Curso “Paso a Paso”: Estratificación del riesgo

Dra. Cristina García Ulloa

Medicina Interna – Endocrinología – Obesidad

Responsable de atención médica

Centro de Atención Integral del Paciente con Diabetes

	Extensión	Infección	Localización	Fisiopatología de la infección	Osteomielitis	Neuropatía	Arteriopatía	Amputación previa	Multiplicidad	Pronóstico
Wagner	X									
Texas	X	X								
PEDIS/IDSA		X								
PUSH	X	X								X
SIDESTEP	X	X								
DUSS	X		X		X		X		X	X
Cierney-Mader					X					
Lipsky		X				X		X		X
North-West						X	X			X
Treece	X	X				X	X			
Waldvogel				X						

Clinical Care/Education/Nutrition
ORIGINAL ARTICLE

A New Wound-Based Severity Score for Diabetic Foot Ulcers

A prospective analysis of 1,000 patients

STEFAN BECKERT, MD
MARIA WITTE, MD
CORINNA WICKE, MD
ALFRED KÖNIGSRAINER, MD
STEPHAN COERPER, MD

RESEARCH DESIGN AND METHODS — Four clinically defined parameters, namely palpable pedal pulses, probing to bone, ulcer location, and presence of multiple ulcerations, were prospectively assessed in 1,000 consecutive patients. In the next step, a new diabetic ulcer severity score (DUSS) was created from these parameters. Palpable pedal pulses were categorized by the absence (scored as 1) or presence (scored as 0) of pedal pulses, while probing to bone was defined as yes (scored as 1) or no (scored as 0). The site of ulceration was defined as toe (scored as 0) or foot (scored as 1) ulcer. Patients with multiple ulcerations were graded as 1 compared with those with single ulcers (scored as 0). The DUSS was calculated by adding these separate gradings to a theoretical maximum of 4. Wounds were followed-up for 365 days or until healing or amputation if earlier. Probability of healing and risk of amputation were calculated by the Kaplan-Meier method.

Diabetes Care 29:988–992, 2006

Clinical Care/Education/Nutrition
ORIGINAL ARTICLE

A New Wound-Based Severity Score for Diabetic Foot Ulcers

A prospective analysis of 1,000 patients

	Profundidad	Llega a hueso	Enfermedad vascular periférica	Localización de úlcera	Múltiples úlceras
0	---	No	Presentes	Dedo	Única
1	Dermis	Si	Ausentes	Pie	Múltiples
2	Subcutáneo				
3	Fascia				
4	Músculo				
5	Hueso				

- Infección de tejidos blandos: Si hay secreción purulenta +2 signos (calor, eritema, linfangitis, linfadenopatía, edema o dolor)
- Máximo 4 puntos

Diabetes Care 29:988–992, 2006

Clinical Care/Education/Nutrition
ORIGINAL ARTICLE

A New Wound-Based Severity Score for Diabetic Foot Ulcers

A prospective analysis of 1,000 patients

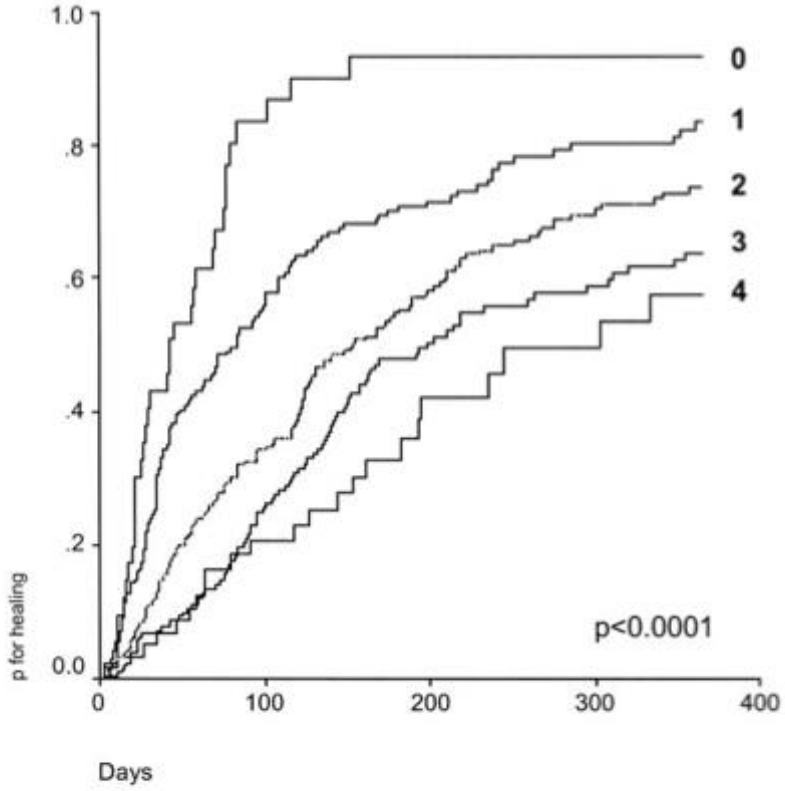


Figure 1—*Probability of healing according to the DUSS. Patients were divided into subgroups having the same DUSS (0–4). Data are given as probability of healing calculated by Kaplan-Meier analysis for a follow-up period of 365 days.*

Probabilidad de curación:
93% con score 0
57% con score 4

La probabilidad de curar disminuye
35% por cada punto del score

- Primer score de severidad capaz de predecir resultados clínicos

- Utiliza factores de riesgo ya conocidos
- No consideraron
  - Tipo de diabetes
  - Duración de la diabetes
  - Otras comorbilidades

Diabetes Care 29:988–992, 2006

Developing and Validating a Risk Score for Lower-Extremity Amputation in Patients Hospitalized for a Diabetic Foot Infection

Benjamin A. Lipsky, MD[1]
John A. Weigelt, MD[2]
Xiaowu Sun, PhD[3]
Richard S. Johannes, MD, MS[3,4]
Karen G. Derby, BA[3]
Ying P. Tabak, PhD[3]

OBJECTIVE—Diabetic foot infection is the predominant predisposing factor to nontraumatic lower-extremity amputation (LEA), but few studies have investigated which specific risk factors are most associated with LEA. We sought to develop and validate a risk score to aid in the early identification of patients hospitalized for diabetic foot infection who are at highest risk of LEA.

RESEARCH DESIGN AND METHODS—Using a large, clinical research database (CareFusion), we identified patients hospitalized at 97 hospitals in the U.S. between 2003 and 2007 for culture-documented diabetic foot infection. Candidate risk factors for LEA included demographic data, clinical presentation, chronic diseases, and recent previous hospitalization. We fit a logistic regression model using 75% of the population and converted the model coefficients to a numeric risk score. We then validated the score using the remaining 25% of patients.

RESULTS—Among 3,018 eligible patients, 21.4% underwent an LEA. The risk factors most highly associated with LEA ($P < 0.0001$) were surgical site infection, vasculopathy, previous LEA, and a white blood cell count >11,000 per mm^3. The model showed good discrimination (c-statistic 0.76) and excellent calibration (Hosmer-Lemeshow, $P = 0.63$). The risk score stratified patients into five groups, demonstrating a graded relation to LEA risk ($P < 0.0001$). The LEA rates (derivation and validation cohorts) were 0% for patients with a score of 0 and ~50% for those with a score of ≥21.

CONCLUSIONS—Using a large, hospitalized population, we developed and validated a risk score that seems to accurately stratify the risk of LEA among patients hospitalized for a diabetic foot infection. This score may help to identify high-risk patients upon admission.

which patients hospitalized for a diabetic foot infection are at highest risk for this complication could help clinicians direct special prevention efforts to these individuals. This information also could help identify the baseline risk for LEA among patients admitted to a medical center, allowing fairer comparisons of amputation rates at different centers. Although the factors associated with diabetic people developing a foot ulcer are well defined (1), risk factors for amputation are less clear. Previous studies have identified independent risk factors that include (in approximate order of odds ratio) a history of a foot ulcer (6), limb ischemia, underlying bone involvement, the presence of gangrene (e.g., a higher Wagner grade), deep wounds, older age, elevated inflammatory markers (7), poor glycemic control (8), a specific ethnicity or geographical region (9,10), nephropathy (8), and retinopathy (6). To determine whether we could develop and validate a scoring system to predict the risk of LEA, we examined data from a large

Table 2—*Univariate analysis of risk factors associated with LEA in the derivation cohort*

Variable	Derivation cohort (% [*n* LEA/*n* evaluable]) (*n* = 2,230)	*P**
n cases	20.8 (463/2,230)	
Mortality (death during hospitalization)	33.3 (10/30)	0.1094
Age ≥50 years	23.1 (394/1,708)	<0.0001
Male sex	22.3 (303/1,359)	0.0282
Previous admission ≤30 days	24.8 (53/214)	0.1322
Transferred from an acute-care hospital	63.2 (12/19)	0.0001
Transferred from a skilled nursing facility	40.3 (29/72)	0.0002

*Fisher exact test.

Table 2—*Univariate analysis of risk factors associated with LEA in the derivation cohort*

Variable	Derivation cohort (% [*n* LEA/*n* evaluable]) (*n* = 2,230)	*P**
Comorbidities		
Congestive heart failure	24.3 (127/522)	0.0227
History of coronary disease	26.1 (139/532)	0.0006
Immunosuppressive medication	26.0 (19/73)	0.3032
Cancer	23.9 (11/46)	0.5829
Peripheral vascular disease	32.2 (260/807)	<0.0001
Chronic liver disease	25.8 (8/31)	0.5033
Chronic lung disease	24.1 (56/232)	0.1993
Previous stroke	23.9 (56/234)	0.2025
Chronic renal disease	28.8 (128/445)	<0.0001
History of amputation	31.3 (191/611)	<0.0001
Renal dialysis treatment	41.5 (22/53)	0.0005

*Fisher exact test.

Table 2—*Univariate analysis of risk factors associated with LEA in the derivation cohort*

Variable	Derivation cohort (% [*n* LEA/*n* evaluable]) (*n* = 2,230)	*P**
Type of skin and soft tissue infection		<0.0001
Cellulitis	16.9 (302/1,788)	
Infected ulcer	32.8 (118/360)	
Surgical site	52.4 (43/82)	
Acute clinical presentation		
Systolic blood pressure <100 mmHg	24.6 (72/293)	0.0892
Temperature <96°F or >100.5°F	27.0 (184/681)	<0.0001
Pulse <49 or >125 bpm	24.2 (31/128)	0.3138
Respiration <10 or >29 breaths per minute	25.6 (22/86)	0.2776
Altered mental status	23.7 (41/173)	0.3293

*Fisher exact test.

Table 2—*Univariate analysis of risk factors associated with LEA in the derivation cohort*

Variable	Derivation cohort (% [*n* LEA/*n* evaluable]) (*n* = 2,230)	*P**
Laboratory results		
Albumin <2.8 g/dL	36.7 (87/237)	<0.0001
Blood urea nitrogen >40 mg/dL	23.6 (94/399)	0.1341
Creatinine >3 mg/dL	35.8 (63/176)	<0.0001
Sodium >145 mEq/dL	25.0 (6/24)	0.6133
Total bilirubin >0.8 mg/dL	23.8 (49/206)	0.2791
pO_2 <55 or >140 or O_2 sat <90%	21.6 (8/37)	0.8398
Prothrombin time international normalized ratio >1.2 or prothrombin time >14 s	37.8 (79/209)	<0.0001
Bands on leukocyte differential >13%	26.3 (21/80)	0.2092
White blood cell count >11,000 per mm^3	30.3 (314/1,037)	<0.0001
Glucose on admission (mg/dL)		0.0603
≤70	12.0 (12/100)	
71–135	18.1 (60/331)	
136–240	22.0 (158/717)	
>240	21.5 (233/1,082)	

*Fisher exact test.

Resultados
Análisis univariado

- Factores asociados con amputación:
  - Ser hombre
  - Mayor edad
  - Transferencia de otro hospital
  - Amputación previa
  - Enfermedad coronaria, renal, vascular periférica
  - Albúmina baja
  - Leucocitosis
  - Tiempos de coagulación
  - Creatinina elevada
  - Hiper/hipotermia
  - Presencia de úlcera
  - Infección del sitio quirúrgico

Resultados

Limitaciones:

- Este estudio no valoró HbA1c
- Retrospectivo
- No incluyeron razones individuales para amputación (urgente, electiva)
- No incluyeron información de revascularización
- Sólo se incluyeron pacientes con cultivos

PEDIS-IDSA

Clinical description of infection (IDSA)	Infection severity (IDSA)	IWGDF grade (PEDIS)
No systemic or local symptoms or signs of infection	Uninfected	1
Infection: • At least 2 of the following items are present: - Local swelling or induration - Erythema >0.5 cm around the ulcer - Local tenderness or pain - Local warmth - Purulent discharge • Exclude other causes of an inflammatory response of the skin (e.g., trauma, gout, acute Charcot, fracture, thrombosis, venous stasis)	Infected	
Local infection involving the skin or subcutaneous tissue only (without involving of deeper tissues) and: • No systemic signs or symptoms of infection • Erythema <2 cm* around the wound	Mild	2
Infection involving structures deeper than skin and subcutaneous tissue (e.g., bone, joint, tendon) or erythema extending >2 cm* around the wound, but without systemic signs or symptoms of infection	Moderate	3
Any foot infection with the following signs of a systemic inflammatory response syndrome, as manifested by ≥2 of the following: • Temperature >38 or <36 °C • Heart rate >90 beats/min • Respiratory rate >20 breaths/min or $PaCO_2$ < 32 mmHg • White blood cell count <12,000 or <4000 cells/μL or ≥10% immature forms	Severe	4

IDSA Infectious Diseases Society of America, *PEDIS* perfusion, extent/size, depth/tissue loss, infection, sensation, *IWGDF* International Working Group on the Diabetic Foot, *$PaCO_2$* partial pressure of arterial carbon dioxide

Curr Diab Rep (2017)

DM
DOI: 10.1111/j.1464-5491.2004.01275.x

S(AD) SAD

Validation of a system of foot ulcer classification in diabetes mellitus

K. A. Treece, R. M. Macfarlane, N. Pound, F. L. Game and W. J. Jeffcoate

S A D

Size

Sepsis

Area

Arteriopathy

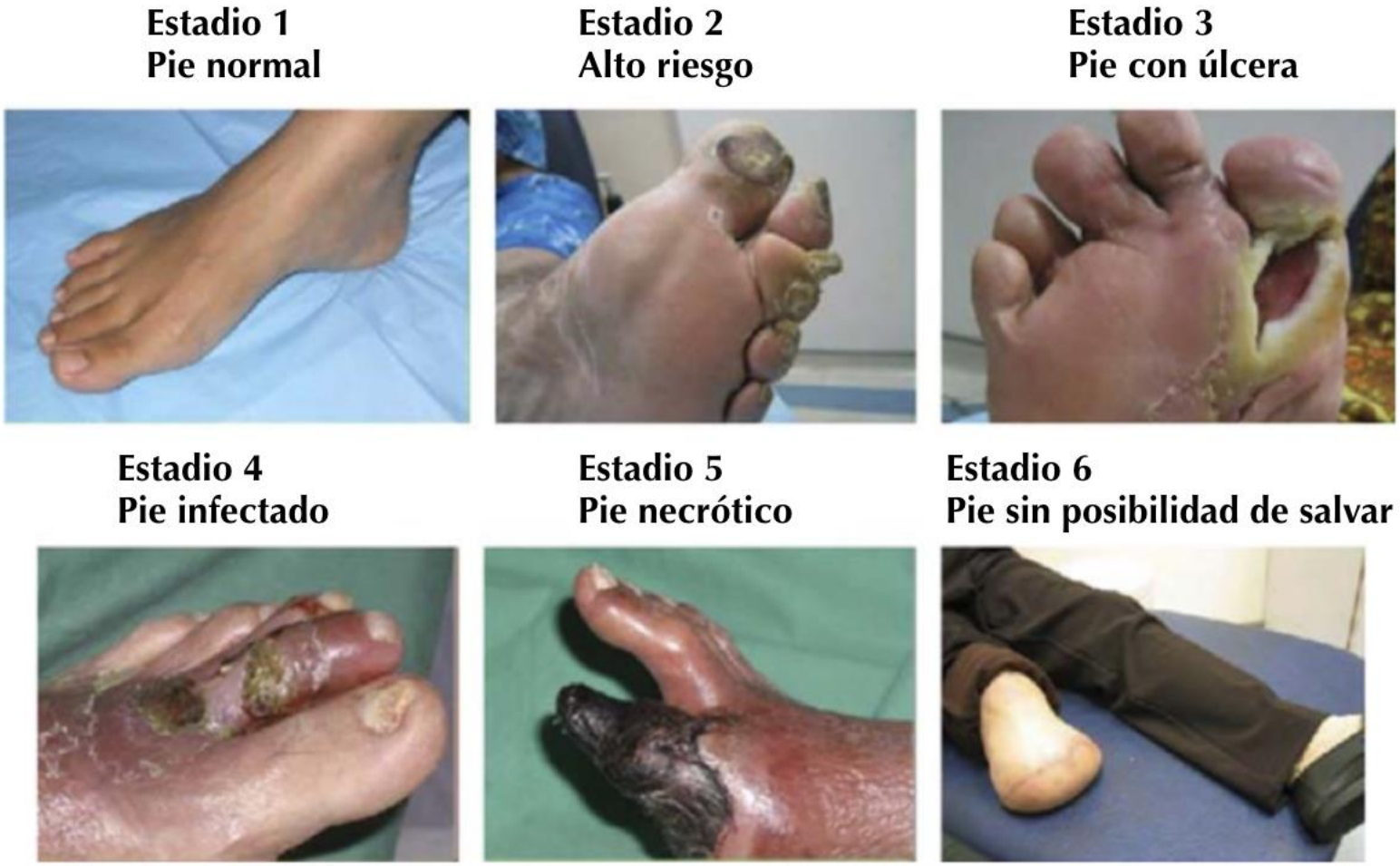
Depth

Denervation

Table 1 The S(AD) SAD classification

	Size				
Grade	Area	Depth	Sepsis	Arteriopathy	Denervation
0	Skin intact	Skin intact	None	Pedal pulses present	Pin pricks intact
1	< 1 cm^2	Superficial (skin and subcutaneous tissue)	Surface	Pedal pulses reduced or one missing	Pin pricks reduced
2	1–3 cm^2	Tendon, periosteum, joint capsule	Cellulitis	Absence of both pedal pulses	Pin pricks absent
3	> 3 cm^2	Bone or joint space	Osteomyelitis	Gangrene	Charcot

Factores predictivos para la respuesta al tratamiento



Ann Plast Surg. 2018 May 30. PMID: 29851722

Factores predictivos para la respuesta al tratamiento

- Angioplastía
  - Mayor enfermedad arterial periférica
- Desbridación previa
  - Recurrencia de lesión
- Presencia de retinopatía y microalbuminuria

Tabla 3. Nueva propuesta de la Clasificación de King con subdivisión del estadio 3

Estadio	Condición clínica
Estadio 1	Pie normal
Estadio 2	Pie de alto riego
Estadio 3	Úlcera
3a	Sin angioplastía o retinopatía
3b	Con angioplastía o retinopatía
3c	Con angioplastía y retinopatía
Estudio 4	Infectado
Estadio 5	Necrótico
Estadio 6	Sin posibilidad de salvar

Ann Plast Surg. 2018 May 30. PMID: 29851722

Factores asociados a curación o amputación

Table 6. Logistic regression for risk factors and outcome of healing

Risk factor	Sig	Exp (B)	95% CI for Exp (B)	
			Lower	Upper
Infection	0.03	0.2	0.3	0.8
NSTI	0.51	0.7	0.3	1.8
Exposed bone	0.60	0.8	0.3	2.0
Ischaemia	0.01	0.3	0.1	0.7

NSTI–necrotising soft tissue infection: CI–confidence interval

Table 7. Logistic regression for risk factors and need for major amputation

Risk factor	Sig	Exp (B)	95% CI for Exp (B)	
			Lower	Upper
Infection	0.06	8.0	0.9	69.3
NSTI	0.80	1.1	0.4	2.9
Exposed bone	0.14	2.0	0.8	5.0
Ischaemia	0.00	5.1	1.9	13.5

NSTI–necrotising soft tissue infection: CI–confidence interval

- Factores de riesgo para no curación o amputación mayor: infección ($p=0.01$), isquemia ($p=0.01$), enfermedad arterial periférica ($p<0.01$) y tabaquismo ($p=0.01$).

JOURNAL OF WOUND CARE VOL 26, NO 5, MAY 2017

International Working Group of Diabetic Foot

Clase	Características	% de riesgo de ulcera
0	No neuropatía sensitiva No enfermedad arterial periférica No historia de complicaciones	2
1	Neuropatía sensitiva No enfermedad arterial periférica No historia de complicaciones Deformidad	4.5
2	Neuropatía sensitiva y deformidad del pie o limitación movilidad articular. Sin historia de complicaciones	3
	Enfermedad arterial periférica Sin historia de complicaciones	13.8
3	Historia de úlcera	31.7

www.iwgdf.org/files/2015/website_infection.pdf

Conclusión

- Más que cualquier escala, la clínica y el juicio médico no fallan

Table 2. **Estratificación del riesgo para la valoración del riesgo de desarrollar problemas de pie diabético o futuras amputaciones**

Bajo riesgo	Riesgo moderado	Alto riesgo
Sin factores de riesgo	Deformidad o	Úlcera previa o
Presencia de callos	Neuropatía o	Amputación previa o
	Isquemia no crítica	En terapia renal de reemplazo o
		Neuropatía e isquemia no crítica o
		Neuropatía con callos y/o deformidad o
		Isquemia no crítica con callos y/o deformidad

Adapted from the National Institute of Clinical Excellence.[12]

J R Soc Med. 2017 Mar;110(3):104-109.

Conclusión

IWGDF e IDSA propusieron un sistema de clasificación aplicable para estimar la infección y guiar el tratamiento

Ambas incluyen definiciones claras y pocas categorías, facilitando su aplicación

La **enfermedad vascular periférica e infección** son los principales factores asociados en todos los estudios

La clasificación de la **IDSA** ha sido validada para **predecir respuesta en infecciones**

IWGDF estima un **pronóstico de amputación**