Consultation response: review of national cancer screening programmes in England

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Submitted to
NHS England

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A review of national cancer screening programmes in England has been commissioned by NHS England. The review is expected to culminate in a report and recommendations on the future commissioning and delivery of cancer screening programmes in England. The following is our response to a call for evidence from the review.

Uptake/coverage in general and in vulnerable and minority groups

Whilst Polygenic Risk Scores or Genomic Risk Scores have potential to refine and improve cancer screening via more accurate stratification of populations into risk sub-groups, one issue to be addressed is the applicability of currently available risk scores to non-Caucasian populations, as they have largely been developed based on genetic / genomic information derived from Caucasian populations. Failure to attend to this limitation would have a negative impact on other populations in whom resulting risk tools may perform less effectively as well as undermining trust and confidence in these tools more generally.

Similarly, any development of AI based tools for healthcare, including forms of cancer screening must involve careful consideration of population diversity and potential bias when identifying and collating datasets for training and validating these tools, to mitigate against potential disparities in performance among different population groups and sub-groups.

Workforce issues

With the newly established National Genomic Medicine Service, opportunities for genomic analysis of cancer patients are likely to continue to expand, with a concomitant rise in the number of individuals identified with inherited cancer syndromes (possessing germline genetic mutations that confer high risk of cancers).

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Similarly, genomic analysis in non-cancer patients (for other clinical indications or through direct-to-consumer testing) may also identify such conditions. Co-ordination with clinical genetics services to ensure access to counselling and testing for family members will therefore continue to be important.

Looking further ahead, it may become increasingly important to identify individuals with significant genetic predisposition to a disease within the general population through screening. General genomic literacy among health and public health professionals, as strongly argued for within the recent Topol Review, will be valuable in equipping front-line staff to understand and act appropriately to different forms of genomic risk information.

Potential for risk-based screening

New scientific knowledge and technologies are enabling improved cancer risk assessment based on multiple risk factors (including genetic/genomic factors), such that stratified prevention of cancers is an increasing possibility, though robust demonstrations of clear clinical utility are still needed. However, this situation is likely to evolve rapidly in the future as further evidence appears, and so screening professionals committees will need to keep up with such developments. For example, evidence from ongoing trials and new studies (WISDOM trial, PROCAS study, MyPEBS) could potentially inform a move towards an age and risk-based screening and prevention programmes for breast cancer. The next report from the B-CAST (Breast CAncer STratification) study will provide policy recommendations based on what prevention pathways for breast cancer are expected to resemble in 5-10 and 20 years from now and the 2017 report on Personalised Prevention in Breast Cancer may similarly be of interest to those considering the future of risk-based screening.

Of particular note, the use of Polygenic Risk Scores (PRS) or Genomic Risk Scores (GRS) to assess multiple common genetic risk factors of individually low significance and combine them to create a clinically significant estimate of genetic risk for cancer is an area of growing interest. The inclusion of genetic assessments as part of cancer risk estimation (along with standard risk measures) has been shown to offer more accurate risk calculation and population stratification for some cancers already. Similarly, there is emerging evidence that inclusion of PRS or GRS scores may also improve current risk estimation. Further research in this area is needed (both for theoretical and, if supported, clinical application). However, the exact clinical application of PRS is likely to differ substantially for various diseases depending on the underlying genetic contribution of the disease, as well as current clinical and public health practice; similarly, different forms of cancer may prove more or less amenable to the application of PRS in screening approaches.

Scope for Artificial Intelligence

The incorporation of machine learning techniques to develop more accurate predictive AI models for estimating risk based on multiple factors may offer new and improved tools for cancer risk stratification. Some of these tools

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may be regulated as *in vitro* diagnostic medical devices by the MHRA and so be subject to performance evaluation, requiring manufacturers to provide sufficient scientific evidence, analytical performance, and clinical performance information. Other tools, while being regulated as medical devices, may qualify as health institution exempt devices if certain criteria are satisfied requiring less evidence prior to market accreditation. Other tools may instead, (or in addition), be regulated as a service under the Care Quality Commission.

In addition, some machine learning models may pose particular regulatory challenges, if they are not readily interpretable by humans, requiring instead additional steps to explain their outputs to clinicians or patients. Further, the ability of some machine learning models to retrain in light of new data means that these models may represent a moving target for regulators, and pose a distinctive regulatory challenge.

Forward look: how should screening look in 2028?

There is considerable scope to harness 'big data' from new and emerging biomedical and digital technologies to better understand the epidemiology and the pathophysiology of different cancers and their subtypes, to understand and better predict risk, and to develop more accurate screening tools. The application of analytical tools and machine learning techniques to large datasets may permit the identification of more granular disease risk population subgroups, to which interventions such as enhanced screening should be targeted. Achieving this will require capture and integration of data from monitoring devices, health records, environmental and social information; consensus will be needed on the data which should be collected, as well as the interoperability of systems and formats for data collection across NHS and non-NHS sites.

Future approaches to screening as a means of cancer prevention and early detection in 2028 may require changes to the current national programme delivery model, as people may increasingly wish to access multiple screening tests from diverse sources according to their own judgement of disease risk, seriousness and personal preference. Health service adaptations would be needed to make best use of these opportunities. Similarly, increasing potential for early detection of cancer is likely to progress, thanks to ongoing developments in technologies to measure biomarkers such as tumour DNA, microRNAs and metabolites from the analysis of blood, breath or other biological samples. Such developments would necessarily affect the balance between screening, diagnosis and management of cancers and require thorough appraisal to understand their wider impact on prevention.

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PHG Foundation is a health policy think tank with a special focus on how genomics and other emerging health technologies can provide more effective, personalised healthcare

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