

Medical Epistemology in the Medieval Islamic Tradition

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“Medical practice has been evidence-based since antiquity. What has changed is our understanding of what constitutes evidence”.

How do we know that a particular treatment works? How can we measure the effectiveness of a certain drug? And how do we assess whether a medical or surgical procedure is better than an alternative one? These are questions of medical epistemology, questions that deal with the topic of how we can know what works in medicine. These questions have occupied physicians from Hippocrates’ times until today. In fact, devising effective trials that exclude bias and are reproducible is one of the

most important areas of debate in modern medicine. The Cochrane Collaboration, originally led by Sir Iain Chalmers, has done much to raise awareness in this area². Sir Iain is also behind an initiative to ‘illustrate the development of fair tests of treatments in healthcare’ through history in the form of the James Lind Library³. It is in this area that physicians working in the medieval Islamic world have made a number of interesting contributions, which will be discussed here. But in order to understand these contributions, we first need to give some background about the Greek antecedents, which were so important for later developments.

The Hippocratic treatise *On Ancient Medicine* discussed medical epistemology in the 5th century BCE: its author argued fervently that medicine cannot be reduced to simple principles such as hot, cold, dry and wet, but rather that medicine ought to understand the human body in all its complexities⁴. It was Galen of Pergamum (ca. 129 to 216 CE), however, who laid the foundations to all subsequent debates about the subject. He wrote a treatise, entitled *On the Sects for Beginners*, in which he describes three medical schools and their epistemological outlooks⁵. The first school was the so-called Methodists, who reduced medicine to a simple ‘method’ (hence their

name), which consisted of understanding disease as a result of three bodily states: stricture, flux and a mixed state. Galen was utterly opposed to these Methodists (possibly because they were his greatest competition in Rome).

The two other sects, the Empiricists and the Rationalists, adopted diametrically opposed positions. The former argued that medicine ought to be based on experience (called *empeiria* in Greek; hence their name). One cannot know the inner workings of the body or the recondite causes of health and disease and should rather rely on one's own or other people's experience of what has worked previously. Sometimes, one may extrapolate from previous experience, say by applying a cream on the skin of the foot when it previously had a beneficial effect on the skin of the hand. Yet one should not seek to explain why treatments work. Conversely, the Rationalists argued that reason is the most important source of medical knowledge: only by understanding the inner workings of the body and the hidden causes of disease can one arrive at the right treatment.

Galen adopted a mixed position himself. He advocated the use of qualified experience, of experience regulated by certain rational rules and conditions in order to be valid. Most of Galen's works were translated into Arabic in the 9th century and formed the basis of medicine in the medieval Islamic world⁶. It is therefore not surprising that Galen's idea of qualified experience also informed debates about medical epistemology in the Arabic tradition, as the example of Abu Bakr Muhammad ibn Zakariya' al-Razi shows (d. 925 CE).

Al-Razi is arguably the greatest clinician of the medieval period. Not only did he pen many medical works, but he also excelled as a hospital director in his native Rayy (near modern Tehran) and Baghdad. Al-Razi prized experience (*tajriba*) very highly when trying to test previous medical knowledge and find new treatments. Yet he was also aware of the fact that unqualified experience,

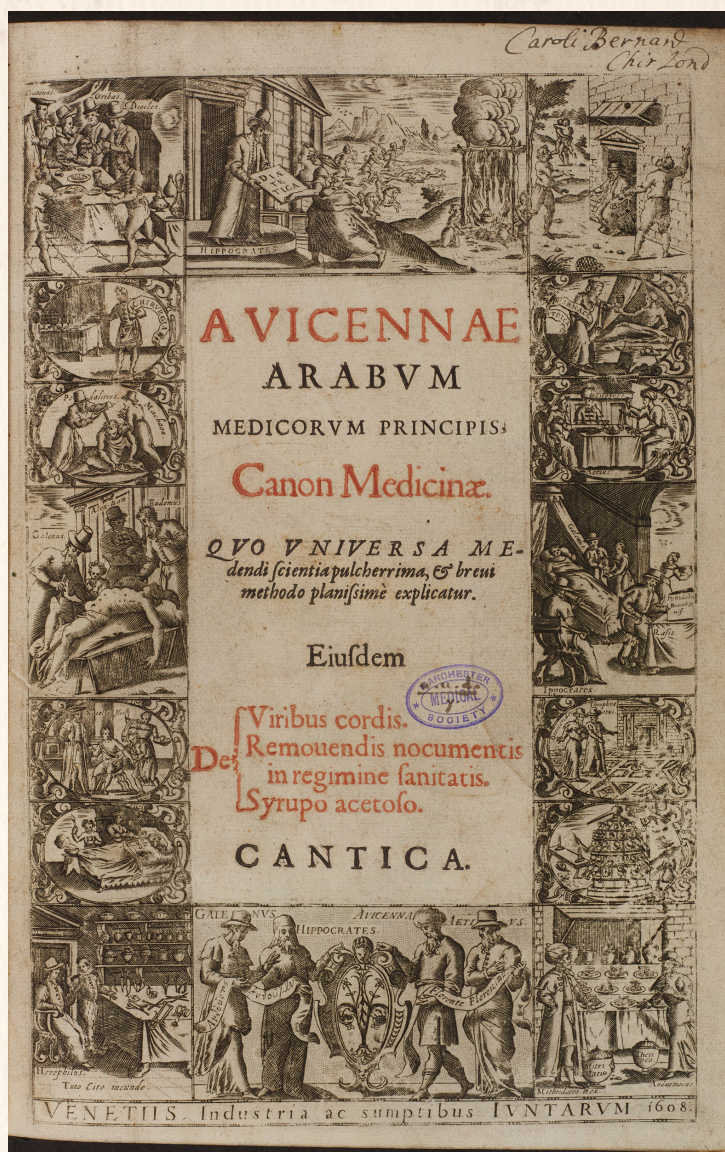


Image: Avicenna's Canon in Latin, 1608 Venice edition, containing a revised Renaissance translation. Reproduced by courtesy of the John Rylands Library.

simply relying on what has worked in the past – whether it be through one's own experience or the experience reported by others in books – is simply not good enough. In an Epistle to One of His Students (*risala ila ba'd talamidhihi*), al-Razi admonished his protégé very strongly against experience⁷:

"Leave aside what confuses common idiots, namely [the idea] that one can hit on [the right treatment] by experience [tajriba] without any reference to [scientific] knowledge ['ilm]. [...] Even if the only thing written about the topic of experience were Galen's discussion, I would still prevent those who consult me about the art of medicine from being treated 'by experience'. The wise teacher Hippocrates avoided it as well when he began [his Aphorisms] by saying: 'Life is short, the art is long, the [right] time is fleeting and experience dangerous'. By my life, he was right in saying this. And I certainly prohibit experience in the medical art".

We have to understand that when al-Razi talks about experience in this quotation, he thinks of unqualified experience, experience that is not conditioned by rational principles and rules. Let us now turn to a number of instances in which al-Razi used experience to validate previous medical knowledge, to criticise past authorities and to develop new treatments.

In his medical encyclopaedia called *Book for al-Mansur* (*al-Kitab al-Mansuri*), he has a long section on poisonous substances. There, he also talks about quicksilver (mercury, *zi'baq* in Arabic). In Greek sources, quicksilver was considered to be harmful and al-Razi wants to ascertain whether this is really the case. Therefore, he administered a dose of quicksilver to an ape. He described this experiment in the following terms⁸:

"I do not think that pure mercury causes much damage. When one drinks it, however, it does cause a lot of pain in the stomach and

the bowels. It is secreted in its [original] form, especially if the patient has bowel movement. I, myself, have administered it to an ape in my possession. I observed exactly the symptoms which I have just mentioned”.

Scholars have sometimes presented this experiment as an animal drugs test, similar to those we see nowadays, but this is obviously not the case. Here, al-Razi assesses the toxicity of a substance and confirms a previous opinion. Nor is this the first animal test in history, as Galen – to give just one example – had frequently experimented on living animals to illustrate anatomical insights. Yet, it does illustrate al-Razi's critical attitude towards authority and his keenness to submit medical doctrines to experience.

Perhaps al-Razi's greatest claim to fame in the area of medical epistemology is his use of a control group in an experiment. Al-Razi tested the efficacy of blood-letting in cases of 'brain fever' (*sirsam* corresponding to Greek *phrenitis*), a condition partly mapping onto what we nowadays call meningitis. In a passage from his *Comprehensive Book* (*al-Kitab al-Hawi*), he first described symptoms leading to brain fever. Then he advised⁸:

“So when you see these symptoms, resort to bloodletting. For I once saved one group [of patients] by it, whilst I intentionally left another group (*jama'a*), so as to remove the doubt from my opinion through this. Consequently all of the these [latter] contracted brain fever”.

This is a somewhat startling case. Obviously, in modern medicine, we do not recognise bloodletting as a preventive treatment for meningitis. Could the placebo effect perhaps account for this positive link between bloodletting and meningitis? Be that as it may, in terms of medical epistemology, this process of using a control group is certainly highly innovative. It also raises the question whether al-Razi had a notion of patient groups, a concept which most historians of medicine believe only emerged in the modern period⁹.

Al-Razi was also aware of the limitations of medical knowledge. As a hospital director, he saw many different patients and in a number of places, al-Razi says that he observed certain phenomena in a hospital context and that these observations allowed him to criticise previous medical doctrine. In his *Doubts about Galen*, al-Razi mentions one instance where ‘there were

approximately 300 out of 2000 patients whose state developed in a contrary fashion’, contrary, that is, to the expected outcome⁹. Such large numbers of patients were most likely only observed in a hospital context and this underpins the importance of hospitals for medical research. More importantly, however, it shows al-Razi's awareness about the limited nature of medical knowledge. Medical knowledge is in a category that is quite different from philosophical knowledge. It deals with particulars and therefore can only reach approximate truth values.

It is for this reason that in the hierarchy of knowledge, Avicenna (Ibn Sina, 980 to 1037 CE), the great Persian physician, classified medicine as a derivative science together with astrology and agriculture. Yet, despite this apparent disdain, he also wrote one of the most famous and influential medical works of all time, the *Canon of Medicine* (*al-Qanun fi l-Tibb*), in which he also touches on questions of medicine epistemology¹⁰.

The second book of his *Canon of Medicine* deals with simple drugs and their faculties. In the introductory section of the book, Avicenna discusses ‘how to ascertain the faculties of the mixtures of drugs through experience (*tajriba*)’. He argues that seven conditions (*shara'it*, singular *sharita*) ought to be met.

- ‘It [sc. the drug] should be free from any acquired quality’.
- ‘The experience should be conducted on a simple illness (*'illa mufrada*)’.
- It should be tested on a drug and its opposite as well.
- The strength in the drug (*al-quwa fi l-'illa*) should correspond to the strength in the illness.
- The time that the drug requires to take effect should not be too long.
- The effect should be constant and occur in most cases.
- The human body should be used for testing (*'an takuna l-tajribatu 'ala badani l-'insani*) and not that of animals.



Image: Two physicians are preparing a drug; taken from the Arabic translation of Dioscorides' *On Medicinal Substances*. Baltimore, Walters Museum, leaf W.675.

By 'simple illness', Avicenna means that it should be an illness that is not accompanied by other complications or a so-called 'mixed (*makhlut*)' condition. For otherwise, one cannot know for certain on which disease the drug has an effect. In Avicenna's own words, one needs to find the 'essential benefit (*naʿf bi-l-dhat*)', not an accidental one. The conditions for testing drugs through experience that we find in Avicenna are more complex than those mentioned by Galen and therefore constitute a further refinement of previous medical methodology.

In the list of conditions for assessing simple drugs we also find the idea that the effect should 'occur in most cases (*ʿala l-ʾakthari*)'. We have previously seen that both al-Razi and Avicenna were aware of the limitation of medical knowledge as it deals with particulars. Another famous physician, 'Abd al-Latif al-Baghdadi (1162 to 1231 CE), compared the uncertainty of medicine to that of archery in a striking passage from the medical section of his work entitled *The Two Pieces of Advice* (*Kitab al-Nasihatayn*). There he says¹¹:

"When the conditions [shurut] of the medical art are fully adhered to, then it never makes a mistake. The intelligent physician only errs occasionally... Moreover, his mistake will be neither decisive nor great nor far from what is correct. One can compare him to an expert in archery who mostly hits the mark and when he misses then it [i.e. his arrow] will not be far off, but it will rather land near [the target]. But in the event of the arrow falling entirely in the opposite direction, then [this is like] a physician committing an error".

In other words, 'Abd al-Latif assumes that in real life one can never fulfil all the conditions of medicine; one can only hope for a good approximation. He then goes on to compare medicine to mathematics. One cannot accurately calculate the square root of ten or pi, because they are irrational numbers; one can only come to a good approximation. Good medicine is like a good approximation in mathematics: "As long as the part which one tolerates [that is, the margin of error] is small, the solution is quite correct and the person arriving at it is quite skilled. Therefore, artful conjecturing in medicine is similar". 'Abd al-Latif even goes so far as to describe medicine as 'the knowledge of probabilities (*al-ma'rifa al-akthariya*)'.

To conclude, we first ought to note that the debates about medical epistemology in the medieval Arabic tradition continue on from Greek physicians, most prominently Galen of Pergamum. Yet, it is also clear that we have a number of instances where physicians in the Arabic tradition refine their methodology. Avicenna, for instance, specified a set of conditions to ascertain the faculties of simple drugs going beyond those of his Greek forebears. Al-Razi carried out an animal experiment to nuance his view about the toxicity of mercury. And, most strikingly, he also used a control group to gain certainty about a treatment. Like al-Razi and Avicenna, the physician and philosopher 'Abd al-Latif al-Baghdadi was acutely aware of the limitations of medical knowledge, where we can only hope for good approximation when dealing with concrete cases.

Nowadays, we think that 'evidence-based' medicine is a relatively recent phenomenon, but as the opening quotation by Edwards illustrates, evidence has been very much at the heart of debates about medical epistemology from antiquity until today. The examples above show that physicians in the medieval Islamic world were capable of very sophisticated analysis of epistemological questions. And since they contributed greatly to the university medicine as it later developed in Europe, their legacy is still with us today.

Further reading

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