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Opinion paper

What is clinical nutrition? Understanding the epistemological foundations of a new discipline

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SUMMARY

Background: Although the therapeutic and economic efficacy of nutrition has been proven, optimal nutritional care is still scarce among hospital and ambulatory patients. Thus malnutrition is still highly prevalent. We identify as an underlying cause the absence of a common understanding of clinical nutrition as a discipline. The aim of this paper is to establish the epistemological foundations of clinical nutrition and to characterize it as a science.

Methods and results: From the standpoint of historical epistemology, we examine the historical conditions that determine i) the main object of knowledge, ii) the nature and iii) domain of this science. Our hypothesis is that clinical nutrition as a science was formed in the second half of the twentieth century as an outcome of the integration of medicine and nutrition and underpinned by a primary transformation of the "nutrient" concept. We identify malnutrition as the primary practical and research domain of knowledge.

Conclusion: Clinical nutrition is an autonomous empirical science that can be characterized as a basic and applied science. Its wide multi-disciplinarity guarantees its future.

1. Introduction

The link between humans and food has been studied since Antiquity. In fact, human beings have learnt that their environment, especially food, can interfere with their health. Nutrition is now recognized as a determinant in chronic and acute diseases. The efficacy of nutritional care has been extensively documented, and has enabled improvement in nutritional and biochemical markers, quality of life and reduction in mortality, morbidity, as well as in the length of hospitalization and rehospitalizations. Moreover, there is growing evidence that nutrition may contribute to the cost-effectiveness and financial sustainability of health care systems [1]. Nevertheless, malnutrition is still highly prevalent in hospitals but also in ambulatory care clinics, among children, adults, and geriatric patients [2].

Researchers have proposed reasons to account for the persistence of inadequate nutritional care and the prevalence of high malnutrition. Academic arguments range from of the absence of full recognition of clinical nutrition specialists, difficulties in implementing national educational programs in medical and other health care professionals, to lack of faculty expertise in nutrition in medical schools and training. Other practical factors include the lack of consistent criteria for diagnosing malnutrition, a lack of confidence when addressing nutrition issues as well as inadequate attention to the nutrition support of hospitalized patients [3]. Economic factors have also been reported, such as the heterogeneous nature of coverage or reimbursement of nutritional care products and services across countries [1].

Given that the impact of malnutrition is well-known and that the efficacy of nutritional care has been proven, one may wonder why it is still so difficult to overcome those difficulties. Our hypothesis is that there is a widespread and deeply rooted problem: the lack of a common understanding of clinical nutrition as a science. In fact, "clinical nutrition" is not a new phrase: it has been used in scientific research publications for the last 60 years at least. The phrase was first used to refer to the application of nutrition principles to the specific field of "clinics" [4]. The concept of "clinic" (*klinein*, lying down) is originally related to the physician's practice at the patient's bedside (i.e. all medical activities in connection with

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patients). Thus we may raise the following question: is clinical nutrition to be considered only as the application of the science of nutrition to "clinics"? If so, this implies that we consider clinical nutrition to be a sub-discipline of nutrition. On the contrary, we think that clinical nutrition is an autonomous discipline: an outcome of the integration of medicine and nutrition, underpinned by a primary transformation of the "nutrient" concept. In this paper, we will therefore attempt to characterize clinical nutrition as a science and to define its epistemological foundations.

2. Method

Epistemology is the area of philosophy that investigates the foundations and the limits of human knowledge. It aims to characterize existing sciences in order to assess their value – in particular to decide whether they are entitled to approach the ideal of a ascertainable and genuinely justified knowledge [5]. To achieve this objective, epistemology describes how a given scientific discipline provides and develops its theories and gauges the logic and cognitive value of such theories. In our study, we draw on the French approach, especially the methodology of "historical epistemology", with a view to answering three fundamental questions: i) How was clinical nutrition established ii) What are the object and the domain of this science? iii) What is clinical nutrition?

3. The origins of clinical nutrition

In order to understand what we consider as clinical nutrition today it is necessary to look for its epistemological foundations. For this purpose, we have searched the history of sciences for the events that favoured the emergence of this discipline. We identified as the main key fact the primary transformation of the "nutrient" concept achieved as the result of the progress and expansion of medical and human nutrition knowledge. In fact, the concept of the nutrient evolved in the second half of the 20th century to the point of being understood as a *medical or artificial* nutrient capable of feeding the sick patient while facing new challenges and adapting to evolving medical practices (i.e., new medicines, surgical techniques, technology and facilities). Hence, the clue to understanding the origins of clinical nutrition is to examine the causes of its transformation in the last decades of the 20th century.

3.1. The nutrient from pre-scientific to scientific era

The first conceptual idea of the word "nutrient" can be found in Aristotle's biology [6]. Indeed, for Aristotle there was a substance extracted from food that after becoming blood could turn into any part of the body. This notion evolved in the XVIII century after the chemical revolution brought about by the works of Antoine-Laurent Lavoisier, Joseph Priestley and Carl Scheale, which demonstrated the true nature of oxygen and the process of oxidation [7]. However, throughout the 18th century as in Ancient times, food was seen as being constituted of a *single universal substance* called the "nutrient". Indeed, the word nutrient, from the Latin *nutrimentum* (any food substance which serves as nutrition), was defined in 1854 by the doctor Lucien Corvisart as a "food substance that can be assimilated directly." [8] The role of a nutrient was then to be assimilated. This transformation, which involved biochemical pathways, allowed the nutrient to maintain its nutritional status, and therefore to contribute to health. The work of the English chemist William Prout in the 1830s brought about the notion that there was not just a single nutrient but a variety of nutrients (fat, carbohydrates and proteins) in food. For the next hundred years, the history of the science of nutrition was then marked by the discovery of most of the nutrients and their specific physiological functions. As a consequence in the first decade of the 20th century, "dietetics" was established as a separated paramedical profession in America, to help the government make optimal use of Armerica's food resources in wartime. In Europe, dietetics was later developed also as an instrument of state policies. Thus, nutrition became a political concern rather than a scientific priority [9]. This is illustrated by the lag in the progress of nutrition in the clinical setting.

The way of feeding the sick changed with the emergence of modern hospitals in Europe [10]. The new design of the hospitals, introduced by the political and social changes that occurred after the French Revolution in the nineteenth century, went beyond the notion of a hospice for the poor. The architecture of the hospital was now based on therapeutic and hygienic principles. Hospitals became a privileged spaces for medical education. In fact, the hospital setting favoured the advances of clinical sciences because a significant number of patients could be observed, studied (and compared), and because the hospital made it possible to conduct autopsies and thus develop anatomopathology. In that context, the religious meaning of feeding (as an act of charity) that had prevailed until then was replaced by medical feeding based on Hippocratic dietetic principles. However, doctors rapidly lost interest in diet and abandoned the feeding care and research on nutrition, leaving it in the hands of hospital administrators. And indeed, administrators in the nineteenth century did recognize nutrition in the clinical setting to be important: nutrition could reduce the length of patients' stay at the hospital, speed up convalescence, prevent rehospitalisation and diminish the cost of care [11].

3.2. The nutrient from the 20th century

In the first half of the 20th century, nutrition was defined as "the science of food (and the ingredients of food known as nutrients), and its relation to health" [12]. The aim of this science was to contribute to the well-being and public health conditions. Nutritional care in the hospital and other medical settings was scarce. For decades, dietary practices in clinical settings relied on outdated principles. For example, while human nutrition science had already determined the principal nutrients and the notion of daily ratio and calorie needs, patients were still being fed according the ancient principles of an "absolute diet", ignoring all notions of quantity and quality. Thus, there was a gap in the advancement of knowledge between public health research and the clinical field.

In the post-war decades, doctors slowly developed a new interest in and expressed concerns about the feeding of hospitalized patients. Feeding patients in various situations while coping with the progress of surgical techniques and other medical interventions became a real challenge. In fact, such situations, leading to undernutrition, had an impact on morbidity and mortality. In 1932, Cuthbertson had described in detail the metabolic responses of four patients with lower limb injuries [13]. In 1936, the surgeon HO Studley had published a statistical analysis that quantified the relationship between weight loss and mortality. He demonstrated that a reduction of more than 20% of body weight resulted in a postoperative mortality rate of 33%, while a group of patients with a weight loss of less than 20% had a postoperative mortality rate within 3% [14]. In 1947, it was recognized that the quantity and quality of food could distinctly influence the outcome of infectious diseases, surgical or traumatically wounds, burns and blood loss [15].

Thus, the challenge was to feed the patients by any possible route (i.e., oral, enteral or parenteral) to prevent malnutrition and modulate the metabolic response to injury. However, technically the parenteral route was impossible to perform, which triggered extensive research on the subject. In the 1960s, the prevailing dogma was still that "feeding entirely by vein is impossible; even if