In Focus: Uses and Limitations with using Digital Photography for Pressure Ulcer Staging in the Acute Care Setting

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Wound Photography Investigators

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- Maureen McLaughlin, PhD, RN
- Lauren Myers, BSN, RN, CWOCN
- Gail Thurkauf, MS, RN
- Joyce Johnson, PhD, RN, NEA-BC, FAAN
- Larry Strassner, PhD, RN, NEA-BC
Specific Aim

- Examine whether a digital photo could reliably convey the characteristics of a pressure ulcer

- Multi-rater agreement used to compare bedside assessment of pressure ulcer by certified WOCN to assessment of the same wound by a panel of experts.
Research Questions

Question 1:
What is the level of agreements between scores on the BWAT 13 characteristics and total score of the bedside assessment and the digital photo assessment?

Question 2:
What is the level of agreement between NPUAP stages of the bedside assessment and the digital photo assessment?

Question 3:
Is there a difference in how CWON’s rate characteristics and stage the pressure ulcer based on their background?
Problem/Background

- Digital photography:
  - Used in home care & long-term care settings
  - Used for nursing education
  - Tool for legal and clinical documentation of wounds
  - Allow access to wound specialist via telemedicine
Problem/Background

- WOCN Society has neither recommended nor discouraged use of photography

- Emphasized need for clearly written guidelines & standards

- Need to build a foundation for digital photography use in acute care settings
Methods/Design

• Assessed inter-rater reliability of 13 characteristics and staging of pressure ulcers

• Compared direct CWON onsite observation of the wound with visual inspection of a digital color photograph

• Photograph sent via internet to expert panel of three CWONs for assessment

• Approved by MedStar Health and Georgetown Institutional Review Boards.
Methods/Design

Study Design
• A non-experimental, cross sectional, correlational study

Setting
• General & critical care med/surg nursing units at two of the MedStar Health System hospitals
  ▫ Georgetown University Hospital (609 licensed beds)
  ▫ Franklin Square Hospital Center (380 licensed beds)
Methods/Design

Sampling Plan & Size

• Non-probability sampling plan

• Convenience sample of 69 adult inpatients at the 2 hospitals

• 100 pressure ulcer photographs
Methods/Design

Wound Photographer Preparation

- Twelve RNs (6 from each site) received 6 hours of training in the techniques of wound photography by an experienced medical photographer.

- Following training, each RN assessed for competency by the medical photographer through return demonstration.

- Wound photography competency validation conducted using established guidelines.
  - Developed by Buckley, Adelson, & Hess (2005)
Methods/Design

Instruments

- Bates-Jensen Wound Assessment Tool (BWAT)©
  - Measures 13 Wound Characteristics

<table>
<thead>
<tr>
<th>Tissue Edema</th>
<th>Drainage Amount</th>
<th>Drainage Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necrotic Tissue Amount</td>
<td>Granulation</td>
<td>Epithelialization</td>
</tr>
<tr>
<td>Necrotic Tissue Type</td>
<td>Size</td>
<td>Periwound</td>
</tr>
<tr>
<td>Tissue Induration</td>
<td>Wound Edge</td>
<td>Undermining</td>
</tr>
<tr>
<td>Depth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Methods/Design

## Instruments

- **National Pressure Ulcer Advisory Panel**
  - Definitions for staging were used (2007)

<table>
<thead>
<tr>
<th>Suspected deep tissue injury (SDTI)</th>
<th>Stage III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>Stage IV</td>
</tr>
<tr>
<td>Stage II</td>
<td>Unstageable</td>
</tr>
</tbody>
</table>
Methods/Design

Data Analysis

• Descriptive techniques
  ▫ Frequencies
  ▫ Measures of central tendency

• Inter-rater reliability analysis
  ▫ Percent agreement
  ▫ Spearman rho correlation
  ▫ Cohen’s kappa

• Additional analyses
  ▫ Chi square to assess for differences among the CWONs
  ▫ Linear regression for potential confounding relationships of wound evaluators
  ▫ Study sites on total BWAT scores
Results

Demographic Data

- 7 CWONs served as wound evaluators
  - 3 as panelists at off-site locations
  - 4 as direct observers at MedStar hospitals

Location

- Consistent with literature
- 74% of the wounds located on sacrum/coccyx and the heels
Results

Research Question #1
“Level of agreement between BWAT characteristics and bedside photo assessment”

- The kappa coefficients for the 13 characteristics ranged from slight to moderate agreement

- Wound characteristics that could be observed and quantified had the highest percent agreements and kappa coefficients
Table 2: Kappa Interpretation

<table>
<thead>
<tr>
<th>Kappa</th>
<th>Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0</td>
<td>Poor</td>
</tr>
<tr>
<td>0 - .2</td>
<td>Slight</td>
</tr>
<tr>
<td>.21 - .4</td>
<td>Fair</td>
</tr>
<tr>
<td>.4 - .59</td>
<td>Moderate</td>
</tr>
<tr>
<td>.6 - .79</td>
<td>Substantial</td>
</tr>
<tr>
<td>&gt;= .8</td>
<td>Outstanding</td>
</tr>
</tbody>
</table>
Table 1: Inter-rater Reliability for Bates-Jensen Wound Assessment Tool

<table>
<thead>
<tr>
<th>Item</th>
<th>Panelist 1</th>
<th></th>
<th>Panelist 2</th>
<th></th>
<th>Panelist 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Agreement</td>
<td>Spearman Correlation</td>
<td>Kappa</td>
<td>% Agreement</td>
<td>Spearman Correlation</td>
<td>Kappa</td>
</tr>
<tr>
<td>Size</td>
<td>60%</td>
<td>0.75</td>
<td>**</td>
<td>51%</td>
<td>0.77</td>
<td>**</td>
</tr>
<tr>
<td>Depth</td>
<td>53%</td>
<td>0.73</td>
<td>**</td>
<td>61%</td>
<td>0.69</td>
<td>**</td>
</tr>
<tr>
<td>Edges</td>
<td>42%</td>
<td>0.34</td>
<td>**</td>
<td>42%</td>
<td>0.32</td>
<td>**</td>
</tr>
<tr>
<td>Undermining</td>
<td>78%</td>
<td>0.41</td>
<td>**</td>
<td>79%</td>
<td>0.53</td>
<td>**</td>
</tr>
<tr>
<td>Necrotic Tissue Type</td>
<td>69%</td>
<td>0.84</td>
<td>0.60</td>
<td>60%</td>
<td>0.70</td>
<td>0.49</td>
</tr>
<tr>
<td>Necrotic Tissue Amount</td>
<td>66%</td>
<td>0.83</td>
<td>0.54</td>
<td>66%</td>
<td>0.81</td>
<td>0.53</td>
</tr>
<tr>
<td>Exudate Type</td>
<td>43%</td>
<td>0.55</td>
<td>0.24</td>
<td>58%</td>
<td>0.57</td>
<td>0.32</td>
</tr>
<tr>
<td>Exudate Amount</td>
<td>41%</td>
<td>0.58</td>
<td>0.23</td>
<td>54%</td>
<td>0.73</td>
<td>0.37</td>
</tr>
<tr>
<td>Skin Color SurroundingWound</td>
<td>47%</td>
<td>0.24</td>
<td>0.17</td>
<td>37%</td>
<td>0.19</td>
<td>0.21</td>
</tr>
<tr>
<td>Peripheral Tissue Edema</td>
<td>93%*</td>
<td>0.23</td>
<td>**</td>
<td>96%*</td>
<td>0.33</td>
<td>**</td>
</tr>
<tr>
<td>Peripheral Tissue Induration</td>
<td>80%*</td>
<td>0.19</td>
<td>**</td>
<td>97%*</td>
<td>**</td>
<td>95%*</td>
</tr>
<tr>
<td>Granulation Tissue</td>
<td>49%</td>
<td>0.48</td>
<td>0.34</td>
<td>49%</td>
<td>0.40</td>
<td>0.28</td>
</tr>
<tr>
<td>Epithelialization</td>
<td>74%</td>
<td>0.16</td>
<td>0.14</td>
<td>66%</td>
<td>0.31</td>
<td>0.21</td>
</tr>
<tr>
<td>NPUAP Stages</td>
<td>62%</td>
<td>0.64</td>
<td>0.48</td>
<td>69%</td>
<td>0.68</td>
<td>0.58</td>
</tr>
</tbody>
</table>
Results

Research Question #2
“Level of agreement between NPUAP stages and bedside photo assessment”

• Inter-rater reliability was deemed *fair* to *moderate*

• Kappa coefficients for NPUAP stages ranged from 0.39 to 0.58

• SDTIs had the *highest level of agreement*

• Percentage agreements on stage III and IV pressure ulcers were *higher* than stage I and II pressure ulcers

• Using digital photos as visual record to depict the staging proved to be highly problematic
<table>
<thead>
<tr>
<th>Stage</th>
<th>NPUAP-P1</th>
<th>NPUAP-P2</th>
<th>NPUAP-P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>5 %</td>
<td>5 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Stage II</td>
<td>1 %</td>
<td>2 %</td>
<td>1 %</td>
</tr>
<tr>
<td>Stage III</td>
<td>8 %</td>
<td>9 %</td>
<td>13.1 %</td>
</tr>
<tr>
<td>Stage IV</td>
<td>13 %</td>
<td>13 %</td>
<td>6.1 %</td>
</tr>
<tr>
<td>Unstageable</td>
<td>4 %</td>
<td>6 %</td>
<td>5.1 %</td>
</tr>
<tr>
<td>SDTI</td>
<td>31 %</td>
<td>34 %</td>
<td>30.3 %</td>
</tr>
</tbody>
</table>

| Kappa        | .484     | .581     | .393     |
| p-value      | .000     | .000     | .000     |
| Interpretation | Moderate agreement | Moderate agreement | Fair agreement |
Results

Research Question #3

“Difference in how CWON’s rate characteristics and stage the pressure ulcers based on their backgrounds”

• No statistically significant differences between off-site panelists and MedStar wound evaluators

• Great amount of variability in years of work experience as RN & CWONs existed among hospital & panelist wound evaluators
Table 4: Comparison of Wound Experts: Independent Samples t-test

<table>
<thead>
<tr>
<th></th>
<th>t (df)</th>
<th>Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of beds</strong></td>
<td>1.1 (4)</td>
<td>.33</td>
</tr>
<tr>
<td><strong>Years experience as RN</strong></td>
<td>.68 (5)</td>
<td>.52</td>
</tr>
<tr>
<td><strong>Years experience wound care RN</strong></td>
<td>.75 (5)</td>
<td>.49</td>
</tr>
<tr>
<td><strong>Years certified as WON</strong></td>
<td>1.1 (5)</td>
<td>.33</td>
</tr>
<tr>
<td><strong>Average # PU/week</strong></td>
<td>1.7 (5)</td>
<td>.14</td>
</tr>
<tr>
<td><strong>Years experience wound photo</strong></td>
<td>.45 (1)</td>
<td>.73</td>
</tr>
</tbody>
</table>
Conclusions

• Results indicate that a photograph alone cannot accurately and reliably convey the characteristics of a pressure ulcer.

• SDTIs and unstageable pressure ulcers had the highest level of agreement.
Conclusions

Practice Implications

• Bedside assessment continues to be the “gold standard”

• Digital photo in combination with clinical assessment may increase the accuracy of the assessment and documentation
Conclusions

Research Implications

- Exploration and research on wound imaging systems is needed

- Recognizes the current limitations of digital photography use for pressure ulcer staging
References

References

Questions or Comments?

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