Science Fiction or Fictional Science in Medical Education

Bektas Murat Yalcin, Mustafa Unal, Hasan Pirdal, and Yasin Selcuk

Abstract

We designed a class titled “Medicine in Science Fiction” in the Medicine in the Future selective rotation (for 3 weeks) of 40 first-year students at the Ondokuz Mayis University Medical Faculty. This class consisted of presentations, discussion sessions and a group project. Students attended active presentations enriched by various clips from science-fiction movies. These were selected based on their scientific value, questioning important ethical problems or challenging the development of technology, or just because they are popular. In the discussion sessions students evaluated these clips in terms of whether they are logical, whether or not they conflict with the general laws of science, and whether they are compatible with daily medical procedures or ethical principles. Finally, the students prepared group presentations concerning a science fictional medical technology and the obstacles (scientific or ethical problems, etc.) to this being developed today. The first group’s project concerned the medical ‘tricorder’ in Star Trek, second group’s was about biological autograft (stem cell) or mechanical prosthetic limb technology and the third group’s was about nanotechnology.

Keywords: Medical Education, Science Fiction, Electives, Undergraduate

Article

We had the privilege of designing a class titled “Medicine in Science Fiction” in the Medicine in the Future selective rotation (for 3 weeks) of 40 first-year students at the Ondokuz Mayis University Medical Faculty, Turkey. This class consisted of presentations (enriched by short official video clips from science fiction movies downloaded from YouTube), a group discussion and a group project (student presentations to the whole group) about a science fiction medical technology and the obstacles (scientific or ethical problems, etc.) to its being developed today.

We selected examples from several science fiction movies or novels on the basis of their scientific value, the originality of the idea concerned, whether they question important ethical problems or challenge the development of technology, or just because they are popular. We discussed parasitism (Dracula, Invasion of the Body Snatchers), transplantation and tissue regeneration (Frankenstein, Star Trek Voyage Home, Star Trek Voyager, Fifth Element), clone technology (Star Wars Attack of the Clones, The Island), genetic racism
(Gattaca, Brazil), genetic engineering and reconstruction (The Island of Dr. Moreau, The Fly), genetic treatments (Spider Man), genetic mutations (Hulk, Spiderman, X-Men), xenobiology (the Alien series), prosthetic limb implants (Star Wars the Empire Strikes Back and the Revenge of Sith), implants improving body functions (Johnny Mememonic, I Robot, Elysium), robotic doctors and surgeons (the Star Wars series), holographic medical aid programs (Star Trek Voyager), highly advanced diagnostic or therapeutic devices (the tricorder in the Star Trek movies and series, Elysium), Cyborg technology (Robocop) and finally nanotechnology (Borg nanoprobe in several Star Trek movies and series).

Following the presentations, discussion sessions were held in which students set out their ideas concerning these examples. They evaluated the clips and extracts on the basis of whether they were logical, whether or not they conflicted with the general laws of science, and whether they were compatible with daily medical procedures or ethical principles. Students expressed the opinion that the works of H.G Wells (The Invisible Man, The War of the Worlds and The Island of Dr. Moreau) which they had never read before, were far ahead of their time. They also particularly enjoyed the scene from Star Trek Voyage Home in which Dr. McCoy (played by DeForest Kelley) travels back to the 20th century from the 23rd and gives a kidney regenerating pill to a geriatric patient on a hemodialysis program. They also doubted that Amidala Skywalker (played by Natalie Portman in Star Wars the Revenge of the Sith) received any prenatal care since she was unaware that she was expecting twins until they were born. They also identified an illogicality in that the highly advanced clone technology in the Star Wars series, Anakin Skywalker (played by Hyden Christensen) should have received biological autograft treatment instead of ugly cybernetic prosthetic limbs (Sorry, George Lucas). They thought that although Frankenstein was ahead of its time, it is impossible to transplant different organs and tissues with cellular decay and damage from a different host to create new life. They found the concept of small parasites controlling the higher cognitive functions of hosts and turning them into puppets very unrealistic, because these creatures are so small, also their neurological mass must be relatively small in order to be intelligent. In order to live in parasitic state in an unmatched biological creature (have their evaluation process in different biological environments) is against the evaluation law of Charles Darwin (Star Trek Wrath of Khan, Invasion of the Body Snatchers). Finally, they considered that the transformation of Hulk or the xenobiological life cycles of the creature in Alien violates the laws of science (Conservation of mass law of Lomonosov-Lavoisier). Also they underlined that there is no known creature in the nature can develop or produce natural metal organs in cellular level (It has metal teeth’s). Hulk turns into a 300-kg monster from the 80-kg individual named as Bruce Banner (played by Mark Ruffalo) in a matter of seconds. In order to acquire such a huge mass, extreme amounts of material (proteins, fats etc.) would be needed from somewhere. A large amount of time was spent on genetic engineering technologies, and many students stated that they knew little about the ethical issues attendant on this. They were very concerned that this technology might be used to violate human rights (1).

There were three project groups. The first prepared a presentation about the medical ‘tricorder’ technology in the Star Trek series. This is a portable diagnostic (X-ray, ultrasonography, biological, hematological etc.) device that provides medical data assistance (contains all sort of the medical files) and suggests possible forms of treatment to the user, depending on possible diagnosis. They believed that the most significant obstacle to the development a ‘tricorder’ today is the lack of advanced micro-electronics and computer technology. The second group chose biological autograft (stem cell) or mechanical prosthetic limb technology. They stated that neurological connections between host and graft would be major obstacle to these replacing the lost organs. The last group suggested nanorobotic technology in cancer treatment. Nanorobots filled with chemotherapeutic agents could find, bind and unload their payload to the neoplastic cell with precise accuracy, preventing patients against the side-effects of these drugs, and patients would be cured in days. Students considered that advanced bio-electronic scientific approaches would be needed for these wonder pills.
In conclusion, we (students and instructors) had enormous fun from this class, which was reflected in the written feedback [They rated this lesson as 9.5±0.4 (1= very bad, 10= excellent)]. We believe that this class offers many advantages. Apart from stimulating students’ scientific curiosity, creativity and imagination, students had the opportunity of comparing differences between current levels of medical technology with fiction. Many medical students miss the big picture of science (physics, chemistry etc.) while focusing on the medical sciences. However, experience shows that many great discoveries in medicine are made through cooperation between different fields (computer tomography, etc.) (2). We need to balance our students’ roles between that of the scientist and the medical technician, and science fiction seems to be a good way of doing it.
References


Footnotes

* Alien: It is a cult 1979 British-American science-fiction horror film directed by Ridley Scott. After the first movie several sequels (Aliens, Alien 3, and Alien Resurrection etc) have been produced. The film is about a highly aggressive extraterrestrial creature which is designed as a biological weapon by an unknown alien race. The creature in the movie had a complex life cycle. A queen alien hatches some kind of eggs including a creature (face-hugger) which transports an embryo (chest-burster) to the host victim. The embryo uses the host body’s resources to develop (including the hosts’ DNA in order use its features as an advantage). When the initial process is completed it burst-out of its victim’s chest (It has a two jaw organ with metal teeth’s). In the final development stage this newborn becomes an Alien drone which is genetically programmed to terminate all of the living creatures it encounters or to bind them in a web in order that other face-huggers can transmit their embryos to them.

† Tricorder: It is a multifunction hand-held device used for sensor scanning, data analysis, and recording data by Star Fleet of United Stars of Federation (Main Headquarters is in San Francisco). The medical tricorder is used by doctors to help diagnose diseases, collect a huge array of information from patients (even in subatomic levels) and if necessary provide the treatment data about the disease. It is first seen in 1967-1969 The Original Series of Star Trek. It was just like multi functional pad loaded with the entire data base of federation literature. The device evolved in time and its shape become much familiar like nowadays pads many years before. Today many projects are undergoing and great effort is spent to develop a practical working medical tricorder.

‡ The Borg Nanoprobes: The Borg is an evil race which appears in the science-fictional Star Trek universe. They are cybernetically enhanced humanoid drones of multiple species. Although each drone is unique, they are not individual creatures. They are organized as an interconnected collective, the decisions of which are made by a hive mind, linked by subspace radio. Their only motivational goal is pursuit of an unemotional, mechanical perfection. This is achieved through forced assimilation, a process which takes individuals and technology, enhancing and controlling them. The assimilation process depends on highly sophisticated nanoprobes. Nanoprobes, each about the size of a human red blood cell, travel through the victim’s bloodstream and latch on to individual cells. Then they rewrite the cellular DNA, altering the victim's cell morphology, physiology, biochemistry, and may form more complicated structures and networks within the body such as electrical pathways, processing and data storage nodes, and ultimately prosthetic devices. They also perform the function of maintaining the Borg cybernetic systems, as well as repairing damage to the organic parts of a Borg. They generate new technology inside a Borg when needed as well as protecting them from many forms of disease and virus.
The Authors

Bektas Murat Yalcin¹, Mustafa Unal², Hasan Pirdal³, Yasin Selcuk²

¹ Assoc. Prof. Dr. Ondokuz Mayis University Medical School Department of Family Practice, Turkey

² Asst. Prof. Dr. Ondokuz Mayis University Medical School Department of Family Practice, Turkey

³ Goynicek Town Integrated State Hospital, Turkey