Ulceration	Absent 1 ☐	Present 2 ☐		Absent 1 ☐	Present 2 ☐	
3. Ankle Reflexes	Present 1 ☐	Present/ Reinforcement 2 ☐	Absent 3 ☐	Present 1 ☐	Present/ Reinforcement 2 ☐	Absent 3 ☐
4. Vibration perception at great toe*	Present 1 ☐	Reduced 2 ☐	Absent 3 ☐	Present 1 ☐	Reduced 2 ☐	Absent 3 ☐

5. 10 gm filament (number of applications detected out of 10 applications):

Right Foot			Left Foot		
Present (≥ 8)	Reduced (1-7)	Absent (0)	Present (≥ 8)	Reduced (1-7)	Absent (0)
1 ☐	2 ☐	3 ☐	1 ☐	2 ☐	3 ☐

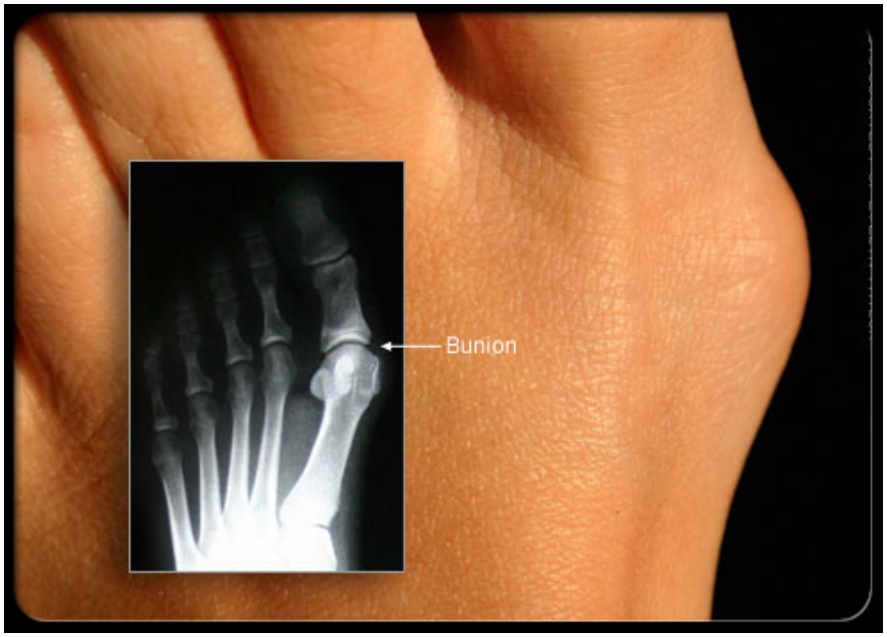
*Vibration is Present if the examiner feels vibration on his finger joint for 10 seconds or less after the patient reports vibration at toe has stopped. Vibration is Reduced if examiner feels vibration for more than 10 seconds after patient reports vibration at toe has stopped. Vibration is Absent if patient does not perceive any vibration from the tuning fork.

Signature:_____ Total Score _____ /10 Points

Appendix B: FOOT ABNORMALITIES

Foot Abnormalities

Bunion (Halux Valgus)



Bunionette (Tailor’s Bunion)

Foot Abnormalities

Hammer Toe

Claw Foot Deformity

Charcot Arthropathy (rocker bottom)

Dry Skin/Callus

Dry skin/fissures

Corn/Callus

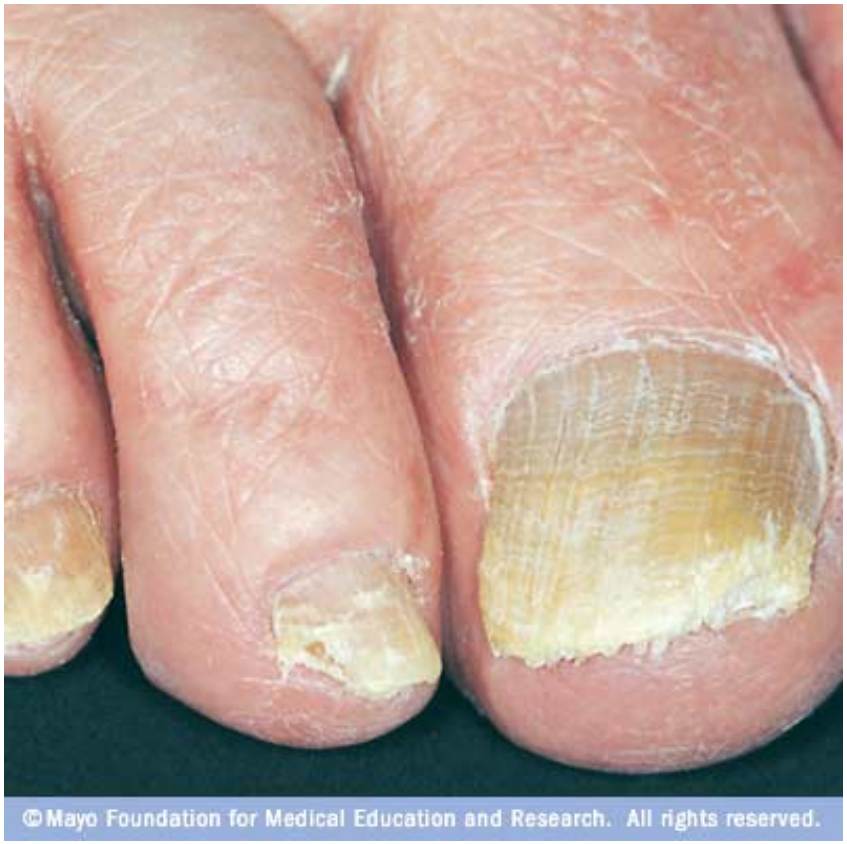
Athletes Foot Infection

Athletes Foot

Interdigital Athletes Foot

“Other” Foot Inspection Findings

Onchomycosis (Toenail Fungus)



Ingrown Toenail

Ulcer

Pressure ulcer associated with Charcot Arthropathy

Ulcer associated with pressure over the DIP joint of the great toe

Appendix C: MNSI GUIDANCE

University of Michigan
Health System

July 30, 2014

Dear SEARCH MNSI EXAMINERS:

This note is to provide guidance for all sites with regard to how to report wounds and other "abnormalities" on the MNSI. This has been a source of ongoing concern by a number of examiners.

As a reminder, the purpose of the MNSI is to identify abnormalities of the foot that are highly correlated with peripheral neuropathy. This would include changes in foot structure (deformities such as bunions, Charcot arthropathy, claw foot deformities, hammer toes) , skin integrity (significant callus, significant dry skin, fissures), edema, discoloration/mottling foot ulcers, reduced or absent ankle reflexes, reduced or absent distal vibration perception, and reduced or absent distal monofilament perception.

During the foot examination there will be, without doubt, abnormalities identified. However, it's important to remember that not all abnormalities should be reported on the MNSI as they are not usually associated, or highly correlated with neuropathy. Common examples of abnormalities that should not be captured on the MNSI include blisters, rashes, moles, scars, skin discolorations, edema, birthmarks, and sores/scratches or other wounds related to incidental trauma (including trauma induced by ill-fitting shoes or going barefoot). I realize that this goes against the grain. But again, within the context of the MNSI, these should not be recorded as abnormalities. They may of course be recorded as clinically relevant findings in other source documents or clinical notes.

The determination of whether or not a wound rises to the level of a foot ulcer is another issue of concern. In order to provide better guidance, we are proposing the following definition of foot ulcer, which is based on the definition used for the DCCT/EDIC study.

Ulcer *is diagnosed when a traumatic or non-traumatic excavation or loss of subcutaneous tissue in the foot occurs with evidence of inflammation and/or infection that requires medical or surgical treatment by a health professional in an office or hospital setting. The "foot" is defined by all anatomic structure distal to the malleoli (e.g., everything below the ankle bone).*

We hope that this information is helpful to you. As always, thank you for your hard work and never hesitate to send an email or call with any questions you may have about the MNSI!

Sincerely,

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