Reflections on the main epistemological currents regarding health sciences

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Technological progress in science is remarkable and undeniable, especially regarding the health area. Financial investments in this sector have exponentially grown in relation to the early 20th century, and even work-up and therapeutic methods available to health professionals are based on scientific statements, theories and laws.[1] However, such technological increment was only possible thanks to deep philosophical reflections throughout time and that were often conflicting.[2,3] It becomes relevant to know the main philosophical conceptions and their influence on the evolution of health sciences, which allows a better understanding of their dynamism and fallibility.[1-3]

Philosophy can be defined as the study characterized by human intention of widening its knowledge about the reality, in order to comprehend it as a whole, whether in materialized and/or imaginary real "Being", whether in the definition of instruments able to corroborate a thought, a fundament, a law or a principle. A digest, defined as a detailed description about facts, between philosophy correlations and the scientific method, allows us to see that throughout time the philosophical thinking was established in different currents with peculiar definitions and foundations, which, however, as a common sense, harmonize and complete such differences.[2,4,5]

Despite the line of thought called logical positivism or logical empiricism having been initially created by mathematicians and physicists in Austria around 1920, Comte was its main character. Comte's positivism was based on the principles of logic and mathematics as foundations for knowledge or confirmation of hypotheses, since they established rules independent of experience. For Comte, even general statements and scientific laws could be obtained based on observation or induction of a phenomenon, whether it was natural and/or experimental.[2,6]

However, positivists faced several criticisms that were based on the fact that every scientific observation is immersed in theories, such as, for example, measuring temperature with a mercury thermometer, whose principle is that all metals dilate when their temperature increases. And, due to the possibility that observations could incorporate fallible theories, it would not be possible to consider them as safe sources to build knowledge, neither as a solid foundation for scientific development.

Validity of inductive reasoning was also questioned, since induction is not a deductive argument and, therefore, is not logically valid. The main example is that before the first confirmation of the existence of black swans, it was believed that all swans were white. Induction could not, therefore, be justified neither by logic, nor by experience.[2] Even the practice of scientific evidence stresses that one should be careful about conclusions based on personal experience, independently of professional population and of the individual's scientific knowledge.[1]

From those reflections Popper's critical rationalism was developed, based on the attempt of

achieving truth about the scientific method and general knowledge without only involving induction, which could be possible using as principle that observations could only be used to refute (deny, reprove) general statements, not being possible to evolve any knowledge whose theories were not open to criticism and refutation. Popper also defined that statements potentially able to contradict a law or theory would be called potential falsifiers and that the group of such falsifiers would serve as a parameter for the empirical content of the theory: the more the theory "prohibited" them (they are now identified as exclusion criteria), the more it would tell us about the world.[2,7] Therefore, scientific criticism is crucial for scientific progress.[1,8,9]

Finally, Popper claimed that the level of corroboration (acceptance) increased when we moved from older to more recent theories and researches in the following manner: search for knowledge started with the formulation of hypotheses that aimed at solving problems and that should resist the most rigid tests as possible. In case they did not resist, hypotheses would be refuted and replaced by others, which would also be tested and so forth.[2,7,10] Hence the importance of continuity in research, of detailed method description, of statistical analysis of results and study publication.[2,7,11] However, it is important to understand that, even after they are confirmed, hypotheses should be accepted as temporary solutions for a given problem and that, similarly, their refutation will always be conjectural, since there might have been an error in observation, experiment or even a random error.[2-4,9]

Popper was criticized by the current called "the new philosophy of science," represented by Kuhn, Lakatos and Feyerabend, who claimed: "statements and tests are impregnated with theories; we usually test complex theoretical systems, and not isolated hypotheses."[2,4,12,13] For Thomas Kuhn, in *The Structure of Scientific Revolutions* (1962), the mere observation of a given theory incompatibility or refutation would not justify its abandonment by the researcher; on the contrary, he should analyze maturely the criticisms and unconfirmed results to save his theory, only justifying such attitude when faced with the following facts: significant discrepancy between predicted and expected, accumulation of anomalies found or that prevented its practical application and that resisted for a long time, even after test repetition or change. Confronted with such phenomena, the researcher would have a scientific crisis, which, in its turn, would foster search for a new paradigm.[1,2,4,7,8,12] Also according to Kuhn, there is a change in paradigm in those "scientific revolutions," and although the world does not change after a change in paradigm, the scientist begins to see and work in a different world."[2,12]

On the other hand, for Imre Lakatos (1922-1974) it would always be possible to prevent one theory from being refuted, as long as changes were made only in auxiliary hypotheses, maintaining its core intact, which is actually one of the characteristics of a line of research.[1,2] For Lakatos, the history of science shows that theories are not abandoned, even after being refuted. Similarly to Thomas Kuhn, Lakatos claimed that a scientific theory can be rehabilitated at any time, as long as some researchers keep working on it.[2,4,10,13] This is one of the reasons to experience throughout time scientific reasoning and conducts that have already been used in past times. However, it is essential to critically analyze the justification of trying again something that could not be explained and/or approved before, considering whether there is plausibility in the proposal brought back to life.[1,2,4,9]

But it was Feyerabend who dared to challenge the logic of scientific harmony. With great exclusiveness, he created the anarchic conception of science by claiming that it does not have its own method, a rigid rule, neither it is a rational activity, but an anarchic entrepreneurship in which any previously proposed methodological rule, including rules of logic, were at some time violated by scientists, representing a crucial stage to make science progress.[2,4] Nevertheless, at the same time he was contradicting Kuhn, saying that he could not see a place for the objective criteria of assessments, he corroborated his predecessors by stating that one should not abandon a theory when faced with refutations.[2,4,12,13] Despite Feyerabend's apparent radicalism, the history of medicine partially corroborates the anarchism proposed by him.[10] However, attitudes that go

against current bioethical principles are no longer accepted by everyone involved in scientific progress.[8,9]

Finally, sociology of science also stood out, focusing on the great influence existing between social factors and scientific activity, according to which it is common that evaluations, awards and publications of papers and researches in relevant scientific journals are determined not only by their scientific contents, but also by social factors. The "victory" of these works would then be a result of a dispute or negotiation between scientists, institutions or even countries.[2,4]

The statements of sociology of knowledge were also quite criticized by different sectors, since it is hard to accept that the success of science is only based on negotiations and social and political interests. In addition, it is known that one of the ways to achieve fame, professional success and funds is by producing methodologically correct studies.[1,2,14] But such information obligatorily refers us to a deep reflection on this theme.

It can then be perceived that the different philosophical currents about the scientific method allowed a wide space for a mature and highly constructive debate of science itself and that changes in paradigms have always occurred and will always occur. Not investing or escaping from scientific rigor implies abdicating the possibility of correcting errors, thus abdicating the true spirit of science itself.

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