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Progress Away From Evidence based Medicine to Discovery of Dynamic Principles of Disease and its Treatment

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Abstract: *Background*: Medical science in the form of "evidence based medicine" demands when measuring any object that object be isolated from others, from context, from the method of measurement and from the observer. Linear non changing relations amongst variables are thus defined which allow prediction based on probabilities and define information from the resulting statistic. *Method and Result:* It was hypothesized that information of a non statistical nature could be sought in the individual patient. Fuzzy logic and the geometry of fuzzy theory were considered as viable methods for discovery of the process of disease and response to treatment. The result is that variables of interest are allowed to intermingle with others, their context, and the dynamic of these interactions is measured in such a way that the measurer and the measured coexist in each instant. Conclusion: Isolation as a principle of scientific measurement need not be a requirement for attainment of medical knowledge.

I. Introduction

"Evidence- based medicine" has become the criterion for "standard of care". It is the practice of medicine based on statistical information obtained through the application of probability theory to clinical and basic science research. The principle of clinical decision in this form is prediction.

Statistical information is different from any principle underlying biologic and physiologic processes. These latter are directly applicable to the diagnosis and treatment of any patient. They instantiate a self developing dynamic by which a changing character of interactions of elements and their conditions manifest in the state of the patient. We outline in this paper an alternative approach to medical science that provides non statistical information.

II. Isolation versus Interaction

The primary criteria met by science today are that of "isolation" of variables from one another, the observer and his/her method of measurement from the variables and the variables from their context. This method has as its aim prediction. It uses a gambling model, that of probability theory, whose basic assumptions can be found in binary logic and Cartesian space. They rely on non dynamic but certain interrelations amongst variables, their context and

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the observer. In a series of papers focused on medical diagnosis and treatment, we consider an alternative approach to science, an approach which rather than seeking prediction, aims to understand the process of a dynamic self development of disease and response to treatment. The principle(s)of this dynamic define expectation.

III. The Unit Hypercube and Change

Fuzzy theory has a geometric space which is the unit hypercube. The unit hypercube is perfectly asymmetric. That means that when any two points are considered, their surround is different. This means they have a different symmetry. [1] As suggested by Zadeh and developed by Kosko, the geometric space of fuzzy theory can be used to represent systems of variables. We say that it represents the medium of change. Systems imply interaction, and symmetry breaking implies change. The basic fuzzy measures of fuzzy cardinality and subsethood are the result of variable interaction. When summed the variables define the size of a fuzzy set system. When fuzzy subset hood is measured, it defines the interaction between two fuzzy sets is defined by fuzzy entropy, itself derived from an interaction between the elements and their complements. When two fuzzy sets are considered, the change from one to another can be defined by the change in their respective fuzzy cardinality and surrounding symmetry. Thus, if you want to discover the dynamics of variable interactions, fuzzy theory offers an approach that will provide this type of information. [2,3]

IV. Measuring Clinic Dynamics

With fuzzy measures of symmetry breaking and subsethood the state of the individual patient can be captured over time and this dynamic can be compared to that of other patients. The comparison discovers the dynamic principle of variable interplay within the given individual patient. The principles of the dynamic change of the given individual's clinical state, his response to treatment, to disease, can be understood within this framework and the physician can make an informed clinical decision.

V. Fuzzy Time Space

The dynamic of perception can be represented within the fuzzy time space of the doubling unit hypercube.[4] With each doubling of the unit hypercube volume, each object or set as point has the capability of becoming more fine tuned as to the representation of its elements and the addition of other elements. This fine tuning can occur 10 fold when the symmetry of one object or fuzzy sets representation can no longer be broken. At each doubling, the measure of the set as point and its fuzzy entropy change. This dynamic is intrinsically related to perception of the observer and the anatomy of cortical computation.

VI. Measuring the Clinical State and its Dynamic

Science now states that the measured object must be separated from everything else, including the measurement process. Experiments isolate variables from one another, their context and the measurement process. Probability theory its statistics produce a result that exists out of time. The probabilities measured are not performed in the same time frame as the thing being measured, so there is no interaction between the measuring process, taking the probability, and the object(s) being

measured. Out of time means no dynamic.

Fuzzy theory on the other hand allows for a dynamic measurement to take place in the same time frame as the thing being measured changes from one instant to the next. In studying any patient's clinical state, the representation of that patient as a fuzzy set system allows his / her variables to interact with each other and with their context, and the measured interaction define any process that occurs in the same moment as it is measured and can do so continuously. The observer's perception and method of measurement is intrinsically bound to the instantaneous discrete representation of that object in the mind of the observer who measures. In this process the measurer and the measured object have to coexist in the same instants over and over again. In the real world each observer is unique and every measurement is uniquely attached to that person.

The appreciation of the course of clinical disease and its treatment will have to rely on the experience of the individual patient and his/her physician. Statistical information in this regard is not a good match for the dynamic process of clinical change and its measurement.

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