A Secure Wireless Telehealthcare Monitoring System and its Web Application

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RESEARCH SCOPE

Remote

Real-time

Wireless
Work Overview

• Research focuses on two important areas of healthcare; real-time remote patient monitoring and wireless medical device connectivity.

• Advanced real-time, wireless patient monitoring system with two-way audio/video transmission as well as vital signs.

• Real-time testing is underway at New Zealand Hospitals.
Blood Pressure Monitor
Limitations and Challenges

• Delay in alert/warning due to data transmission or real-time data processing

• Security and privacy of patient’s medical data and personal identification

• Rate of false alarms generating by diagnosis systems
Logic Diagram

- Pulse Oximeter
- BP Monitor
- Blood Glu
- Ear Temp
- Spirometer
- Body Temp
- BT
- Set-top Box
- WiFi or 3G
- Doctor/Specialist
- Call Centre
- Laptop/PC
- Smartphone/Tablet
- Accelerometer
Key Functionalities

• Set-top-box-data collection and transmission

• Vital signs-ECG, heart rate monitor, blood pressure, pulse and blood glucose meter

• Two way audio-video transmission

• Secure and user friendly
The System
Doctor-Patient Consultation

Remote patient monitoring
The Devices

1. Data receiver box - Set-top-box
2. Boso-medicus prestige BP Monitor
3. Nonin’s Onyx II finger clip oximeter
4. Accu-Chek Compact plus B Glu. Monitor
5. Omron’s Ear Thermometer
6. G-plus wireless remote thermometer
7. nSpire’s Piko-6 spirometer
8. Gulf Coasts Data Concept’s accelerometer X8M-3mini
Results

• The proposed system is tested offline using approximately 200 hours of patient data.

• The performance was measured using; true positive (TP), true negative (TN), false positive (FP) and false negative (FN).

• System has achieved an accuracy of 92.60%, sensitivity of 94.35%, specificity of 91.92 % and predictability of 81.81%.
## Results Summary

<table>
<thead>
<tr>
<th>Alarms</th>
<th>PROPOSED SYSTEM</th>
<th>Oberli et al.#</th>
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<tbody>
<tr>
<td></td>
<td>Diagnostic module</td>
<td>Datex-Ohmeda S/5 Monitor</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>117</td>
<td>104</td>
</tr>
<tr>
<td>TN</td>
<td>296</td>
<td>327</td>
</tr>
<tr>
<td>FP</td>
<td>26</td>
<td>82</td>
</tr>
<tr>
<td>FN</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Total Alarms</td>
<td>446</td>
<td>548</td>
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<tr>
<td>Accuracy (%)</td>
<td>92.60</td>
<td>78.64</td>
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<tr>
<td>Sensitivity (%)</td>
<td>94.35</td>
<td>74.82</td>
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<tr>
<td>Specificity (%)</td>
<td>91.92</td>
<td>79.95</td>
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<tr>
<td>Predictability (%)</td>
<td>81.81</td>
<td>55.91</td>
</tr>
</tbody>
</table>

Where TP is true positive, TN is true negative, FP is false positive, FN is false negative. The authors used TP and TN to calculate the sensitivity and predictability.

Conclusion & Future Work

• Our aim is to minimize current challenges and limitations, by using a remote patient monitoring system.

• Add more physiological parameters and devices.

• Currently, the proposed system is on-going clinical trial with more than 30 patients at New Zealand Hospitals.
Thank You