

## Medicine of Complexity: the Modern Internal Medicine

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### Abstract

Complexity bears its methodological and doctrinal contribution to the general health and medical assistance management, as well as to the clinical context and medical training. Internal Medicine possesses the cultural and methodological tools to confront the challenge of complexity which modern medicine.

The science of complexity has suggested an alternative model in which the disease as well as the patient's general well-being are the results of a complex interaction between various elements of the entire system, dynamic and unique, in the individual. *Clin Ter 2010; 161(1):9-11*

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In the evolution of basic and applied medical science, and with the progressive specialisation of medical knowledge, Internal Medicine is taking on a more and more fundamental role. Contrary to popular belief, it is just this widespread view of clinical problems and methodological tools which gives Internal Medicine the power to tackle the challenges of modern medicine, on both a diagnostic scheme as well as on a therapeutic level, with a holistic and multidisciplinary approach and a wide field of vision (1, 2).

It has been said time after time that Internal Medicine is the medical care of complex patients, or rather the medicine of complexity, and is, nevertheless, not always defined based on the precise meaning of the terms. Consequently, it is still necessary to have a few appropriate specifications. The *Società Italiana di Medicina Interna* (SIMI, 1994) has termed the branch of Internal Medicine as that of conceptual and operative field which concerns the understanding of the disease of the organs and systems, susceptible to interact among themselves and to directly alter the physiological parameters of the body; that clinical activity which suggests the pathological phenomenon of the disease, considered to be holistic as a whole and not as an array of organs/systems to be studied separately. Furthermore, the operations of Internal Medicine are the functions realised by Medical Clinics, Internists, who are physicians not possessing all

the necessary medical knowledge, but rather physicians who know how to make use of the methodology which allows them to globally assess the problems of the diseases in question. Lastly, if it has been proven that the specialisation and the division of the scientific field are indispensable – in order of necessity of a closer nosography examination and a more intimate knowledge of the diagnostic and therapeutic scientific equipment – the pathology of a single organ/system as detached from the entire body can not be assumed. This having been said, two substantial elements have emerged: conceiving an individual patient as unique and inseparable, and putting the clinical methodology before the patient as fundamental in the approach.

Defining the concept of *complexity* is not so simple (3). Nowadays, the very expression of “complexity” is being used, not as a clarification, but rather as an incapacity to describe the confusion in the problems and the issues themselves; “complex” meaning difficult to understand; “complex” meaning chaotic and, in this sense, impossible to define and to analyse (4). However, there has been a conceptual transformation in modern scientific thought taking place in the last few years; that which the historicists of this idea and the epistemologists describe as *a change in the paradigm of knowledge* (5). The red line which has led to this change in the representation of modern scientific thinking (6) and marks the end of classic rationalism, as coherent as it is simplified, and the beginning of an ontologically self-sufficient concept where the subject is placed at the centre of observation, thus allowing for a complete analysis. In fact, Morin replaces the concept of object, or the *system*, with the undoubted advantage of studying, not only individual object-subject, but the *complex systems* (6). More specifically, composite systems organised in a way according to a structure in which the interactive elements constitute a global entity; a system that is more than the parts it is made up of (and sometimes less) in a huge process of adaptation to external events. A principle of *feed-back* and *feed-forward* intended as elements capable of allowing for, from time to time, the possibility of adaptation, transformation and maintenance of the integrity, homeostasis and well-being

of the patient. These concepts are determining profound repercussions within the realm of the medical profession, introducing multidisciplinary work methodologies infused in integration, implementation and contextualisation (7). In this broad area, *complexity* bears its methodological and doctrinal contribution to the general health and medical assistance management, as well as to the clinical context and medical training. For example, the traditional approach to problems in the healthcare system through individual effort and personal involvement is no longer adequate. The system, which actually represents a complex adaptation, must act simultaneously in which evolution, adaptation, flexibility and change all represent a cornerstone on which to establish and to realise the course of healthcare assistance, both in the daily operations and in strategic planning. The complex nature of present day healthcare must adapt itself to the ever increasing demands, such as the distinction between the clinical pictures of nosography, which is becoming more and more unexpected. Therefore, a certain degree of unpredictability must be accepted and sustained in order to attain flexible solutions to the models and the opportunities which emerge. This reinforces the conviction that, as far as *complexity* in medical assistance management is concern, the *performances* are optimised in as much as the work is specified in minute details and that it is also articulated into distinct operative units. Also bear in mind that however much this is sustained, it cannot be supported by Clinical Physicians, Internists and Practitioners within the complex adaptive system to carry out activities of coordination, integration nor cooperation among the different elements within the specific areas of sectorial specialisation. As a third aspect of this vast issue, it is the very Complexity in Medicine itself which has lead to the profound change in the context more specifically represented by clinical practice (8, 9). The fact that the human body is composed of interconnected and interactive physiological systems has already been stressed, while each person carries on with a determined behaviour following a set of rules, improving on it little by little based on experience and the ability to adapt to and interact with the environment. Thus this individual, as a dynamic, interactive, variable and adaptable system in which the disease, and more importantly the polypathology, triggers a pattern of cause and effect which cannot be considered as linear. A consequence of this is that the cause-effect pattern, which is no longer valid and is even less validated by modern medical science, occurs less often and can determine a complex situation in which a diagnostic uncertainty still exists. Based on this argument, even the *Evidence Based Medicine* must, in various practical daily situations, deal with the structure of the clinical picture presented by the individual patient. This clinical experience has taught us that the approach to clinical problems is rarely simple. The science of complexity has suggested an alternative model in which the disease, but also the patient's general well-being, are the results of a complex interaction; interactions between various elements of the entire system, dynamic and unique, in the individual under examination. This is the holistic approach mentioned earlier, which takes into account the unpredictability and proposes solutions on the basis of elements which are at times imperceptible, yet emergent to the clinical sensibility of Internists. The fourth, and last, aspect described is represented

by the complexity in the field of medical training. Degree programs in Medicine and Surgery have been undergoing a marked transformation for some years now. The traditional system of education and training largely based on clinical knowledge, with the acquisition of theoretical and practical competence geared towards a specialisation in knowledge, practical abilities and aptitude (*to know, to know how to do, to know how to be*) is now being achieved by an educational system which meets the needs of actual reality. This reality is well-structured and complex, arising from an increase in the demands for better health, a longer average life span, a rise in the polypathology and fragility, as well as pressure from the industries and the field of non-allopathic medicine. This is why medical training and education also falls within the complex system, in which, and above all, the professors must be able to adapt to the changes and to the continuous retraining of their cultural and professional resources. Teaching not only implies knowledge passed on to the students, but more importantly, refers to the quality of communication with the students in order to provide an education with competence, with the ability of assessment, the willingness to change, and the adaptability to the variations integral to the complex systems (10, 11). Nowadays, to become a *medical expert* does not require one to know everything; more realistically, it signifies the ability and knowledge of methods and tools, as much intellectual as technical, in order to reach an adequate and conscious cognizance; to know how to be an observer and critical reader; to be able to correlate various fields of competence which, at times, may seem to be far from relevant to each other.

A profound transformation, as much intellectual as practical, as illustrated, can only lead to new rules and models, which in appearance only, can be the object of a certain resistance, at least in the beginning. In other words, the "old" rules used to be followed without having been explicitly shared nor logically expressed when applied to interpersonal, or rather inter-institutional relationships. Given these facts, everyone is, almost "by nature," inclined to follow his own models and to operate on the basis of his own convictions, which are usually limited and not highly modifiable. On the other hand, a complex system, as emphasised many times before, sees the adaptation and change as an instrument which is not in the least opposing, but rather as an element of added value expressed by a constant increase and improvement with time, greatly directed towards obtaining results. These concepts, which could theologially be considered as elements of a paradox, serve as operative tools which, when implemented with analytical and objective criteria, guarantee the improvement of this very system. Additional elements characteristic of the complex system, a conceptual plan that is not at all new, are represented by their non-linearity, their unpredictability with time, and the presence of their intrinsic characteristics. In fact, their interactions within the complex system can favour a new typology of classification, innovation and progress. This, together with the conditions described today in terms of *margins of chaos*, is interpreted as a union of circumstances inciting adaptive behaviours (12). In conclusion, the preparation and the guidelines of clinical application in the last analysis, as assistance to patients with polypathology and with complex social issues, the co-ordination of the *clinical governance* of public health,

the planning and development of didactic processes and the implementation of practical internships are all examples of concrete references to a context which is currently being defined as the *area of complexity*. Gaining greater certainty and consensus will allow us to shift our activities towards the area of simplicity which arises as a shared goal. While at the same time, the adaptation to the complexity and the understanding of its intrinsic solution, even when it brings us to the opposing area – that of *chaos* – can still supply us with the methodological tools, because from *chaos tout court* we can discover the area of deterministic *chaos* – aimed at deriving elements of intellectual enrichment and operative tools for the purpose of achieving the predetermined goal.

This thesis has begun by asserting that Internal Medicine possesses the cultural and methodological tools to confront the challenge of complexity which modern medicine has put before us. In this case, if modern medical science requires an adequate approach to the articulate conditions which have been extensively discussed. This editorial should serve to briefly illustrate a new cultural aspects of an old profession and a new methodological perspective which modern Internal Medicine is now facing as it continues along the course of healthcare assistance, in medical training and research, with the certainty of achieving what is expected of it. Fur-

thermore, it aims to operate to the best of its capabilities for the common good in the name of scientific progress.

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