

Focus Issue: The Future Of Cancer Research

New treatments and technologies offer exciting prospects for cancer research and care, but their global impact rests on widespread implementation and accessibility.

Cancer care has advanced at an impressive pace in recent years. New insights into tumor immunology and biology, combined with advances in artificial intelligence, nano tools, genetic engineering and sequencing — to name but a few — promise ever-more-powerful capabilities in the prevention, diagnosis and personalized treatment of cancer. How do we harness and build on these advances? How do we make them work in different global settings? In this issue, we present a Focus dedicated to the future of cancer research, in which we take stock of progress and explore ways to deliver research and care that is innovative, sustainable and patient focused.

This year brought news that two of the first patients with leukemia to receive chimeric antigen receptor (CAR) T cell treatment remain in remission more than a decade later. Writing in this issue, Carl June — who helped to treat these first patients — and colleagues reflect on how early transplant medicine laid a solid foundation for CAR T cell development in blood cancers, and how this is now paving the way for the use of engineered cell therapies in solid cancers. In a noteworthy step toward this goal, Haas and colleagues present results of a phase 1 trial of CAR T cells in metastatic, castration-resistant prostate cancer — a disease that has seen relatively few new treatment options in recent years.

Up to now, CAR T cells have been used only in the context of relapsed or refractory hematological malignancies, but in this issue, Neelapu et al. present phase 2 study data that suggest CAR T cell therapy could be beneficial when used earlier in certain high-risk patients. In addition, prospective data from van den Brink et al. support a role for the gut microbiome composition in CAR T cell therapy outcomes, highlighting new avenues of research to help maximize therapeutic benefit.

Although the idea that the gut microbiome influences CAR T cell therapy outcomes may be relatively new, it has been known for some time that it has a role in the response to checkpoint-inhibitor immunotherapy. A plethora of microbe-targeting therapies are now under investigation for cancer treatment; in this issue, Pal and colleagues describe one such strategy — whereby the combination of a defined microbial supplement with

checkpoint blockade led to improved responses in patients with advanced kidney cancer. In their Review, Jennifer Wargo and colleagues take stock of the latest research in this field, and predict that microbial targeting could become a pillar of personalized cancer care over the next decade.

The theme for this year's World Cancer Day was 'Close the care gap' — a message that is woven through several pieces in this issue. Early detection strategies have enormous potential to make a difference in this area; reviewing the latest advances, Rebecca Fitzgerald and colleagues ask who should be tested, and how — and outline their vision for personalized, risk-based screening, keeping in mind practicality and clinical implementation. Journalist Carrie Arnold reports on an emerging strategy known as 'theranostics' that aims to both diagnose and treat cancers in a unified approach, highlighting the growing commercial interest in this field. Of course, commercial interest does not equate to widespread availability or equal access to new therapies, and increasingly sophisticated technologies — although beneficial for some — can serve to widen existing inequalities.

Pediatric cancers lag far behind adult cancers in terms of drug development and approval. Nancy Goodman, a patient advocate whose son died from a childhood cancer, argues that market failures are largely to blame for the gap — but that legislative changes can correct this. Although in some cases there is a strong mechanistic rationale for testing promising adult cancer therapies or combinations in children, translational research is also needed to identify new therapeutic targets — such as the approach taken by Behjati and colleagues, which sheds new light on the molecular characteristics of an aggressive form of infant leukemia.


Meanwhile, for adult cancers, countless new therapeutic modalities are on the horizon, and drug approvals based on genomic biomarkers have accelerated in recent years. Unfortunately, their implementation into routine clinical care is progressing at a much slower pace. In their Perspective, Emile Voest and colleagues point out that bridging this gap will require investment in health infrastructure, as well as in education and decision-support tools, among other things.

Perhaps the most striking gap is that between high-income countries and

low- and middle-income countries, not only in terms of cancer survival outcomes but also in terms of resources and infrastructure for impactful research. In their Perspective, CS Pramesh and colleagues outline their top priorities for cancer research in low- and middle-income countries, arguing that cancer research must be regionally relevant and geared toward reducing the number of patients diagnosed with advanced disease. Practicality is key — a sentiment echoed by Bishal Gyawali and Christopher Booth, who call for a "common sense revolution" in oncology, and regulatory policies and trial designs that serve patients better.

To realize this goal, clinical trial endpoints and outcome measures should be designed to minimize the burden on patients and maximize the potential for improving on the standard of care. This should go beyond survival outcomes; systemic effects, including cachexia and pain, have a major impact on quality of life and mental health during and after treatment. Two articles in this issue highlight the enormous psychological burden associated with a cancer diagnosis; increased risks of depression, self-harm and suicide emphasize the need for psychosocial interventions and a holistic approach to treatment.

As noted by members of the Bloomberg New Economy International Cancer Coalition in their Comment, the widespread adoption of telemedicine and remote monitoring in response to the COVID-19 pandemic could, if retained, help to make cancer trials more patient centered. Therefore, as health systems and research infrastructures adapt to the ongoing pandemic, there exists an unprecedented opportunity to reshape the landscape of cancer research.

We at *Nature Medicine* are committed to helping shape this transformation. We are issuing a call for research papers that utilize innovative approaches to address current challenges in cancer prevention, detection, diagnosis and treatment — both clinical trials and population-based studies with global implications. Readers can find more information about publishing clinical research in *Nature Medicine* at <https://www.nature.com/nm/clinicalresearch>. 

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