Aim: Chemotherapy can be safely administered at home through chronomodulated delivery over the 24 hours via a programmable pump, with improved tolerability and efficacy (Levi F, Annu Rev Pharm Toxicol 2010). The purpose of the study was to further increment safety through the detection of early warning signals predicting for hospitalization through daily telemonitoring of multidimensional objective and subjective data.

Methods: Telemonitoring involved daily self-assessment of body weight, symptoms (M.D. Anderson Symptom Inventory, MDASI), and recording of circadian rest-activity rhythm through a wrist accelerometer (AMI). Data were received in a server, and visualized daily by the medical/nursing staff using a web app. Alarm thresholds were adjusted according to body weight loss, weighted MDASI symptoms according to sparse linear discriminant analysis SLDA, and dichotomy index I<O, a measure of circadian disruption corresponding to the percentage of minutes In-bed with activity being lower than the median activity Out-of-bed (Innominato P, Cancer Res 2009).

Results: 37 patients (Male/Female, 57% / 43%), aged 35-91 years were followed for a median duration of 63 (34-246) days from October 2011 to August 2013. The majority of patients had been previously treated for metastatic cancer of the colon (43%), pancreas (26%) or breast (13%). Out of 98 chrono-chemotherapy courses at home (1-16 per patient; chronofOLFIRINOX for 46% patients), 12 led to emergency hospitalizations in 6/37 patients (16%). Hospitalizations lasted a cumulated span of 72 days (2-9 per patient) among 2330 patient-days on study (3.1%). Retrospective analysis identified 3 relevant alerts within the 7 days before hospitalization: body weight loss ≥5%; I<O <95%; and a linear combination of weighted MDASI scores >4. The combination of circadian disruption and high weighted MDASI score predicted hospitalization for 4/6 patients (67%) and occurred in 0/31 non-hospitalized patients (Fisher’s exact test p < 0.003).

Conclusions: Multidimensional telemonitoring of circadian rest-activity rhythm and weighted symptoms provided effective detection of risk for emergency hospitalization in patients on chronomodulated chemotherapy at home. These biomarkers are integrated for validation in a multicenter patient-centered prospective assessment of domomedicine (PiCADO).

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