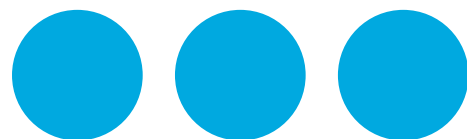varian

The Future of Cancer Care:
Moving from Promise to Reality

Snapshot...
from the future

On June 11, 2048, a few months after her 45th birthday, Victoria Anderson is meeting with her Multidisciplinary Cancer Care Team (MCCT) at the local cancer center. Following her annual physical, circulating tumor cells indicative of early stage breast cancer were found in Vicky's blood. A follow-up liquid biopsy confirms the diagnosis. Vicky's primary care doctor, who is linked with the MCCT, has referred her to the cancer center and is present at the meeting as the primary care member of Vicky's team.

The MCCT leader, a cancer specialist, explains to Vicky that she has Stage I breast cancer. While this news is serious and should not be taken lightly, the good news, as the doctor explains, is that in 2048, the prognosis for early stage breast cancer is very positive. With current treatment options, standardized protocols and integrated care management, disease-free survival for early stage breast cancer patients averages 96% at five years, 92% at 10 years and 91% after 20 years. In other words, with proper care provided by an integrated, multidisciplinary team, the chances are very good that Vicky will not only survive but will be cancer-free over the long term.

During her visit with the MCCT, thanks to the benefit of artificial intelligence (AI) and access to enormous volumes of data on treatment outcomes in early stage breast cancer, Vicky is provided with a personalized treatment plan. Her plan includes an algorithm showing all of the possible treatment options her care team will consider. Among these options are radiation therapy, combination immunotherapy, robotic surgery, microwave ablation, and emerging treatments such as nanoparticle therapy. Vicky's treatment plan will be adjusted in real time based on companion diagnostics and treatment response assessments through imaging during treatment. The MCCT will also connect Vicky with the cancer center's cancer survivorship and healthy lifestyles teams so she can learn about lifestyle factors that may affect breast cancer survivors and make any necessary lifestyle adjustments. Last but not least, Vicky schedules follow-up visits with her care team and is provided with the appropriate contact information for team members in case of any questions or concerns.

With all of her available treatment options clearly understood, a personalized treatment plan provided with follow-up visits scheduled, and a clear understanding of what she can expect from her care team, Vicky leaves her visit feeling like an active member of the MCCT for her cancer treatment. She feels involved in all aspects of her care, and very confident that she will be able to overcome her cancer and move forward to live a happy and healthy life. In other words, while Vicky is concerned, she is confident that with the help of her team, she will get through this and enjoy the rest of her life. She is not afraid.

(Achieving this vision of a world without fear of cancer within the next 30 years may sound like science fiction to some. Cancer remains one of the deadliest and most difficult to treat diseases in the world. However, with many of the advances being made today, it is entirely possible for this vision to become reality by 2048.)

Where are we in 2018? Rising global incidence and fragmented cancer care

Cancer is currently one of the biggest global health challenges we face. It is the second leading cause of death worldwide. Globally, one out of every six deaths are due to cancer. An estimated 9 million people died from cancer worldwide in 2015.[1] Against this backdrop of daunting figures and global challenges, there are today more reasons to be hopeful for the future of cancer care than ever before. Over the next 30 years, some experts predict that it is entirely possible that cancer can become a manageable, chronic disease, similar to diabetes, so that a cancer diagnosis will no longer hold the fear that it does today. Advances in global networking, cloud computing and digital communications are enabling greater connectivity between centers of excellence in cancer care and populations in need throughout the world. New discoveries and methodologies in diagnostics, genomics, precision medicine, immunotherapy, artificial intelligence, robotic surgery, radiotherapy and data analytics are being introduced every year. Over the next 30 years, these new technologies and treatment approaches will be used synergistically to create a world where surviving cancer is much more commonplace. By harnessing these and other emerging treatments and technologies, we could see a future in cancer care where a number of tumor types can be effectively managed and even eradicated.[2,3]

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Achieving a better future for cancer patients: the challenges that lie ahead

From fragmented care to integrated care

One big challenge to achieving the vision of a world without fear of cancer over the next 30 years will be moving beyond the current fragmented cancer care landscape toward a more integrated approach to cancer care. **Helping to remove "silos" between cancer specialists, primary care physicians, affiliated healthcare providers and patients is a major challenge that we currently face.** Providing integrated, multidisciplinary cancer care teams, where cancer patients become active participants in sharing information and making treatment decisions, is necessary to move cancer care forward.[4] Ensuring connectivity between academic institutions, cancer treatment centers, community oncology practices and primary care providers is key. Empowering physicians to spend more of their time treating patients and less time wrestling with technology is an important mutual goal for physicians and for technology solutions providers. And giving patients tools that allow them to become more active and engaged members of the cancer care team is critical to improving outcomes.

Increasing demands on medical professionals

Rapid, exponential progress in available technology, data analytics and cancer treatment approaches over the next 30 years will demand significant changes in the skill sets that physicians are going to need to enter their profession. New competencies will be needed. This will require changes in medical education, training and certifications for physicians and other healthcare professionals specializing in cancer care.

Earlier detection, diagnosis and localized treatment approaches

Diagnosing cancer earlier will significantly improve the chances of successful treatment outcomes. **With earlier diagnosis, more cancers will be targeted and treated locally (at the tumor site) rather than systemically.** In these cases, patients diagnosed with early stage disease may not need systemic treatments such as chemotherapy. Less reliance on systemic chemotherapy can significantly reduce treatment side effects.

The potential impact earlier diagnosis will have on treatment outcomes and survival will be transformative. Artificial intelligence and machine learning have both been shown to improve the early detection of cancer by more accurately identifying at-risk patients, improving diagnostic test sensitivity and specificity, accelerating our ability to screen and risk-stratify patient populations, improving treatment planning and predicting treatment outcomes.[5,6] Blood tests used as "liquid biopsies" to identify circulating tumor cells will also enable earlier detection, diagnosis and treatment of cancer, and these technologies are currently in development. In addition to advances in available drugs and biologics to treat cancer, other treatment modalities including intensity modulated x-ray and proton therapy (IMRT and IMPT), stereotactic radiosurgery (SRS), and robotic surgery will become increasingly more precise. Coupled with the ability to diagnose cancer earlier and while the disease is still localized, these technologies will be used more frequently with curative intent for specific types of cancer. **All of these advancements hold the potential of delivering better treatment outcomes and improve both convenience and quality of life for millions of cancer patients.**

Harnessing the power of genomics

An accelerated understanding of the complex molecular basis of cancer is leading toward panomics, which combines genomics, proteomics, metabolomics and more. Panomics offers an expanded framework for learning about the complex networks of molecular pathways and characteristics of the tumor microenvironment. A more sophisticated understanding of the factors

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that drive cancer is significantly increasing the number of available targets and allowing for far greater precision in attacking those targets.[2]

Transforming data into decision support tools

Over the past decade we have also witnessed an explosion in Big Data, particularly in our ability to collect and analyze vast amounts of data points. There is great focus within governments, industry and academia on improving our ability to synthesize all of this data and leverage it into actionable intelligence. **Our success in doing this will determine the degree to which we can transform cancer care over the next 30 years.**

The four "Vs" of Big Data:(volume, velocity, variety and veracity) illustrate the ways in which big data is expanding to meet the needs of cancer care, and the challenges inherent in effectively managing and ensuring the quality and accuracy of this data so that it delivers meaningful outcomes to cancer patients. Volume refers to the incredible amounts of data now being generated. Velocity is the rapid speed at which data is accumulating. Variety is the proliferation of different data sets and the wide range of formats, practice settings, specialties and disease states for which these data sets are being created. Standardizing these many different data sets so that together they provide meaningful, actionable information that drives treatment is key. And with so much data being generated at an increasingly rapid rate and for so many different treatment settings and disease states, the veracity of this data—whether it is accurate and error-free—is extremely important as healthcare practitioners and patients come to rely on it more and more.[8]

Having large volumes of data is one thing. Turning that data into useful decision support tools for physicians and patients is a major challenge where a significant amount of work remains to be done. This will require greater standardization of data sets and electronic health records (EHRs) between governments, large institutions and private practices. It will require better integration between databases including ASCO's CancerLinQ® the Surveillance, Epidemiology and End Results (SEER) database in the United States, the World Health Organization's Global Cancer Observatory (GCO) and the EU's European Cancer Information System (ECIS) internationally. And it will require the improved utilization of treatment guidelines. Last but not least, it will require significant improvements in the ability to track, analyze and use patient reported outcomes to change research and treatment protocols in real time. All of this will need to be done in ways that adhere to national and international data privacy laws and regulations and respect the confidentiality of individual cancer patients throughout the world.

Tapping the potential of immunotherapy

Since 2010, when the first randomized clinical trial of ipilimumab was published, it has become clear that targeted immunotherapy—treatments that trigger the body's immune system to fight cancer— has the potential to control or even eradicate certain types of cancer. While there are different approaches, and some are in early phases of development, immunotherapy in general holds enormous promise for several disease processes. In the past five years, the increased availability of approved and investigational targeted immunotherapy drugs has led to more interest in the potential of combining immunotherapy treatments with other treatment modalities (e.g. radiotherapy) for certain types of cancer. The results of these combination studies have been encouraging so far, but many researchers believe that we are just starting to scratch the surface.[9]

There are still major challenges to be overcome in order for immunotherapy to deliver on its early promise. These include patient selection for a particular treatment based on tumor biomarkers, effectively managing toxicities, identifying ideal combinations of immunotherapy and other therapies for specific tumor types, and managing treatment costs.

Tackling clinical research and treatment costs

In 2016, The Tufts Center for the Study of Drug Development estimated the total cost to bring a new drug to market to be $2.8 billion and rising.[10] With cancer incidence and mortality continuing to rise in developing countries, cost effectiveness must become the guiding principle in cancer treatment and clinical research. This is an area where data analytics, AI and machine learning can have an enormous impact by reducing the time required to complete clinical trials and improving the quality and utility of the data generated from those trials. In addition to promising new drugs and biologics to treat specific tumor types, new cancer treatment technologies in imaging, radiotherapy, robotic surgery and stereotactic surgery are adding to the range of treatment options available to cancer specialists. Over the next 30 years, to successfully address the challenges of managing cost effectiveness and improved access to promising new treatments, partnerships between industry, governments, academic institutions and patient advocacy groups will be critical.
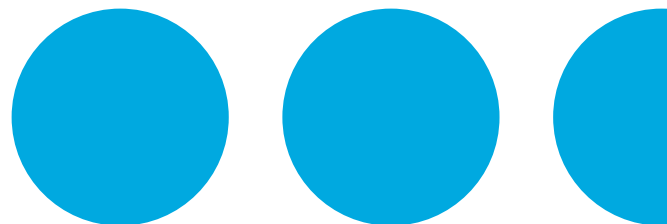
Varian's role in helping to create the future of cancer care

Varian is a global leader in developing and delivering multidisciplinary, integrated cancer care solutions. Our focus is on creating a world without fear of cancer.

At Varian, our strategy is to put the patient and provider at the center of our thinking and create an ecosystem with three evolving pillars: intelligent treatment delivery through effective decision support tools, knowledge-based medicine (bringing knowledge to the point of care) and analytics—obtaining actionable insights from aggregated data. Varian pursues its patient centered strategy by equipping the world with new tools to fight cancer and solutions that solve the problems of fragmented care defining the cancer care landscape of today.

Varian's advances in intensity modulated x-ray and proton radiation therapy, stereotactic radiosurgery, and robotic surgery are helping to redefine 'state of the art' in cancer care today. Our practice integration software systems and solutions enable leading cancer treatment centers, academic research institutions and community oncology practices throughout the world to provide integrated, multidisciplinary care with the patient as an active member of their care team. Varian's work in building an ecosystem of cost-effective products and services designed to help solve the biggest problems facing the global cancer community gives us hope that our solutions can impact every cancer patient in need, regardless of where they are in the world.

(At Varian, we believe our unique focus on products and services that span the cancer care continuum places us in an ideal position to be an integrated solutions provider driving the progress of cancer care for the next 30 years and beyond.)

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Important Safety Information
Radiation treatments may cause side effects that can vary depending on the part of the body being treated. The most frequent ones are typically temporary and may include, but are not limited to, irritation to the respiratory, digestive, urinary or reproductive systems, fatigue, nausea, skin irritation, and hair loss. In some patients, they can be severe. Treatment sessions may vary in complexity and time. Radiation treatment is not appropriate for all cancers.

Medical Advice Disclaimer
Varian as a medical device manufacturer cannot and does not recommend specific treatment approaches. Individual treatment results may vary.

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