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Review Article

A Short Review on 4P Domain in Oncology (Personalized, Predictive, Preventive and Participative)

Hania Noor[1*]

[1]Department of bioinformatics and biotechnology, Government college university Faisalabad

***Corresponding Author:** Hania Noor
Department of bioinformatics and biotechnology, Government college university Faisalabad

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Abstract: Since the 1970s, our society has been undergoing rapid digitalization. This has been paralleled by rapid advancements in biology, in particular with the sequencing of the human genome and the development of proteomics and metabolomics. This digital world presents an unmatched opportunity to revolutionize health. Today, genetic medicines deal with patients who have inherited diseases. Tomorrow, we will be able to deal with a much larger scope, including the multigenic susceptibility to disease. This is the promise of precision medicine. Cancer is a major focus of precision medicine. Initiative and developments in precise and effective treatment could benefit many other chronic diseases. Precision oncology focuses on matching the most accurate and effective treatment to this individual cancer patient based on the genetic profile of cancer and the individual,(*Precision Medicine the Foundation of Future Cancer Therapeutics - Google Search*, n.d.). Because every single cancer patient exhibits a different genetic profile. It can help make more accurate diagnosis and improve treatment that can help people to make decisions regarding their own health and they can deal with areas of uncertainty that might have lowered their risk of cancer.

Keywords: digitalization, biology, proteomics and metabolomics, inherited diseases, chronic diseases.

INTRODUCTION

Cancer is a genetic disease that is caused by changes to the genes that control the way our cells function, especially how they grow and divide. Cancer can be broadly divided into benign and malignant tumors. Cancer is further classified and divided by their cell type, tissues, or organ of origin (Deng & Nakamura, 2017)Cancer is one of the largest health problems in the world, and about 10 million people die from it every year. Cancer can happen because of errors that occur as cells divide, or damage to DNA caused by harmful substances in the environment, such as chemicals in tobacco smoke or ultraviolet rays from the sun. Some cancers may also be inherited from our parents (StoryMD, n.d.). In contrast to the long history of disease diagnosis and treatment of cancer at a cellular and molecular level, a new strategy for fighting cancer has developed and expanded dramatically in recent years. While a single drug has not yet been discovered that can cure all patients, even those with similar cancer type, cancer is an extremely heterogeneous disease (Shin *et al.*, 2017). Each person's cancer is unique, due to its combination of genetic changes. As the cancer continues to grow, additional changes will occur, even within the same tumor. Different cells within the tumor may have different genetic changes. The problem is that physicians do not know which treatment is likely to be effective in any given patient, so the treatment that works most often for the greatest number of patients is usually selected first, even though this treatment may not be effective for some patients (Klonoff, 2008).

Precision Medicine in Cancer

Genomic alteration significantly contributes to cancer development and can be understood and analyzed through available methods. Definitive diagnosis of cancer is made by evaluating a biopsy sample after screening through clinical examination, biomarker testing, and various diagnostic imaging methods such as radiography, ultrasonography, psychological testing, endoscopy, CT, and MRI. In addition to histological classification, biomolecular cancer

classification has been added according to accumulated cancer genomic information and is used clinically. This opens the door to precision medicine (Deng & Nakamura, 2017). Precision oncology integrates molecular derived information, such as information obtained from genomic sequencing, with traditional clinical pathological parameters.

The prognosis of a disease is important for obvious reasons - it tells patients and doctors how likely it is that a disease will progress, and how best to treat it. Prognosis is usually derived from statistical measures from the analysis of patient populations, but predicting the prognosis of an individual patient is quite difficult. Even when we have a lot of information about a disease, it can be difficult to predict how it will progress in an individual patient. This is because every patient is different, and the course of a disease can vary from one person to the next.

The second thing that is of great importance in clinical practice is the prediction of response to treatment. It is important to find treatments that are effective and well tolerated. We know that not all patients respond to chemotherapy, and that it can be quite toxic. So it is important to target treatments to the right patients to increase the chances of a successful outcome while minimizing the side effects.

It is important to be able to predict how a patient will respond to treatment in order to maximize the chances of a successful outcome. Identify people who might be at high risk for cancer and help these people lower their risk. Find certain cancers early. Diagnosed as specific type of cancer correctly. Choose which cancer treatment option at best. Evaluate how well a treatment is working.

Some more common cancers where precision medicine is being used include colorectal cancer, breast cancer, lung cancer, certain types of leukemia, ovarian cancer, stomach and thyroid cancer (Precision or Personalized Medicine | Precision Medicine for Cancer, n.d.).

Biomarker Testing

Biomarkers are molecular changes in cancer cells that can be used to identify the best treatment for a particular patient; precision oncology has potential to improve the outcome of cancer patient by tailoring treatment to the individual. Biomarkers can be used to identify patients who are most likely to respond to a particular treatment, and to identify patients who are likely to experience adverse side effects for a particular treatment. Biomarkers used to find promising features that separate these patients into clinically relevant groups, to properly separate the two it is necessary to do a prospective trial involves both patients with or without the biomarker and exposure or not exposure to the treatment.

The development of biomarker must be rigorous and involve multiple steps that include;

- Discovery of biomarker.
- Validation.
- Proof of utility.

Precision oncology is an important area of research and many new biomarkers are being identified all the time there are currently several biomarkers that are being used to guide cancer treatment.

The most important biomarkers used in precision oncology are;

- Gene expression profiling.
- Tumor mutational burden.
- Immunohistochemistry.
- Circulating tumor DNA.
- Protein expression profiling.
- Micro RNA's.
- Epigenetic.
- MiRNAs.

The development of biomarkers is a challenging process, but recent advancements in technologies like circulating tumor cells DNA (ctDNA) are making it easier to detect and track cancer cells in the body. ctDNA is released from tumor cells when they die and circulates for a short time in the blood. This makes it a valuable tool for monitoring the progress of cancer treatments and predicting a patient's prognosis. We can analyze ctDNA to determine the presence of residual disease in tumors. This information can help us predict a patient's prognosis and guide treatment decisions. While we know that ctDNA can be a valuable tool for monitoring cancer treatments, we still need to learn whether treating patients based on this information will improve their outcome.

Limitations

Precision medicine is still in its early stages and is not yet widely available. Generally, this approach has undeniable success in some patient but it's not yet clear how many patients benefit what is the exact success rate and this varies between institutions depending how they interpret what is a successful outcome and what are the exact question of a given institutions.

Precision medicine is expensive and may not be covered by insurance. The cost of biomarker testing and the medicines that might be recommended because of testing can sometimes be a concern (*Precision or Personalized Medicine | Precision Medicine for Cancer*, n.d.).

Precision medicine is still being developed and is not always accurate. false positive results have been attributed to genomic heterogeneity of the tumor, particularly in the setting of acquired drug resistance (Paweletz *et al.*, 2019).

Precision medicine can only be used for certain types of cancers such as breast, colorectal cancer, lung cancer, certain types of leukemia, stomach cancer, and thyroid cancer (*Precision or Personalized Medicine | Precision Medicine for Cancer*, n.d**.)**.

Precision medicine is not always effective.

CONCLUSION

Precision medicine is an emerging field of cancer treatment that uses information about a person's gene and environment to tailor cancer care. Precision medicine is still in its early stages, but it has the potential to improve cancer care by helping doctors choose the best treatments for each person.

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