Defining Process Capability Indices for Time Series Data from Patients with Chronic Diseases

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Adherence to long term therapies has been recognized as a major problem. Several quantitative measures have been developed to track the wellbeing of patients with chronic diseases. Most measures are however subject to high random variations. Many statistical techniques have been developed in signal processing for detecting abrupt changes. These techniques are being applied to a number of areas such as quality control, navigation and seismic data processing. Statistical process control is widely used to track time series data with the aim of achieving stable and capable processes as well detecting early signs of deterioration. An overall index of performance calculated using these charts is named process capability index and serves to quantitatively assess the overall performance of a process in terms of both variability and adherence to upper and lower specification limits. It is widely used in industry to determine whether a process is capable of generating results that meet requirements. To our knowledge, although statistical process control has been applied to a number of medical problems, the process capability concept has not yet been used. The aim of this paper is to introduce this concept for chronic diseases and argue that it can be a useful index for monitoring since this is similar to a quality control problem, In this case, the doctor and the patient cooperate to adjust several parameters (e.g. diet, medication, exercise) in order to achieve a process that delivers satisfactory physiological results. The process capability is used for continuous improvement in industrial processes. In this way, it is possible to document and standardize the improvements made to a process. In the chronic disease context, it can be a valuable metric for disease management by both the patient and the doctor in addition to instantaneously measured quantities.