The evolution of technology for cancer patient management: an interview with Dr Daniel Vorobiof

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Please introduce yourself, your research background and your

My name is Daniel Vorobiof, I am the Medical Director of Belong.Life (New York), and a medical oncologist for the past 40 years. In 1989, I founded the Sandton Oncology Medical Centre in Johannesburg, South Africa – the first private oncology multidisciplinary cancer center in the country. There, I served as the Medical Oncology Director until the end of 2017, when I retired from active clinical practice.

I am a member of the American Society of Clinical Oncology (ASCO) and the European Society for Medical Oncology (ESMO). I also currently sit on the editorial board for various international oncologic medical journals, including The Breast, Cancer and Chemotherapy Reviews, The ASCO Post the Journal of Global Oncology and the SA Journal of Oncology.

I have been involved in clinical research with a number of international cooperative oncology groups such as the International Breast Cancer Study Group (IBCSG), the Breast International Group (BIG), the WHO Melanoma Group, European Organization for Research and Treatment of Cancer (EORTC), the Swiss Group for Clinical Cancer Research (SAKK) and other multicentric co-operative clinical trials in South Africa, Europe and North America.

Since retiring from clinical practice, I have remained active in oncology education on several fronts – I am a member of the European School of Oncology (ESO) Core Faculty in Breast Cancer and Malignant Melanoma, as well as a Visiting Professor with ESO. In addition, I serve as the Section Co-Head for Oncology Drugs, Faculty 1000 Medicine (Oncology), a literature service that helps clinicians and researchers stay informed about key findings in medicine.

In 2018 I relocated to Israel and became the Medical Director of Belong.Life, a leading provider of patient engagement and networking solutions for advocacy groups, research organizations and pharmaceutical companies. Working at Belong, I have been involved with Real-World Data Evidence research in the areas of financial toxicity in patients with a variety of cancers receiving immunotherapy, as well as those with advanced breast cancer. These research projects have been presented (as posters and oral presentations) at international meetings such as ASCO, ESMO, ASCO-SITC, and the ABC.

How has the use of technology for cancer patient management evolved over the last 5 years?

Knowing that you or a loved one has cancer is never easy, but the development of new technology in cancer treatment management can provide hope for those suffering from the physical, emotional and mental distress that cancer causes.

Over the past 5 years, the use of Artificial Intelligence (AI) has been established as one of

For example, some initiatives have shown that machine learning models are able to accurately predict the severity of three common symptoms faced by cancer patients – depression, anxiety and sleep disturbance. This research took place in universities in Surrey (UK) and San Francisco (CA, USA), and confirmed that these symptoms are associated with severely affecting cancer patients' quality of life. Our own AI-based research at Belong.Life has documented the high prevalence and adverse impact of cancer-related fatigue, which can alter a patient's adherence to planned treatments, influencing their outcome in terms of relapse and survival.

Some AI teams are focused on diagnosis and pathological evidence of malignancy by comparing results between biopsies and histologies from different patients and situations, reducing the possibility of human error, allowing for quicker diagnosis, and therefore improving patient's treatment and prognosis.

Another important use of AI is in the sorting of large amounts of data available regarding cancer – there's simply too much for the human mind to reliably sort through and create value. For example, the Memorial Sloan Kettering Cancer Center has recently shared its collection of 25 million tumor slides with an AI company that uses the digitized data to train accurate programs. Real medical data is key to developing helpful AI machines, because fabricated data may lead to unintentional biases or failure. Also, the Cancer Genome Atlas, which has a larger dataset than the above mentioned, together with the NCI, created a secure platform called the Cancer Genome Cloud, where researchers can collaborate on a cloud platform that is fast and accessible. Big companies also collating cancer data include Belong.Life, Google, IBM and others.

Advancements in medical technology have the ability to save lives, reduce costs and streamline the entire system. Information to allow new, innovative treatments may hide in the unique molecular structure of each cancer cell. Finding and unlocking those secrets using AI, memory storage and machine learning technologies enables cancer professionals to tailor individual treatments for individual tumor types. Now referred to as personalized cancer medicine or precision oncology, it has become a hot trend which, although currently in its infancy, will hopefully continue to develop with new technologies improving at an accelerated pace.

Can you explain what the Belong.Life app, 'Beating Cancer Together' is and what it aims to achieve?

Belong.Life was founded in 2015 to assist patients and caregivers in managing and navigating their treatment journey. We also hoped to advance medical research through technology, big data and advanced AI. Our first app, *Belong – Beating Cancer Together*, is

Beating Cancer Together is free and unites hundreds of thousands of cancer patients, caregivers and healthcare providers in over 100 countries.

The platform allows patients and caregivers to connect, share information anonymously and to privately discuss issues related to their condition with medical professionals. The platform also allows users to organize their documents in one place. The content and group suggestions the patient receives on the app are personalized to the specifics of their condition (such as cancer stage and type, and any other preferences they may have.)

In addition to providing a service to patients, anonymized aggregated data from the app is run through algorithms to uncover new insights into the patient journey. Data from our app has been used in studies from major universities and presented at key industry events.

The app also offers a free clinical trial matching feature, which has so far provided a clinical trial service to more than 10,000 cancer patients.

What challenges do you hope the app will help to overcome in cancer patient management?

Just over a year ago, we had no idea that a global pandemic was headed our way. Nevertheless, as soon as the need presented itself, Belong.Life rose to the occasion and opened a dedicated group for our cancer patients on the *Belong – Beating Cancer Together* app called 'Coronavirus and Cancer,' solely dedicated to questions about the virus. This group has become a favorite with our Belong members, and I spend much time chatting to users about the problems cancer patients are facing during the raging pandemic, doing my best to guide them through these difficult times.

The topics discussed in this group are numerous, but mostly relate to hospital, and treatment access, availability of clinical trials, family and/or caregiver involvement during lockdowns and social distancing requirements, delays in imaging and other tests, as well as postponements in diagnosis and treatments. More than ever, it is necessary to continue supporting patients and caregivers through these difficult times, as they not only have to deal with the diagnosis of cancer, but also cope with the pandemic and all the struggles it involves.

In addition, we have also performed a series of real-world evidence survey investigations focused on the use of telemedicine, the advent of sexuality issues in younger patients diagnosed with breast cancer, and other circumstances that require support and guidance in the face of cancer and COVID-19. Important data will be shared at relevant virtual meetings during 2021.

information applicable to the current times. We have also intensified our clinical trial support and matching efforts to allow patients to continue benefiting from participating in trials. We continue being committed to our objective of helping cancer patients, their families and caregivers overcome obstacles in general, and especially during this particularly difficult time.

Where do you see cancer patient management in another 5 years' time? How do you think COVID-19 will impact this field's evolution?

Cancer patient management will continue to advance during the COVID-19 pandemic and new technologies will adapt to the current circumstances. Let's discuss some of the more relevant and promising technologies.

Telemedicine has recently emerged as a silver lining. As a result of improved technology and better internet infrastructure and availability, an increase in access to healthcare, even in the most remote areas, will allow for improved diagnosis, treatments and follow-up consultations. There are obvious benefits of using telemedicine to support cancer care delivery – patients can be diagnosed, receive treatment plans and be managed remotely, all while being at home. Telemedicine also offers the ability to engage caregivers in treatment planning discussions when it is difficult or not permissible for them to go to a clinic, allowing for care coordination and education around multidisciplinary cancer care. An added benefit is that with the introduction of remote checkup methods, coping with cancer will be made somehow easier as patients will be able to follow up on their treatment in their own familiar environment, while being supported by their close ones.

In addition to telemedical consultations and follow-ups, oncologists will have access to reliable devices and technology to assist them in their tasks. AI-based medical decision support will play a central role in the future of oncology, advancing healthcare by improving diagnosis, tailoring treatment plans and shifting the oncology field, which will need to embrace these new technologies.

The COVID-19 pandemic has accelerated the production of a variety of antiviral vaccines, two of them, already available, containing an mRNA approach which has also been previously investigated for cancer patients. For example, in the late '90s, the first clinical trial with mRNA was approved using dendritic cells to induce an immune response in cancer patients. The first clinical trial with a direct mRNA application was conducted in 2008 using total tumor mRNA to vaccinate patients with malignant melanoma. Subsequent studies have shown that RNA therapy can help immunotherapy to target more precisely in the

The evolution of anticancer treatment towards a precision-based approach has led to significant progress in cancer therapy. Thanks to detailed genome analysis, precision medicine is able to offer individualized therapy tailored for patient's conditions based on their genetic makeup. As a result, patients whose tumors have a particular molecular characteristic can be treated with a specific targeted drug. However, genetic mutations alone may not always result in the predicted change of a corresponding protein, while there are additional factors that could contribute to differences in tumor behavior. Future efforts will be guided by the understanding of the role of new drivers with novel drugs, based on better knowledge of the individual cancer patient's molecular biology.

The opinions expressed in this interview are those of the interviewee and do not necessarily reflect the views of Oncology Central or Future Science Group.

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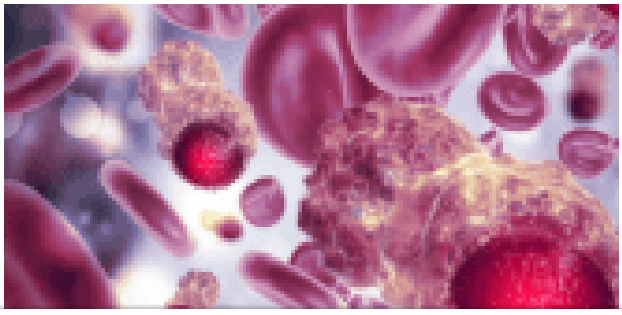

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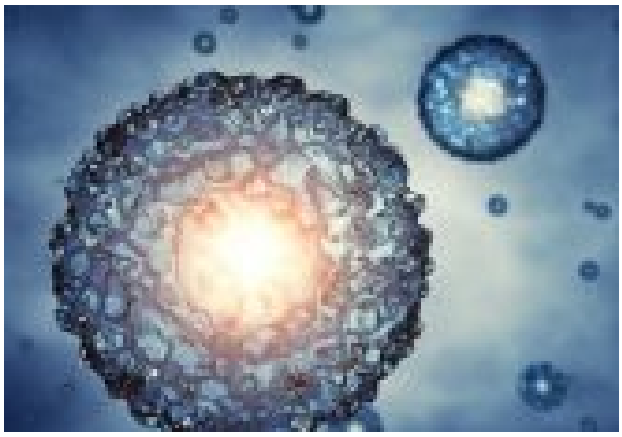

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