

Review

*Corresponding author

Badriya Al-Lenjawi, PhD

Senior Assistant

Executive Director of Nursing

Hamad Medical Corporation

P.O.Box. 3050

20 Sahar Bin Ayash Street

Old Airport Area, Doha, Qatar

Tel. 00974-55559584

E-mail: blenjawi@hamad.qa

Volume 2 : Issue 1

Article Ref. #: 1000DRMTOJ2121

Article History

Received: January 25th, 2017

Accepted: March 30th, 2017

Published: March 30th, 2017

Citation

Al-Lenjawi B, Mohamed H, Azmy A. Is it time to reconsider the 60 seconds-diabetic foot screen reorganizing the 60 second foot exam for people with diabetes? *Dermatol Open J.* 2017; 2(1): 10-15. doi: [10.17140/DRMTOJ-2-121](https://doi.org/10.17140/DRMTOJ-2-121)

Copyright

©2017 Al-Lenjawi B. This is an open access article distributed under the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Is It Time to Reconsider the 60 Seconds-Diabetic Foot Screen Reorganizing the 60 Second Foot Exam for People with Diabetes?

Badriya Al-Lenjawi, PhD^{1*}; Hashim Mohamed, MD²; Azzam Azmy, MD³

¹Senior Assistant Director of Nursing, Hamad Medical Corporation, Doha, Qatar

²Associate Professor, Weill Cornell Medical College, Doha, Qatar; Senior Consultant Family Medicine, Doha, Qatar

³General Practitioner, Doha, Qatar

ABSTRACT

Diabetic patients have 25% lifetime risk of developing foot ulceration. More than half of these ulcers may eventually become infected, which greatly increases the likelihood of subsequent amputations. Although a multidisciplinary approach is the standard management for treating diabetic foot ulcers (DFUs), screening of diabetic foot ulcers is an integral part of that process. This review highlights the importance of the Inow's 60 seconds screening tool but at the same time highlights serious gaps in the screening tool which is supposed to be a comprehensive screening tool for use in diabetic patients. The authors have addressed these gaps in a constructive and scientific way thereby solidifying the screening tool further in order to capture all the features and complications of the diabetic foot.

KEY WORDS: Diabetic foot; Screening tool; Diabetes.

ABBREVIATIONS: DFUs: Diabetic Foot Ulcers; IWGDF: International Working Group on Diabetic Foot; ABI: Ankle-Brachial Index.

INTRODUCTION

We read with interest the Inlow's 60 second foot exam for people with diabetes.¹ Comprehensive and easy to apply wound screening tools are a vital pre-requisite in formulating a management plan to achieve optimal wound healing and patient well-being. The authors of the 60 second foot exam for people with diabetes made a considerable effort in devising a simple and practical screening tool for health care professionals worldwide. Since 2004, the 60 seconds-diabetic foot screen remained unscrutinized and therefore remained unchanged. Although comprehensive history is a vital element of risk assessment, clinicians cannot fully assess patients with diabetes for risk factors for foot ulceration based on history alone; a comprehensive foot exam remains the essential element of this process. Essential elements of the history include previous foot ulceration and or amputation, Charcot foot, angioplasty, cigarette smoking (number of packets per year), electrical sensation, rest pain, claudication, history of microvascular and macrovascular complications neuropathic or peripheral vascular symptoms,^{2,3} retinopathy, or chronic renal impairment renal replacement therapy.

A comprehensive examination of the feet and footwear in a well-lit clinic should routinely be done after the patient has taken off his shoes and socks. Although improper footwear is a common contributory element in the development of foot ulceration^{4,5} most health care professionals do not pay attention to them, the footwear must be examined at every visit and

also the patient usually comes to the clinic with a different footwear to the one(s) he or she is used to. So the health care professional must ask about home worn foot wear as well as outdoor foot wear. Both the health care professional and the patient must ask the question “*Are these footwear adequate for these feet?*”, since improper footwear will result in friction, erythematic, blister, corn and callus formation and ultimately ulceration. The discipline of wound care and wound assessment are continuously evolving. However, few attempts have been carried out to revalidate screening tools⁶⁻⁹ and advanced wound products wound products.^{10,11}

Dermatological Problems in People with Diabetes

Skin disorders occur in 79.2% of people with diabetes.¹² A recent study of 750 patients with diabetes showed that the most prevalent skin conditions were coetaneous infections (47.5%), xerosis (26.4%), and inflammatory skin diseases (20.7%).¹² The majority of patients will eventually develop skin complications due to the long-term consequences of diabetes on the microcirculation and on skin collagen. Autoimmune-related cutaneous lesions are more prevalent in patients with type 1 diabetes whereas cutaneous infections are more common in type 2 diabetes.¹³

Skin manifestations of diabetes can be divided into those related to insulin resistance, type 1 diabetes and type 2 diabetes.

Skin conditions related to insulin resistance include, acanthosis nigricans, acrochordrons, diabetic dermopathy, eruptive xanthoma, rubeosis faciei and epidermal necrolysis/Stevens-Johnson syndrome. Some of the most common cutaneous manifestations in patients with type 1 DM include, periungual telangiectasia, necrobiosis lipoidica, bullosis diabeticorum, vitiligo and lichen ruberplanus.

On the other hand patients with type 2 diabetes mellitus (T2DM) complain of the following problems yellow nails or onychomycosis, diabetic thick skin presenting as asymptomatic thick skin involving the fingers and hands ranging from pebbling over the knuckles to diabetic hand syndrome. The skin of the neck and back may also be involved leading to diabetic scleredema, with “peaud’orange” appearance and reduced sensitivity to touch and pain in the affected areas.¹³ Other skin conditions linked to T2DM include diabetic dermopathy, acquired perforating dermatosis. Cutaneous infections associated with diabetes include, candidiasis, dermatophytosis, and bacterial infections.

Diabetic Foot (Epidemiology and Etiopathogenesis)

It is well established that a number of contributory elements working in a synergistic fashion eventually result in the final pathway to foot ulceration among patients with diabetes. The commonest element is peripheral neuropathy, external trauma, foot deformity, peripheral vascular disease, peripheral oedema¹⁴ and improper foot care practices. This makes it vital to have a comprehensive annual screening of patients with diabetes espe-

cially the foot and to screen them more often if they have high risk for foot ulcerations. Patients at high risk of foot complications including those peripheral neuropathy, long standing diabetes, smokers, improper foot wear, previous history of ulceration and amputations.

Screening Tools for Diabetic Foot

High-risk foot identification is a vital component of comprehensive diabetes care. Furthermore, risk classification allows timely and precise follow-up for different levels of risk.¹⁵ According to the International Working Group on Diabetic Foot (IWGDF) patients with a low risk should be screened in a year or sooner if a foot problem arises whereas patients who have loss of protective sensation can be seen more frequently i.e. every three to six months.⁴ Those who have previous ulceration, and or amputation and or evidence of peripheral vascular disease must be seen every month. Many practical tools to screen for diabetic foot problems exist including those for peripheral neuropathy such as the 10 gram monofilament, neurothesiometer, the 128 KHZ tuning fork, etc. Peripheral vascular disease can be assessed by palpation of the dorsalis pedis pulse and tibialis posterior and the use of hand held doppler and measuring the ankle-brachial index (ABI).

Several elements are essential to ensure a valid and optimal screening test including simplicity, quick to conduct, have high inter and intra-observer reliability, validity, and generalizability. In their assessment of the 60 seconds Inlow’s diabetic foot screen Murphy et al¹⁶ concluded that the tool demonstrates excellent interrater and intrarater reliability. However, these results have to be considered with caution since the numbers which were tested were only 69 and the sample was a convenient sample, therefore bias cannot be ruled out.

However, there are few shortcomings that need to be examined when utilizing the Inlow’s screening tool in daily practice and these include: under the skin section the authors included only.

Skin
0=intact and healthy
1=dry with fungus or light callus
2=heavy callus build up
3=open ulceration or history of previous ulcer

Firstly, the combination of (dry, fungus and light callus) cannot be justified (placed together) since they are three separate conditions with different etiologies which can co-exist together or be on their own, so the numbering has to be modified. Additionally, patient with long standing diabetes may suffer from autonomic neuropathy leading to dysfunctional sweat glands thereby leading to cracked/fissured skin which is also had been omitted from the screening tool.

Secondly, there is no mention of the following condi-

Inlow's 60-second Diabetic Foot Screen³⁶			
Screening Tool		www.cawc.net	
Patient Name:		Clinician Signature:	
ID number:		Date:	
1. Skin 0=intact and healthy 1=dry with fungus or light callus 2=heavy callus build up 3=open ulceration or history of previous ulcer			
2. Nails 0=well-kept 1=unkempt and ragged 2=thick, damaged, or infected			
3. Deformity 0=no deformity 2=mild deformity 4=major deformity			
4. Footwear 0=appropriate 1=inappropriate 2=causing trauma			
5. Temperature – Cold 0=foot warm 1=foot is cold			
6. Temperature – Hot 0=foot is warm 1=foot is hot			
7. Range of Motion 0=full range to hallux 1=hallux limitus 2=hallux rigidus 3=hallux amputation			
Assess – 30 seconds	Left Foot	Right Foot	Care Recommendations
8. Sensation – Monofilament Testing 0=10 sites detected 2=7 to 9 sites detected 4=0 to 6 sites detected			
9. Sensation – Ask 4 Questions: i. Are your feet ever numb? ii. Do they ever tingle? iii. Do they ever burn? iv. Do they ever feel like insects are crawling on them? 0 = no to all questions 2=yes to any of the questions			
10. Pedal Pulses 0=present 1=absent			
11. Dependent Rubor 0=no 1=yes			
12. Erythema 0=no 1=yes			
Score Totals=			
Screening for foot ulcers and/or limb-threatening complications. Use the highest score from left or right foot. Score=0 to 6 → recommend screening yearly Score = 7 to 12 → recommend screening every 6 months Score=13 to 19 → recommend screening every 3 months Score = 20 to 25 → recommend screening every 1 to 3 months			
Comments:			

tions which may accompany diabetic foot common conditions:

Maceration

Around 55% of wounds under investigation are reported to have macerations according to one clinical study¹⁸ and in diabetic ulcers maceration represents a challenge for the treating health care provider.¹⁹ Maceration is a frequent phenomenon in heavily exuding ulcers of all types, and in order to avoid damage to the periwound area frequent dressing is required.^{20,21}

Corns

Many patient with diabetes have improper footwear and according to a study done by Gayle et al,²² 39% of patients with diabetes who were attending a specialist diabetic clinic were reported wearing pointed toe shoes. Regular debridement in patients with diabetes, may reduce the incidence of subcutaneous bleeding, subsequent ulceration thereby avoiding the need for surgery.²³ Therefore, the inclusion of corns is needed in the screening tool.

Dermatitis

Topical treatments and other sensitizers are a common cause of allergic dermatitis among patients with type II diabetes. A retrospective study conducted in Jordan in 2002 by Najdawi and Fa'ouri.²⁴ Of 232 elderly patients with diabetes reported eczema/dermatitis as the commonest skin disorder seen (25.9% of cases). Another study in Turkey showed the prevalence of dermatitis to be 15.2%.²⁵

Fragility of the Skin

This is a common finding among elderly patients and worsened by autonomic neuropathy thereby making the patient susceptible to skin integrity breakdown and subsequent microbial invasion.

Shiny Skin and Loosing Hair

The risk of peripheral artery disease (PAD) is markedly increased among individuals with diabetes²⁶ and accurate estimation of the prevalence of PAD in patients with diabetes is difficult as the condition may be often asymptomatic, pain perception may be altered by co existing peripheral neuropathy and worst still, the presence of intermittent claudicating and absence of peripheral pulses, are non-sensitive diagnostic indicators.²⁷ However studies utilizing the ankle-brachial index (ABI) showed the prevalence of PAD in patients with diabetes to be between 20% to 30%.²⁸⁻³⁰ In patients with peripheral arterial disease the skin may be smooth, cool and shiny with hair loss, and nails tend to be dystrophic or thickened.³¹

Uncommon Conditions

Although some of the following conditions are rare, they may co-exist in patients with diabetes. These include but not limited to; verruca plantaris, psoriasis, hemosiderin deposition, naevi,

moles, malignant melanoma, greenish discoloration due to pseudomonas infection on top of tinea pedis.

Diabetes Specific Conditions

Healthcare practitioners must also be aware of other diabetes mellitus-specific conditions, including, granuloma annulare, necrobiosis lipoidica diabetorum which occurs in 0.3-1.6% of patients with diabetes,³² granuloma annulare, diabetic dermopathy affecting 7% to 70% of diabetics,³³ waxy skin syndrome, and bullosis diabetorum affecting 0.5% of those aged between 40-77 years old suffering from long standing diabetes and neuropathy.³⁴

Sensation

Sensation – Ask 4 Questions:

- i. Are your feet ever numb?
- ii. Do they ever tingle?
- iii. Do they ever burn?
- iv. Do they ever feel like insects are crawling on them? 0=no to all questions
2=yes to any of the questions

The sensation items have omitted very essential elements including unsteadiness while walking and aching pain or tenderness in legs. These are essential components of the neuropathy disability score (NDS). This is of great clinical significance since diabetic peripheral neuropathy (DPN) is one of the most common microvascular complications in patients with diabetes.³⁵ Furthermore, DPN is the most common element in the cascade to diabetic foot ulceration. The maximum score of DNS is four points, one point or more indicates neurological abnormalities and as such omitting two components will make the scoring system unreliable.

The screening tool has failed to include (presence/loss of hair) in their assessment since loss of hair on the toes represent a significant marker of reduced perfusion to the periphery along with dystrophic toenails, dry and fissured skin.

This review article may serve to encourage further scientific enquiry into wound assessment tools and more importantly advanced wound care products, where prescription and utilization has been largely influenced by drug companies for many decades with very few rigorous scientific data to support most of those products out there in the market.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

1. Sibbald RG, Ostrow B, Lowe J, et al. Screening for the high-risk diabetic foot: A 60-second tool. *Adv Skin Wound Care*. 2012; 5(2): 72-82. doi: [10.1097/01.ASW.0000421460.21773.7b](https://doi.org/10.1097/01.ASW.0000421460.21773.7b)
2. Sage RA, Webster JK, Fisher SG. Outpatient care and mor-

- bidity reduction in diabetic foot ulcers associated with chronic pressure callus. *J Am Podiatr Med Assoc.* 2001; 91(6): 275-279. doi: [10.7547/87507315-91-6-275](https://doi.org/10.7547/87507315-91-6-275)
3. Najdawi F, Fa'ouri M. Frequency and types of skin disorders and associated diabetes mellitus in elderly Jordanians. *East Mediterr Health J.* 2002; 8(4-5): 574-578. Web site. <http://apps.who.int/iris/handle/10665/119202>. Accessed January 24, 2017.
 4. Ewan A, Masson EA. Dermatological care of the diabetic foot. *Am J Clin Dermatol.* 2002; 3(7): 463-474. doi: [10.2165/00128071-200203070-00003](https://doi.org/10.2165/00128071-200203070-00003)
 5. European Wound Management Association (EWMA). *Position document. wound bed preparation in practice.* London: MEP Ltd; 2004.
 6. Woodbury MG, Sibbald RG, Ostrow B, Persaud R, Lowe JM. Tool for rapid & easy identification of high risk diabetic foot: Validation & clinical pilot of the simplified 60 second diabetic foot screening tool. *PLoS One.* 2015; 10(6): e0125578. doi: [10.1371/journal.pone.0125578](https://doi.org/10.1371/journal.pone.0125578)
 7. Carreau L, Niezgodna H, LeBlond S, Trainor A, Orsted H, Woodbury MG. A prospective, descriptive study to assess the reliability and usability of a rapid foot screen for patients with diabetes mellitus in a complex continuing care setting. *Ostomy Wound Manage.* 2013; 59(1): 28-34. Web site. <http://www.o-wm.com/article/prospective-descriptive-study-assess-reliability-and-usability-rapid-foot-screen-patients-di>. Accessed January 24, 2017.
 8. Murphy CA, Laforet K, Da Rosa P, Tabamo F, Woodbury MG. Reliability and predictive validity of inlow's 60-second diabetic foot screen tool. *Adv Skin Wound Care.* 2012; 25(6): 261-266. doi: [10.1097/01.ASW.0000415343.45178.91](https://doi.org/10.1097/01.ASW.0000415343.45178.91)
 9. Murphy-Chutorian B, Han G, Cohen SR. Dermatologic manifestations of diabetes mellitus: A review. *Endocrinol Metab Clin North Am.* 2013; 42(4): 869-898. doi: [10.1016/j.ecl.2013.07.004](https://doi.org/10.1016/j.ecl.2013.07.004)
 10. Al-Lenjawi B, Mohamed H, Abu Salma M, Abo Gouda Z. Natural honey in the management of thermal burn of the foot in a type 2 diabetic patient: A case report. *Dermatol Open J.* 2016; 1(1): 14-18. doi: [10.17140/DRMTOJ-1-105.26](https://doi.org/10.17140/DRMTOJ-1-105.26)
 11. Al-Lenjawi B, Mohamed H, Al-Ali A, Kherallah B. Are all wound products created equally? The re-emergence of natural honey. *J Diabetic Foot Complications.* 2015; 7(2): 26-41. Web site. <http://jdfc.org/spotlight/are-all-wound-products-created-equally-the-re-emergence-of-natural-honey/>. Accessed January 24, 2017.
 12. Demirseren DD, Emre S, Akoglu G, et al. Relationship between skin diseases and extracutaneous complications of diabetes mellitus: Clinical analysis of 750 patients. *Am J Clin Dermatol.* 2014; 15(1): 65-70. doi: [10.1007/s40257-013-0048-2](https://doi.org/10.1007/s40257-013-0048-2)
 13. Van Hattem SI. "Skin manifestations of diabetes." *Cleve Clin J Med.* 2008; 75(11): 772-774.
 14. Boulton AJM. The diabetic foot: From art to science. *Diabetologia.* 2004; 47(8): 1343-1353. doi: [10.1007/s00125-004-1463-y](https://doi.org/10.1007/s00125-004-1463-y)
 15. Boulton AJ, Armstrong DG, Albert SF, et al. Comprehensive foot examination and risk assessment: A report of the task force of the foot care interest group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. *Diabetes Care.* 2008; 31(8): 1679-1685. doi: [10.2337/dc08-9021](https://doi.org/10.2337/dc08-9021)
 16. Murphy CA, Laforet K, Da Rosa P, Tabamo F, Woodbury MG. Reliability and predictive validity of Inlow's 60-Second diabetic foot screen tool. *Adv Skin Wound Care.* 2012; 25(6): 261-266. doi: [10.1097/01.ASW.0000415343.45178.91](https://doi.org/10.1097/01.ASW.0000415343.45178.91)
 17. Bower VM, Hobbs M. Validation of the basic foot screening checklist: A population screening tool for identifying foot ulcer risk in people with diabetes mellitus. *J Am Podiatr Med Assoc.* 2009; 99(4): 339-347. doi: [10.7547/0980339](https://doi.org/10.7547/0980339)
 18. Jergensen B, Price P, Andersen KE, et al. The silver-releasing foam dressing, Contreet Foam, promotes faster healing of critically colonised venous leg ulcers: A randomised, controlled trial. *Int Wound J.* 2005; 2(1): 64-73. doi: [10.1111/j.1742-4801.2005.00084.x](https://doi.org/10.1111/j.1742-4801.2005.00084.x)
 19. Rodgers A, Watret L. Maceration and its effect on periwound margins. *Diabetic Foot.* 2003; 6(3 Suppl): S2-S5.
 20. Hilton JR, Williams DT, Beuker B, Miller DR, Harding KG. Wound dressings in diabetic foot disease. *Clin Infect Dis.* 2004; 39(Suppl 2): S100-S103. doi: [10.1086/383270](https://doi.org/10.1086/383270)
 21. Gayle KAT, Tulloch Reid MK, Younger NO, et al. Foot care and footwear practices among patients attending a specialist diabetes clinic in Jamaica. *Clin Pract.* 2012; 2(4): e85. doi: [10.4081/cp.2012.e85](https://doi.org/10.4081/cp.2012.e85)
 22. Sasmaz S, Buyukbese M, Cetinkaya A, Celik M, Arican O. The prevalence of skin disorders in type-2 diabetic patients. *Internet J Dermatology.* 2004; 3(1): 1-4. Web site. <https://ispub.com/IJD/3/1/8588>. Accessed January 24, 2017.
 23. Marso SP, Hiatt WR. Peripheral arterial disease in patients with diabetes. *J Am Coll Cardiol.* 2006; 47(5): 921-929. doi: [10.1016/j.jacc.2005.09.065](https://doi.org/10.1016/j.jacc.2005.09.065)
 24. American Diabetes Association. Peripheral arterial disease in people with diabetes. *Diabetes Care.* 2003; 26(12): 3333-3341. doi: [10.2337/diacare.26.12.3333](https://doi.org/10.2337/diacare.26.12.3333)
 25. Elhadd TA, Robb R, Jung RT, Stonebridge PA, Belch JFF. Pilot study of prevalence of asymptomatic peripheral arterial

- occlusive disease in patients with diabetes attending a hospital clinic. *Practical Diabetes Int.* 1999; 16: 163-166. doi: [10.1002/pdi.1960160605](https://doi.org/10.1002/pdi.1960160605)
26. Hirsch AT, Criqui MH, Treat-Jacobson D, et al. Peripheral arterial disease detection, awareness, and treatment in primary care. *JAMA.* 2001; 286(11): 1317-1324. doi: [10.1001/jama.286.11.1317](https://doi.org/10.1001/jama.286.11.1317)
27. Beks PJ, Mackaay AJ, de Neeling JN, de Vries H, Bouter LM, Heine RJ. Peripheral arterial disease in relation to glycemic level in an elderly Caucasian population: The Hoorn study. *Diabetologia.* 1995; 38(1): 86-96. doi: [10.1007/BF02369357](https://doi.org/10.1007/BF02369357)
28. Gardner AW, Afaq A. Management of lower extremity peripheral arterial disease. *J Cardiopulm Rehabil Prev.* 2008; 28(6): 349-357. doi: [10.1097/HCR.0b013e31818c3b96](https://doi.org/10.1097/HCR.0b013e31818c3b96)
29. Paron NG, Lambert PW. Cutaneous manifestations of diabetes mellitus. *Prim Care.* 2000; 27: 371-383.
30. Sibbald RG, Landolt SJ, Toth D. Skin and diabetes. *Endocrinol Metab Clin North Am.* 1996; 25: 463-472.
31. Lipsky BA, Baker PD, Ahroni JH. Diabetic bullae: 12 cases of a purportedly rare cutaneous disorder. *Int J Dermatol.* 2000; 39(3): 196-200. doi: [10.1046/j.1365-4362.2000.00947.x](https://doi.org/10.1046/j.1365-4362.2000.00947.x)
32. Soliman E, Gellido C. Diabetic Neuropathy. *Medicine.* 2002.
33. Reiber GE, Vileikyte L, Boyko EJ, et al. Causal pathways for incident lower-extremity ulcers in patients with diabetes from two settings. *Diabetes Care.* 1999; 22(1): 157-162. doi: [10.2337/diacare.22.1.157](https://doi.org/10.2337/diacare.22.1.157)
34. Meijer JW, van Sonderen E, Blaauwwekel EE, et al. Diabetic neuropathy examination: A hierarchical scoring system to diagnose distal polyneuropathy in diabetes. *Diabetes Care.* 2000; 23(6): 750-753. doi: [10.2337/diacare.23.6.750](https://doi.org/10.2337/diacare.23.6.750)
35. American Diabetes Association. Preventive foot care in people with diabetes (Position Statement). *Diabetes Care.* 2003; 26 (Suppl 1): S78-S79. Web site. <http://journals.sagepub.com/doi/abs/10.1177/107110070002100115?journalCode=faib>. Accessed January 24, 2017.
36. Inlow S. A 60 second foot exam for people with diabetes. *Wound Care Canada.* 2004 ;2(2): 10-11.