

English version

DESIGN-R

scoring manual

Japanese Society of Pressure Ulcers

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What is DESIGN/DESIGN-R?

Development of DESIGN (2002) ¹⁾

- In 2002, the Scientific Education Committee of the Japanese Society of Pressure Ulcers (JSPU) developed DESIGN as a tool to score the severity of pressure ulcers and monitor their healing. This tool classifies an ulcer's severity based on the necessity of treatment or care.
- DESIGN is an acronym derived from the six components of the tool: depth, exudate, size, inflammation/infection, granulation tissue, and necrotic tissue. P is added to the acronym when a pocket (undermining) is present. Each item is scored in three to seven grades, and the total score is calculated; a higher score indicates greater severity.
- The committee used the consensus method (the nominal group technique) to develop the tool. The committee comprised a facilitator, one representative each from the departments of internal medicine, surgery, dermatology, and plastic surgery, and two wound ostomy and continence nurses.
- The reliability and validity of DESIGN have already been shown. DESIGN is a very useful tool for chronological monitoring of an individual pressure ulcer.

Revision to DESIGN-R (2008) ²⁾

- With DESIGN, it is difficult to compare the wound healing process between different pressure ulcers in different patients because of a lack of statistical weighting of the components. For example, an ulcer with good granulation tissue may have the same score as an ulcer with a small pocket. Therefore, revision of the tool was required to accurately distinguish healing rates.
- First, a large-scale retrospective case series study enrolling 2,598 patients was conducted, followed by a prospective case series study with 1,003 patients. For each study, a large number of participants were enrolled in both the healing and non-healing groups using the Cox hazard analysis.
- Based on this statistical analysis, we developed a new and validated tool, "DESIGN-R", for monitoring wound healing in pressure ulcers (App. 1). The "R" stands for "rating". Using DESIGN-R, we can compare pressure ulcers not only in the same patient, but also among different patients hospitalized in different wards and hospitals.
- In 2008, the DESIGN-R tool was published; it has since been widely used throughout Japan as a pressure ulcer assessment scale with acceptable predictive validity.
- Recently, this tool has been translated into other languages. ³⁾
- In 2012, the Ministry of Health, Labour and Welfare in Japan introduced DESIGN-R in the care planning sheet for reimbursement (App. 2).

When is DESIGN-R used?

Application:

- DESIGN-R is not used for pressure ulcers during the acute phase, because wound status is rapidly changing and wounds show many pathological manifestations during the acute phase. DESIGN-R is not suitable for monitoring such rapid change.
- At the chronic phase, DESIGN-R is evaluated once a week or at any time when wound status changes (e.g., because of debridement or surgery).

Objectives:

- DESIGN-R is used for two purposes: 1) to score the severity of pressure ulcers and 2) to monitor the healing process.

1) Evaluation of severity ²⁾

- The severity of each item is classified as “slight”, indicated by lower-case letters, or “serious”, indicated by upper-case letters. A wound’s status, therefore, can be quickly determined by this unique lettering system. For example, if the depth, size, and degree of necrosis are classified as serious and a pocket is present, the wound will be described as “D-eSigNP”.
- The guidelines from the Japanese Society of Pressure Ulcers recommend topical treatment and care based on the DESIGN-R severity classification (App. 3). ⁴⁾

2) Monitoring healing ^{5,6)}

- Six of the DESIGN components (depth was excluded) were weighted according to their relationship to the healing rate, and their scores can be summed to create a total DESIGN-R score, which ranges from 0 (healed) to 66 (greatest severity).
- The predictive validity of the DESIGN-R total score and of weekly changes in this score were verified (App. 4).

1) Depth: initial assessment

- Depth is measured at the deepest point of the wound bed. If depth cannot be determined, the score is “unstageable”.
- The depth score is determined based on the gap between the wound bed and the wound edge as well as the type of tissue at the wound bed.

*** IMPORTANT--THE DEPTH SCORE IS NOT INCLUDED IN THE TOTAL SCORE.**

d0
No particular skin lesion and no redness

d1
Persistent redness

d2
Lesion extends to dermis

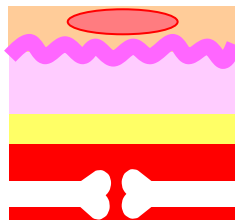
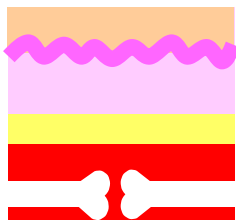


Intact skin

Erythema, but without skin breakdown

No gap between wound bed and edge

e.g.,



Epidermis
Dermis
Fat
Muscle
Bone

D3
Lesion extends into the subcutaneous tissue

D4
Lesion extends to the muscle, tendon, and bone

D5
Lesion extends into the articular or body cavity

DU
Impossible to measure depth

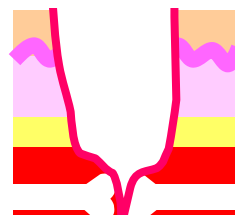
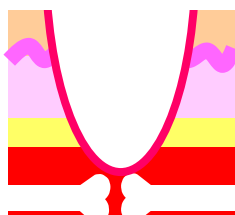


Necrotic tissue in fatty layer with gap between bed and edge

Necrotic tissue in muscle fascia

Exposed tendon with tunnel to ankle joint

Covered by necrotic tissue

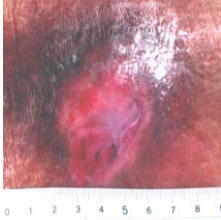


1) Depth: healing process

- When the wound improves and becomes shallow, the score is changed in correspondence with the depth.
- The healing process is determined by the degree of the gap between the wound bed and edge.



d0
No particular skin lesion and no redness



d2
Lesion extends to dermis



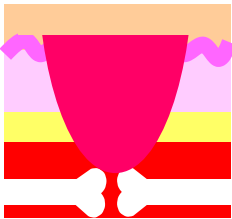
*** IMPORTANT—
d1 IS NOT INCLUDED DURING THE HEALING PROCESS.**

The gap between bed and edge mostly disappears. Epithelialization begins

e.g.,

Healing

Epidermis
Dermis
Fat
Muscle
Bone



Healing process



D3
Lesion extends into the subcutaneous tissue



Increased granulation tissue in wound bed, but the gap between bed and edge remains



D4
Lesion extends to the muscle, tendon, and bone



Necrotic tissue (white color) of tendon in wound bed



D5
Lesion extends into the articular or body cavity



DU
Impossible to measure depth



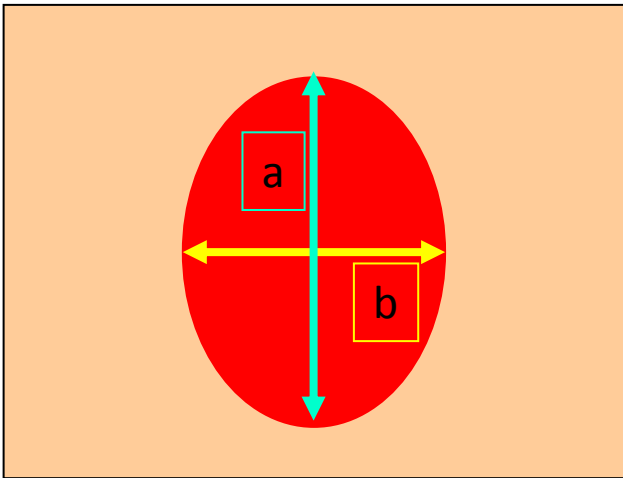
2) Exudate

- The exudate level is evaluated based on the amount absorbed by the dressings or gauze.
- If dressing changes are performed once a day, but exudate is excessively leaked, the score is assessed as E6 (twice a day).
- If dressing changes are performed twice a day, but there is only a little exudate, the score is assessed as e3 (once a day).

3) Size

- Size should be measured at the determined position (e.g., the right lateral position) every time.
- This score includes the visible surface of the wound and excludes the pocket.
- Size is calculated by multiplying the longest wound measurement (length) and the longest measurement perpendicular to this axis (width).

Measuring the area of skin injury
The longest measurement in wound
and the longest measurement
perpendicular to this axis.



$$a \times b$$



4) Inflammation/infection

- Inflammation represents the response of a tissue to the physical stimulation caused by necrotic tissue, visible as redness around the wound, swelling, heat, and pain.
- Infection is a symptom caused by bacteria invading the body and growing up. Infection is typically accompanied by pus, a foul smell, and fever. Do not use the results of bacterial tests to score.

i1 Signs of inflammation
(fever, redness, swelling and
pain around wound)



Redness and swelling are
observed around wound

I3 Clear signs of local infection
(inflammation, pus and foul smell)



Pus is discharged from
undermining

I9 Systemic impact,
such as fever



Osteomyelitis is suspected
with high fever up to 39°C

5) Granulation tissue

- Granulation tissue is classified as healthy or unhealthy.
- The score is then determined by the proportion of healthy granulation tissue.

g: Healthy granulation tissue



Bright red color and proper moist environment

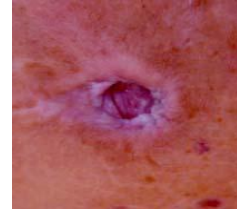
G: Unhealthy granulation tissue



Proper moist environment, but edematous tissue



Dark-red tissue



Whitish tissue

g0
Granulation cannot be assessed because the wound is healed or too shallow



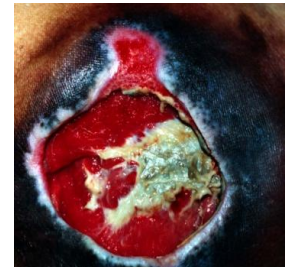
Damage to dermis

g1
Healthy granulation tissue occupies 90% or more



Healthy granulation tissue occupies 100% of wound surface

g3
Healthy granulation tissue occupies 50% or more, but less than 90%



Healthy granulation tissue occupies 70% of wound surface

G4
Healthy granulation tissue occupies 10% or more, but less than 50%



Healthy granulation tissue occupies 40% of wound surface

G5
Healthy granulation tissue occupies less than 10%



Granulation tissue is increasing beneath the necrotic tissue

G6
No healthy granulation tissue exists



Whitish tissue over whole surface

6) Necrotic tissue

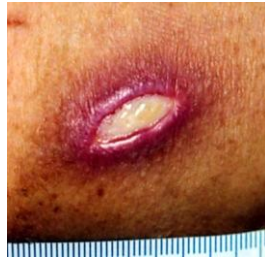
- Necrotic tissue is classified by the type, color and hardness.
- If necrotic tissue and non-necrotic tissue are mixed, the dominating tissue should be evaluated

N3

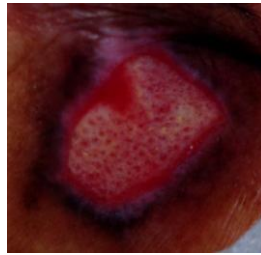
Soft necrotic tissue exists



Necrotic tissue covers entire wound surface, but can be pinched by tweezers



Fibril-like necrotic tissue



Necrotic tissue of dermis

N6

Hard and thick necrotic tissue is attached to the wound



Black and dried tissue



Softened and loose necrotic tissue

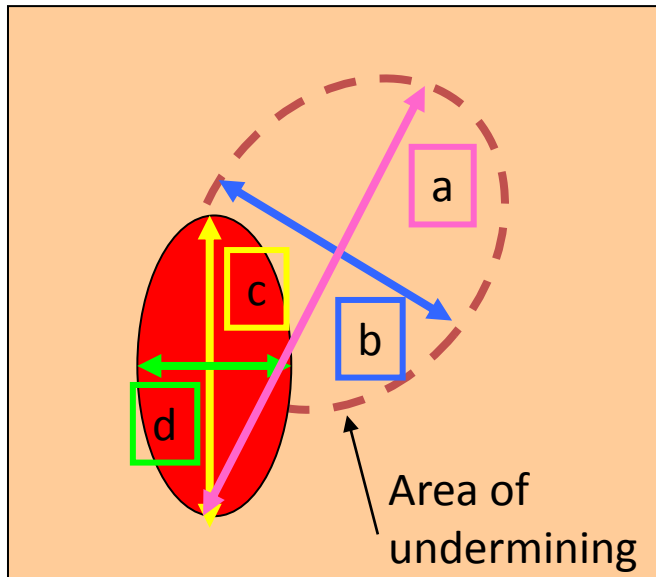


Auto-debrided necrotic tissue

7) Pocket (undermining)

- The score is determined by the measured pocket area (the longest length [cm] × width [cm]). Specifically, the pocket area is obtained by subtracting the ulcer area ($c \times d$) from the entire affected area (including the pocket) ($a \times b$).
- Pocket area should be measured in the determined position every time.
- The pocket area is checked using a soft tube (P-light), tweezers, or a swab.

The area obtained by subtracting the ulcer area ($c \times d$) from the entire affected area, including pocket ($a \times b$)



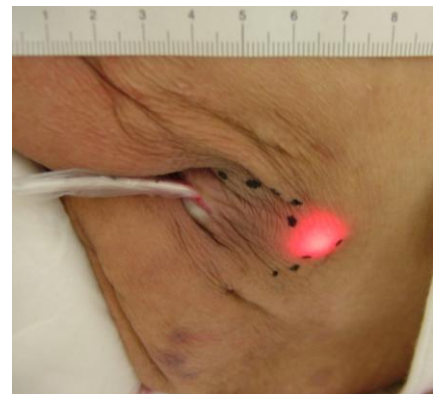
$$\text{Pocket area} = a \times b - c \times d$$

a: the longest length including undermining

b: the longest width including undermining, perpendicular to the length (a)

c: the longest length without undermining

d: the longest width without undermining, perpendicular to the length (c)



The pocket area is marked after wound cleansing. The P-light is a safe device to measure the pocket area by a soft tube with transmitting light. This device prevents further expansion of the pocket caused by the measurement.

Examples of DESIGN-R scoring

- The DESIGN-R score is expressed as D4 - E6 s12 I9 G5 N3 p0: 35.
- Add a hyphen between the depth score and the exudate score to distinguish the depth score from the other subscores used for the total score calculation.
- In accordance with the scoring table, the severity of each item is classified as “slight”, indicated by lower-case letters, or “serious”, indicated by upper-case letters.
- Six of the components (excluding depth) were weighted based on their relationship to the healing rate; these items are summed to create the total DESIGN-R score.



Sacrum ulcer

Depth : Extending to fascia **D**

Exudate : Dressing change twice a day **E**

Size : 72 **s**

Infection : Yes **I**

Granulation : Less than 50% **G**

Necrosis : Yes **N**

Pocket : No **p**

D-E s I G N

D4 - E6 s12 I9 G5 N3 p0 : 35



Sacrum ulcer

Depth : Lesion extends into the subcutaneous tissue **D**

Exudate : Dressing change once a day **e**

Size : 4-16 **s**

Infection : No **i**

Granulation : More than 50% **g**

Necrosis : No **n**

Pocket : Yes **P**

D-e s i g n P

D3 - e3 s6 i0 g1 n0 P24 : 34

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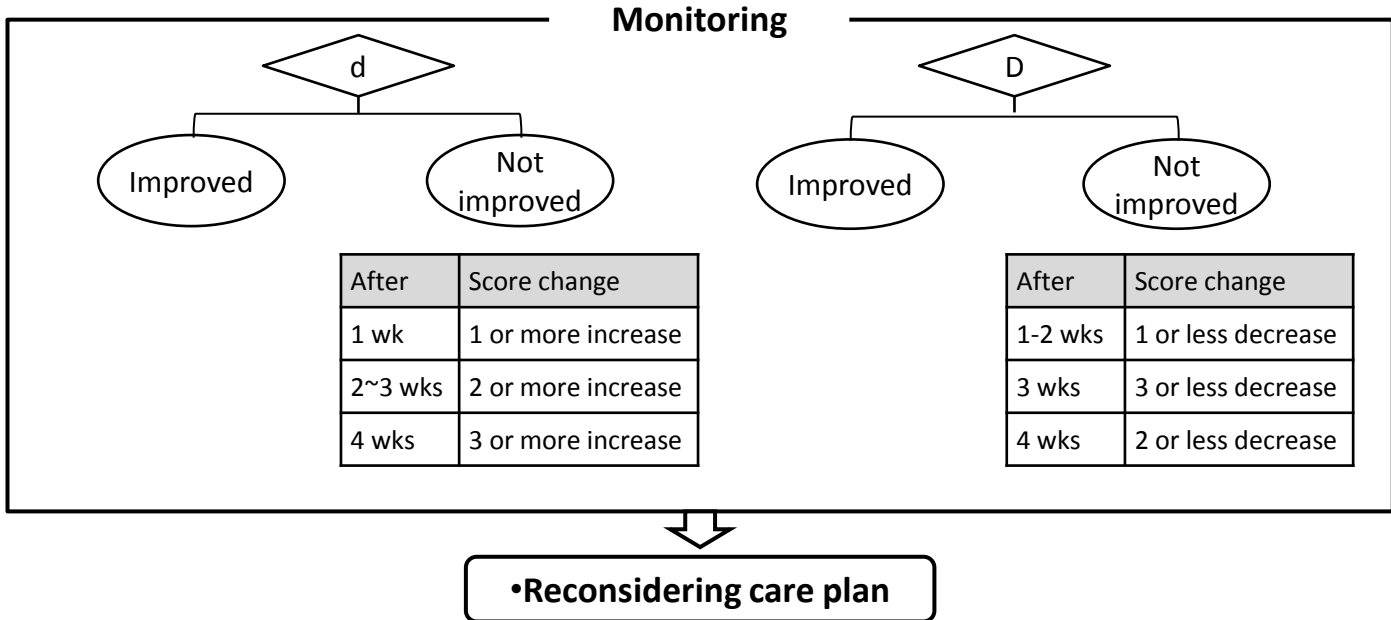
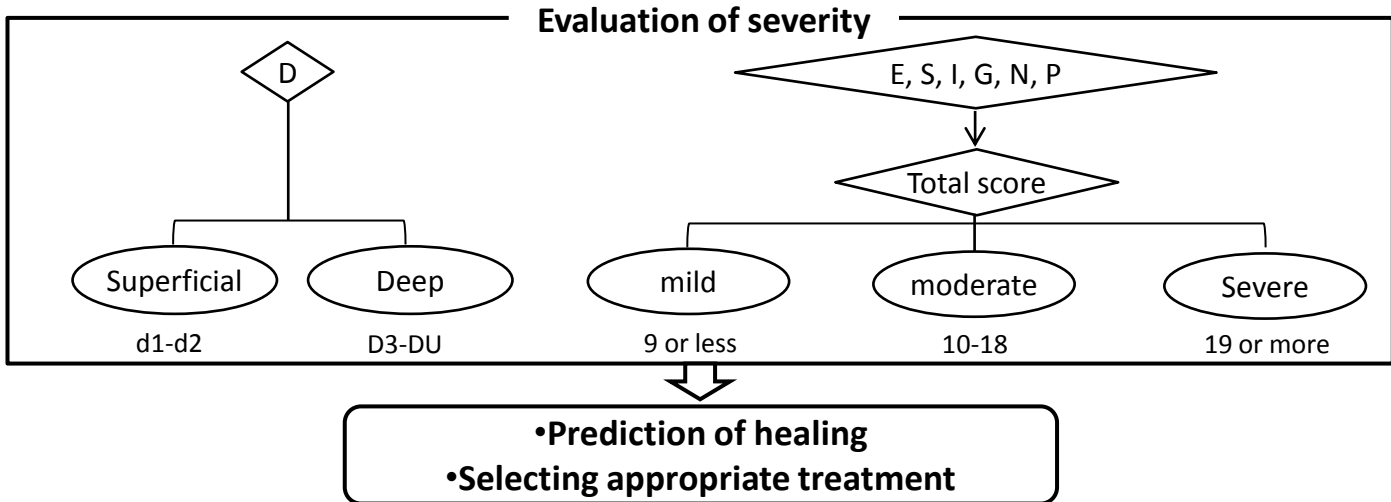
App. 1. DESIGN-R

Depth: this should be measured at the deepest point of the wound. If the wound becomes shallower, the decreased depth should be reflected in the assessment					
d	0	No particular skin lesion and no redness	D	3	Lesion extends into the subcutaneous tissue
	1	Persistent redness		4	Lesion extends to muscle, tendon and bone
	2	Lesion extends into dermis		5	Lesion extends into the articular or body cavity
			U	It is impossible to measure the depth	
Exudate: amount					
e	0	None	E	6	Heavy: requires dressing change more than twice a day
	1	Slight: does not require daily dressing change			
	3	Moderate: requires daily dressing change			
Size: the area of a skin injury (length × width).					
s	0	None	S	15	100cm ² or larger
	3	Smaller than 4cm ²			
	6	4cm ² or larger, but smaller than 16cm ²			
	8	16cm ² or larger, but smaller than 36cm ²			
	9	36cm ² or larger, but smaller than 64cm ²			
	12	64cm ² or larger, but smaller than 100cm ²			
Inflammation/Infection:					
i	0	None	I	3	Clear signs of local infection (eg, inflammation, pus and foul smell)
	1	Signs of inflammation (fever, redness, swelling, and pain around the wound)		9	Systemic impact, such as fever
Granulation tissue: percentage of healthy granulation					
g	0	Granulation cannot be assessed because the wound is healed or too shallow	G	4	Healthy granulation tissue occupies 10% or more, but less than 50%
	1	Healthy granulation tissue occupies 90% or more		5	Healthy granulation tissue occupies less than 10%
	3	Healthy granulation tissue occupies 50% or more, but less than 90%		6	No healthy granulation tissue exists
Necrotic tissue: when necrotic and non-necrotic tissues are mixed, the dominating condition should be used for assessment					
n	0	None	N	3	Soft necrotic tissue exists
				6	Hard and thick necrotic tissue is attached to the wound
Pocket: the area obtained by subtracting the ulcer from the entire affected area, including the pocket					
p	0	None	P	6	Smaller than 4cm ²
				9	4cm ² or larger, but smaller than 16cm ²
				12	16cm ² or larger, but smaller than 36cm ²
				24	36cm ² or larger

App. 3. Recommendation for topical treatments

	Necrotic tissue (N to n)	Inflammation /infection (I to i)	Exudate (E to e)	Granulation tissue (G to g)	Size (S to s)	Pocket (P to p)
Topical Agents		Cadexomer-iodine		Aluminium chlorohydroxy allantoinate		
		Silver sulfadiazine		Lysozyme hydrochloride		
		Dextranomer		Dextranomer	Zinc oxide	
					Trafermin	
				Tretinoin tocoferil	Isopropylazulene	Tretinoin tocoferil
		Bromelain	Iodine form gauze		Bucladesine sodium	
			Povidone-iodine		Alprostadiil alfadex	
			Povidone-iodine sugar			
Dressings		Silver+	Alginate		Silver+	
			Chitin membrane			
			(a little exudate)	Hydrocolloid		
	Hydrogel				Hydrogel	
		Silver+	Hydrofiber®		Silver+	Silver+
			Hydropolymer			
			Polyurethane foam/soft silicone			
Surgery	Surgical debridement				Reconstructive surgery	Surgical incision
Physio-Therapy				Negative pressure wound therapy		
					Near-infrared therapy	
		Hydrotherapy			Ultrasonic therapy	
		Pulsatile lavage with suction			Electromagnetic therapy	
Cleansing/ Disinfection		Antiseptics (clearly infected)	Skin emollients to the peripheral skin			
		Cleansing with a mildly acidic cleansing agent				Cleansing in pocket
		Sufficient quantities of isotonic saline or tap water				

App. 4. Predictive validity of DESIGN-R



Sanada H et al. Wound Repair Regen. 2011;19:559-67.

Iizaka S et al. Wound Repair Regen. 2012;20:473-81.