International Conference
NEW PERSPECTIVES in SCIENCE EDUCATION

The HOPE Online Course on Oncogenetics

Anca Colibaba[1], Irina Gheorghiu[2], Ovidiu Ursa[3], Anais Colibaba[4]

Grigore T.Popa University Iasi / EuroED Foundation, Romania[1]
Albert Ludwigs University Freiburg, Germany[2]
Iuliu Haţieganu University of Medicine and Pharmacy Cluj, Romania[3]
Trinity College Dublin, Ireland[4]

Abstract

The article is based on the open online course promoted by the Hope project. The project is funded by the European Commission (under the Erasmus+ programme) being implemented within an international partnership from Bulgaria, France, Hungary and Romania. The main objective of the HOPE project (2018-1-RO01-KA202-049189) is to highlight the role of oncogenetics, a medical branch, in the early detection and prevention of cancer. The article gives insights into the open online course on oncogenetics which will definitely enable students to acquire advanced knowledge, competences and professional experience in the field of oncogenetics. Following the successful experience of other projects a MOOC has been used as a way of conveying information and implementing it on a larger scale. Students will get training in theoretical and practical clinical, epidemiological and biological oncogenetics. The joint efforts of all partners involved (healthcare centres, universities, non-governmental educational organisations and IT centres) will also contribute to the collaboration between oncogenetics specialists, departments and medical specialists and family doctors and medical centres for the benefit of patients and their families.

Keywords: *oncogenetics, cancer, detection and prevention, MOOC, students*

1. European context

Every day worldwide millions of people fight cancer going through therapies that hugely impact their quality of life. Over the next 2 decades, the number of new cases is expected to rise by about 70% [1]. Oncogenetics is a new branch of medicine that can change this future scenario by monitoring the genetic predispositions of people with mutations or family histories of cancer. The objective of oncogenetics is to understand genetic predisposition to cancers and care for persons at risk. The purpose of a genetic consultation is to determine the share of family history and possible predisposition. Genetic tests, seldom practiced, sometimes confirm a hereditary origin. If an alteration is identified in a family, it can be sought in its relations. This makes it possible to reassure those having no predisposition and following up those at risk.

2. The HOPE project

The HOPE project (2018-1-RO01-KA202-049189) raises awareness about the importance of oncogenetics and the role it can play in the early detection and prevention of the disease.
The project aims to:
- do research on situations, strategies, best practices of oncogenetics at Central and East European level
- create profiles of specialists in oncogenetics
- devise a training guide to advanced high-specialized intervention in oncogenetics
- create an Open Online Course on Oncogenetics
- create HOPE Mobile APP (iOS & Android), which will keep people informed about cancer risk.

The project's target groups are medical specialists: specialists in oncogenetics, oncogenetics advisers, psychologists, oncologists, gynecologists, epidemiologists, geneticists, surgeons, specialists in molecular biology, bioethics specialists and medical management, patients and their families at risk of hereditary or familial cancer, medical institutions, lecturers in medicine (Medical Universities)-educational centres and public at large [2].

3. The Hope MOOC

3.1. Main principles of a MOOC

Since 2000 the development of technology has significantly impacted every field of education, highlighting the need for openness and accessibility in education. The innovative online courses, MOOCs, have met this need. The MOOC of the Hope project tries to meet academic needs of the medical universities. The Hope MOOC relies on the pedagogical principles underlying any MOOC [3]:
Competence-Based Design Approach. The Hope MOOC focuses on outcomes of learning and addresses what the learners are expected to do, what competences they are expected to develop.
Learner Empowerment. The MOOC design favours a learner-centred approach, where students are active participants.
Learning plan and clear orientations Students are given a study plan and details as to how to carry out the activities of the MOOC.
Collaborative learning. Students are encouraged to collaborate with their peers in teamwork activities and discussion forums.
Social networking Social interaction and frequent contact between students are encouraged.
Peer assistance is also valued through peers' support and comments.
Quality criteria for knowledge creation and generation Quality criteria for content development and content selection are provided. Creation of knowledge is appreciated.
Interest groups The approach provides opportunities for small group discussion and exchange.
Assessment and peer feedback Participants are provided with objective and precise criteria and explanation, rubrics, scales, and explanatory automatic answers.
Media-technology-enhanced learning Students are offered a variety of rich-media for capturing their attention and retention.

3.2. The Hope MOOC: General Elements; Oncogenetic monitoring

The Hope MOOC provides students and those interested with a training guide for highly specialized interventions in oncogenetics. Its main topics are as follows: cancer epidemiology, risk factors, esssential clinical elements in hereditary cancer, the basics of human genetics, molecular oncogenetic diagnosis, psychological and ethical issues, selection criteria, bioethic issues, psychological counseling in oncogenetic monitoring, clinical practice etc.

3.2.1. Cancer epidemiology

The paper gives a few insights into descriptive epidemiology of cancers.
Cancer epidemiology is the study of the distribution, determinants, and frequency of malignant disease in specific populations in order to define causative factors (including preventable/ avoidable causes and inherited tumor susceptibility) and to formulate preventive strategies for the disease control [4].

3.2.2 Risk factors of cancers

Any factor that increases the likelihood of an event to occur, the cancer in this case, is called risk factor and the factors that decrease the chance of developing this event are called protective factors. According to IARC (International Agency for Research on Cancer) and World Cancer Research Fund (WCRF) /American Institute for Cancer Research (AICR), the risk (RF) or protective (PF) factors for cancer can be divided into the following categories depending on the type of evidence identified in the specialty literature [5]:
- factors that increase the risk (sufficient or convincing evidence);
- factors that could increase the risk (limited or probable evidence);
- factors that reduce the risk (sufficient or convincing evidence);
- factors that could increase the risk (limited or probable evidence).

Factors known to increase the risk of cancer include: smoking, infections, radiation, immunosuppressive drugs, etc.
Factors that could increase the risk of cancer include: diet, alcohol consumption, physical activity, obesity, carcinogens in the environment, etc (Table1).
Also, some of these risk factors can be avoided, while the action of others cannot be influenced, thus the risk factors are divided into modifiable risk factors (smoking, diet, number of births, etc.) and unchangeable (genetic factors, age, sex, etc.) [6].

Table 1 Cancer Risk factors

Tobacco • Smokeless tobacco, environmental tobacco smoke •	*Radiation* • Ionizing and ultraviolet radiation, radon and its byproducts
Alcohol	*Medications*
Diet • High animal - fat intake; aflatotoxins; deficiencies in vitamins A and C and beta-carotenes	*Infection* • Bacterial *(Helicobacter pylori)* • Parasites *(Schistosoma haemotabium, Clonarchissinensis)* • Viral (Epstein-Barr virus, hepatitis B and C viruses, HIV, HPV, human T-lymphotropic virus type 1)
Occupational exposures • Aromatic amines, arsenic, asbestos, nickel, pesticides, polycyclic hydrocarbons, vinyl chloride, wood dusts, others	*Genetic susceptibility*

3.2.3 Protective factors for cancers

Diet. A person's diet may contain foods that increase the risk of cancer and foods that reduce this risk. Some studies support the hypothesis that diet rich in starch-free vegetables and fruits can provide protection against oral, esophageal and gastric cancers. Also, fruit consumption can protect against colorectal cancer [7].

Physical activity. Research shows that there is a strong relationship between physical activity and decreased risk for colorectal cancer. There is scientific evidence that sustain the protection of physical activity against postmenopausal breast cancer and endometrial cancer.

Among the protective factors for breast cancer are: breastfeeding (the risk decreases by 4% for every 12 months of breastfeeding); physical activity; celiac disease; regular intake of aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs); diet (consumption of fruits and vegetables; fiber; carotenoids; soy; mushrooms; coffee); hysterectomy with ovariectomy (performed before menopause reduces the risk by 24-41%).

Regarding the ovarian cancer, risk-lowering factors include: multiparity; breastfeeding (decreases risk by 24%); the use of OC (reduces the risk by 25-28%); hysterectomy (decreases risk by 27-31%); ovariectomy; tubal ligation (30% risk reduction); the use of statins (decreases risk by 21%); the presence of erythematosus systemic lupus (decreases the risk by 34%); consumption of starch-free vegetables.

Protective factors for colorectal cancer include: physical activity; hormone replacement therapy (decreases risk by 16%); the use of OC (decreases risk by 14%); daily use of aspirin (a period of 5 years or more decreases the risk by 32-49%); Parkinson's disease (decreases risk by 24%); diet (rich in fiber, garlic, milk, calcium) is a factor that is likely to decrease the risk for colorectal cancer.

The European Code Against Cancer suggests 12 ways to reduce cancer risk:

Do not smoke. Do not use any form of tobacco.

Make your home smoke-free. Support smoke-free policies in your workplace.

Take action to be a healthy body weight.

Be physically active in everyday life. Limit the time you spend sitting.

Have a healthy diet:

- Eat plenty of whole grains, pulses, vegetables and fruits.
- Limit high-calorie foods (foods high in sugar or fat) and avoid sugary drinks.

If you drink alcohol of any type, limit your intake. Not drinking alcohol is better for cancer prevention.

Avoid too much sun, especially for children. Use sun protection. Do not use sunbeds.

In the workplace, protect yourself against cancer-causing substances by following health and safety instructions.

Find out if you are exposed to radiation from naturally high radon levels in your home.

- Take action to reduce high radon levels.

For women:
- Breastfeeding reduces the mother's cancer risk. If you can, breastfeed your baby.
- Hormone replacement therapy (HRT) increases the risk of certain cancers.
- Limit use of HRT.

Ensure your children take part in vaccination programmes for:
- Hepatitis B (for newborns)
- Human papillomavirus (HPV) (for girls).

Take part in organised cancer screening programmes for:
- Bowel cancer (men and women)
- Breast cancer (women)
- Cervical cancer (women).

4. Conclusions

The project aims at optimising students' access to the real medical situations by connecting students' academic knowledge and skills with real medical activity. The HOPE MOOC meets a vital need in monitoring the genetic predispositions of people with mutations or family histories of cancer. It is based on well documented and generally accepted educational tools and establishes a unitary system of medical education in oncogenetics across Europe. The project encourages the flow and exchange of knowledge between higher education institutions and stimulates the collaboration between higher education institutions and the world of work (hospitals and clinics).

In addition, by developing the MOOC course the project enhances the ICT component of the teaching and learning process, which will increase the prestige and the profile of the medical universities from Europe internationally.Through international cooperation between education and training providers and other stakeholders (such as hospitals and clinics) the project generates and promotes innovation, at the level of medical education institutions.

Acknowledgements

This paper is based on a study of the HOPE project (Erasmus+ programme/ 2018-1-RO01-KA202-049189/ Field: Strategic Partnerships for vocational education and training), funded by the European commission.

References

[1] *** International Agency for Research on Cancer. GLOBOCAN 2018. *Globocan cancer observatory.* Retrieved from: http://gco.iarc.fr (10 January 2020).
[2] The Hope project, Retrieved from https://hope.projects.umfiasi.ro/ (20 January 2020)
[3] Guàrdia, L., Maina, M., Sangrà, A., (2013). MOOC Design Principles. A Pedagogical Approach from the Learner's Perspective, Retrieved from https://www.researchgate.net/publication/239608003_MOOC_Design_Principles_A_Pedagogical_Approach_from_the_Learner's_Perspective
[4] Matei M, Azoicăi D. Epidemiologia cancerelor. În: Prisecari V: *Epidemiologie specială*. SA „Tipografia Reclama", Chişinău, 2015, 369-392. ISBN 978-9975-58-024-3.
[5] International Agency for Research on Cancer. GLOBOCAN 2018. Retrived from (http://gco.iarc.fr./today/data/factsheets/cancers/39-All-cancers-fact-sheet.pdf
[6] dos Santos Silva I. *Cancer epidemiology: principles and methods*. International Agency for Research on Cancer. Lyon, France, 1999. Retrieved from: https://publications.iarc.fr/Non-Series-Publications/Other-Non-Series-Publications/Cancer-Epidemiology-Principles-And-Methods-1999
[7] Huxley RR, Ansary-Moghaddam A, Clifton P, et al. The impact of dietary and lifestyle risk factors on risk of colorectal cancer: a quantitative overview of the epidemiological evidence. Int J Cancer 2009; 125 (1): 171-180.