

Chapter 4

The Usefulness of the Humanities in Teaching Pharmacology



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Introduction

In his classic book *The two cultures and the scientific revolution* [1], Charles Percy Snow (1905–1980) called attention to the chasm that had opened between the sciences and the humanities, which had grown to the point where the two paths seemed to hold each other in mutual scorn. In the more than six decades since the book's publication, efforts to recognise science as culture and humanities as an indispensable element for understanding and contextualising scientific advances and beliefs have started to close the breach between these two approaches to understanding the world.

In recent decades, there has been a growing recognition of the potential importance of the humanities in medical education. This recognition comes after a long period in which the aim of the practice of medicine was seen as to repair dysfunctional organisms, a vision grounded in a technocratic orientation originating in the mechanistic physics of the eighteenth century that was consecrated in the advances in diagnosis and treatments in the following centuries. At least in some fields, this orientation has started to change as the profession comes to accept that incorporating knowledge from history, philosophy, literature, or the visual arts can

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substantially improve our understanding of disease and especially of people afflicted with disease. Early in the twentieth century, William Osler (1849–1919) affirmed ‘*In no profession does culture count for so much as in medicine, and no man needs it more than the general practitioner*’ [2]. This affirmation holds true for the future professionals being educated in our medical schools today.

Putting Osler’s vision into practice has not been a simple proposition. Perhaps the critical point came at the end of the 1950s, when the appearance of the first efficacious haemodialysis machines made it necessary to establish priorities for access to this limited resource among the numerous patients who stood to benefit from this treatment. This situation led to the creation of hospital committees to enable rational prioritisation. These committees were based on ethical principles derived from moral philosophy, and the application of these principles in medical science and practice later came to be known as bioethics. Thus, for the first time, it was generally accepted that a discipline from the humanities could help in clinical decision-making [3].

In biomedical research, however, the need to apply ethical principles had actually been recognised a few years earlier with the discovery of experimentation on prisoners in concentration camps during World War II [4]. Although the experiments carried out by Nazi Germany are better known, the Japanese army had also done similar experiments in a centre in Manchuria [5]. The discovery of these atrocities led to the first worldwide agreement about ethics in medical research, the Nuremberg Code, in 1947 [4].

As we enter the third decade of the twenty-first century, the need for the humanities seems indisputable. Nevertheless, apart from bioethics, the traditional presence of humanistic disciplines in medical-school curricula has declined considerably [6]. The battle among professors of scientific and medical disciplines to prioritise their own subject matters in allocating class time and credits in medical-school curricula has severely limited the inclusion of new disciplines [3].

Given the difficulties of introducing humanistic disciplines *de novo*, an alternative approach is to facilitate the integration of contents from the humanities into subjects that already form part of the curriculum. This approach makes it possible to present humanistic elements in context and to avoid conflicts about the number of credits that should be assigned to coursework in disciplines outside the realm of medical science. This approach also helps students to understand medical situations from the viewpoints of their patients and of society. A detailed description of the historical pathway to the recognition of the importance of the humanities in medicine and strategies for incorporating these disciplines in medical education is available elsewhere [7].

The current chapter aims to propose ways that the humanities can be exploited in teaching pharmacology to provide essential context for students who are learning about a field that has improved the prognosis of many diseases in the last century, a field that must not be taught simply as a succession of pharmacological groups. As Metzl [8] stated, ‘*In pharmacology courses, students are responsible for digesting massive amounts of information concerning every aspect of a medication’s profile, ranging from its half-life to its mechanism of action and to its clinical indications.*

[...] *Little attention, if any, is paid to the complexities that can arise when these treatments are considered as symbols rather than hard-and-fast facts*'. Pharmacology is a field that encompasses both the basic sciences (e.g. physiology, chemistry, and biology) and the clinical sciences, providing essential elements for medical treatment. Since pharmacology serves as a bridge between these two areas of knowledge, it is even more important to situate this discipline within the context of society through the incorporation of the humanities.

Linguistics and Pharmacology

Within the field of linguistics, the most pertinent area in the study of pharmacology is etymology. Knowing the origin of words enables us to use them more precisely and helps us understand the content of their messages better. Therefore, we are considering the contribution of the study of etymology in pharmacology, which could be called *pharmaco-etymology*. The origins of the word *pharmacology* itself could be an interesting place to start.

The term is a combination of the Greek words *pharmakon* (φάρμακον) and *logos* (*-logia*) (λόγος; *-λογία*). Whereas the element *logos* denotes knowledge or treatise, the element *pharmakon* denotes both medication and poison. This double meaning is of special interest for pharmacologists because it recognises the duality of the active principles of drugs, whose therapeutic effects are inseparable from their toxicity. When prescribing drugs, physicians need to remember this dual nature, weighing the possible therapeutic effects against the risk of toxic effects in each case. Benefit-risk analysis is an essential part of treatment in general and of pharmacology in particular. Explaining this dual etymology to medical students can help them bear in mind that administering drugs always involves the risk of harm to the patient.

Many other lessons can be found in the names of drugs, especially of those that were extracted from natural principles. For instance, the origin of the word *morphine* in the Greek god Morpheus illustrates its ability to induce somnolence, and the words that make up the term *salicylic acid* reveal that plant from which this substance was extracted, the white willow (*Salix alba*). Thus, etymology can help students appreciate the circumstances in which different drugs have been obtained and used.

History and Pharmacology

Students can benefit from knowing how the most important drugs used in the past and present have been discovered. They need to learn how intelligent observation, whether applying the scientific method or not, has made it possible to improve the prognosis for different diseases. The term *historio-pharmaco-etymology* would be a

useful neologism for an approach that helps students learn from explanations of the context in which drugs such as heparin [9], atropine [10], scopolamine [11], morphine [12], or artemisinin [13] were discovered.

Another way historical events can be used in teaching pharmacology is by incorporating historical elements in texts prepared for problem-based learning [14]. One example is the use of James Black's (1924–2010) work and his contributions to the discovery of propranolol and cimetidine, drugs that were based on the theory of the chemical modification of neurotransmitters to convert them from agonists to antagonists [15]. Another example is George Hitchings's (1905–1998) and Gertrude Belle Elion's (1918–1999) discoveries about the inhibition of nucleic acids that paved the way for the development of the first rational anticancer drugs and the first antiviral agents [16].

Literature and Pharmacology

Literature is one of the disciplines of the humanities that is most used in medical education [17]. Here we consider its use for the specific purpose of teaching pharmacology.

Physicians have written many literary works. Here we mention only two that are especially interesting for teaching pharmacology. Both *Morphine* (Morfi) by Mikhail Bulgákov (1891–1940) [18] and *The lost art of healing* by Bernard Lown (1921–2021) [19] are autobiographical works. *Morphine* relates Bulgákov's own experience of addiction to opioids, which arose from treatment for pain from severe wounds during World War I. Lown's work includes fragments of his professional life that are remarkably useful for teaching. One of these anecdotes, a case of digoxin poisoning, inspired a text for problem-based learning that we used in teaching pharmacology for several years [20].

One especially rich genre for pharmacology is crime fiction, where drugs are often used as poisons. Among writers in this vein, Agatha Christie (1890–1976) and Anne Hocking (1889–1966) are especially noteworthy. A detailed analysis of the plausibility of Christie's texts from a pharmacological point of view found that they were quite realistic, probably thanks in part to her experience in hospital pharmacies [21]. Her novel *Sad cypress* (1940) is especially interesting. The plot revolves around the murder of a woman by a nurse, who adds morphine to her tea. The nurse also drinks the tea, but injects herself with apomorphine immediately afterward to induce vomiting and thus prevent the absorption of the drug. In teaching pharmacology, the novel allows us to discuss the oral absorption of morphine, the consequences of overdosing, and ways of counteracting the drug, with special attention to the use of emetics in the absence of specific antagonists.

More recently, Donna Leon (1942), an American writer, got her start in crime fiction with the novel *Death at La Fenice* [22]. In this work's twisted plot, the victim is a German opera conductor, a despicable scoundrel who kills himself by cyanide poisoning and attempts to frame his wife for murdering him. Readers discover that

his wife was indeed indirectly responsible for her husband's death because she had surreptitiously administered him the antibiotic netilmicin, causing hearing loss and pushing him to the brink of suicide.

Although studies about the connections between pharmacology and literature are not common, we have published an analysis of the usefulness of different works for teaching this discipline that can be a good starting point for those who are interested in this approach [23].

Music and Pharmacology

Although few studies have addressed the use of music for teaching medicine, music can be used to help create a context for some subjects in pharmacology. MacDonald and Saarti [24] showed that a set of 12 blues songs about subjects ranging from pharmacological definitions to the effects of prolonged treatment with glucocorticoids helped improve medical students' performance in a pharmacology course. Similarly, Hermanns et al. [25] successfully used two original songs to teach psychopharmacological concepts to nursing students.

Our group used content analysis to determine to the possible usefulness of songs by The Beautiful Brains, a group initially made up of psychiatrists at Zamudio Hospital (Bizkaia, Spain), for teaching health sciences students [26]. We found that several songs in their albums *Creo en Emil Kraepelin* and *Toma la medicación* could be useful for teaching pharmacology and psychiatry. Finally, our analysis of Gaetano Donizetti's (1797–1848) opera *L'elisir d'amore* (1832) shows that it can be used for teaching students about the possible effects of administering a placebo [27].

Painting and Pharmacology

The use of the visual arts in medical teaching is becoming more common. Paintings are often used to help students learn to observe and to sharpen diagnostic competencies (see Heyn [28] for a review of this topic). Through detailed observation, students learn the importance of visually examining patients in the diagnostic process.

To our knowledge, no reports of the use of paintings in teaching pharmacology have been published. Nevertheless, some works of art could be used for this purpose. For instance, Santiago Rusiñol's (1861–1931) paintings *Before the morphine* (1894) and *Morphine* (1894) show the effects of this drug by depicting a young woman before and after taking it, offering an opening to the analysis of its abuse and the connection with the invention of the hypodermic needle. Another work that could be used to the same end is Eugène-Samuel Grasset's (1845–1917) lithograph *The morphine addict* (1897), which shows a woman injecting morphine into her thigh. Marià Fortuny's (1838–1874) two paintings entitled *The opium smoker* (1867

and 1869) show a man inhaling from a pipe. These works could help students understand the changes in addiction to opioids related to changes in the route of administration. Another work that might be useful is Hermen Anglada-Camarasa's (1871–1959) *The drug* (1901), which shows a woman under the effects of an unspecified substance that students could try to ascertain through observation, reflection, and debate.

Cinema and Pharmacology

The usefulness of commercial cinema in medical education is widely recognised, and some articles instruct how to use this tool optimally [29]. This teaching approach has been dubbed *cinemeducation* [30]. Although cinemeducation has long been used in many different areas of biomedicine, this approach is relatively new in pharmacology education; our group started using it about 25 years ago with two films, *Awakenings* (1990) and *Lorenzo's oil* (1992) [31]. Farré et al. [32] used these films together with *The Tuskegee experiment* (1997) in a teaching activity.

Another experience, *Biocinema*, used cinema to present transversal aspects of research through the films *Mary Shelley's Frankenstein* (1994), *The Andromeda strain* (1971), and *The boys from Brazil* (1978), among others [33]. To help students better understand the principles of bioethics applied to clinical research on drugs, we compared the film *Extreme measures* (1996) [34] with *Miss Ever's boys*. A randomised parallel study found that both these films were useful for this purpose [35]. Another film that proved useful for teaching undergraduate pharmacy students and graduate students was *The constant gardener* (2005), based on John le Carré's (1931–2020) novel of the same name, which was inspired by the true story of some pharmaceutical companies' unethical practices in Nigeria [36].

Even older films can be used to aid learning about topics of current interest. For instance, the film *Murder, my sweet* (1944), which shows the use of scopolamine, the active principle in burundanga, is useful for increasing awareness of the relatively common use of drugs to render victims helpless in robberies or sexual aggressions [37]. Another film, *The third man* (1949), based on Graham Greene's (1904–1991) novel, tells the story of the black market for penicillin in post-World War II Vienna, where the drug was often adulterated. This film can be very useful for introducing the topic of fake drugs, an important public health problem, especially in some third-world countries [38].

We recently studied the usefulness of the French film *La fille de Brest (150 Milligrams)*, (2016), based on Irène Frachon's (1963) true story [39], for helping students in undergraduate programs in medicine, biomedicine, and human biology learn about adverse effects and the principles of pharmacovigilance [40]. We found that the using clips from the film improved students' knowledge about these topics [41].

Medical Series and Pharmacology

The development of new platforms for delivering audiovisual content, especially after the advent of widespread access to the internet, has changed the way people consume movies and series, resulting in substantial changes to viewing habits.

The most famous medical series in the last 20 years is *House M.D.* A content analysis of the first season found diverse episodes and scenes that could be used for teaching clinical pharmacology [42], and an empirical study showed that watching and discussing the series improved students' learning significantly [43].

A more recent study analysed the presence of COVID-19 in the most popular medical television series [44]. Content analysis identified elements that could be used in teaching students of the health sciences about the complexity of medical care early in the pandemic.

Epilogue

This chapter provides some examples of how the humanities can contribute to the teaching of pharmacology, showing that it is not necessary to teach these subjects in isolation from the elements that traditionally make up the curriculum or to replace the contents of pharmacology courses. Rather we propose that the humanistic disciplines impregnate the teaching methods used regularly to enrich theoretical classes, seminars, or laboratory experiments and to help students achieve their learning objectives. It is crucial to remember that professors do not merely train physicians, rather we educate critical, responsible professionals who need to know the traditions and culture of their profession.

University education must involve more than transmitting knowledge found in books and on the internet. Multiple resources from the humanities constitute a useful set of tools for presenting pharmacologic concepts in context. By taking advantage of these tools, professions can help students appreciate the importance of pharmacology in medicine and inspire students to delve deeper into the medical and social roles of pharmaceuticals, beyond their chemical structure. The emotional engagement engendered by these techniques is key to learning.

NOTE: This chapter is based on Josep E Baños' speech delivered on his appointment as a Fellow to the Royal Academy of Medicine of Catalonia on April 24, 2022 (https://ramc.cat/wp-content/uploads/2022/04/Josep_Eladi_Baños_i_Díez.pdf).

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