




FACULTY OF MEDICINE AND HEALTH SCIENCES
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 SKIN INTEGRITY RESEARCH GROUP (SKINT)

NORTON OR BRADEN FOR PRESSURE ULCER RISK ASSESSMENT: A REFLECTION

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RISK ASSESSMENT



Why?

- To identify individuals at risk of developing a pressure ulcer
- To identify those individuals who are at risk (sensitive), as well as those not at risk (specific) - and do this consistently (reliability)



How?

- Numeric scales are recommended in international pressure ulcer prevention guidelines (e.g. Braden, Waterlow, Norton)
- Clinical judgment based on knowledge of risk factors
- Head to toe skin inspection

Problems?


- More than 40 risk assessment scales available but still there is ongoing debate about their usefulness
- Clinical judgment: validity and reliability issues
- Skin inspection: low reliability and damage at the cellular level is invisible to the naked eye

Moore ZE, Coeman S. Risk assessment tools for the prevention of pressure ulcers. Cochrane Database Syst Rev. 2014 Feb 5;(2):CD006471.

RISK ASSESSMENT SCALES



CAUSAL FACTORS + RISK FACTORS




PREVENTION

PRESSURE ULCER?

DeFloor T, Grysdanck MF. Validation of pressure ulcer risk assessment scales: a critique. J Adv Nurs. 2004 Dec;48(6):613-21.

RISK ASSESSMENT SCALES



Different from a diagnostic screening test

Not intended to identify the existence of a certain condition, but the risk that a certain condition may develop

Probability of a patient to develop a condition does not remain constant over time

Sensitivity and specificity will alter over time

Sensitivity/specificity to indicate validity?

Only appropriate if the condition does not change over time and is not affected by intermediate measures (such as prevention)

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Beekman D. et al. Een nationale richtlijn voor Decubituspreventie. Good Clinical Practice (GCP). Brussel: Federaal Kenniscentrum voor de Gezondheidszorg (KCE), 2012. KCE Reports 183A. D2012/10.273/95

RISK ASSESSMENT SCALES

BRADEN SCALE

Study	Time point	Incidence*	Cut-off score	Sensitivity*	Specificity*	
Barnes 1993	7 weeks	6.1	≤10	72.7	95.6	
			>10	28.9	47.2	
	Barnes 1994	48-72 hours*	NR	≤10	43.0	96.0
				>10	46.0	84.0
				≤17	61.0	78.0
				>17	79.0	68.0
				≤19	92.0	51.0
				>19	96.0	56.0
	4 weeks	27.6		≤14	21.4	92.9
				>14	32.1	94.8
Bergstrom 1987a (a)		6 weeks	7.1	≤17	57.1	85.1
				>17	78.6	74.3
				≤19	88.7	89.3
				>19	92.9	83.2

SENSITIVITY: THE PROPORTION OF ACTUAL POSITIVE CASES WHICH ARE CORRECTLY IDENTIFIED

SPECIFICITY: THE PROPORTION OF ACTUAL NEGATIVE CASES WHICH ARE CORRECTLY IDENTIFIED

SENSITIVITY AND SPECIFICITY ARE ASSOCIATED WITH TIME POINT OF OUTCOME ASSESSMENT AND CUT-OFF POINT

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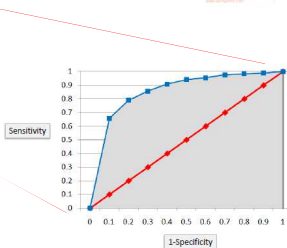
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95.0-100.0: very good discrimination; 85.0-95.0: good discrimination; 70.0-79.9: fair discrimination; 60.0-69.9: poor discrimination; 50.0-59.9: fair to poor discrimination

Beekman D. et al. Een nationale richtlijn voor Decubituspreventie. Good Clinical Practice (GCP). Brussel: Federaal Kenniscentrum voor de Gezondheidszorg (KCE), 2012. KCE Reports 183A. D2012/10.273/95

RISK ASSESSMENT SCALES



SKINT
SINCE 2012

Study	Risk bias	Inconsistency	Indirectness	Imprecision	Number of patients (range)	Number of events (range)	Median AUC (%) (range)	Acceptability of values*	Quality
All populations									
9 (Schoorhoven 2002; Pemmer 2002; Steengook 2004**; Susiadi 2006; Hatanaaka 2007; Chan 2009; Kim 2009; de Souza 2010**; Serpa 2011)	Very serious ¹	Serious ²	No serious indirectness	Serious ³	72-1229	8-170	74.0 (65.0 – 88.0)	Fair discrimination	SOOO VERY LOW
General population									
5 (Schoorhoven 2002; Pemmer 2002; Hatanaaka 2007; Chan 2009; de Souza 2010**)	Very serious ¹	Serious ²	No serious indirectness	Serious ³	149-1229	38-170	68.0 (55.0 – 81.0)	Poor discrimination	SOOO VERY LOW
Intensive care patients									
4 (Steengook 2004**, Susiadi 2006; Kim 2009; Serpa 2011)	Very serious ¹	No serious inconsistency	No serious indirectness	Serious ³	72-219	8-40	79.0 (71.0 – 88.0)	Fair discrimination	SOOO VERY LOW


* 90.0-100.0: very good discrimination; 80.0-89.0: good discrimination; 70.0-79.0: fair discrimination; 60.0-69.0: poor discrimination; 50.0-59.0: fail to discriminate
 ** Unclear if patients with a procedure later at start of the study were included
¹ All studies had high to very high risks of bias (see quality table)
² Wide variation in AUC across the studies
³ Low event rates (< 100), except for the study of Schoorhoven 2002 and Pemmer 2002

Beekman D, et al. Een nationale richtlijn voor Decubituspreventie. Good Clinical Practice (GCP). Brussel: Federaal Kenniscentrum voor de Gezondheidszorg (KCE), 2012. KCE Reports 193A. D/2012/10.273/95

BRADEN SCALE

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RISK ASSESSMENT SCALES



SKINT
SINCE 2012

Study	Risk bias	Inconsistency	Indirectness	Imprecision	Number of patients (range)	Number of events (range)	Median AUC (%) (range)	Acceptability of values*	Quality
General population									
2 (Schoorhoven 2002; Pemmer 2002)	Serious ¹	Serious ²	No serious indirectness	No serious imprecision	1190-1229	135-170	65.0 (56.0 – 74.0)	Poor discrimination	SOOO LOW


* 90.0-100.0: perfect discrimination; 80.0-89.0: good discrimination; 70.0-79.0: fair discrimination; 60.0-69.0: poor discrimination; 50.0-59.0: fail to discriminate
¹ Studies had high risks of bias (see quality table)

Beekman D, et al. Een nationale richtlijn voor Decubituspreventie. Good Clinical Practice (GCP). Brussel: Federaal Kenniscentrum voor de Gezondheidszorg (KCE), 2012. KCE Reports 193A. D/2012/10.273/95

NORTON SCALE

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RISK ASSESSMENT SCALES



SKINT
SINCE 2012

Study	Risk bias	Inconsistency	Indirectness	Imprecision	Number of patients (range)	Number of events (range)	Median AUC (%) (range)	Acceptability of values*	Quality
All populations									
4 (Schoorhoven 2002; Anthony 2003; Compton 2008; Serpa 2009)	Very serious ¹	Serious ²	No serious indirectness	Serious ³	98-45735	7-203	60.0 (54.0 – 90.0)	Poor discrimination	SOOO VERY LOW
General population									
3 (Schoorhoven 2002; Anthony 2003; Serpa 2009)	Very serious ¹	Serious ²	No serious indirectness	Serious ³	98-45735	7-203	61.0 (54.0 – 90.0)	Poor discrimination	SOOO VERY LOW
Intensive care patients									
1 (Compton 2008)	Very serious ¹	No serious inconsistency	No serious indirectness	No serious imprecision	698	121	59.0 (95% CI: 54.4-65.0)	Fail discrimination	SOOO LOW


* 90.0-100.0: perfect discrimination; 80.0-89.0: good discrimination; 70.0-79.0: fair discrimination; 60.0-69.0: poor discrimination; 50.0-59.0: fail to discriminate
¹ The studies had high to very high risks of bias (see quality table)
² Wide variation in AUC across the studies
³ Very low event rates (< 100) for the study of Serpa 2009. The other studies had an event rate > 100



Beekman D, et al. Een nationale richtlijn voor Decubituspreventie. Good Clinical Practice (GCP). Brussel: Federaal Kenniscentrum voor de Gezondheidszorg (KCE), 2012. KCE Reports 193A. D/2012/10.273/95

WATERLOW SCALE

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RISK ASSESSMENT SCALES









Is it feasible to design an RCT to study to effectiveness of pressure ulcer risk assessment scales?

- Cluster trial (unit level): Between **62.000 – 286.000 patients** (depending on intra-cluster correlation coefficient)
- Single patient randomisation: **> 20.000 patients** are needed (power 90%, two-sided significance level of 0.05)

Balzer K, Köpke S, Lüthmann D, Haastert B, Kottner J, Meyer G. Designing trials for pressure ulcer risk assessment research: methodological challenges. *Int J Nurs Stud*. 2013 Aug;50(8):1136-50.

CLINICAL JUDGMENT









Balzer et al. (2014)

- What patient characteristics guide nurses' clinical judgment on pressure ulcer risk?
- Mixed methods study
- Nurses' clinical judgment draws on well-known etiological factors, and tends to expand conditions covered by risk assessment scales
- Patients' care dependency and self-care abilities seem to be core concepts for nurses' risk assessment

Balzer K, Kremer L, Junghans A, Hallens RL, Dassen T, Kottner J. What patient characteristics guide nurses' clinical judgment on pressure ulcer risk? A mixed methods study. *Int J Nurs Stud*. 2014 May;51(5):703-16.

SCALES VS. CLINICAL JUDGMENT



Saleh et al. (2009)

- Does a risk assessment scale (Braden) reduce nosocomial pressure ulcers?
- Pretest- posttest comparison (n= 719)
- Clinical judgment may be as effective as employing a risk assessment scale to assess the risk of pressure ulcers

ULCER Trial (Webster et al. 2011)

- What is the effectiveness of two pressure-ulcer screening tools (Waterlow and Ramstadius scale) against clinical judgment in preventing pressure ulcers?
- Single blind randomized controlled trial (n= 1231)
- No evidence that two common pressure-ulcer risk-assessment tools are superior to clinical judgment to prevent pressure ulcer

HEAD TO TOE SKIN INSPECTION

HOW?

- Visual inspection
- Plastic disk or pressing with finger
- Signs of redness
- Include for localized heat
- Edema
- In duration (hardness), especially in individuals with darkly pigmented skin



BECKMAN D., SCHOONHOVEN L., European Pressure Ulcer Advisory Panel, PuClas3 in Learning Module, University Centre for Nursing & Midwifery and European Pressure Ulcer Advisory Panel, 2015


HEAD TO TOE SKIN INSPECTION

Skin inspection is an essential element in pressure ulcer risk assessment, but:

- **Complex skill for nurses: low inter- and intra-rater reliability**
- Damage at the cellular level is invisible to the naked eye

Beekman et al. 2008

- Sample: 1452 nurses from five European countries
- Respondents classified 20 validated photographs as normal skin, blanchable erythema, pressure ulcers, IAD or PU/IAD
- Pressure ulcers were often classified erroneously (kappa = 0.33) and only a minority of nurses reached a substantial level of agreement
- **Non-blanchable erythema was frequently assessed incorrectly as blanchable erythema**



Beekman D, Schoonhoven L, Fletcher J, Furtado K, Gunningberg L, Heyman H, Lindholm C, Pasuly L, Vesilo J, Deffoor T. EPUAP classification system for pressure ulcers: European reliability study. J Adv Nurs. 2007 Dec;60(6):682-91.


HEAD TO TOE SKIN INSPECTION

Skin inspection is an essential element in pressure ulcer risk assessment, but:

- Complex skill for nurses: low inter- and intrarater reliability
- **Damage at the cellular level is invisible to the naked eye**



Vanderwee et al. 2007

- Sample: 1617 patients in surgical, internal and geriatric units
- Randomly assigned to experimental group (n = 826) and control group (n=791)
 - Experiment: prevention started when non-blanchable erythema appeared
 - Control: prevention was started when Braden score <17 or when non-blanchable erythema appeared
- Both groups: identical prevention
- Results:
 - Experiment: 16% of patients received prevention, PU Cat: II-IV = **6.8%**
 - Control: 32% of patients received prevention, PU Cat: II-IV = **6.7%**




Vanderwee K, Grypdonck M, Deffoor T. Non-blanchable erythema as an indicator for the need for pressure ulcer prevention: a randomized-controlled trial. J Clin Nurs. 2007 Feb;16(2):245-55.

CONCLUSIONS



- There is a causal relationship between immobility/inactivity and PU development, **many other risk factors** differ between populations
- There is **no sound evidence base** that supports superior clinical effectiveness of one PU risk assessment scale over another
- Skin assessment is an essential element in PU risk assessment screening, but **damage at the cellular level** is invisible to the naked eye
- We urgently **need accurate tools to assess early tissue damage** to allow more timely and appropriately targeted interventions



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