In this paper, the performance of two non-invasive sensing modalities, electrical bioimpedance (EBI), and skin strain sensing, for the automatic detection of IV infiltration was investigated in an animal model" Bicen et al (2018).

Abstract:

Intravenous (IV) therapy is prevalent in hospital settings, where fluids are typically delivered with an IV into a peripheral vein of the patient. IV infiltration is the inadvertent delivery of fluids into the extravascular space rather than into the vein (and requires urgent treatment to avoid scarring and severe tissue damage), for which medical staff currently needs to check patients periodically. In this paper, the performance of two non-invasive sensing modalities, electrical bioimpedance (EBI), and skin strain sensing, for the automatic detection of IV infiltration was investigated in an animal model. Infiltrations were physically simulated on the hind limb of anesthetized pigs, where the sensors for EBI and skin strain sensing were co-located. The obtained data were used to examine the ability to distinguish between infusion into the vein and an infiltration event using bioresistance and bioreactance (derived from EBI), as well as skin strain. Skin strain and bioresistance sensing could achieve detection rates greater than 0.9 for infiltration fluid volumes of 2 and 10 mL, respectively, for a given false positive, i.e., false alarm rate of 0.05. Furthermore, the fusion of multiple sensing modalities could achieve a detection rate of 0.97 with a false alarm rate of 0.096 for 5mL fluid volume of infiltration. EBI and skin strain sensing can enable non-invasive and real-time IV infiltration detection systems. Fusion of multiple sensing modalities can help to detect expanded range of leaking fluid volumes. The provided performance results and comparisons in this paper are an important step towards clinical translation of sensing technologies for detecting IV infiltration.

Full Text

Reference:

Bicen, A.O., West, L.L., Cesar, L. and Inan, O.T. (2018) Toward Non-Invasive and Automatic

Intravenous Infiltration Detection: Evaluation of Bioimpedance and Skin Strain in a Pig Model. IEEE Journal of Translational Engineering in Health and Medicine. April 3rd. .

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