Predictive Monitoring of Mobile Patients by

Combining Clinical Observations With Data From Wearable Sensors

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**SUMMARY**

The paper is all about monitoring 200 mobile patients in a postoperative ward of

the Cancer Centre, Oxford University Hospitals NHS Trust,Oxford, U.K. Patients were discharged to the ward following upper-gastrointestinal (GI) cancer surgery by constituiting explaining the terms E-health, novelty detection, personalized monitoring,

predictive monitoring. Data collecting was possible in two systems :

* 1. Existiing Manual Monitoring : Clinical guidance in the U.K. [6] recommends the regular observational recording of vital signs, combined with the use of early warning score (EWS) systems.The disadvantages are :
     1. Error rate associated with manual scoring, especially in the high workload setting of a high-dependence clinical ward.
     2. The EWS assigned to each vital sign, and the thresholds against which the scores are compared, are typically heuristic.
     3. Each vital sign is treated independently and correlations between vital signs are not taken into account.
  2. *Continuous Wearable Monitoring : Continuous wearable monitoring devices are widely available, despite the disadvantages of high false alarm rates.Devices that were used : ECG for HR, Mobile Pulse Oximeters for the acquisition of PPG.*These wearable devices were configured to communicate via Bluetooth to a patient-worn PDA, which collected ECGat 256 Hz and the PPG at 75 Hz. These waveforms, along with derived estimates of HR and SpO2 , were transmitted to a central server via wi-fi.

But with those existing data it is typically insufficient for constructing accurate models of these failure states, because the data were obtained from a small number of patients, with differing comorbidities, lifestyles, etc.

**INSIGHTS :**

**Applied methods :**

This paper compares four methods of performing novelty detection:

two discriminative methods (using 1#one-class SVMs and 2#one-class GPs) and two generative methods (using 1#Gaussianmixture models, or GMMs, and 2# a kernel density estimator). In the SVM based approach a novel parameter selection technique is needed to describe which is suitable for training the model for novelty detection with patient physiological data.

All available data, both manual observations and those from patient-worn sensors when available, are provided to each of the candidate algorithms.Where data are missing or incomplete, missing channels are not provided to the classifiers, but replaced by the mean of that channel.

The SVM using the proposed optimization method achieves the highest accuracy and partial AUC in comparison to the other methods when evaluated using the independent test data.

By observing two emergency patients data while fighting with death , EWS system showed the same result.The novelty detection methods are used to classify the continuously acquired data from wearable sensors identify deterioration in abnormal patients, which is not identified by existing manual methods. This demonstrates that predictive monitoring is feasible using mobile sensors and offers significant advantages to manual observation of the patient, which is the current standard of care in many hospitals.

**Conclusion:**  
Due to the difficulty of collecting physiological data, advances in principled approaches to predictive patient monitoring was limited. The devices used to collect data were put off frequently for patient comfort or even nurses forgot to put on again. Data-dropout was another issue such as interruption in hospital WiFi service. Nurses could change ECG batteries in 24 hours because of shorter battery life and this deemed unrealistic for clinical practice.  
  
  
This type of automated methods can be used to identify patient deterioration, fulfilling the aim of predictive monitoring, and automatically parse the large quantities of data acquired from the trial. This research also shows that such methods accurately identify “abnormal” physiological data, arising due to patient deterioration, which makes mobile approaches

to predictive monitoring more realistic.

1. What is new in this paper?

-> Novelty detection of patients data and methods of getting abnormal physiological data due to patient deteriotation more accurately which make predictive monitoring more realistic.

2. What is the unique advantage of the proposed/implemented method?

-> This paper compares four methods of performing novelty detection:

Two discriminative methods : (!)one-class SVMs

and (!!)one-class GPs.

Two generative methods (!)Gaussianmixture models, or GMMs

and (!!) a kernel density estimator).

3. What is your unique contribution in this direction?

->After reading the paper thoroughly, the only problem I noticed is insufficient number of patients . Accuracy of predictive monitoring could be more precise and sharp if the number of patients more than 200, at least 1000. The entire work got complex because of early released patients. Blank space was filled with average means and had to divide 200 patients in many categories.