Accuracy of ECG lead placement by UK paramedics

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BACKGROUND: The use of the 12-lead ECG is common in UK paramedic practice but its value depends upon accurate placement of the ECG-electrodes. Several studies have shown widespread variation in the placement of chest electrodes by other health professionals but no studies have addressed the accuracy of paramedics.

AIM: The main aim of this study was to ascertain the accuracy of the chest lead placements by registered paramedics.

Method: Registered paramedics who attended the Emergency Services Show in Birmingham in September 2018 were invited to participate in this observational study. Professional demographic data were collected prior to completion of the study. Participants were asked to place the chest electrodes on a male model in accordance with their current practice. Placement was measured against reference points that had been pre-determined by two paramedics and an advanced clinical practitioner in accordance with the Society for Cardiological Science & Technology's 2017 Clinical Guidelines for recording a standard 12-lead electrocardiogram. A tolerance of 19mm from optimal positioning was considered to be acceptable for this study.

Rationale for 19mm tolerance

- ECG morphology changes were prominent in all shape parameters beyond 2 cm distance to precordial leads. 2
- Misplaced ECG electrodes have the possibility to produce incorrect ECG patterns 3

Participants

- 52 eligible participants
- 62% had between 1 & 4 years of operational experience as a paramedic
- Over 86% were current in practice at the time of the study.
- The route to first registration was mainly via higher education; 43 (82.7%) had a FdSc, DipHE, or BSc/BSc (Hons) in a paramedic subject.
- Four (7.7%) held a higher degree in clinical practice.

Table: Range of electrode placements from pre-determined reference point (mm)

<table>
<thead>
<tr>
<th>Electrode</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most superior</td>
<td>59</td>
<td>68</td>
<td>35</td>
<td>30</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Most inferior</td>
<td>-31</td>
<td>-25</td>
<td>-50</td>
<td>-52</td>
<td>-57</td>
<td>-61</td>
</tr>
<tr>
<td>Range</td>
<td>90</td>
<td>93</td>
<td>85</td>
<td>82</td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td>Mean horizontal (mediolateral) position</td>
<td>10</td>
<td>63</td>
<td>27</td>
<td>46</td>
<td>32</td>
<td>33</td>
</tr>
<tr>
<td>Most lateral</td>
<td>-45</td>
<td>-20</td>
<td>-17</td>
<td>-18</td>
<td>-35</td>
<td>-43</td>
</tr>
<tr>
<td>Range</td>
<td>55</td>
<td>60</td>
<td>44</td>
<td>64</td>
<td>67</td>
<td>76</td>
</tr>
</tbody>
</table>

Key findings

- First study of its kind to explore the accuracy of chest lead placement by UK registered paramedics
- There was a wide variation in placement of chest electrodes when compared with the pre-determined reference points
- Only 3 participants placed all leads within the 19mm tolerance of the reference points
- Results are similar to studies involving other healthcare professionals

References


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