Genetic test improves clinical care for children with cancer in England

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Whole genome sequencing has improved clinical care of some children with cancer in England by informing individual patient care.

New research from the Wellcome Sanger Institute, Cambridge University Hospitals NHS Trust, Great Ormond Street Hospital, and the University of Cambridge, supports the efforts to provide genome sequencing to all children with cancer and shows how it can improve the management of care in real-time, providing more benefits than all current tests combined.

The study, published today in *Nature Medicine*, represents the first time that the impact of using whole genome sequencing in current NHS practice has been assessed.

The team analyzed the use of routine genome sequencing, through the NHS Genomic Medicine Service, in two children's cancer centers for solid cancer and leukemia in England. The researchers found that cancer sequencing provided new insights that improved the immediate clinical care of 7% of the children, while also providing all the benefits of current standard tests.

Furthermore, in 29% of cases, genome sequencing provided additional information that helped clinicians better understand the tumors of individual children, and informed future management. For example, uncovering unexpected mutations that increase future cancer risk, leading to preventative measures being taken, such as regular screening.

Overall, whole genome sequencing provides additional, relevant data about childhood cancer that is useful for informing practice. The results also show that it can reduce the number of tests required, and therefore, researchers suggest it should be provided to all children impacted by cancer.

Whole genome sequencing (WGS) is a single test that provides a complete readout of the entire genetic code of the tumor and identifies every single cancer-causing mutation. Comparatively, traditional

standard-of-care tests only look at tiny regions of the cancer genome, and therefore many more tests are often required per child.

Professor Sam Behjati, senior author from the Wellcome Sanger Institute, Cambridge University Hospitals, and the University of Cambridge, says, "Whole genome sequencing provides the gold standard, most comprehensive and cutting-edge view of cancer. What was once a research tool that the Sanger Institute started exploring over a decade ago has now become a clinical test that I can offer to my patients. This is a powerful example of the genomic data revolution of health care that enables us to provide better, individualized care for children with cancer."

NHS England is one of the few health services in the world that has a national initiative, through the Genomic Medicine Service, offering universal genome sequencing to every child with suspected cancer. However, due to multiple barriers and a lack of evidence from real-time practice supporting its use, whole cancer genome sequencing is not yet widespread practice.

The latest study, from the Wellcome Sanger Institute, Cambridge University Hospitals NHS Trust, Great Ormond Street Hospital, and the University of Cambridge, looked at 281 children with suspected cancer across two English units where this gold-standard test is provided regularly.

The team analyzed the clinical and diagnostic information across these units and assessed how genome sequencing affected the care of children with cancer. They found that WGS changed the clinical management in 7% of cases, improving care for 20 children, by providing information that is not possible to acquire from standard of care tests.

Additionally, WGS faithfully reproduced every one of the 738 standard

of care tests utilized in these 281 cases, suggesting that a single WGS test could replace the multiple tests that the NHS currently uses if this is shown to be economically viable.

WGS provides a detailed insight into rare cancers, for example, by revealing novel variants of cancer. The widespread use of genome sequencing will enable clinicians to access these insights for individual patients while simultaneously building a powerful shared genomic resource for research into new treatment targets, possible prevention strategies, and the origins of cancer.

Dr. Jack Bartram, senior author from Great Ormond Street Hospital NHS Foundation Trust and the North Thames Genomic Medicine Service, explained, "Childhood cancer treatment is mostly guided by genetic features of the tumor, and therefore an in-depth genetic understanding of cancer is crucial in guiding our practice. Our research shows that whole genome sequencing delivers tangible benefits above existing tests, providing better care for our patients. We hope this research really highlights why whole genome sequencing should be delivered as part of routine clinical care to all children with suspected cancer."

More information: Benefits for children with suspected cancer from routine whole genome sequencing, *Nature Medicine* (2024). DOI: 10.1038/s41591-024-03056-w

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