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Standardized Screening for Diabetic Peripheral Neuropathy as an Equity Intervention in Vulnerable Populations

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ABSTRACT

Diabetic peripheral neuropathy is a common and potentially disabling complication of diabetes, yet it often remains unrecognized and undertreated. For vulnerable populations experiencing a disproportionate burden of diabetes and barriers to equitable healthcare, inconsistent screening and treatment can contribute to preventable disparities. A standardized approach to diabetic peripheral neuropathy screening and subsequent treatment offers an opportunity to address these inequities. Consistent processes can help ensure that every eligible patient is assessed, that symptoms are documented using a common approach, and that treatment decisions are guided by current evidence rather than by inconsistent clinical practices. The purpose of this manuscript is to describe a set of validated instruments to be used in conjunction with a standardized screening approach for diabetic peripheral neuropathy, and provide a case study illustrating the use of the instruments.

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Introduction

Diabetes mellitus and its associated complications remain a major public health concern in the United States [1-3]. Diabetes disproportionately affects some racial and ethnic minority populations and untreated diabetic peripheral neuropathy can be a particularly consequential complication as it may affect patient morbidity and quality of life. However, symptoms such as allodynia, paresthesia, hypoesthesia, hyperpathia, lancinating pain, and loss of sensation may be normalized by patients, attributed to aging, or never discussed during a busy diabetes visit. Therefore, the condition is too often underdiagnosed and untreated, which represents both a quality-of-care problem and a health equity concern. Barriers that may affect the recognition of diabetic peripheral neuropathies in some racial and ethnic minority populations may include language and communication barriers, health literacy and patient knowledge, and access to healthcare services [3,4].

Neuropathy symptoms can be difficult to describe because patients may use culturally specific language or terms that do not correspond directly to standardized medical terminology. A patient may describe burning, numbness, “pins and needles,” weakness, heaviness, or discomfort. If clinicians do not ask specific, understandable questions, important symptoms may remain undisclosed. Standardized screening should therefore be available in the patient’s preferred language and should use clear terminology that facilitates meaningful communication.

Patients cannot be expected to seek treatment for a condition they do not recognize. Some individuals may believe that pain, numbness, or burning in the feet is an inevitable consequence of aging or diabetes and therefore not something that can or should be treated. Others may not understand the difference between treatment directed at the underlying diabetes and treatment intended to reduce neuropathic pain. Limited health literacy can further affect medication adherence and follow-up. Culturally and linguistically appropriate education should therefore accompany screening and treatment.

The identification and treatment of diabetic peripheral neuropathy may be influenced by access to primary care, endocrinology, neurology, pain management, podiatry, behavioral health, and pharmacy services. Patients who are uninsured, underinsured, geographically isolated, or dependent on fragmented healthcare systems may experience delays in diagnosis and treatment. A standardized process can reduce unnecessary dependence on specialty referral for initial recognition and evidence-based management. Primary care clinicians and diabetes care teams should have clear guidance regarding when and how to screen, initiate treatment, reassess symptoms, adjust therapy, and refer patients with complex or refractory symptoms. The American Diabetes Association Standards of Care in Diabetes 2026 [4], recommends that adults with Type 2 diabetes be assessed for diabetic peripheral neuropathy beginning at diagnosis and at least annually thereafter.

A standardized patient-reported assessment can complement, rather than replace, this clinical examination. A standardized approach to diabetic peripheral neuropathy screening and subsequent treatment offers an opportunity to address inequities [4,5]. Consistent processes can help ensure that every eligible patient is assessed, that symptoms are documented using a common approach, and that treatment decisions are guided by current evidence rather than by inconsistent clinical practices.

The purpose of this manuscript is to describe a set of validated instruments to be used in conjunction with a standardized screening approach for diabetic peripheral neuropathy, and provide a case study illustrating the use of the instruments.

Standardized screening should be incorporated into routine diabetes care. The goal is to establish a reproducible process for identifying patients who may have peripheral neuropathy and determining whether painful symptoms are present. Early diagnosis and management are key, as irreversible nerve damage may occur if there is a delay.

A standardized process may include:

- **Identification of Eligible Patients:** Patients with diabetes should be screened according to current clinical recommendations and organizational policy.
- **Routine Symptom Assessment at Regular Intervals:** Patients should be asked directly about burning, tingling, numbness, electric sensations, stabbing pain, hypersensitivity, and pain affecting the feet or lower extremities.
- **Use of Validated Assessment Instruments:** Organizations should select feasible, validated tools to support consistent identification and documentation of neuropathic symptoms and pain severity. The following are examples of validated tools that have been successfully used to assess patients with diabetes on a regular basis.
- **The Brief Pain Inventory (BPI):** is a validated instrument which measures both the intensity of pain and interference of pain in the patient's life (mood, walking ability, and sleep). ([Brief Pain Inventory \(BPI\) - Complete Explanation + PDF - clinicaltoolslibrary.com](#)).
- **The Numeric Rating Scale:** (equidistant 0-10 rating scale with 0 indicating no pain and 10 indicating the worst pain possible) has proven validity and sensitivity in diverse clinical settings ([Numeric Rating Scale \(NPRS\) - Complete Explanation + PDF - clinicaltoolslibrary.com](#)).
- **Wong-Baker FACES Scale:** ([Wong-Baker FACES Pain Scale: A Visual Guide for Patients and Providers | PainClinics.com](#)). Six faces represent pain intensity and range from a smiling face (no hurt) to a crying face (worst hurt). While originally designed for children, it has been widely used and validated in adults including those with cognitive impairments, language barriers, and low literacy.
- **The Michigan Hand Questionnaire:** is a reliable and valid instrument for assessing hand-related outcomes. The questionnaire is divided into the following domains: (1) Overall Hand Function, (2) Activities of Daily Living, (3) Work Performance, (4) Pain, (5) Aesthetics, and (6) Satisfaction ([Michigan Hand Outcomes Questionnaire : An Expert Guide](#)).
- **The Short Form 36 Health Survey (SF 36):** ([Medical Outcomes Study Short-Form 36-Item Questionnaire | Springer Nature Link](#)) The SF-36 was developed as a generic health-status measure encompassing eight health concepts, including physical functioning, role limitations, bodily pain, mental health, vitality, and general health perceptions. It is well validated across ages and diseases.

Embedding this process into clinical workflow is important. Electronic health record prompts, diabetes visit templates, standing protocols, and quality dashboards can help reduce dependence on individual memory. However, electronic reminders alone are insufficient. Successful implementation requires clinician education, leadership support, workflow integration, and feedback regarding performance.

An interdisciplinary implementation team may include primary care clinicians, endocrinology specialists, nurses, pharmacists, podiatrists, pain specialists, informatics personnel, quality improvement professionals, interpreters, community representatives, and patients. Inclusion of patients from the target population is particularly important because they can identify barriers that may not be apparent to clinicians or administrators.

Case Presentation

Ms. H. is a 62-year-old woman with a 12-year history of Type 2 diabetes who receives primary diabetes care at a community health center. Spanish is her preferred language. She works part-time in food service and has limited transportation. Missing work for medical appointments creates a financial burden, and she frequently combines multiple healthcare needs into a single visit.

Her most recent hemoglobin A1C is 9.1%. During a routine diabetes visit, the nurse asks her whether she has experienced numbness, tingling, burning, electrical sensations, or pain in her feet. Ms. H. initially responds: "Not really. It is just something I have learned to live with."

On further questioning, she describes intermittent burning in both feet and occasional "electric shocks" involving her toes. She also reports that her feet sometimes feel numb after standing at work for several hours. The symptoms have not previously been documented using a standardized assessment instrument.

Identification of the Equity Problem

Ms. H.'s case illustrates how clinical variation can create an opportunity for inequitable care.

Her symptoms could easily remain unidentified because:

- She does not initially describe the symptoms as "pain";
- She has normalized the symptoms;
- The clinical visit is time-limited;
- She has communication needs that require attention to language and health literacy;
- Work and transportation limitations make additional visits difficult; and
- No standardized neuropathy symptom assessment has previously been incorporated into her diabetes care.

The intervention therefore focuses on creating a reliable system for symptom identification, rather than assuming that patients will independently initiate discussions about neuropathy.

The Standardized Health Equity Intervention

The clinic implements a standardized assessment pathway for adults with diabetes. At appropriate clinic visits, patients are given standardized pain-intensity assessments, a multidimensional assessment of pain interference, assessment of broader health-related quality of life, assessment of hand function when upper-extremity symptoms are present and a standardized clinical neurologic and foot examination.

The instruments are used to identify symptoms, quantify their effects, reveal functional consequences, and trigger appropriate clinical assessment.

Intervention Components

Component	Instrument/Action	What It Measures	Role in Equity Intervention	Clinical Response
1	Numeric Rating Scale	Pain intensity, typically 0–10	Provides a simple, standardized opportunity to report pain	Document and reassess; investigate clinically meaningful symptoms
2	Wong-Baker FACES	Patient-reported pain intensity using visual representations	Offers an additional communication method	Use the patient's selected rating; do not infer pain from facial appearance
3	Brief Pain Inventory	Pain severity and interference with activities	Identifies consequences of pain that may not emerge from a single pain score	Assess function, treatment needs, and contributing factors
4	SF-36	Broader health-related quality of life	Identifies effects on physical, social, emotional, and general health	Integrate patient priorities into treatment and follow-up
5	Michigan Hand Outcomes Questionnaire	Hand function, ADLs, pain, work performance, aesthetics, satisfaction	Captures upper-extremity functional consequences when hand symptoms are present	Evaluate hand symptoms and differential diagnosis; refer when appropriate
6	Neurologic examination	Small- and large-fiber function	Provides objective clinical assessment needed for DPN evaluation	Evaluate for DPN and loss of protective sensation
7	Foot examination	Skin integrity, deformity, pulses, protective sensation	Identifies risk for ulceration and amputation	Risk stratification, education, referral, surveillance

Assessment Findings

Numeric Rating Scale

The nurse first asks Ms. H to rate her current foot pain from 0 to 10. She reports current pain = 6/10. When asked about her usual pain during the previous week, she reports average pain = 5/10. The standardized score establishes that Ms. H.'s symptoms are clinically meaningful despite her initial statement that she did not have "pain."

Wong-Baker FACES

The Wong-Baker FACES Pain Rating Scale provides an additional method of communicating pain intensity. Ms. H. selects the face corresponding to 6/10. This creates an important equity opportunity: the measurement process provides a visual representation of pain intensity in addition to the numeric scale. Therefore, it provides an additional communication method.

Brief Pain Inventory (BPI)

The nurse then administers the BPI to determine whether pain is affecting Ms.H.'s daily activities.

Illustrative findings are shown below.

BPI Domain	Patient-Reported Score
Worst pain	8/10
Least pain	3/10
Average pain	5/10
Current pain	6/10
Interference with walking	7/10
Interference with work	6/10
Interference with sleep	5/10
Interference with enjoyment of life	6/10

The BPI substantially changes the clinical picture. Ms. H. initially characterized her symptoms as something she had learned to live with. The BPI demonstrates that the symptoms interfere with walking, work, sleep, and enjoyment of life. This distinction is important. A single pain score answers: "How much does it hurt?" The BPI additionally asks: "What is the pain preventing you from doing?"

SF-36

The SF-36 is administered to assess the broader consequences of Ms. H.'s symptoms. The SF-36 evaluates eight health concepts, including physical functioning, social functioning, role limitations related to physical health, bodily pain, mental health, role limitations related to emotional problems, vitality, and general health perceptions.

Her responses demonstrate limitations in physical functioning, usual activities, bodily pain, vitality, social participation, and perceived general health. The SF-36 adds information that cannot be obtained from a neuropathy-focused examination alone. For example, two patients could have similar sensory findings but very different effects on work, social participation, energy, and perceive health.

Michigan Hand Outcomes Questionnaire (MHQ)

During the same visit, Ms. H. reports intermittent numbness and tingling in her fingers and difficulty opening jars and manipulating small objects at work. Because these symptoms involve the upper extremities, a hand-specific functional assessment is appropriate.

The MHQ was developed specifically to measure health states important to patients with hand disorders and includes six domains: overall hand function, activities of daily living, pain, work performance, aesthetics, and satisfaction with hand function. Its original validation demonstrated substantial test-retest reliability and good internal consistency.

In this case, the MHQ is used to characterize the functional consequences of hand symptoms, not to establish that the symptoms are caused by diabetic peripheral neuropathy. This distinction is important because hand numbness in a person with diabetes may have multiple causes, including diabetic neuropathy, carpal tunnel syndrome, cervical radiculopathy, or other neurologic conditions.

Clinical Neuropathy Examination

The patient-reported findings prompt a clinical assessment that includes inspection of both feet, assessment for skin breakdown and calluses, assessment of foot deformities, pedal pulse assessment, monofilament testing, vibration testing using a 128-Hz tuning fork, pinprick or temperature testing, assessment of balance and gait as clinically indicated, and assessment for other potential causes of neuropathy. In selected cases, a skin biopsy for morphology and fiber count may be indicated to confirm the diagnosis [6].

Ms. H. demonstrates reduced vibration sensation and diminished monofilament perception at several plantar sites bilaterally, accompanied by reduced pinprick sensation. The ADA recommends annual diabetic peripheral neuropathy assessment and specifically recommends evaluation of temperature or pinprick sensation, vibration sensation, and monofilament testing for identification of feet at risk. The clinician therefore does not interpret the questionnaires as diagnostic of diabetic peripheral neuropathy. Instead, the patient-reported findings and objective neurologic findings are integrated into the clinical assessment.

From Screening to Intervention

The most important component of the model is the response to abnormal findings.

The pathway is: Standardized assessment → abnormal finding → clinical evaluation → risk stratification → intervention → follow-up for Ms. H. the results lead to documentation of probable distal sensory neuropathy, assessment of foot-ulcer risk, education regarding daily foot inspection, education regarding appropriate footwear and avoidance of walking barefoot, review of glycemic management, assessment and treatment planning for painful neuropathic symptoms, evaluation of the hand symptoms (occasionally diabetic neuropathy shows up first in hands instead of feet), identification of barriers to medication access and follow-up, referral when clinically indicated; and planned reassessment. The ADA emphasizes that people with diabetes who have sensory loss or other high-risk findings require more intensive foot surveillance and education.

Why Standardization Can Promote Health Equity

The intervention addresses health equity at the system level. Without standardization, neuropathy assessment may depend on which clinician the patient sees, how much time is available, whether the patient describes symptoms spontaneously, whether the clinician asks about pain, how pain is defined, whether the patient is comfortable communicating in English, whether functional limitations are explored, and whether an abnormal finding results in follow-up. A standardized process reduces some of this variability. The intervention does not assume that every patient communicates symptoms in the same way. Instead, it provides multiple ways for patients to communicate pain and functional effects. This is an important distinction. Equity is not achieved by giving every patient exactly the same interaction. Equity is promoted by giving every patient a reliable opportunity to have symptoms recognized and then adapting the assessment to clinically relevant individual needs.

Limitations

Several limitations should be acknowledged.

First, patient-reported pain instruments do not diagnose diabetic peripheral neuropathy. It remains a clinical diagnosis requiring history and appropriate neurologic assessment, and other causes of neuropathy must be considered.

Second, the SF-36 is a generic health-status measure rather than a neuropathy-specific instrument.

Third, the MHQ was developed for hand disorders and should not be used to infer the presence or severity of diabetic neuropathy.

Fourth, the use of translated instruments requires attention to validated translations, permissions, and instrument-specific licensing requirements.

Finally, standardized screening alone does not eliminate health inequities. The intervention must be accompanied by access to appropriate treatment, medications, foot care, specialty care, education, and follow-up.

Discussion

An equitable system is one that reliably identifies patients with symptoms and provides accessible, understandable, evidence-based treatment and follow-up. Consistent standardized screening has particular potential to reduce disparities because it decreases reliance on patient self-report and clinician memory. Patients who do not know that burning or tingling should be discussed may be identified through direct questioning. Patients who encounter different clinicians are more likely to receive comparable assessment when the process is embedded in the healthcare system.

Nevertheless, standardization alone is insufficient. A protocol that is not available in the patient's preferred language or that relies on inaccessible treatment options could reproduce existing inequities. Standardized processes must therefore be combined with cultural responsiveness, affordability, communication support, and attention to social determinants of health. Treatment success should be measured broadly. Reduction in pain intensity is important, but patients may define meaningful improvement in terms of sleeping through the night, walking farther, returning to work, participating in family activities, or experiencing fewer medication-related problems. Patient-reported outcomes should therefore be incorporated into evaluation.

Conclusion

Diabetic peripheral neuropathy is a common and potentially disabling complication of diabetes, yet it may remain unrecognized and undertreated. For vulnerable populations experiencing a disproportionate burden of diabetes and barriers to equitable healthcare, inconsistent screening and treatment can contribute to preventable disparities.

The greatest potential for improving health equity lies in combining standardization with individualization. Every patient should receive a reliable standard of assessment, but communication, education, treatment, and follow-up must be responsive to the patient's language, culture, resources, preferences, and circumstances. When healthcare systems screen consistently, treat systematically, communicate responsively, and measure outcomes equitably, they can move beyond identifying disparities toward actively reducing them.

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