Pressure ulcers- grading, epidemiology, costs, risk indicators

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Staging of pressure ulcers (EPUAP)

• Grade 1
• Grade 2
• Grade 3
• Grade 4
Prevalence of pressure ulcers

- Acute care hospitals
  - 13.2% *
  - 14.0% **
  - 15.0% **
- General hospitals 23.3% *
- Geriatric clinics 23-55% **
- *Bours, Halfens & Winter 1998
- **Lindholm 2002
Incidence of pressure ulcers

- 1-11% * (overall hospital population)
- 4,7 - 66% (surgery)**
- 21,2% (postsurgery)***

* Haalboom, van Everdingen, Cullum 1997
*** Schoonhoven, Defloor et al 2002
Costs of pressure ulcers

- The Netherlands €453.780.000 - 1% of total health care costs (1998) (Third biggest expense after cardiovascular and cancer diseases)
- Reason for re-admission to hospital
- USA: $1.335 billion dollars
Risk indicators

• Pressure/ Shear forces
• Tissue tolerance determine the effect pressure and shear forces have on the tissue (Defloor 1999)
• Pressure--hardness of mattress, positioning, duration (Defloor 1999)

• Comparison of pressure reducing effect of 5 operating room mattresses
• Lowest interface pressure: visco-elastic, supine (Defloor 2000)
Risk indicator: duration of surgery

- Length of surgery: duration of pressure.
- > 4 hours on op.table: double incidence (Hicks 1990)
- Surgery > 2.5 hours- significant risk factor
  - (Hoshowsky et al 1994)
- Length of surgery (minutes) OR 1.01.
- For every 30 minutes after 4 hours the risk increases by 33% (Schoonhoven 2002)
- Other studies have not confirmed this
OR table

• Positioning on the OR table
• Shearing forces (Mc Ewen 1996)
• Material of mattress (Tang 1991)
• Many layers of sheets
• Warming blankets/mattresses: oxygen demand of tissue↑, significant risk factor in surgery > 10 hours (Grous et al 1997)
Diastolic blood pressure

• Diastolic blood pressure < 60 mm increases risk (Bergstrom and Braden 1992)
• Not confirmed (Kemp et al 1990)
Ageing and pressure ulcers

- Decrease of elastine in soft tissue - skin more vulnerable to pressure - pressure conducted to the interstitial liquid and the cells
- Collagen synthesis changed - mechanical capacity of tissue ↓, stiffening of tissue
- Less subcutaneous tissue, less muscle tonus, slower skin cell regeneration (Defloor 1990)
- Risk of developing a p.u. tripled if ≥ 70 years
Pain and development of pressure ulcers

- Pain- stress-hormones-chatechoholamines constrict capillaries (not confirmed)
- Preopereative analgesics significantly correlated to development of pressure ulcers 
  (Schoonhoven 2002)
Nutrition

• Malnutrition- increased risk of pressure ulcers *(CBO 1992, Breslow&Bergstrom 1994).*
• Body weight <58 kg independent and significant risk indicator *(Allman et al 1995)*
• Patients with p.u had significantly lower body weight *(Berlowitz & Wilking 1989)*
• Lower BMI in patients who developed p.u *(Bergstrom&Braden 1992)*
Nutritional status and pressure ulcer development

• Protein deficiency plays a role *(Berlowitz & Wilking 1989)*

• Serum albumin level <3.5gm/dL - higher risk *(Allman et al 1986, Defloor 1999)*

• Association between nutritional intake and pressure ulcer development *(Wilking 1989, Bergstrom & Braden 1992)*
Surgery and nutritional intake

- Acute surgery - long time since last meal/drinks
- Long waiting at A&E department
- Perioperative intake limited (one week of little food)
Pressure ulcers and corticosteroids

• Corticosteroids (prolonged administration), especially in combination with protein deficiency hampers capillary regeneration and collagen production.

**Blood and pressure ulcers**

- Decrease of blood supply (transport of nutrients and oxygen to the tissues) - risk of p.u. ↑
- Betablockers (some) decrease tissue blood flow by 20-30%
- *(Mc Sorley & Warren 1978, Defloor 1999)*
- No clinical studies have confirmed this
Diseases associated with increased risk of p.u. development

- Reduced oxygen supply, delayed reactive hyperemia, accelerated vascular occlusion.
- Pulmonary diseases, anemia, diabetes mellitus, spine injury, vascular disease, jaundice
Reperfusion and pressure ulcers development

- During pressure: ischemic damage - insufficient oxygen supply to skin and muscles. Reversible or irreversible damage
- Reperfusion damage: postischemic reperfusion-damage to viable cells
- Development of superoxide anion?
- Superoxide anion causes damage to capillaries and infiltration of neutrofiles (*Defloor 1998*)
Risk indicators

• **Analgesics** preoperatively- significant higher risk of developing pressure ulcers (OR 4.75, 95% confidence interval (CI) 1.87-12.05)

• Patients who used **betablockers** preoperatively lower risk (OR 0.26, 95% CI 0.08-0.80)

• Patients with **malnutrition** had higher risk of developing p.u. (OR 4.94, 95% CI 1.14-21.47) *(Schonhoven, Defloor 2002)*
Risk indicators

• Longer continuous period with diastolic blood pressure <60mm had higher risk of developing p.u (OR 1.0033, 95% CI 1.0013-1.0052)
• Spinal and head and neck surgery- high risk
• Risk of p.u. increased with longer time for surgery
• Patients on preop. Analgesics- higher risk
• Multiple regression analysis: Only length of surgery (Scoenhoven, Defloor 2002)
Time between development and clinical observation of p.u.

- 3-5 days between development and observation (Defloor 2000)
- Within 48 hours- related to surgery (Lubbers)
- Within 4 days after hip fracture surgery (Gunningberg, Lindholm 2002)
- Grade 1-2 can quickly develop into grade 3-4 a few hours after surgery (Gendron 1980)
Pan European Pressure Ulcer Study "PEPUS"

European coordinator
Christina Lindholm
Why pressure ulcers and hip fractures? (references)

- **Prevalence:**
  - 18% (*Strömberg*)
  - 29% *Gunningberg*

- **Incidence:**
  - 25-64% week 1 postop. (*Hofman*)
  - 55% (*Gunningberg*)
Results

- **North**
  - Finland $n=300$ (15)
  - Great Britain $n=61$ (3)
  - Sweden $n=107$ (6)

- **South**
  - Italy $n=41$ (3)
  - Portugal $n=24$ (2)
  - Spain $n=104$ (2)

- **Total:** $N=637$
Results

- Number of patients 637
- Age $M = 79$ (r 17 - 99)
- Female 74% Male 26%
Results continued

- Patients with pressure ulcers/arrival: \( \frac{59}{574} = 10\% \)
- Patients with pressure ulcers/discharge: \( \frac{133}{605} = 22\% \)
- North: 24% (Finland 26%) South: 15%
- 68% Grade I
- No Grade IV at discharge
Patient-related parameters vs pressure ulcers, discharge n.s.

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<th>North</th>
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<tbody>
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<td>Systolic</td>
<td>M = 145</td>
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<td>M = 155</td>
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<tr>
<td>Diastolic</td>
<td>M = 79</td>
<td></td>
<td>Diastolic</td>
<td>M = 82</td>
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<td>M = 23.68</td>
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<tr>
<td>Underweight</td>
<td>7%</td>
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<tr>
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<tr>
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### A&E Medical parameters

**Hunger/thirst vs pressure ulcers**

n.s.

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<tbody>
<tr>
<td>Hungry</td>
<td>38%</td>
<td>18%</td>
</tr>
<tr>
<td>Thirsty</td>
<td>27%</td>
<td>54%</td>
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<tr>
<td>Dehydr</td>
<td>11%</td>
<td>29%</td>
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Patient-related factors vs pressure ulcers/discharge

- Diabetes n.s.
- Urology n.s.
- Gastro/int n.s.
- Cardiovasc. n.s.
- Hb n.s.
- Serum-alb n.s.
- Blood pressure n.s.
Hunger/thirst/BMI

- Hungry 22%
- Thirsty 47%
- Dehydrated 54%
- BMI 14-47 M= 24 (N=567) Md=24

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<th>Tot.</th>
<th>S</th>
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<tr>
<td>Underw.&lt;20</td>
<td>86   (15%)</td>
<td>12%</td>
<td>16%</td>
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<tr>
<td>Normal 21-24</td>
<td>220  (39%)</td>
<td>32%</td>
<td>41%</td>
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<tr>
<td>Overw. &gt;25</td>
<td>261 (46%)</td>
<td>56%</td>
<td>43%</td>
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<tr>
<td>BMI-group</td>
<td>n</td>
<td>%</td>
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<tr>
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<tr>
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<tr>
<td>Overw</td>
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<td>19</td>
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BMI-groups vs % p.u. at discharge South/North

- **South**
  - n.s. (.751)
  - Underw 19%
  - Normalw 17%
  - Overw 13%

- **North**
  - n.s. (.133)
  - Underw 34%
  - Normal 22%
  - Overw 22%
Nutritional status vs p.u. at discharge

• Braden nutrition parameter p=0.007
• Dehydration (tot) 24% p.u.
• No dehydration 17.2% p=0.039
Braden vs p.u. at discharge

- Mann-W U Total 0.039
- Moist skin 0.001
- Nutrition 0.007
- Sensory perc 0.053
Pressure ulcers have different etiology
Pressure ulcers most common in the sacral area and the heels.
Pressure ulcers can be prevented
Use of risk assessment instruments?

- Braden
- Waterlow
- Norton
- Modified Norton...
Local treatment

- Foam dressings
- Hydrocolloids
- Alginate
- Hydrofibre
- Silverdressings
- Povidone iodine
European Pressure Ulcer Advisory Panel (EPUAP) Guidelines for prevention and treatment of pressure ulcers.

Nutritional Guidelines