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The Concept of Cancer Translational Research - A Review

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ABSTRACT

The translational research is a multidisciplinary research model which includes the process of discovering the concepts of research by using basic science and applying that knowledge with in the clinical praxis. This model appears to be well constructed and highly systematic and it bridges the concept of basic research and the clinical practice. This research paradigm is one of the basis for developing translational medicine which leads to progression of evidence based medicine to solve the public health issues. In this review, the concept of translational research along with various stages, cancer therapeutics & prevention, the main reasons for inadequate therapeutics along with contemporary and future perspectives were discussed. The terminal goal of translational research is to identify the therapeutic guidelines and regimes which are highly effective with low toxicity. The evolution of biotechnology lead to the development of indisputable chances for ameliorating the ability to diagnose, treat and prevent the neoplasms. Preclinical investigations are undergoing for latest developments and advancements in the molecular biology or molecular targeted therapies which lead to the increased identification of the latest agents for treatment. For the expected quality of oncological practice large variety of molecular tumor characteristics and their supporting models will be helpful for allowing continuous reassessment of human malignancies at molecular level. In conclusion, translational research can be used to improve the public health outcomes and can develop the therapeutic and preventive strategies regarding various diseases or disorders and can provide cost benefit health care analysis. Thus, consistent efforts in translational research stimulate the logical and reasonable inventions in the field of multidisciplinary cancer research in future.

Keywords: *Chemotherapy, Oncology, Palliative care, Translational Research*

INTRODUCTION

The translational research is a multidisciplinary research model which includes the process of discovering the concepts of research by using basic science and applying that knowledge with in the clinical praxis. This model appears to be well constructed and highly systematic and it bridges the concept of basic research and the clinical practice. This research paradigm is one of the basis for developing translational medicine which leads to progression of evidence based medicine to solve the public health issues. The main aim of the translational research is to promote patient centered care and to develop the preventive measures which help to offer the effective health care services.

Translational research is bidirectional and this model forms a complex network as it includes the exchange of knowledge among the researchers, health care professionals as well as the patients for a proper team work & coordination to perform research effectively. As this research paradigm is having a greater importance in the medical practice with in the community, the interventional epidemiology should also be taken into consideration. The model of translational research can be classified into four different stages that include T1, T2, T3 and T4 [1-5].

T1 Stage

It is a preclinical phase of translational research, which can be described as "bench to bedside". In this stage, researchers develop the discoveries from basic science and human medicine through early phases of clinical trials. Phase-I clinical trials are involved in this stage and the researchers try to identify the bridge between the concept of basic science and human medicine. Once if the link is evaluated, the researchers try to initiate using the healthy human models or non human models, computerized programs, tissue samples etc, for allowing the evidence of the concept to establish. Some examples are development of the drugs, study of different disease mechanisms involved with proteins, genes & genetics and technologies used for the treatment [6-9].

T2 Stage

It can also be described as a phase, from "bedside to practice" of translational research where phase-II and phase-III clinical trials are involved in this stage. The safety and efficiency of an intervention is verified and established by the researchers in this stage. The concept that is discovered and established in T1 stage is applied among the human volunteers and the response is observed and assessed using a clinical trial. The quality and validity of the evidence that is generated in these studies are more important and required for receiving an approval for doing interventions related to the patient safety and as well as patient care. The clinical guidelines can also be developed and established in this stage [10-13].

T3 Stage

The T3 stage of translational research is evaluative in nature. It involves the phase-IV clinical trials which describes about dissemination research and implementation research. Dissemination research includes the evidence based interventions which are confirmed from human volunteers by observing them with in a patient care setting. Implementation research includes the integration of interventions within the existing program. The main aim of T3 is not only to give treatment to the patients but also to spread the knowledge regarding the results of the previously conducted trials. This stage provides a further scope of research to understand the clinical outcomes and to identify any new clinical concepts for further interventions.

T4 Stage

It is the ultimate stage of translational research which mainly focuses on positive outcomes within a population to establish the value of the research. The main aim of this stage is to improve the community based health status or health benefits and to decrease the economic burden that could be related to etiology of an intervention. Diffusion research is involved in this stage and it describes the benefits to the public by adapting the evidence based interventions into the clinical practice for improving the health status & preventive measures. As the interventions could impose financial burden, the cost benefit analysis study should also be done [5-7].

Translational Cancer Research

Translational cancer research can be defined as a logical tumour research continuum in which it is obligatory to convey the cancer problems effectively. The increasing cancer difficulties can only be substantially altered by taking coordinated action and also by implementing the preventive measures. These measures must be helpful to decrease the occurrence of cancer cases, early observation to improve the healing rate, individualized cancer medicine to improve the chance of recovery and treatment to the biological attributes of a tumour. The cancer translational research continuum includes the

principle aspects of cancer research. The main aim of translational cancer research continuity is to improve the preserving rate, enhance the survivability and increasing the health related quality of life. The therapeutics of translational cancer research mainly targets the needs of the patients there by preventing the negative consequences among the at-risk population [14].

Research in Cancer Therapeutics

The model of cancer translational research can be categorized into two different phases which includes early translational research and late translational research. Early translational research links the basic or preclinical research with the clinical research. By closely observing the cancer research continuum, the components of the late translational research were not properly linked and were observed with four extra gaps. Based on the basic research innovations in the clinical trials in gap-1, the intended proof of the concept can be developed. For linking the extensive information between fundamental tumour biology and basic research, there is a need of censorious group of skillful professionals; sophisticated facilities and funds along with huge study population. The tumour biology and basic research includes the recognition of cancer triggering molecular pathways, identification of latest targets for therapy and recognizing the molecular markers for research to develop anticipating tumour medication. Early translational research includes the evaluation of the clinical efficacy within a few patients with confined information of side effects whereas the late translational research is to explain the clinical value and effectiveness of research ideas in the aspect of health care system thereby bringing out a "pharmaceutical product" for effective treatment. As it is a tough move, it demands important investments and basic assurance from pharmaceutical and biotechnology industries which is related to gap-2 of cancer translational research. To encounter the requirements, coalition of Comprehensive Cancer Centers (CCCs) which are prepared to take on scientific research and early clinical research have been established. These centres play a key role by linking the research with health care system will reduce the time for the research inventions to reach the patients [15-19].

Implementation research is helpful for connecting the research outcomes to its use within the health care system that represents the gap-3. It's better to follow the firm rules and practice regarding the therapeutics and documentation of both the positive and negative outcomes of the therapy in the implementation research. The main goal of this research is to evaluate the outcome that is observed in the research can be procreated in a systematic clinical set up. Due to intricacy of diagnostic methods and therapeutic conventions, there is a chance of developing the issues while managing the individualized tumor medicine. At this stage of research, the health related pharmacoeconomics should always be taken into the consideration. The revised medical guidelines conveying the latest therapy should be included after identifying the positive outcomes of the implementation research that is related to gap-4. The clinical guidelines should endorse data collection for the clinical cancer registry to authorize outcomes research. The clinical data that is gathered by maintaining the quality will be evaluated for the medical utility and connected to pharmacoeconomics for evaluating the cost effectiveness and use for patients and the public [19].

The capability to perform outcomes research and evaluate the health related financial aspects of the latest diagnostic methods and therapies will be considerable and provides essential information to health care organizations. So it's better to collaborate with more number of CCCs is required for prioritization of various aspects of diagnostic methods and treatment. An increase in cancer patients with or without proof of residual illness should be concentrated as they suffer from long-term somatic and psychodynamic side effects. Hence, long duration of follow up is required related to cancer survivorship. As this is entangled with various problems related to patients and health care systems, lots of information should be gathered by long period follow up with patients especially those who underwent the treatment is needed to draw conclusions about the positive and negative consequences of new research inventions as well

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as health economics and to know the worth of cancer treatment. To make certain that the assortment of data from centres can be promptly evaluated, connecting therapy with long term follow up should be carefully contemplated and comprehensive standards of clinical registers have to be accepted based on gap-5 of cancer translational research [20, 21].

Research in Cancer prevention

Early translational research connects the basic preclinical research with the advancement of probable prevention strategy. It mainly concentrates on the detection of etiology of cancer and spotting of risk and protective factors representing the gap-1. Gap-2 mainly aims to evaluate the efficacy of the newly developed strategy which has to be tested in the clinical trials. The healthcare systems should document the preventive research and required economic outcomes in order to prevent the gap-3. This gap is having its own significance as it reduces cancer difficulty by 30-40%. The prevention programmes should be planned in the implementation research as the major goal for outcomes research is linked with the health economics related to gap 4 [17].

Cancer Medicine in Translational Research: Bench to Bedside

In cancer translational research, development of unique diagnostic methods and drugs play a significant role and the anti-neoplastic agent should have a targeted effect for cancer cells by not affecting the healthy or normal cells. Before 1945 there was no existence of any medications or treatment strategies for the management of cancer. During World War-I, the first chemotherapeutic agent was accidentally discovered where the individuals exposed to mustard gas and they were observed with the suppressed lymphoid and myeloid leukemia. Hence, it was identified that mustard gas might be able to treat leukemia or blood cancer. In the next generation, DNA damaging agents, anti-metabolites, taxanes and combination of the therapeutic agents have been developed. At the early stages of the chemotherapy development, cell growth inhibition was mainly concentrated and various aspects of the concept of growth regulation, vasculature and tumour cell growth were explained later [22].

Radiation therapy

Ionizing radiation is widely used for the treatment of cancer which utilizes the radiation energy at the higher levels and sometimes along with the chemotherapy or surgery for effective treatment of tumors. Radiation therapy is well tolerated but, can cause side effects such as secondary neoplasms, bone related complications and heart diseases due to radiation exposure. So, there is a need for developing the therapies specified to cancer cells by sensitizing them to radiation and protecting the normal cells from harmful effects of the radiation [23-29].

Chemotherapy

It mainly includes the use of the drugs that mainly targets the cell growth. The chemotherapeutic agents differ from each other in the various aspects of their chemical composition/structure, function, specific actions and their toxicities. As these agents can cause severe side effects, there is a requirement to develop the chemo-protective and chemo-sensitizing agents which are tumor specific [30, 31].

Molecular targeted therapy

For the effective preclinical and clinical trials, rational drug development and identification of suitable targets for drug were based on the specific tumour characteristics. Examples of these molecular targets include EGFR (Epidermal Growth Factor Receptor), VEGF (Vascular Endothelial Growth Factor), C-MET (Mesenchymal Epithelial transition Factor). Src, HER2 (Human Epidermal growth factor Receptor) can also be involved in the tumor therapy. Increased proliferation, angiogenesis, invasion, metastasis and decreased cell death can be observed due to the amplification of the genes and the proteins which can further lead to disease aggression, less chance of survival rate, resistance to the drugs that makes the drug target sites ideal for the specificity of the cancer therapy. Small molecule inhibitors or

monoclonal antibodies mostly inhibit these targets by specifically acting against a gene or protein [32]. In various cancers, kinase inhibitors inhibit the inappropriate signaling and the examples of these inhibitors include imatinib, erlotinib and lapatinib. Around 30 antibody and kinase inhibitors were identified in the preclinical development in which they were more specific to cancer cells and less toxic to the normal cells [33].

EGFR is the first receptor identified for tumour targeted therapy that belongs to the family of the trans-membrane receptor tyrosine kinases. This receptor is involved in the cell growth of the neoplasm, tumour invasion and metastasis of the cancer. Excessive expression of EGFR can be observed in the epithelial tumors [34-39]. The monoclonal antibody cetuximab inhibits the signaling of the EGFR which mediate the immunoglobulin dependent cellular toxicity [40]. The monoclonal antibody transtuzumab acts against HER2 which initiate the antibody dependent cellular cytotoxicity that prevents the receptor activation and signaling which inhibits the angiogenesis and induces the programmed cell death [41, 42]. The drug lapatinib inhibits both EGFR and HER2 by involving the intracellular signaling which has shown highly effective outcomes in the clinical trials [43, 44].

Angiogenesis is the crucial factor and major concern that is associated with primary tumour and metastasis in the cancer patients which has to be treated with the anti-angiogenesis agents [45-47]. Bevacizumab is a humanized monoclonal antibody that works against VEGF and is the most advanced drug available at present. This drug is the first compound to treat angiogenesis authorized by USFDA and is used to treat various types of neoplasms associated with lungs, colorectal regions, prostate cancer in men and breast cancer in women [45, 48, 49]. Imatinib mesylate inhibits the Philadelphia chromosome which is the first line agent for treating the chronic myelogeneous leukemia (CML) [50, 51]. As this drug is having disadvantages such as it cannot completely eliminate the residual leukemic stem cells and progenitor cells that causes the risk of recurrence. This drug has the tendency to develop drug resistance which another disadvantage [52].

Reasons for inadequate therapeutics in clinical scenario

The terminal goal of the treatment of cancer is to eliminate all the neoplastic cells at the site of origin or other parts of the body which might cause recurrence after certain period of dormancy. The drug therapy resistance, inadequate primary drug therapy or possessing resistant cancer cells are some of the factors that lead to re-growth of the tumors. Based on the type of cancer, the recurrence of the disease varies from individual to individual. The period of time taken for the occurrence of relapse and the therapeutic regimen that was initially given also shows impact on the recurrence of the disease. By giving the additional therapies there is a chance to completely remove the cancer cells in the aspect of the recurrent neoplasms. Controlling the growth of the tumor, pain management and monitoring toxic effects should be the goals of the treatment if it is difficult to eliminate the cancer recurrence that helps to improve the quality of life of the patient [51, 53, 54]. Cancer with metastasis is mostly not curable with in a less number of individuals observed with long term survival even after giving the standard therapies. There is a need for developing the unique therapies which can mainly act on the specific drug resistant cells, cells that trigger the recurrence of the tumour and cells with metastasis which ultimately leads to the improvement of effectiveness and specificity [57-59]. To inhibit the multi-drug-resistant pumps (P-glycoprotein, MDR1, ABCG2/BCRP), newer therapeutic agents have been developed to stay longer within the cancerous cells [60-62].

The cancer stem cells (CSCs) are mainly involved in the formation of the new cancers which are having the characteristics of the normal stem cells. CSCs are immortal, pleuripotent cells and the capacity to self-renovate which can multiply to various cell lines. CSCs can be traced out in both solid and non-solid neoplasms. It includes breast, blood cancer, prostate, brain and multiple myelomas [63-68]. There is a lack of information regarding the physiological features and expression of markers, so it is difficult to define the CSCs among the various types of neoplasms. Stem cell marker heterogeneity is trendy for conducting the new aspect of the

research. Quiescent cancer stem cells might start the recurrence of the tumour cells even after completion of the initial treatments. To identify the difference between the CSCs and the normal cells, the recent therapeutic strategies are failing to eliminate the solid tumors [63, 64, 66-72].

Contemporary and future perspectives

Large number of opportunities has been created regarding the latest methods of the diagnosis, treatment and prevention due to recent improvements in the field of the biotechnology. In the cancer cells, there will be ideal therapeutic targets which play a crucial role to maintain the tumor. Huge efforts should be kept to develop the newer agents for treatment of cancer without damaging the normal cells, by targeting the cancer specific molecular targets.

Omics

Genomic and the proteomic studies play an important role in oncology to understand the gene stimulation and expression within the normal and the cancer disease states. Targeted proteomic methods determine the effectiveness of the targeted therapy and may be helpful in future aspects. The genomic and proteomic studies lead to the identification of the biochemical substances called the biomarkers used for the evaluation of the disease. These biomarkers can be classified into three different types that include diagnostic, prognostic and predictive markers. Diagnostic biomarker helps for diagnosing the disease. Prognostic markers are used to know the clinical outcome of the disease status where as the predictive markers are used to predict the disease state and response to the therapy and all these markers are required for designing the therapeutic regimens [49, 73-79].

Gene /protein regulation

Highly tolerable drugs such as latest generation of the SERMs, 5 alpha reductase inhibitors and inhibitors of COX-2 can be useful in the cancer prevention [80, 81]. Mitotic inhibitors were also proved to be efficient anti-neoplastic agents where as they are highly toxic, because they are toxic to the normal cells and as they are not specific to the cancer cells [82-84]. Transcriptional inhibitors help to inhibit the cell migration, development of new blood vessels, and induction of apoptosis in the cancer therapeutics. Abnormal gene expression is mostly present in all the types of the neoplasms [85-87].

Apoptotic pathway is complex where the anti-apoptotic signaling plays a key role in the chemotherapy and the radiation therapy resistance which may reduce the efficacy of the treatment of the cancer. Apoptosis inhibitor proteins are expressed in the tumor cells which can lead to poor prognosis and can show impact on the therapeutic targets. IAPs (inhibitors of apoptosis proteins) can escalate cell death induced by the ionizing radiation and chemotherapy. “Survivin” is an important IAP which can be used as diagnostic markers to differentiate cancer and the noncancerous cells. In some aspects of cell death, TNF (tumor necrosis factor) will be involved in this process [88-92].

Nanotechnology

In this new innovative technology, the radioactive atoms will bind to the tumor specific immunoglobulin which is injected into the systematic circulation and carried out directly to the location of the tumor. Several factors like location of tumor, shape, size, presence of blood vessels play an important role in the radionuclide-based therapies. For the radio-immunotherapy of the lymphoma, two radio-labeled antibodies of anti-CD 20 were available and these antibodies were having the higher risk of re-emission of cancer compared to the unlabelled antibody. In patients with solid tumors, radio-labeled antibody therapy is less successful as these tumors are poorly sensitized by the radiation which have the restricted vascularization and do not have the equal uptake of the radio-labeled immunoglobulin. Usage of the nanoparticles promotes the pharmacokinetics, distribution and release of the associated drug for the treatment of cancer. Nanotechnology decreases the toxic effects by promoting the tumor cell specificity of the drug targets. It is also used to establish sensitive assay

techniques for the identification of the latest tumor biomarkers [93-95]. Quantum Dots (QDs) are the inorganic fluorephores which are highly specific, brighter and highly stable compared to the other fluorescent markers. One disadvantage is the penetration of the light into the body is restricted. Ultimately, nanotechnology is useful in understanding the progression of the disease and outcomes of the therapeutics [96-99].

Telomerase

About 85-90% of the human cancers were identified with the telomerase activity that mainly increases during the progression of the tumor. Hence, it can be used as potential biomarker for the diagnosis of the cancer. In the cancer therapy, telomerase inhibition can specifically act on the targeted cancer cells by slowing the progression of the primary cancers and decreases the movement of the cancer cells towards the lungs.

Immunotherapy

Cancer cells are mostly escaped from the immune response which is considered as the essential feature that is observed in the cancer disease progression. Anti neoplastic immune therapies might contribute to control the tumor after treating with the conventional chemotherapy. Vaccines for cancer, immune stimulating antibodies and the inhibiting antibodies are involved in the response of the immune system for the treatment of cancer which can further lead to progression of cancer cell death and the cancer stem cell stimulation [100-109].

Cancer Translational Research - Contemporary Practice of Palliative Care

There is a necessity to conduct research based on the aspect of palliative care for cancer patients to gather more knowledge and to face the new challenges in the cancer translational research [110-112].

Micro assay technology and genetic sequencing techniques gathers great amount of genomic information to disentangle the convoluted tumour biology and contrasts in the clinical responses which can leads to development of immunotherapy of cancer and the targeted gene therapy. There is a difference between the palliative care and end-of-life care. In critically cancer patients, it is difficult to observe the transition of the palliative care and the end-of-life care to be provided. Hence, identification with in the time limit is required for optimal care [113-115]. Humanized murine models have been developed to perform the in-vivo study for understanding the human biology by overcoming the ethical and the technical considerations. The cancer related pain studies can be affected by the various types of factors such as gender, genotype and communication with the society, as the pain phenomenon itself is complicated context. So, all these factors should be taken into consideration when the murine models are used in the research aspects [116].

Palliative care drugs are frequently utilized outside their authorizing license. Unique research techniques may be helpful in preventing the unanticipated suggestions of such practice like high content screening technologies in humans, PK-PD modeling and Langendroff-perfused heart model in female rabbit for grasping the medication induced conducting effects of electrophysiology [117]. Biochemical markers can be utilized for the diagnostic aspects, selecting the drug therapy, understanding the prognosis and also plays a vital role in biology of dying [118, 119].

For the rehabilitation research in the aspect of palliative care neuroimaging techniques have become the essential tools for identifying the brain trauma effects or cognitive behavioral symptoms. These diagnostic techniques can include the MRI, positron emission tomography scan, encephalographic techniques, IR spectroscopy and transcranial magnetic stimulation. Quantification of the integrity of white matter can be examined by diffusion-weighted magnetic resonance techniques like diffusion tensor imaging and high angular resolution diffusion [120].

Palliative care related research can include the quantitative and the qualitative methods and can be descriptive as well as interventional study patterns [121]. The proper balance should be

maintained to safeguard the ethical rights of the patient by providing adequate care and to promote & evaluate the efficacy or safety aspects of the scientific research. Randomized Control Trials can be useful for the validation of the prospective and retrospective clinical information in the aspects of the scientific research areas but there are some barriers while conducting RCT in the aspect of the palliative care. By using the inventive approaches like response adaptive randomization methods can also be considered. These study designs can concentrate on minimizing the predicted therapeutic failures while maintaining the benefits of the randomization. The RCTs can include the "add-on- trial" designs and the cross over study designs. In the "add on" trial designs the newer therapy is added to the present ongoing therapy of the patient. Cross over trial designs can be applicable in the disease state where the clinical presentation and the symptoms of the patient are stable and useful for the study of various diseases. The strength of the study can be increased markedly by using the patients as their own control the carryover effects might be observed which can cause a serious imminence for the study validity within the therapeutic period [122-124]. Hesitation of the study participants can lead to under enrolment or selective enrolment which results in failure of gathering the adequate information and identifying the effect of the therapeutic effect. By adding the patients with the early to mild symptoms into the inclusion criteria the rate of the response or outcome can be greater than the predicted. The study participants who are uncooperative may show less outcome rate than the standard treatment there by miscalculating the usefulness of the therapy. Less adherence by the study participants and dropping in the middle of the study are the issues which can further lead to the bias within the trial [125, 126]. Latest trials can be designed to prevent these challenges or barriers. They include the "N-of-1" trial, standard parallel-arm RCTs, fast-track RCTs and adaptive RCTs [119, 127]. These can include either an individual participant or group of the participants like cluster randomization types. They bring the scientific research closer to real life health care which includes pragmatic trials, implementation research, community based research and project demonstration are the latest methods which can reduce the gap and distortion in the aspects of the translational research related to the cancer biology/oncology aspect [128, 129].

Limitations of Translational Research

Translational research paradigm appears to be highly systematic and well intact. But, some of the factors can impede the process of translational research. The examples are failure to implement the core aspects like developing the focused concept of interest, accomplishing an effective multidisciplinary effort, usage of the standard bio-banking protocols, maintaining the research bi-directionality, introducing the in-depth education and mentoring methods and developing the programmes that can reach to community. During these past two decades, less number of the effective educational programs were conducted which has lead to the 95% of failure rate by influencing the investments and advances in the molecular science. Effective interdisciplinary cooperation and effective training programmes are the main aspects of an effective translational research that should be focused [1, 129].

CONCLUSION

The terminal goal of translational research is to identify the therapeutic guidelines and regimes which are highly effective with low toxicity. The evolution of biotechnology lead to the development of indisputable chances for ameliorating the ability to diagnose, treat and prevent the neoplasms. Preclinical investigations are undergoing for latest developments and advancements in the molecular biology or molecular targeted therapies which lead to the increased identification of the latest agents for treatment. To develop these new agents there is a requirement of proper coordination between the persons involved in the basic research, clinicians, computational biologists and the pharmaceutical industry. The exchange of information from each section will improve and help out to face the challenges endlessly to trace out the latest therapeutic approaches. Approaches in the study of genetics and proteins permit to understand the

features or characteristics of cancer to develop individualized treatment patterns based on the genetics and protein construction. At present, various drug discovery programmes have been expanded internationally for sequencing the genomes of diverse human malignancies. In these drug discovery programmes, the diagnostic tests plays a key role in anticipating the worth of the anti tumor agents at the molecular level. These agents are visualized and approved collaterally with new micro-molecular treatments and immune cell therapies assisted by better preclinical cancer models. The DNA sequencing techniques have been improved due to complex interactions between cancer cells and their microenvironment, illumination of interaction between genetic drivers of cancer (oncogenes and tumor suppressor agents) and recent perception into the genetic heterogeneity of human neoplasms. These developments are used in the genomic clinical trials of the first generation which will scrutinize the viability of matching the systemic therapies in an extensive range to specific attributes of the tumor molecules. For the expected quality of oncological practice large variety of molecular tumor characteristics and their supporting models will be helpful for allowing continuous reassessment of human malignancies at molecular level. In conclusion, translational research can be used to improve the public health outcomes and can develop the therapeutic and preventive strategies regarding various diseases or disorders and can provide cost benefit health care analysis. Thus, consistent efforts in translational research stimulate the logical and reasonable inventions in the field of multidisciplinary cancer research in future.

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