



## The present and the future of Nursing in the *Brave New World*

O presente e o futuro da Enfermagem no *Admirável Mundo Novo*

El presente y el futuro de la Enfermería en *Un Mundo Feliz*

Maria Neyrian de Fátima Fernandes<sup>1,2</sup>, Rafael Braga Esteves<sup>2</sup>, Carla Araujo Bastos Teixeira<sup>3</sup>, Edilaine Cristina da Silva Gherardi-Donato<sup>2</sup>

### How to cite this article:

Fernandes MNF, Esteves RB, Teixeira CAB, Gherardi-Donato ECS. The present and the future of Nursing in the *Brave New World*. Rev Esc Enferm USP. 2018;52:e03356. DOI: <http://dx.doi.org/10.1590/S1980-220X2017031603356>

<sup>1</sup> Universidade Federal do Maranhão, Coordenação de Enfermagem, Imperatriz, MA, Brazil.

<sup>2</sup> Universidade de São Paulo, Escola de Enfermagem de Ribeirão Preto, Programa de Pós-Graduação em Enfermagem Psiquiátrica e Ciências Humanas, Ribeirão Preto, SP, Brazil.

<sup>3</sup> Universidade CEUMA, Campus Imperatriz, Imperatriz, MA, Brazil.

### ABSTRACT

The “Brave New World” envisioned a society dominated by scientific and technological progress that went as far as to subjugate and dehumanize human beings. The future foreseen in this literary work is not far from what we are currently experiencing. Thus, considering that Nursing is affected and challenged in the midst of these technological transformations, this article aims to discuss the present and future of Nursing in a society that is undergoing constant technological transformations. In the midst of a whole technological apparatus in which fundamental procedures begin to be carried out by machines, Nursing needs to begin reflecting on what would be the best posture or its differential in a world with strong technological tendencies. Future transformations are still uncertain, nonetheless they will drastically change the way individuals relate to one another and to health services. Even in the midst of these uncertainties arising from present and future technological and scientific advances, the nature of Nursing which is essentially based on human interactions, can guarantee a place of prominence for this profession in society.

### DESCRIPTORS

Nurse's Role; Philosophy, Nursing; Nursing Theory; Technological Development; Literature, Modern.

### Corresponding author:

Maria Neyrian de Fátima Fernandes  
Rua João Ribeiro, 1454  
CEP 14085-700 – Ribeirão Preto, SP, Brazil  
[neyrian@usp.br](mailto:neyrian@usp.br)

Received: 07/26/2017  
Approved: 02/27/2018

## INTRODUCTION

The novel “Brave New World” by the British writer Aldous Huxley (1894–1963) published in 1932, envisioned a society dominated by scientific and technological progress, which went as far as to subjugate and dehumanize human beings<sup>(1)</sup>. The future foreseen in Huxley’s work is not far from what we are experiencing today, considering that since its publication (a period marked by World War II), humanity has witnessed historical events that caused important changes in society, among which we can highlight the invention of the Internet and of computers.

The so-called 4<sup>th</sup> Industrial Revolution has enabled advanced developments in genetics, artificial intelligence, robotics and nanotechnology, biotechnology and three-dimensional (3D) printing, allowing for integration of these technologies in the digital, physical and biological dimensions<sup>(2)</sup>. Robots and humanoids already occupy several spaces in the health sectors, including performing several nursing functions<sup>(3)</sup>, surgeries<sup>(4)</sup> and even interacting with humans<sup>(5)</sup>. Artificial intelligence can detect cancer<sup>(6)</sup>, chips are used in the diagnosis and monitoring of chronic diseases<sup>(7)</sup>, and the human brain in an interface with machines can help in the rehabilitation of individuals with spinal cord injuries<sup>(8)</sup>.

Technological advances produce changes in social interactions, as they are being intermediated by electronic devices, replacing person-to-person relationships. In this sense, technology has become part of society’s communication process, affecting the way individuals interact with one another; on the one hand shortening physical distances, and on the other diminishing empathy, connection and the quality of conversation between people due to the constant presence of cell phones and the Internet in social gatherings<sup>(9)</sup>.

Considering the impact of these technological transformations, we can point out that they will require adaptation and the valorization of skills such as interpersonal relationships and creativity, especially among health professionals, since technological advances are enabling the automation of diagnoses and personalized treatments of various diseases. This scenario requires us to redefine the professional roles related to the transmission and communication of data in an effective way to users<sup>(2)</sup>.

Faced with the described reality, it is pertinent to bring forth the provocation made by Huxley over 80 years ago into Nursing nowadays: What is Nursing’s role/place in a society dominated by machines and scientific progress? In this sense, “Brave New World” also allows reflection on the strategies that humanity could adopt to avoid dehumanizing itself, contributing to maintaining the essence of the Nursing role, valuing human beings and preventing the possible extinction of this category in society.

The rising costs of health care due to population aging and the shortage of both professionals and health services stimulate computerization and automation of healthcare systems to balance its distribution<sup>(10)</sup>. In view of the described scenario and considering that Nursing is affected and challenged in the midst of these transformations, this article aims to discuss the present and future of Nursing in a society under constant technological transformations.

## THE PRESENT AND THE FUTURE OF HEALTH CARE

In Brazil, this process began in the private network in 2008 with the incorporation of robotics in surgeries, in which 3,651 individuals have used this type of procedure in a single private hospital<sup>(11)</sup>. This technology is present in the states of Ceará, Rio de Janeiro, Rio Grande do Sul and São Paulo, and the Unified Health System (SUS – *Sistema Único de Saúde*) has also offered this type of service since 2011<sup>(12)</sup>.

According to the International Federation of Robotics (IFR), automation of health services has increased in recent years: 1,325 robots were purchased for the health sector in the world in 2015 alone. It is estimated that this number exceeds 8 thousand, and that investments in the sector will exceed US\$ 7 billion by the year 2019. The major trends in the area are exoskeletons for rehabilitation and ergonomic use, and in health care systems such as diagnosis, robot assisted surgeries and assistance to the elderly with special needs.

Studies related to sensors have impacted health care systems and contributed to strengthening health care in the household environment, as several electronic devices have been developed to measure and analyze physiological information, providing immediate data on the health status of users<sup>(10)</sup>.

Different forms of monitoring vital signs, biomarkers and other physiological information are part of the advances made by the “Internet of Things” (IoT), characterized by having a physical device that along with other network devices integrated by software and sensors collect information with the intention of transmitting them wirelessly<sup>(13)</sup>.

Taking into account that personalized care should be based on the biological factors and social characteristics of each individual, IoT is important for achieving superior results. Thus, IoT is an instrument which is capable of providing personalized care, as well as preserving the digital identification of individuals, basically making this system omnipresent, effective and inexpensive<sup>(13)</sup>.

In line with the trend of current technological advances, futuristic predictions state that diagnosis and treatments will become automatic. Cardiovascular diseases and cancer will be completely eliminated with the help of DNA chips scattered around the home environment in clothes, restrooms and mirrors, which will detect any type of abnormality in the body. Clothing will have sensors that will detect any irregularity in heart rate, breathing and brain waves<sup>(14)</sup>.

Thus, it is not difficult to glimpse a future in which the need of health professionals is different from their current ones, or that hospitals such as they exist today become scarce or cease to exist. In order to become real and to allow more progress, the technological changes that are modifying health care practices open up a range of possibilities that generate a need for adaptation by professionals in the area. For example, it is estimated that by 2020, technological development will cause the loss of approximately 5 million jobs, generating the need for 2 million new jobs<sup>(2)</sup>.

For the survival of certain professional categories, a reorganization of the curricula as well as continuous education and training of professionals in the practice will be necessary. The present and the future demand the skill to continuously learn about human abilities which guarantee the health and well-being needs of the population and justify the existence of professional categories, including Nursing, in society.

## THE PRESENT AND THE FUTURE OF NURSING

Scientists at the Nanyang Technological University in Singapore introduced the Nadine robot to the world, a humanoid with an almost identical appearance to that of a human being. Nadine simulates a real person in many ways, including handshakes. Nadine's hands were designed to have five fingers, unlike other robots that usually only have three, because humans interact with five fingers and the touch of the hands is one of the most important skills during interactions with people and objects that surround them<sup>(15)</sup>.

In addition, Nadine is sociable, has different types of humor, she makes eye contact, recognizes people after their first contact and has dialogues according to the history of previous conversations with each individual<sup>(15)</sup>. This brings an intriguing and paradoxical perspective in which human characteristics which have been lost by the end of person-person relationships are inserted into machine-person relationships in order to meet human needs for interaction. It is an attempt to meet a need, aiming at the end of a production network.

A robot with these characteristics can (in theory) adapt itself to the needs of each individual, interacting in a suitable way to establish relations of a certain therapeutic way with the users. The extremely human aspects of the robot Nadine mark the beginning of an era in which humanoids will be common in various sectors of society, especially in the health area. Thus, it is believed that technology can interfere in the Nursing process with individuals, families and communities.

Among technological apparatuses in which even basic nursing procedures begin to be carried out by machines<sup>(3-5)</sup>, Nursing needs to start reflecting on what would be its best posture or differential in a world with strong technological tendencies.

Another point to be considered is that the historical legacy of care based on interpersonal relationships of the twenty-first century was put in check due to the importance attributed to neuroanatomy, neurobiology, genomics and neurophysiology in understanding human behavior to the detriment of interpersonal dynamics. When the brain mass gains more strength than the theoretical abstractions on the mind, Nursing navigates between the strain of its historical legacy of care with the current needs of strengthening the meaning of personal relationships, and the biological demands that integrated the meaning of relationships in Nursing practice<sup>(16)</sup>.

Regarding the interpersonal communication process, the observed tendency is that it is possible to choose communication mediated by electronic devices, probably due to its dissemination through IoT, but also because the apparatuses do not make judgments or challenges in coping with the complexity of the human condition. However, it is believed that this behavior can produce a critical situation that generates such an intense instability that it awakens the need to resume, return or rescue

lost human characteristics; a need that integrates the set of emotional and psychosomatic demands of nursing care.

Humanity is heading toward a world steeped in automation and virtual reality environments, in which it is possible to establish social bonds or undergo hedonistic experiences. In this way, it is possible that characteristics which legitimize our humanity are at risk, such as multifaceted social skills, empathy, compassion, or the ability to improvise solutions to new problems, among others. If these skills are not cultivated, there will be a reduction in individuals' cognitive abilities<sup>(17)</sup>. Moreover, a breakthrough in these technologies may mean maintaining the superficial relationships mediated by technology.

The Brave New World society, with all its technological apparatuses under constant transformation, needs to value the human condition in order to avoid the hegemonic domination of technology, making it work for the benefit of society itself. It is imperative that technology be incorporated into Nursing care.

However, it is equally important to be aware that this coin has two sides to be considered: technology will streamline care by performing ergonomic activities, monitoring the health status of individuals through IoT and the automation of health information; while the passive immersion into the digital and automated world could, progressively, negatively affect cognitive functions, leading to the impoverishment of human interactions<sup>(17)</sup>.

In this sense, Nursing needs to value itself as a profession and to be aware that its essence enables it to occupy a privileged place in facing this technology, since there is no Nursing without human interaction. Due to the nature of Nursing work, it is probable that only a small part of its attributions will be replaced by technological advances.

However, to justify its existence as a professional area within society, Nursing must not lose sight of its greatest attributes which are important contributions to human life and freedom. Among the most important are presence in the moment, attention, listening and compassion; values that cannot be minimized or forgotten, since even if machines are able to read thoughts for providing care, only nurses can be the voice of deeper human needs<sup>(18)</sup>.

Even with the advent of Nadine, it is still not possible to know how and/or if robots will be able touch the human essence. The unknown is based on the ability of an artificial, systematic, programmed and objective intelligence to develop to the point of reaching the depth of the human mind. Another relevant line of thought is the possibility that individuals give meaning to their expressions of love and compassion. It is believed that robots still cannot conduct a true and deep dialogue in their interactions<sup>(18)</sup>.

All current and future technological advances will require constant transformations, but their characteristics will demand a cultivation of skills that identify us as humans. In this sense, Huxley himself believed that the true social revolution would be that which would occur in the soul and the flesh of individuals. Thus, it will only be possible to make technology be useful for Nursing through actions that respect this principle, recalling the essence and the historical legacy of this professional category and therefore avoiding dehumanization, the most striking feature of the Brave New World society.

In this sense, the transformation of curricula and professional practice focusing on interpersonal and intrapersonal intelligence<sup>(19)</sup> with attitudes that value human skills will ensure Nursing's place/role in a society dominated by machines and scientific progress.

## FINAL CONSIDERATIONS

Transformations of the future are still uncertain, however they have already drastically altered the way individuals relate to one another and to health services. Even in the midst of the uncertainties arising from the technological and scientific advancement of the present and the future, the nature of Nursing being essentially based on human interactions can guarantee a prominent place for this profession in society.

In this sense, Nursing must recognize its own value, actively include technology in the care process and redefine its professional role as technological development takes place, be aware of the changes and observe its movement as a profession in the midst of the current reality. Finally and above all, to cultivate the characteristics which legitimize our humanity such as interpersonal relationships, creativity, presence and attention in the moment, listening, compassion and continuous learning ability. In this way, the Nursing of the present and the future will value human nature in detriment of technological devices, avoiding the mechanization of care and expanding the nursing process with individuals, families and communities.

## RESUMO

O "Admirável Mundo Novo" previa uma sociedade dominada por um progresso científico e tecnológico que chegava ao ponto de subjugar e desumanizar os seres humanos. O futuro previsto nessa obra não é distante do que estamos vivendo na atualidade. Assim, considerando que a Enfermagem é afetada e desafiada em meio a essas transformações tecnológicas, este artigo objetiva discutir o presente e o futuro da Enfermagem em uma sociedade em constante transformação tecnológica. Em meio a todo um aparato tecnológico, no qual os procedimentos fundamentais começam a ser realizados por máquinas, a Enfermagem precisa começar a refletir sobre qual seria sua melhor postura ou seu diferencial em um mundo com forte tendência ao domínio tecnológico. As transformações do futuro ainda são incertas, mas elas alterarão drasticamente a forma de os indivíduos relacionarem-se consigo mesmos, entre si e com os serviços de saúde. Todavia, mesmo em meio às incertezas advindas do avanço tecnológico e científico do presente e do futuro, a natureza da Enfermagem, essencialmente fundamentada nas interações humanas, pode garantir um lugar de destaque para essa profissão na sociedade.

## DESCRITORES

Papel do Profissional de Enfermagem; Filosofia em Enfermagem; Teoria de Enfermagem; Desenvolvimento Tecnológico; Literatura Moderna.

## RESUMEN

*Un mundo feliz* preveía una sociedad dominada por un progreso científico y tecnológico que llegaba al punto de subyugar y deshumanizar a los seres humanos. El futuro previsto en esa obra no está tan lejano de lo que estamos viviendo en la actualidad. De esa forma, considerándose que la Enfermería se ve afectada y desafiada en medio de dichas transformaciones tecnológicas, este artículo tiene el fin de discutir el presente y el futuro de la Enfermería en una sociedad en constante transformación tecnológica. A la vista de todo ese aparato tecnológico, en el que las máquinas empiezan a realizar los procedimientos fundamentales, la Enfermería necesita empezar a reflejar acerca de cuál sería su mejor postura o su rasgo distintivo en un mundo con fuerte tendencia al dominio tecnológico. Los cambios del futuro todavía son inciertos, pero modificarán drásticamente la forma cómo los individuos se relacionan consigo mismos, entre sí y con los servicios sanitarios. Sin embargo, aun mediante las incertidumbres advenidas del avance tecnológico y científico del presente y del porvenir, la naturaleza de la Enfermería, esencialmente fundada en las interacciones humanas, puede asegurar un sitio de relieve a esa profesión en la sociedad.

## DESCRIPTORES

Rol de la Enfermera; Filosofía en Enfermería; Teoría de Enfermería; Desarrollo Tecnológico; Literatura Moderna.

## REFERENCES

1. Huxley AL. *Brave new world*. London: Chatto & Windus; 1932.
2. Toma MC. The future of jobs: employment, skills and workforce strategy for the fourth industrial revolution [Internet]. Geneva: World Economic Forum; 2016 [cited 2017 Apr 02]. Available from: [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf)
3. Williams LM, Hubbard KE, Daye O, Barden C. Telenursing in the intensive care unit: transforming nursing practice. *Critic Care Nurse*. 2012;1;32(6):62-9. DOI: 10.4037/ccn2012525.
4. Cestari A, Galli AC, Sangalli MN, Zanoni M, Ferrari M, Roviario G. Totally extraperitoneal (TEP) bilateral hernioplasty using the Single Site® robotic da Vinci platform (DV-SS TEP): description of the technique and preliminary results. *Hernia*. 2017;21(3):383-9. <https://doi.org/10.1007/s10029-016-1552-0>.
5. Shamsuddin S, Yussof H, Mohamed S, Hanapiah FA, Ainudin HA. Telerehabilitation service with a robot for autism intervention. *Procedia Comput Sci*. 2015;76:349-54. DOI: <https://doi.org/10.1016/j.procs.2015.12.306>
6. Bartsch G, Mitra AP, Mitra SA, Almal AA, Steven KE, Skinner DG, et al. Use of artificial intelligence and machine learning algorithms with gene expression profiling to predict recurrent nonmuscle invasive urothelial carcinoma of the bladder. *J Urol*. 2016;195(2):493-8. DOI: <https://doi.org/10.1016/j.juro.2015.09.090>
7. Zhang B, Kumar RB, Dai H, Feldman BJ. A plasmonic chip for biomarker discovery and diagnosis of type 1 diabetes. *Nat Med*. 2014;20(8):948-53. DOI: <http://doi.org/10.1038/nm.3619>

8. Donati ARC, Shokur S, Morya E, Campos DSF, Muioli RC, Gitti CM, et al. Long-term training with a brain-machine interface-based gait protocol induces partial neurological recovery in paraplegic patients. *Sci Rep*. 2016;6:e30383. DOI: <http://doi.org/10.1038/srep30383>
9. Przybylski AK, Weinstein N. Can you connect with me now? How the presence of mobile communication technology influences face-to-face conversation quality. *J Soc Pers Relat*. 2013;30(3):237-46. DOI: <https://doi.org/10.1177/0265407512453827>.
10. Ma Y, Zhang Y, Wan J, Zhang D, Pan N. Robot and cloud-assisted multi-modal healthcare system. *Cluster Comput*. 2015;18(3):1295-306. DOI: <https://doi.org/10.1007/s10586-015-0453-9>
11. Poffo R, Toschi AP, Pope RB, Montanhesi PK, Santos RS, Teruya A, et al. Robotic cardiac surgery in Brazil. *Ann Cardiothorac Surg*. 2017;6(1):17-26. DOI: 10.21037/acs.2017.01.01.
12. Madureira Filho D. Robotic surgery: a reality among us. *Rev Col Bras Cir*. 2015;42(5):281-2. DOI: <http://dx.doi.org/10.1590/0100-69912015005002>.
13. Bhatt C, Dey N, Ashour AS. Internet of things and big data technologies for next generation healthcare. New York: Springer; 2017.
14. Kaku M. Physics of the Future: how science will shape human destiny and our daily lives by the year 2100. New York: Anchor; 2012.
15. Thalmann NM, Tian L, Yao F. Nadine: a social robot that can localize objects and grasp them in a human way. *frontiers in electronic technologies*. Singapore: Springer; 2017.
16. D'antonio P, Beeber L, Sills G, Naegle M. The future in the past: Hildegard Peplau and interpersonal relations in nursing. *Nurs Inq*. 2014;21(4):311-7. DOI: 10.1111/nin.12056
17. Nicolelis MAL. Are we at risk of becoming biological digital machines? *Nat Hum Behav*. 2017;1:0008. DOI: 10.1038/s41562-016-0008
18. Karnick PM. Nursing practice: imaging the possibles. *Nurs Sci Q*. 2007;20(1):44-7. DOI: <https://doi.org/10.1177/0894318406296806>.
19. Esteves RB, Sigaki LHJ, Gonçalves MFC. Enfermeiros educadores no ensino superior: as especialidades à luz das Inteligências Múltiplas (IM). *Saúde Transform Soc [Internet]*. 2012 [citado 2017 jul. 10];3(3):77-83. Disponível em: <http://incubadora.periodicos.ufsc.br/index.php/saudeettransformacao/article/view/1664/2184>



This is an open-access article distributed under the terms of the Creative Commons Attribution License.