Abstract

This is a non-randomized, one-time measurement of HR and SpO2 of patients who present to the emergency department or outpatient clinics at UCSD. After providing consent, each participant was seated with both arms at the sides of his/her body and the forearms resting on their legs. Participant was instructed on how to place the index finger against the sensor on the back of MaximFAST, as shown below.

Study Design

Four sets of measurements were taken, as described below. A stable PPG waveform must be obtained for at least 10 seconds before the measurements are considered as valid and recorded.

1. Welch-Allyn Spot VS monitors, unit 1 (with Masimo oximetry) on left index finger and unit 2 (with Nellcor oximetry) on right index finger;
2. MaximFAST on both index fingers;
3. MaximFAST on left index finger and Welch-Allyn Spot VS monitor on right index finger;
4. Welch-Allyn Spot VS monitor on left index finger and MaximFAST on right index finger.

Results

During the study, it was noted that skin conditions, hand cleanliness, excessive motions from tremors, or underlying cardiac arrhythmia were all noted to affect MaximFAST’s ability to acquire stable PPG. Table 1 – Performance comparison of MaximFAST and Welch-Allyn units

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<table>
<thead>
<tr>
<th>Measurement</th>
<th>Left Index Finger</th>
<th>Right Index Finger</th>
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<tbody>
<tr>
<td>Measurement 1</td>
<td>Welch-Allyn unit 1</td>
<td>Welch-Allyn unit 2</td>
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<tr>
<td>Measurement 2</td>
<td>MaximFAST unit 1</td>
<td>MaximFAST unit 2</td>
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<tr>
<td>Measurement 3</td>
<td>MaximFAST unit 2</td>
<td>Welch-Allyn unit 1</td>
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<tr>
<td>Measurement 4</td>
<td>Welch-Allyn unit 2</td>
<td>MaximFAST unit 1</td>
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</table>

Data Analysis

For Maxim engineers to fill in

Conclusion

1. MaximFAST shows good performance in SpO2 measurement as its deviation is in the same limits of Massimo vs. Nellcor deviation.
2. The analyses above show that MaximFAST’s accuracy for SpO2 measurement can be estimated as less than ±3%.
3. MaximFAST can be used in a variety of clinical settings and in patients with various underlying chronic illness.
4. Collaborative study such as this provide development team potential challenges and issues that may encounter with end users.

Discussion/Future Directions

MaximFAST potentially have a wide range of possible applications, such as

a) Outpatient management of patient with chronic conditions such as asthma, COPD, and congestive heart failure (CHF), or post-transplantation, allowing for early intervention and avoiding unnecessary hospitalization;
b) post ED or hospital discharge follow-up;
c) Reduction of morbidity, mortality and costs associated with unnecessary hospital admissions/ readmissions

d) Provide much needed clinical tool in many resource-poor/limited areas of the world

Goal is to develop a device that is mobile, wireless, user-friendly, and capable of providing the entire suite of vital sign measurements (heart rate, SpO2, respiratory rate, and blood pressure).

Current and future collaborations between industry and academic medical centers will be essential for development of target end-user populations, potentially unexpected user issues, and product refinement

Acknowledgement

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