Designing a dashboard to visualize patient information

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Background

Handover of patient information at traumas

Prehospital
- Comprehensive amount of data e.g.
  - Incident location
  - Patient status
  - Vital signs

Support
- Trauma clinicians in decision making
- Increase patient safety

Trauma care
- Complex patient handovers from prehospital care
- Decision making processes are challenged by stress
- Verbal handovers may not include all key data
## Materials and Methods

### Phase 1 – Designing a dashboard prototype

<table>
<thead>
<tr>
<th>Prioritize key prehospital data for use in trauma care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field study</strong></td>
</tr>
<tr>
<td>• Qualitative observations</td>
</tr>
<tr>
<td>• Conducted in an ED with a trauma room</td>
</tr>
<tr>
<td>• Two observers</td>
</tr>
<tr>
<td>• Analysis of the workflow and physical surroundings in a trauma room</td>
</tr>
<tr>
<td>• Inquiring into the needs of relevant prehospital patient information</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visualize data simplistically</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dashboard design</strong></td>
</tr>
<tr>
<td>• 20 Requirements for the design</td>
</tr>
<tr>
<td>• Results from the field studies</td>
</tr>
<tr>
<td>• Outcomes from other studies</td>
</tr>
<tr>
<td>• <em>The good design principles</em> by Wiklund et al.</td>
</tr>
<tr>
<td>• Interactive mockups</td>
</tr>
<tr>
<td>• Gives users possibility to interact with the design</td>
</tr>
</tbody>
</table>
Materials and Methods

**Phase 2 – Evaluate the design**

**Cognitive walkthrough**

- **Case presentation**
  - Medical trauma case presented
  - Evaluators were asked to indicate relevant information

- **Dashboard was displayed**
  - Evaluators were asked to select relevant information
  - Identify alternatives

- **Feedback from evaluators**
  - Usability
  - Access to data
  - Design of the mockup
  - Level of ease of use
  - Confirmation of key prehospital data

<table>
<thead>
<tr>
<th>Evaluators of the dashboard</th>
<th>Emergency department A</th>
<th>Emergency department B</th>
<th>Peers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♂ ♂ ♂</td>
<td>♂ ♂ ♂</td>
<td>♂ ♂ ♂</td>
</tr>
<tr>
<td>3 nurses</td>
<td>3 nurses</td>
<td>2 nurses 1 radiographer</td>
<td></td>
</tr>
<tr>
<td>Use prehospital information system</td>
<td>Non-use pre-hospital information system</td>
<td>None pre-hospital experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 2 years healthcare experience</td>
<td></td>
</tr>
</tbody>
</table>
Results

**Field study at an emergency department**

**Workflow**

- Emergency call → the coordinator calls relevant personnel to the trauma room
- At the trauma room → personnel awaits information from the attending physician

*Could this wait be utilized?*

*Loss of important contextual information?*

**Useful prehospital information**

- Prehospital notes
- Pictures from the accident
- ABCDE assessment og GCS
- Vital values (pulse, BP, etc)
- Triage/trauma score
## Results

### Dashboard design

<table>
<thead>
<tr>
<th>Patient</th>
<th>Assessment and treatment</th>
<th>Vital signs &amp; observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allergi:</strong></td>
<td>Ingen kendte</td>
<td>GCS</td>
</tr>
<tr>
<td><strong>Diagnose:</strong></td>
<td>DS369 Læsion af intraabdominale organer uden</td>
<td>13(E3+E5+M5)</td>
</tr>
<tr>
<td><strong>ID bevis:</strong></td>
<td>Ja</td>
<td>13(E3+E5+M5)</td>
</tr>
<tr>
<td><strong>ID bekræftet af:</strong></td>
<td>Patient</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

Mathilde Busk (MB) på 21 år har været fastkastet i trafikulykke. Undersøgelserne på ulykkesstedet viser, at MB har smerte fra abdomen og brystet samt dårlig vejtrakning, som viser sig at være lungekontusion og nyrekontusion. MB er vågen men panisk og kan selv identificere sig. MB har et blodtryk på 90/51 mmHg, puls på 100/min., respiration på 18/min. og en saturation på 89.
Results

Evaluation findings

- The panel design provides a good and clear overview of relevant data
- The expandability feature was appreciated
- Assessment and Treatment
  - Alot of data in one panel
- Vital signs and observations
  - Positive towards segregated data
  - Critical values should be highlighted
- Pictures
  - Provides insight
  - Currently only used by EDA
- Notes
  - Currently only used by EDA
- Injuries
  - Important knowledge of location and injury type
  - Multiple injuries needs to be clearly distinguished from each other
Discussion

- Prehospital data is complex and benefits from being visualized
- The user centered design provided important know how
- All key prehospital data needs to be digitized
- Segregation of data eases search
- Fast access to relevant data can result in fewer steps in decision making
Synopsis

Overview of dashboard:
Evaluators:
- “Great overview”
- “Clean simplistic design”

Other studies:
Dowding: Efficiency in information sharing
Franklin: Real-time data support

Usability of a dashboard in trauma care:
Evaluators: “The dashboard can be used with advantage in the trauma room”
Other studies:
Batley: Dashboard designs are extremely easy to use and is helpful to healthcare clinicians

Key prehospital data:
- Identified through observations and supported in earlier studies by Carter and Swartz
Evaluators:
- “It is precisely the information I need”

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Conclusion

- Dashboards in trauma rooms provides easy access to key prehospital data, and is valuable for clinicians in critical situations
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