

Cost-Optimal Patient-Specific Turning Schedule

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MOTIVATION: One of the biggest problems pertaining to care for patients is allocation of scarce nursing resources. The current standard for pressure ulcer prevention is to reposition at-risk patients every two hours. This level of attention is becoming increasingly unrealistic for already overworked nursing staff.

PURPOSE: We propose an algorithm for finding a nurse-effort optimized repositioning schedule for bed-bound patients based on their pressure image analysis and risk assessment of ulcer development.

METHODS: By sensing and analyzing the pressure on different body parts for each patient, it is possible to more accurately identify patients who need or do not need additional care in a given time window. We formalize the concept of nurse-effort and apply it to reposition scheduling by considering that certain position changes require more nurse efforts than others. Maximum pressure exposure is specified on a per-body part basis [1]. A novel optimization is developed that creates a safe repositioning schedule with minimum nurse effort and solved by using a graph-based approach. The schedule ensures that no portion of skin is exposed to dangerous pressure levels long enough to form a pressure ulcer.

RESULTS: We used data from a pressure mat [2] covering a hospital bed to compute a repositioning schedule for five healthy subjects. The experimentation includes (a) tracking ulceration risk for different regions of skin based on observed pressure, (b) using a posture-pressure model to assess risk based on a schedule of patient positions, and (c) calculating a schedule that minimizes nurse effort while keeping risk of ulcer at an acceptable level. Our proposed algorithm provides a sequence of next positions and the time of repositioning for each subject. Our results show up to 30% increase in the average time between repositioning over the standard schedule that indicate less nurse effort for the same outcome.

CONCLUSION: Our patient-specific turning schedule minimizes the overall cost of nursing staff involvement in repositioning the patients while simultaneously decreases the chance of pressure ulcer formation.

REFERENCES:

[1] Ostadabbas, R. Yousefi, M. Faezipour, M. Nourani, and M. Pompeo, "Pressure Ulcer Prevention: An Efficient Turning Schedule for Bed-Bound Patients," IEEE/NIH Life Science Systems and Applications Workshop (LiSSA'11), pp. 159–162, 2011.

[2] "Vista Medical Ltd." <http://www.pressuremapping.com>.