A new computerised system can continuously measure functional activities of patients in a stroke rehabilitation unit

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1) Introduction and Purpose

To be able to measure patient activity in a continuous and unobtrusive manner we are developing a new automated system based on Real Time Location Technology.1 This would also allow us to overcome limitations of the current activity monitoring methods.2

The system makes use of Radio Frequency Identification (RFID) tags with an in-built motion sensor, room locators and a reader. The tags relay infra-red location signals from a room locator fitted on a wall or ceiling. The tags relay their location and movement signals to a computer every 10 to 20 seconds (Figure 1).

Having established excellent reliability (Intraclass Correlation Coefficients ≥ 0.90), we subsequently validated the system against Observational Behaviour Mapping Technique (OBMT).

We found a high level of agreement between the two methods.3 Over 12 hours (720 minutes) a mean difference of 1 minute was found between the methods for measuring the time spent in Own Room (System = 570 mins; OBMT = 569 mins) and the time spent in Physiotherapy Room (System = 49 mins; OBMT = 48 mins).

Currently we are measuring functional activities of patients from admission to discharge. In this study we report the individual activity profiles of 5 patients based on the tag location and movement signals.

3 (a) Results

<table>
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<tr>
<th>Patients</th>
<th>Sex</th>
<th>Age in yrs</th>
<th>Type of stroke</th>
<th>Side affected</th>
<th>1st ever stroke</th>
<th>FAC score*</th>
<th>Days post admn</th>
<th>Follow up days</th>
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<td>58</td>
<td>Lt MCA Infarct</td>
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<td>75</td>
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<td>3</td>
<td>F</td>
<td>75</td>
<td>Rt Mid Pontine Inf</td>
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</tbody>
</table>

The percentage of time spent active in each location is given in Table 2. The average movement detected in the tag is representative of the quantified daily activity of the patient. An example of the difference in the activity patterns of these patients over days is seen in Graph 2. The activity levels of Patient 2 and Patient 5 remain consistently high. The activity levels of Patient 1 and Patient 4 increase while that of Patient 3 steadily decreases over a 4 week period.

3 (b) Results

The average movement detected in the tag is representative of the quantified daily activity of the patient. An example of the difference in the activity patterns of these patients over days is seen in Graph 2. The activity levels of Patient 2 and Patient 5 remain consistently high. The activity levels of Patient 1 and Patient 4 increase while that of Patient 3 steadily decreases over a 4 week period.

4) Conclusions

- The results indicate that the new automated system is capable of long term patient activity monitoring.
- The next step is to determine the system’s ability to measure the time spent undertaking various activities at these locations during the day or a week. For example, the time spent walking outside of therapy hours or on weekends.
- The potential of the system to generate individual patient reports on a daily or weekly basis is being explored further.
- Ultimately, the aim is to generate a better understanding of early rehabilitation post stroke.

References


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