PRESSURE ULCERS

Professor Zena Moore; PhD, MSc (Leadership in Health Professionals Education), MSc (Wound Healing & Tissue Repair), PG Dip, FFNMRC SI, Dip First Line Management, RGN

Professor, Head of the School of Nursing & Midwifery, Royal College of Surgeons in Ireland

RCSI DEVELOPING HEALTHCARE LEADERS WHO MAKE A DIFFERENCE WORLDWIDE
Outline

• Pressure ulcers – overview
• Staging
• Risk Assessment
• SSKIN bundle
Definition

“A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors is yet to be elucidated”

Pressure Ulcers in Ireland


• Mean prevalence of pressure ulcers is 15%, varying from 4% (McDermott-Scales et al. 2009) to 37% (Sheerin et al. 2005)

• The lowest prevalence, 4%, is seen in the community setting (McDermott-Scales et al. 2009) with the highest, 37%, in spinal cord injury services (Sheerin et al. 2005).
Pressure Ulcers in Ireland

• One study, from older person services, notes a pressure ulcer prevalence of 9% (Moore & Cowman 2012)

• From the acute care perspective, findings suggest that prevalence rates vary from 12%-18.8% (Moore & Pitman 2000, Gethin et al. 2005, Gallagher et al. 2008)

• No published prevalence figures from paediatrics, hospice or obstetric services are available for Ireland
Pressure Ulcers in Ireland


- Mean incidence is 10%, varying from 0.71% (Corcoran et al. 2013) to 14.4% (Gallagher et al. 2008)

- One study explored incidence from older persons’ services and an incidence of 11% is reported (Moore et al. 2011)

- The remaining incidence studies are from the obstetrics and the acute care setting and figures vary from 0.71% (Corcoran et al. 2013) to 14.4% (Gallagher et al. 2008)

- Once again, no published incidence figures from paediatrics or the hospice services are available for Ireland
Human Costs

- **Essex et al 2009**: PU impacts negatively on HRQoL, even after adjusting for confoundings

- **Gorecki et al 2009**: physical, social, psychological, symptoms, financial, need for Rx vs. effects of Rx, impact on others……

- **Gorecki et al 2011**: HRQoL impacted, influenced by health behaviours, are impacted by experiences of care & individual factors, cognition, social support and comorbidity
Human Costs

Global mortality rates across 187 countries, from 1990 to 2010, finds that there has been a **32.5% increase in deaths** directly attributable to pressure ulcers.

![Table showing global mortality rates for different causes of death, with a highlighted row for 'Decubitus ulcer' showing a 32.5% increase from 1990 to 2010.]

Pressure Ulcer - Cost

Cost

- £2B in cost to UK healthcare system, in aggregate
- Average cost to treat: £10K vs average cost to prevent: £7K

![Graph showing expected cost of healing a PU by category.](image1.png)

![Graph showing mean healing time of a PU by category.](image2.png)

![Graph showing pressure ulcer inpatient recovery time by stage.](image3.png)

References:


Regulation Requirements

Values for Nursing & Midwifery

Regulation Requirements

Safety Incident Management Policy

<table>
<thead>
<tr>
<th>Document Reference Number</th>
<th>Document Drafted By</th>
<th>Document Approved By</th>
<th>Revision Number</th>
<th>Document Approval Date</th>
<th>Responsibility for implementation</th>
<th>Review Date</th>
<th>Responsibility for review and audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPSD-D-060-1.1</td>
<td>The HSE National Incident Management Team</td>
<td>Dr. Philip Crowley, National Director, Quality and Patient Safety</td>
<td>1</td>
<td>23.05.2014</td>
<td>HSE Leadership Team</td>
<td>23.05.2015</td>
<td>Quality and Patient Safety Division</td>
</tr>
</tbody>
</table>
20 (19%) of the 103 care management events reported relate to category 4i a Stage 3 or Stage 4 pressure ulcer acquired after admission to a healthcare and social care residential facility.

In 3 cases it was confirmed that a person had died.
Outline

• Pressure ulcers – overview
• Staging
• Risk Assessment
• SSKIN bundle
Pressure Ulcer Staging

Category/Stage I: Non-blanchable redness of intact skin

Intact skin with non-blanchable erythema of a localized area usually over a bony prominence. Discoloration of the skin, warmth, oedema, hardness or pain may also be present. Darkly pigmented skin may not have visible blanching.

(EPUAP/NPUAP 2009)
Pressure Ulcer Staging

Category/Stage II: Partial thickness skin loss or blister

Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or sero-sanginous filled blister.

(EPUAP/NPUAP 2009)

RCSI
Pressure Ulcer Staging

Category/Stage III: Full thickness skin loss (fat visible)

Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Some slough may be present. May include undermining and tunnelling

(EPUAP/NPUAP 2009)
Pressure Ulcer Staging

Category/Stage IV: Full thickness tissue loss (muscle/bone visible)

Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. Often include undermining and tunnelling

(EPUAP/NPUAP 2009)
Pressure Ulcer Grading

Unstageable

Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed. Until enough slough and/or eschar is removed to expose the base of the wound, the true depth, and therefore Category/Stage, cannot be determined.
Suspected Deep Tissue Injury

Purple or maroon localized area of discoloured intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.
Pressure Ulcer Development

Classification has its origins in the classification of burn injuries.
Pressure Ulcer Development

But pressure ulcers develop from the inside out

Outline

• Pressure ulcers – overview
• Staging
• Risk Assessment
• SSKIN bundle
Definition of Risk Assessment

“A process that involves measurement of risk to determine priorities and to enable identification of appropriate level of risk treatment”
What is a risk factor?

“A risk factor is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury”
Which risk factors?
Which Risk Factors?

Table 3 Old population and total deaths, 1991, 2011 and 2031 (M2F2 Traditional)

<table>
<thead>
<tr>
<th>Regional Authority area</th>
<th>Persons aged 65+</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thousands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Border</td>
<td>54</td>
<td>65</td>
<td>115</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDA</td>
<td>127</td>
<td>187</td>
<td>362</td>
<td>10</td>
<td>10</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dublin</td>
<td>99</td>
<td>139</td>
<td>249</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-East</td>
<td>29</td>
<td>48</td>
<td>114</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midland</td>
<td>24</td>
<td>32</td>
<td>62</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-West</td>
<td>37</td>
<td>47</td>
<td>85</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South-East</td>
<td>45</td>
<td>62</td>
<td>116</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South-West</td>
<td>65</td>
<td>82</td>
<td>150</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>50</td>
<td>57</td>
<td>100</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>403</td>
<td>532</td>
<td>991</td>
<td>31</td>
<td>28</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Which Risk Factors?

• Inequalities in healthy life years in the 25 countries of the European Union in 2005: a cross-national meta-regression analysis

• In all 25 EU countries, men aged 50 years could expect to live a further 17.3 years (SE 0.17)—i.e., 60% of their remaining life free of activity limitation—whereas the number of HLYs at 50 years for women was 18.1 years (SE 0.18), i.e., 54% of their remaining life free of activity limitation
BUT
Malnutrition

- Foods and drinks high in fat, sugar and salt
  - Not every day
  - Maximum once or twice a week

- Fats, spreads and oils
  - In very small amounts

- Meat, poultry, fish, eggs, beans and nuts
  - 2 Servings a day

- Milk, yogurt and cheese
  - 3 Servings a day
  - 5 servings for children age 9-12 and teenagers age 13-18

- Wholemeal cereals and breads, potatoes, pasta and rice
  - 3-5 Servings a day
  - Up to 7 servings for teenage boys and men age 19-50

- Vegetables, salad and fruit
  - 5-7 Servings a day
BUT
Incontinence
BUT

37% of general female population suffer with some form of urinary incontinence

Risk Assessment Tools

---

**BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK**

Name: Edwards, Jack C  
Room: 105-2  
MRI: 105  
Date: 08/05/2001

**MOISTURE:** Occasionally moist - Skin is occasionally moist, requiring an extra linen change approx. once a day.  
**MOBILITY:** Slightly limited - Wakes frequent though slight changes in body and position independently.  
**FRICITION/SHEAR:** Potential problem - Moves within assist. Some sliding when positioning. Occ. slides down in bed/rost.  
**ACTIVITY:** Walks occasionally - Value occ. during day, very short dist, needs assist. In bedchair most of the time.  
**NUTRITION:** Adequate - Eats > 1/2 meals. Eats 4 protein/day. Occ. refuses a meal, usually twice replacement.  
**SENSORY PERCEPTION:** Slightly limited - Some sensory impairment limits ability to feel pain/irritation in 1 or 2 extremities.

<table>
<thead>
<tr>
<th>Mobility</th>
<th>Function</th>
<th>Activity</th>
<th>Nutrition</th>
<th>Sensory</th>
<th>Moiture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>2.00</td>
<td>2.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>13.00</td>
</tr>
</tbody>
</table>

16 or less indicates risk of pressure sore development.  
15-16 = Low risk  
13-14 = Moderate risk  
12 or less = High risk

---

**TABLE 4**  
**AGREEMENT OF EXPERT NURSES ON RELEVANCE AND CLARITY OF QUESTIONS REGARDING DEVICES AND METHODS TO PREVENT PRESSURE ULCERS (PHASE TWO)**

<table>
<thead>
<tr>
<th>Reference (total)</th>
<th>Clarity (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical devices</strong></td>
<td></td>
</tr>
<tr>
<td>Synthetic sheepskin or sheepskin slippers</td>
<td>32/74</td>
</tr>
<tr>
<td>Genuine sheepskin or sheepskin slippers</td>
<td>32/74</td>
</tr>
<tr>
<td>Skin creams (e.g. Duoderm, Estia Max)</td>
<td>40/80</td>
</tr>
<tr>
<td>Pressure ulcer (e.g., under the cast)</td>
<td>40/80</td>
</tr>
<tr>
<td>Hospital bed</td>
<td>35/70</td>
</tr>
<tr>
<td>Transfer sheet</td>
<td>35/70</td>
</tr>
<tr>
<td>Silk sheet</td>
<td>40/80</td>
</tr>
<tr>
<td>Durex sheeting</td>
<td>40/80</td>
</tr>
<tr>
<td>Transfer board</td>
<td>35/70</td>
</tr>
<tr>
<td>Bed</td>
<td>35/70</td>
</tr>
<tr>
<td>Special bed for pressure ulcers</td>
<td>35/70</td>
</tr>
<tr>
<td><strong>Mattress</strong></td>
<td></td>
</tr>
<tr>
<td>Air-filled</td>
<td>35/70</td>
</tr>
<tr>
<td>Foam-filled</td>
<td>35/70</td>
</tr>
<tr>
<td>Water-filled</td>
<td>35/70</td>
</tr>
<tr>
<td>Gel-filled</td>
<td>35/70</td>
</tr>
<tr>
<td><strong>Cushions</strong></td>
<td></td>
</tr>
<tr>
<td>Air-filled</td>
<td>35/70</td>
</tr>
<tr>
<td>Foam-filled</td>
<td>35/70</td>
</tr>
<tr>
<td>Water-filled</td>
<td>35/70</td>
</tr>
<tr>
<td>Gel-filled</td>
<td>35/70</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td></td>
</tr>
<tr>
<td>Basic care applied to skin in areas susceptible to pressure</td>
<td>35/70</td>
</tr>
<tr>
<td>Antimicrobial creams applied to skin in areas susceptible to pressure</td>
<td>35/70</td>
</tr>
<tr>
<td>Continuous monitoring of the skin at least once a day</td>
<td>35/70</td>
</tr>
<tr>
<td>Diet</td>
<td>35/70</td>
</tr>
<tr>
<td>Dietary supplements</td>
<td>35/70</td>
</tr>
<tr>
<td>Wound care</td>
<td>35/70</td>
</tr>
<tr>
<td>Patient counseling</td>
<td>35/70</td>
</tr>
<tr>
<td>Reminding of significant others</td>
<td>35/70</td>
</tr>
</tbody>
</table>

*Data from: DERM, CoramCare, a Bristol-Myers Squibb Company, Princeton, NJ
## Which Risk Factors?

<table>
<thead>
<tr>
<th>Norton</th>
<th>Braden</th>
<th>Waterlow</th>
<th>Maelor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Factor</td>
<td>Risk Factor</td>
<td>Risk Factor</td>
<td>Risk Factor</td>
</tr>
<tr>
<td>Physical Condition</td>
<td>Sensory perception</td>
<td>Build/weight for height</td>
<td>Predisposing disease</td>
</tr>
<tr>
<td>Mental Condition</td>
<td></td>
<td>X</td>
<td>Level of consciousness</td>
</tr>
<tr>
<td>X</td>
<td>Nutrition</td>
<td>Malnutrition</td>
<td>Nutritional Status</td>
</tr>
<tr>
<td>Activity</td>
<td>Activity</td>
<td></td>
<td>Ambulation</td>
</tr>
<tr>
<td>Mobility</td>
<td>Mobility</td>
<td>Mobility</td>
<td>Mobility</td>
</tr>
<tr>
<td>Incontinence</td>
<td>Moisture</td>
<td>Continence</td>
<td>Incontinence</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>Skin type/visual risk areas</td>
<td>Skin Condition</td>
</tr>
<tr>
<td>X</td>
<td>Friction and Shear</td>
<td>Sex and age</td>
<td>Pain</td>
</tr>
<tr>
<td>Assessment tool</td>
<td>Sensitivity (True +)</td>
<td>Specificity (True -)</td>
<td>Odds Ratio (risk prediction)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------</td>
<td>-----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Braden Scale</td>
<td>57.1%</td>
<td>67.5%</td>
<td>4.08</td>
</tr>
<tr>
<td>Norton Scale</td>
<td>46.8%</td>
<td>61.8%</td>
<td>2.16</td>
</tr>
<tr>
<td>Waterlow Scale</td>
<td>82.0%</td>
<td>27.4%</td>
<td>2.05</td>
</tr>
<tr>
<td>Clinical Judgement</td>
<td>50.6%</td>
<td>60.1%</td>
<td>1.69</td>
</tr>
</tbody>
</table>

Example - Braden

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory perception</td>
<td>3</td>
</tr>
<tr>
<td>Nutrition</td>
<td>1</td>
</tr>
<tr>
<td>Activity</td>
<td>3</td>
</tr>
<tr>
<td>Mobility</td>
<td>3</td>
</tr>
<tr>
<td>Moisture</td>
<td>1</td>
</tr>
<tr>
<td>Friction and Shear</td>
<td>2</td>
</tr>
</tbody>
</table>

Moderate Risk
## Example - Braden

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory perception</td>
<td>2</td>
</tr>
<tr>
<td>Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>Activity</td>
<td>2</td>
</tr>
<tr>
<td>Mobility</td>
<td>2</td>
</tr>
<tr>
<td>Moisture</td>
<td>4</td>
</tr>
<tr>
<td>Friction and Shear</td>
<td>2</td>
</tr>
</tbody>
</table>

Low Risk
Who is actually at risk?
What does it all mean for you?
Definition of a Pressure Ulcer

“A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the primary of which is impaired mobility.”

Pressure & Shear

Factors influencing tolerance of pressure & shear

Age, Incontinence, Malnutrition, General Health

Prime factor exposing individual to pressure & shear

Prime cause of pressure ulcers

Hierarchy of Risk Factors Moore et al. (2011)
Guidelines

• Use a structured approach to risk assessment that is refined through the use of clinical judgment and informed by knowledge of relevant risk factors.

• Use a structured approach to risk assessment that includes assessment of activity/mobility and skin status.

• Do not rely on the results of a risk assessment tool alone when assessing an individual’s pressure ulcer risk.
Bringing it all together

Time

Pressure/Shear

Individual
Outline

- Pressure ulcers – overview
- Staging
- Risk Assessment
- SSKIN bundle
SSKIN

• Skin assessment
• Surface
• Keep moving
• Incontinence
• Nutrition

Skin Assessment
Skin Assessment

- There is strong association between Stage/Grade 1 pressure ulcers (Allman et al., 1995; Reed et al., 2003; Nixon et al., 2006, 2007) and subsequent Stage/Grade 2 pressure ulcers

- 2 large high quality studies (Reed et al., 2003; Nixon et al., 2006) suggest that the presence of a Stage/Grade 1 pressure ulcer increases the odds of subsequent Stage/Grade 2 by 2–3 fold
The Role of Dressing & Topical Agents for Prevention of Pressure Ulcers

- Four trials (561 participants), all of which were of high or unclear risk of bias, showed that dressings applied over bony prominences reduced pressure ulcer incidence; RR 0.21 (95% CI 0.09 to 0.51; P value 0.0006)
The Role of Dressing & Topical Agents for Prevention of Pressure Ulcers

- Five trials (940 participants) of unclear or high risk of bias compared a topical agent with a placebo

- When results from the five trials were combined, the risk ratio (RR) was 0.78 (95% CI 0.47 to 1.31; P value 0.35) indicating no overall beneficial effect of the topical agents
There is insufficient evidence from RCTs to support or refute the use of topical agents applied over bony prominences to prevent pressure ulcers. Although the incidence of pressure ulcers was reduced when dressings were used to protect the skin, results were compromised by the low quality of the included trials.

These trials contained substantial risk of bias and clinical heterogeneity (variations in populations and interventions); consequently, results should be interpreted as inconclusive. 

Surface
Surface

• Pressure re-distribution:
  • Distribute as much as possible of the pressure (body weight) over as large as possible a surface
  • Reduce tissue deformation

• Pressure re-distribution with:
  • Immersion
  • Envelopment
How deep do you sink into the material
- Too soft = bottoming out
- Too hard = sitting on top (increased deformation)
- Too thin = ?

Higher cushion... more immersion
Surface

- **Envelopment**: Capability of a support surface in deforming around and encompassing the contour of the human body.
  - “the ability to encompass and equalize pressure”
Surface

“The ability to encompass and equalize pressure”
Keep Moving
Keep Moving

In the experimental group 96.6% of participants remained free of pressure ulcers, compared with 88.1% in the control group ($p=0.030$).

The cost per patient free of ulcer was €213.9 (experimental) compared with €287.3 (control), the experimental intervention was a dominant option.

Positioning

- Stability
- Comfort
- Security

Van Etten M (2013) Re-positioning to prevent pressure ulcers; considerations on stability and shear forces; EPUAP Conference
Incontinence

Overall, there is some evidence that moisture is a factor in pressure ulcer development with the measures relating to dual incontinence and skin moisture emerging more consistently compared to moisture risk assessment sub-scales, urinary and faecal incontinence.

Incontinence

• A structured skin care regimen consists of two key interventions:
  • Cleansing the skin (CLEANSE )
    • To remove urine and/or faeces, i.e. the source of irritants that cause IAD. This should be done prior to the application of a skin protectant as part of a routine process to remove urine and faeces;
  • Protecting the skin (PROTECT )
    • To avoid or minimise exposure to urine and/or faeces and friction.

Nutrition

- Screen nutritional status for each individual at risk of or with a pressure ulcer
- Use a valid and reliable nutrition screening tool to determine nutritional risk
- Refer individuals screened to be at risk of malnutrition and individuals with an existing pressure ulcer to a registered dietitian or an interprofessional nutrition team for a comprehensive nutrition assessment
Nutrition

• The focus of nutrition assessment should be on evaluating energy intake, unintended weight change and the effect of psychological stress or neuropsychological problems.

• Additionally, assessment should include a determination of the individual’s caloric, protein and fluid requirements.

• Develop an individualised nutrition care plan for individuals with or at risk of a pressure ulcer

• Follow relevant and evidence-based guidelines on nutrition and hydration for individuals who exhibit nutritional risk and who are at risk of pressure ulcers or have an existing pressure ulcer.
In the End

Prevention is so much better than healing because it saves the labour of being sick.

Thomas Adams (1618)
PRESSURE ULCERS

Professor Zena Moore; PhD, MSc (Leadership in Health Professionals Education), MSc (Wound Healing & Tissue Repair), PG Dip, FFNMRCSI, Dip First Line Management, RGN

Professor, Head of the School of Nursing & Midwifery, Royal College of Surgeons in Ireland

RCSI DEVELOPING HEALTHCARE LEADERS WHO MAKE A DIFFERENCE WORLDWIDE