

Approaches to big data analysis of interface pressure measurements from continuous pressure imaging technology

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Introduction

Over 4.5 TB of data will be collected in a randomized clinical trial assessing continuous pressure imaging technology in reducing pressure injuries. To permit efficient analysis we examined different approaches to generating a reduced representation of the data that still produced similar analytical results to the full data set.

Objectives and Approach

Our primary objective was to develop an approach for reducing the pressure data to a manageable size, without loss of information. Frame by frame analysis of excluded participant imaging data allows us to identify changes in patient position. We explored different sampling frequencies (q5, 30, 60, 120, & 240 seconds) for analysis, coalesced frames with periods of stillness, and used correlation coefficients as a measure of similarity between adjacent frames to identify patient position changes. Heat maps and plots were used to evaluate the performance characteristics and usefulness of different sampling frequencies and correlation coefficients to compress the data.

Results

A sampling frequency q60 seconds provided reasonable representation of changes in interface pressure over time. This translates to using only 1.7% of the collected data in our analyses. When the threshold of correlation coefficient was set at 0.99 for coalescing the information based on position changes, then there was a maximum of 80 position changes detected. Therefore, approximately 160 frames q24 hours is sufficient to represent pressure states of participants at high risk of developing pressure injuries. In total we would require 480 frames (160*3) from 72 hours of collected data for our analyses without loss of position changes and pressure information. This represents approximately 0.185% of the data collected.

Conclusion/Implications

Decreasing the sampling frequency significantly reduced our data size without compromising resolution, while the use of correlation coefficients was effective at coalescing the continuous pressure imaging data. These methods of data reduction may be applicable to pre-processing large datasets obtained from other device monitoring technologies.

