High-Resolution Physiological Data Acquisition in the CCU


OVERVIEW:

- Utilization of the continuously-generated data from physiological monitoring medical devices has been predicted to advance medical research and lead to improvements in patient care [1-3]; however, there is a lack of literature documenting the acquisition of high-resolution physiological data in live clinical settings.
- Medical Device Integration (MDI) solutions and Clinical Information Systems (CIS) typically implemented in healthcare facilities are designed for integration into Electronic Health Records (EHRs) and provide limited numeric snapshots of complex physiological data [1, 2].
- High-resolution physiological data is real-time subject data (numeric and waveform parameters) acquired from biomedical devices at frequencies ranging to greater than 500Hz.
- We present here the acquisition of high-resolution physiological data from 44 Philips Intellivue patient monitors in a Critical Care Unit using ViNES®, a software-based Biomedical Device Integration tool.

RESULTS:

- High-resolution physiological data was captured from 44 patient bedside monitors simultaneously in a live clinical environment.
- Initial measurements from a one-hour random sample of ECG bedside monitors show that 99.9% of data messages contain a sequential timestamp of the expected interval of 0.256 seconds.

AVERAGE PATIENT DATA PARAMETER PROFILE:

<table>
<thead>
<tr>
<th>DATA</th>
<th>EXAMPLE PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>500Hz</td>
<td>ECG Electrocardiogram</td>
</tr>
<tr>
<td>250Hz</td>
<td>ECG Electrocardiogram</td>
</tr>
<tr>
<td>250Hz</td>
<td>Arterial Blood Pressure</td>
</tr>
<tr>
<td>125Hz</td>
<td>Arterial Blood Pressure</td>
</tr>
<tr>
<td>125Hz</td>
<td>Arterial Blood Pressure</td>
</tr>
<tr>
<td>62.5Hz</td>
<td>Oxygen Saturation</td>
</tr>
<tr>
<td>25Hz</td>
<td>Respiration Impedance</td>
</tr>
<tr>
<td>1Hz</td>
<td>Arterial Blood Pressure</td>
</tr>
</tbody>
</table>

REFERENCES:


AREAS FOR INVESTIGATION:

- There is a limit on the Philips Intellivue Patient Monitor data output volume. Priority lists must be used to define data prioritization for expected waveform and numeric values exports.
- High-resolution data was accessed via software API, further testing is needed to understand capacity to stream real-time feeds to multiple processing endpoints.
- An additional 45 parameters were captured through Philips IntellivueBridge from other biomedical devices, including Maquet Ventilators, but further investigation is needed to confirm parameters and frequency.

CONCLUSION:

High-resolution physiological data is successfully being captured in a live clinical environment and is providing biomedical researchers additional visibility into subjects’ physiological status. This demonstration shows the feasibility of capturing high-resolution physiological data in intensive care units using a biomedical device integration tool. High-resolution physiological data acquisition is a viable option to support biomedical investigation in live clinical environments.

ACKNOWLEDGEMENTS:

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FURTHER INFORMATION:

ViNES® was developed by Wisconsin-based True Process, Inc. Contact Joe McCullagh at True Process for more information about technology and capabilities.

Disclosure: Joe McCullagh, Kristian Larsen, & Todd Dunsirn are employees of True Process, Inc. which developed ViNES®.