DESIGN-R scoring manual

Japanese Society of Pressure Ulcers

Department of Gerontological Nursing/
Wound Care Management,
Graduate School of Medicine,
The University of Tokyo
Contents

• Overviews
  – What is DESIGN/DESIGN-R? P3
  – When is DESIGN-R used? P4

• Instructions for each score P5
  – Depth
  – Exudate
  – Size
  – Inflammation/infection
  – Granulation tissue
  – Necrotic tissue
  – Pocket

• References P14

• Appendices P15

This document was translated into English by Prof. Hiromi Sanada and Dr. Shinji Iizaka (Dept. Gerontological Nursing/Wound Care Management, Division of Health Sciences and Nursing, Graduate School of Medicine, the University of Tokyo).

No part of this publication may be reproduced, photocopied, or republished in any form, in whole or in part, without permission of the Japanese Society of Pressure Ulcers.

Shunkosha Co., Ltd.
9th Floor, Shinjuku Lambdax Building, 2-4-12 Okubo Shinjuku-ku, Tokyo, 169-0072, Japan.
Fax +81-3-5291-2176, E-mail: jokusou@shunkosha.com
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).

³)
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.*
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.

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

i3  Clear signs of local infection (inflammation, pus and foul smell)

i9  Systemic impact, such as fever

Redness and swelling are observed around wound

Pus is discharged from undermining

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

---

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

**G0**
Damage to dermis

---

**g1**
Healthy granulation tissue occupies 90% or more

**G1**
Healthy granulation tissue occupies 100% of wound surface

---

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

**G3**
Healthy granulation tissue occupies 70% of wound surface

---

**g4**
Healthy granulation tissue occupies 10% or more, but less than 50%

**G4**
Healthy granulation tissue occupies 40% of wound surface

---

**g5**
Healthy granulation tissue occupies less than 10%

**G5**
Granulation tissue is increasing beneath the necrotic tissue

---

**g6**
No healthy granulation tissue exists

**G6**
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

N6
Hard and thick necrotic tissue is attached to the wound

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

Fibril-like necrotic tissue

Necrotic tissue of dermis

Softened and loose necrotic tissue

Auto-debrided necrotic tissue

Black and dried 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 × d) from the entire affected area (including the pocket) (a × 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 × d) from the entire affected area, including pocket (a × b)

Pocket area = a × b - c × 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

**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
References


### 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 |
| 2 | Lesion extends into dermis |

**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 \times width).

| s | 0 | None |
| 3 | Smaller than 4cm² |
| 6 | 4cm² or larger, but smaller than 16cm² |
| 8 | 16cm² or larger, but smaller than 36cm² |
| 9 | 36cm² or larger, but smaller than 64cm² |
| 12 | 64cm² or larger, but smaller than 100cm² |

**Inflammation/Infection:**

| i | 0 | None |
| 1 | Signs of inflammation (fever, redness, swelling, and pain around the wound) |
| 3 | Clear signs of local infection (e.g., inflammation, pus, and foul smell) |
| 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 |
| 1 | Healthy granulation tissue occupies 90% or more |
| 3 | Healthy granulation tissue occupies 50% or more, but less than 90% |
| 4 | Healthy granulation tissue occupies 10% or more, but less than 50% |
| 5 | Healthy granulation tissue occupies less than 10% |
| 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 |
| 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 |
| 6 | Smaller than 4cm² |
| 9 | 4cm² or larger, but smaller than 16cm² |
| 12 | 16cm² or larger, but smaller than 36cm² |
| 24 | 36cm² or larger |
### App. 2. Care plan sheet in Japan

**Name** (M / F)  
**Birthday** / / ( yrs old)  
**Wards**  
**Date of care planning** / /  
**Doctor’s name**  
**Nurse’s name**  

**Pressure ulcers**

1. Current: **NO / YES** (Sacrum, Ischial tuberosity, Coccyx, iliac bone, Greater trochanter, heel, others ( ))  
   (Date of development / / )

2. Past: **NO / YES** (Sacrum, Ischial tuberosity, Coccyx, iliac bone, Greater trochanter, heel, others ( ))

#### Risk assessment of PU

<table>
<thead>
<tr>
<th>Risk assessment of PU</th>
<th>Degree of Independence</th>
<th>Mobility</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J(1,2) A(1,2) B(1,2) C(1,2)</td>
<td>(Position change by oneself on the bed) P(possible) I(Impossible)</td>
<td>Establish and practice care plan if patients fulfil one or more</td>
</tr>
<tr>
<td></td>
<td>(Maintenance of posture or pressure relief in the chair) P(possible) I(Impossible)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Morbid Bony Prominence</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint contracture</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Moisture</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Edema (except for local area)</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### PU status (DESIGN-R)

<table>
<thead>
<tr>
<th>PU status (DESIGN-R)</th>
<th>Depth</th>
<th>Exudate</th>
<th>Size</th>
<th>Inflammation/Infection</th>
<th>Granulation tissue</th>
<th>Necrotic tissue</th>
<th>Pocket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(1)</td>
<td>(3)</td>
<td>(1)</td>
<td>(1)</td>
<td>(3)</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>(3)</td>
<td>(6)</td>
<td>(3)</td>
<td>(3)</td>
<td>(6)</td>
<td>(9)</td>
</tr>
<tr>
<td></td>
<td>(3)</td>
<td>(6)</td>
<td>(8)</td>
<td>(6)</td>
<td>(6)</td>
<td>(9)</td>
<td>(12)</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(9)</td>
<td>(9)</td>
<td>(8)</td>
<td>(9)</td>
<td>(12)</td>
<td>(15)</td>
</tr>
<tr>
<td></td>
<td>(5)</td>
<td>(12)</td>
<td>(12)</td>
<td>(15)</td>
<td>(15)</td>
<td>(15)</td>
<td>(24)</td>
</tr>
</tbody>
</table>

- **Evaluation points**
  - Relief of pressure and shear force (position change protocol, support surfaces, head elevation, posture maintenance in wheel-chair, etc)

- **Contents of plan**
  - On the bed
  - In the chair
  - Skin care
  - Improvement of nutritional status
  - Rehabilitation

Degree of independence: J (Independent), A (Needing support for going out), B (chair-bound), C (bed-bound).
### App. 3. Recommendation for topical treatments

<table>
<thead>
<tr>
<th>Topical Agents</th>
<th>Necrotic tissue (N to n)</th>
<th>Inflammation/infection (I to i)</th>
<th>Exudate (E to e)</th>
<th>Granulation tissue (G to g)</th>
<th>Size (S to s)</th>
<th>Pocket (P to p)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cadexomer-iodine</td>
<td>Silver sulfadiazine</td>
<td>Dextranomer</td>
<td>Aluminium chlorohydroxy allantoinate</td>
<td>Lysozyme hydrochloride</td>
<td>Zinc oxide</td>
</tr>
<tr>
<td></td>
<td>Dextranomer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Trafermin</td>
</tr>
<tr>
<td></td>
<td>Bromelain</td>
<td>Iodine form gauze</td>
<td>Povidone-iodine</td>
<td>Tretinoin tocoferil</td>
<td>Isopropylazulene</td>
<td>Tretinoin tocoferil</td>
</tr>
<tr>
<td></td>
<td>Povidone-iodine sugar</td>
<td></td>
<td></td>
<td></td>
<td>Hemolyzed blood of young calves</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fradiomycin sulfate-trypsin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dressings

<table>
<thead>
<tr>
<th></th>
<th>Silver+</th>
<th>Alginate</th>
<th>Silver+</th>
<th>Chitin membrane</th>
<th>Hydrocolloid</th>
<th>Hydrogel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydrogel</td>
<td>(a little exudate)</td>
<td>Hydrogel</td>
<td></td>
<td></td>
<td>Silver+</td>
</tr>
<tr>
<td></td>
<td>Hydrogel</td>
<td></td>
<td>Hydropolymer</td>
<td></td>
<td>Polyurethane foam/soft silicone</td>
<td></td>
</tr>
</tbody>
</table>

### Surgery

<table>
<thead>
<tr>
<th></th>
<th>Surgical debridement</th>
<th>Reconstructive surgery</th>
<th>Surgical incision</th>
</tr>
</thead>
</table>

### Physio-Therapy

<table>
<thead>
<tr>
<th></th>
<th>Hydrotherapy</th>
<th>Negative pressure wound therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Near-infrared therapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ultrasonic therapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electromagnetic therapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical stimulation</td>
</tr>
</tbody>
</table>

### Cleansing/Disinfection

<table>
<thead>
<tr>
<th></th>
<th>Antiseptics (clearly infected)</th>
<th>Skin emollients to the peripheral skin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cleansing with a mildly acidic cleansing agent</td>
<td>Sufficient quantities of isotonic saline or tap water</td>
</tr>
</tbody>
</table>

JSPU Guidelines for the Prevention and Management of Pressure Ulcers (3rd Ed.)

**Recommendation B**

Recommended because supported by some evidence

**Recommendation C1**

May be considered because supported by limited evidence
App. 4. Predictive validity of DESIGN-R

Evaluation of severity

- Superficial: d1-d2
- Deep: D3-DU
- mild: 9 or less
- moderate: 10-18
- Severe: 19 or more

- Prediction of healing
- Selecting appropriate treatment

Monitoring

- Improved
  - After 1 wk: 1 or more increase
  - After 2~3 wks: 2 or more increase
  - After 4 wks: 3 or more increase
- Not improved

- Improved
  - After 1-2 wks: 1 or less decrease
  - After 3 wks: 3 or less decrease
  - After 4 wks: 2 or less decrease
- Not improved

Reconsidering care plan