**Cancer Research UK response to the Topol Review call for evidence**
**August 2018**

Cancer Research UK (CRUK) is the world's largest independent cancer charity dedicated to saving lives through research. We support research into all aspects of cancer and this is achieved through the work of over 4,000 scientists, doctors and nurses. In 2017/18, we spent £423 million on research in institutes, hospitals and universities across the UK. CRUK wants to accelerate progress so that 3 in 4 patients survive their cancer for 10 years or more by 2034.

Sufficient numbers of staff in the NHS with the right skills are essential to achieving this, helping to turn breakthroughs in cancer research into life-saving tests and treatments. We welcome the opportunity to feed into the Topol Review. There are many technology changes which will impact on cancer prevention, diagnosis and treatment in the next two decades. New technology also has the capacity to support research more generally. Some of these are already in use – either in a research setting, or in some local areas. Others are yet to be invented or discovered. Our research funds new discoveries and the pace of change is accelerating in many fields as we learn and understand more about cancer. It is difficult to predict what technological innovation will be available to the NHS in 20 years' time. The workforce will therefore need to be adaptable with ongoing training, new career paths and effective regulation.

Demand for diagnostic tests and treatments will increase in the next two decades, with an ageing and growing population. The rise in demand for diagnostic tests is also due to greater national efforts to diagnose a greater proportion of cancer patients at an earlier stage. Increasing complexity of cancer treatments will mean that clinicians will be required to spend more time with patients. In some instances, patients may have to visit a new set of health professionals to treat previously rare side-effects. Although technological changes may free up some time, it could also add to demand (by requiring an additional procedure or interpretation; or leading to demand for more interventions (e.g. identifying pre-cancerous changes which then need surveillance). We therefore agree with the findings of the interim Topol report – that some technology will supplement, rather than replace health professionals. Some uses of technology could also free up more 'time to care'.

Staff shortages in the NHS means there is a fundamental need to train and employ more staff across a number of disciplines. This must underpin any activity that aims to improve outcomes for patients.

Our submission has been informed by consulting internal colleagues, clinicians and researchers. We outline the likeliest technological changes that will impact cancer services in the next decade.

Our submission includes possible scenarios relating to the use of:
1. **Genetic testing for inherited risks** – there is a gap in the current provision. Those with inherited gene faults will need further testing, increasing the demand on diagnostic staff.
2. **Digital pathology** – can help to improve early diagnosis of cancer. To realize the potential, challenges in storage space, equipment, processing power and working styles must be overcome.
3. **Artificial intelligence in the diagnostic pathway** – likely to have the biggest impact in tasks that are binary and repetitive. This is likely to augment the work done by staff, giving them the 'gift of time' to provide better healthcare.

4. **Genomics and molecular diagnostics in treatment** – will help tailor treatments to cancer patients. There will be increased pressures on staff working in genomic and genetic services, as demand for existing tests rises and our understanding of genomics improves.
5. **Innovative radiotherapy** – will require more complex planning, taking more staff time. Greater numbers of specialist roles will be required.

## 1. Increased genetic testing for inherited risk

*What is the technology change:*
Genetic testing for inherited risk is a relatively recent technology. As use of genetic tests like BRCA become more commonplace, this technology will have a wider impact on the NHS workforce.

Some people have an increased risk of particular types of cancer because they have an inherited gene fault. Genetics specialists estimate that only about 2 or 3 in every 100 cancers diagnosed are linked to an inherited gene fault.[1] This can vary for different types of cancer – for example, about 10% of people with melanoma have a strong family history of the disease, and 5% of bowel cancers occur in people who have other family members with bowel cancer.

As understanding of the genetic factors increases through research, a more specific genetic predisposition may be found for different cancer types in future.

*What areas of patient care does this relate to:*
This will impact primary and secondary care.

*How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?*
While it is unclear on how the roles and functions of clinical staff will change, changes in patient demand mean the biggest impact will be on the number of staff required. There is a gap in the current provision of genetic testing. There is also a shortage of diagnostic staff in the NHS and increased genetic testing for inherited risk would further increase demand for these services.

The gap in current provision is highlighted by the number of eligible people who are not receiving an appropriate test, nor the requisite surveillance or intervention. NICE estimated in 2012 that 3,930 individuals were accessing BRCA1 and BRCA 2 testing: suggesting a gap in provision for over 3,000 patients, who should be offered the test every year.[2]

Although the number of cancers caused by inherited risk is unlikely to increase hugely, there is likely to be an increase in testing and interpreting the risk associated with inherited gene faults. This is because of greater public awareness (e.g. Angelina Jolie's media coverage of her BRCA experience) and likely changes to clinical guidelines. The cancer strategy suggested that more bowel, ovarian and breast cancer patients should be offered genetic testing.[3] This would also likely impact many more of their family members who would also then qualify for a genetic test if they wanted one.

As an example, clinical guidance states that all bowel cancer patients should be tested for Lynch syndrome at the time of diagnosis.[4] Provision of this test is variable and below the level it should be – Bowel Cancer UK have found that only 17% of hospitals in the UK are testing all bowel cancer patients at diagnosis. There are an estimated 175,000 people[5] with Lynch syndrome in the UK. As they are at high risk of bowel cancer, they should be placed in a screening or surveillance programme to receive regular colonoscopy. They should also receive chemopreventative drugs (aspirin)[6] which should be offered by

their GP.  Therefore, providing the right level of genetic testing would increase demand for genomic medicine laboratories, genetic counsellors, and endoscopy services. If there was also a recommendation to test relatives, this would increase demand further.

*What are the implications of these changes for the skills required? For which professions or sub-specialisms are these likely to be particularly significant?*
More staff will have to be trained and employed, with existing staff upskilled to have a greater understanding of pathways associated with genetic testing. The staff most likely to be affected are those in the diagnostic workforce, GPs, genetic counsellors, bioinformation's and geneticists.

*What does this mean for the selection, curricula, education, training and lifelong learning of current and future staff?*
More medical consultants will have their competence in genomic medicine assessed during revalidation. Royal Colleges should be consulted when determining future curricula, terms and conditions and training.  Inherited genetic risks relating to cancer will need to be included in undergraduate curricula. Oncologists and GPs will need greater understanding of what they tests they need to order, and be able to interpret the results. There will need to be a greater number of genetic counsellors.

## 3. Digital pathology

*What is the technology change:*
Discussion of digitisation within pathology can refer either to the capture, storage and transfer of digital images, or to support reporting with image analysis software.

Interpreting a cellular pathology sample still involves looking at a slide through a microscope, a process which has not changed significantly in decades. While almost all radiological images are stored and transferred digitally, sharing images in cellular pathology still often requires the physical transport of microscope slides.

It is possible to capture microscope slides digitally, but there are a number of challenges to overcome:

- Equipment – slides would have to be loaded into a specific machine, which captures an image of the slide. This would require manual intervention and an additional process step.

- Storage space – a high quality digital copy of a single microscope slide takes up several gigabytes of storage. Given the fact that there could be dozens more slides relating to an individual patient, storing the images for a single patient might require hundreds of gigabytes of memory (this is much more than the equivalent for a radiological image).

- Processing power – in addition to requiring a large amount of digital storage space, digital images also require computer processing power to be viewed. A manual microscope can move the field of view very quickly, boasting an 'image refresh rate' that is faster than many computers. This may change with new technology.

- Working styles – changing cellular pathology reporting from slides viewed on a microscope to slides viewed on a computer would require staff to possess a different set of skills. Pathology training would need take this into account.

Although parallels with radiology can be made, it should be recognised that unlike radiology where an image captured digitally is replacing the production of an analogue image; this is an additional step in the usual cellular pathology process – as slides still need preparation, and a digital image then created.

There are currently experiments in digitisation within cellular pathology in England, notably work being completed at University Hospitals of Coventry and Warwickshire to utilise a fully digital slide storage and viewing system.[7] This may help with the implementation of pathology networks and telepathology, which will reduce the impact of workforce shortages, as well as smoothing the process for providing and reporting images for a multidisciplinary team meeting. While digital image capture is not commonly used in the UK, other nations have a more developed approach to it. For example, it is used in Canada and Sweden to allow for rapid, remote diagnosis.[8,9]

Pathology reporting can occur remotely through telepathology without necessarily storing images digitally, but through remote control and visualisation of a microscope. This can allow specialist and secondary reporting and can support laboratories which may lack expertise to analyse certain rare samples.[10] Facilitating timely discussion of cases with colleagues can increase quality of care and shorten the diagnostic interval for patients. It can also be used to mark salient features in the slide, facilitating Multidisciplinary Team (MDT) review of the case. By saving slides as digital images, preparation for MDTs can be more efficient, and the images can be used again for research, teaching or reviewing the case.

Some companies are currently exploring the viability of digital image recognition and reporting.

***What areas of patient care does this relate to:***
Secondary care.


***How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?***
Digital image interpretation could have a profound impact on the roles and functions of pathology staff. The full realisation of digital image recognition could remove the need for a doctor to be involved in the interpretation of some simple images – radiological or microscopic. Any anomalies or samples above a set threshold are presented to a consultant. Developments in this area would greatly reduce the reporting demand for cellular pathologists. It is possible to see how cellular pathology would develop along the lines of blood sciences, where samples are investigated automatically by digitised equipment. One example would be its use to quantify the cells expressing an immuno-histochemical marker.

However, digital pathology image analysis (to the level of actually making a diagnosis, or even providing a 'yes/no' answer) is still in its infancy, so it is likely to take several years, or even decades, to develop the infrastructure and volume of digital images to support the introduction of digital image recognition. In addition, its implementation could face challenges of a technological, quality, medico-legal and cultural nature. Without having computers fully interpret pathological images, software could still be used to enhance reporting by highlighting suspected anomalies and providing additional value to the reporting process.

Computer software can currently add value to reporting by allowing faster and more accurate quantification and annotation of images. Quantification of results is becoming increasingly important in modern pathology, and digital pathology and digital image analysis allows cellular pathology to be quantified. This technology could also allow pathologists the 'gift of time', enabling them to work at the top of their license and allowing more time for research.

Telereporting could allow pathologists to provide more diagnoses to individuals in areas that have acute shortages of pathologists. Computer software can currently add value to reporting by allowing faster and more accurate quantification and annotation of images. Quantification of results is becoming increasingly important in modern pathology, and digital pathology and digital image analysis allows cellular pathology to be quantified.

### What are the implications of these changes for the skills required?
Pathologists will have to be upskilled to understand how computer software can add value to reporting.

### Which professions will most likely be impacted?
It is likely that digital pathology—capturing images, being able to share them, and enhancements to interpretation—will have an impact on the future pathology workforce, particularly histopathology.

### What does this mean for the selection, curricula, education, training and lifelong learning of current and future staff?
Staff will have to be trained to use required software. The Royal College of Pathology and Institute of Biomedical Scientists should be consulted on this issue.

## 4. Artificial Intelligence in the diagnostic pathway

### What is the technology change:
Artificial intelligence (AI) can be defined as technologies with the ability to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition and language translation. The current research on AI in healthcare implies that AI is likely to have the most impact in areas that require binary, repetitive tasks, use underlying input which is already digitised and has a vast quantity of high-quality clinical and/or outcome data.

A multitude of research is currently being undertaken into AI technologies relating to the diagnostic pathways. One of CRUK's current Grand Challenges is the 'Artificial intelligence' Challenge. With the successful team receiving up to £20m of funding, teams have been asked to propose research projects that explore the use of AI systems to interrogate medical and non-medical data to identify signatures to advance early detection of cancer. CRUK is also collaborating with the Turing Institute to investigate the application of machine learning in chemoprevention for breast cancer. Further research CRUK funds on AI includes multi-parametric ultrasound imaging for assessment of tumour response to radiotherapy and the 'Optimam' project, investigating the application of AI in breast cancer screening[11].

### What areas of patient care does this relate to?
*Secondary care.*

### How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?
There is relatively little research on the impact AI will have on clinical staff. By taking on some basic,

repetitive tasks, AI could free up the time of clinicians to work at the top of their clinical competencies.  It is likely to augment the work of diagnostic staff (such as radiologists and pathologists), freeing them up to do more research, direct patient care and improve services.

***What are the implications of these changes for the skills required?***
 Staff will have to be able to critically interpret results provided by AI.

***Which professions will most likely be impacted?***
The automisation of more basic tasks *could* augment the work of current healthcare professionals such as pathologists and radiologists, enabling them to work at the top of their clinical competencies. There are currently products and services undergoing research evaluation which are aiming to use AI to augment radiology and pathology tasks. In imaging, this could include determining if a mammogram shows abnormal findings, or to identify and determine the likely prognosis from information about a lung nodule. In pathology, this could be applied to help identify cells that have been highlighted by immunohistochemical stains.

While AI tools may have the potential to release some capacity in diagnostic services, for example in imaging and pathology, this does not negate the impact of a growing and ageing population and the requirement to deliver more diagnostic tests. These tools are likely to augment the work of pathologists and radiologists, rather than replace them, but it may reduce the growth in that workforce that would otherwise be needed in the long term. An example of where AI may augment radiologists' work is in the binary reporting of breast screening mammography for determining the prognosis of pulmonary nodules within 10 years. AI could help to produce binary reports which answers questions like 'Is this scan normal?' This type of binary work, that AI appears to be most suited for, only represents a small part of the tasks radiologists currently undertake, since the role requires complex interpreting.

***What does this mean for the selection, curricula, education, training and lifelong learning of current and future staff?***
More staff will have to be trained to work directly with AI. This could be the upskilling of current staff or the creation of new roles, such as those needed to validate and label existing large datasets that AI would analyse.

**2. Genomics and molecular diagnostics within cancer treatment**

***What is the technology change:***
Thanks to scientific advances, cancer treatment can now be guided by specific molecular changes and genetic mutations in cancer cells which help the cell to survive and grow, rather than simply where in the body the cancer is growing. Cancer drugs which can 'target' these variations can offer patients improved response rates, better outcomes and reduced side-effects.

Many mutations which can be targeted with these medicines can be identified through 'molecular diagnostic' or 'genomic' testing. Swift and equitable access to these tests is therefore fundamental to ensuring patient access to targeted medicines. This can also be called stratified, targeted, personalised or precision medicine.

The National Genomic Medicine Service is being set up in England in 2018, with an intention to meet existing demand and offer more testing as technology develops. Previous reports have shown that existing tests were not comprehensively available to patients; we estimated in 2014 that around 24,000

patients in England missed out on tests that would have helped guide their treatment.[12]
In future, it is likely there would be more widespread usage (i.e. providing access to more eligible patients) as commissioning arrangements become more straightforward, because of the introduction of the genetic testing directory. The balance of testing technology is also expected to change, with panel tests (which can look for the presence of several specific genetic mutations at once, without the need to take multiple samples from a patient) increasingly replacing single biomarker tests. NHS England's "final draft" of the National Genomic Test Directory for Cancer states that testing on panels will be delivered "wherever possible"[13]. In the longer term, there is likely to be a growing emphasis on Whole Genome Sequencing, as a greater number of identifiable molecular and genetic variations become clinically relevant. Other relevant mutations and concomitant treatments are likely to emerge with further research.

"Targeted" drugs (which can target specific genetic mutations which help the cancer cells to survive and grow) made up 90% of the late phase global oncology pipeline in 2016, [14] and of the 14 New Active Substance cancer therapies launched in 2017, all were targeted medicines.[15] Whole genome sequencing, like other molecular testing, could indicate 'diagnostic subtypes, predict tumour behaviour, prognosis and drug response, and enable monitoring for early recurrence of disease'[16]. This is likely to become more routine for some cancer types as the Genomic Medicine Service begins operation.
As well as providing more specific initial diagnoses, these services may also be involved in more monitoring and surveillance – for instance, to find circulating tumour DNA. Demand for these services will also be increase due to the need to run multiple molecular analyses at different stages throughout a patient's treatment course, to understand the cancer's progression and evolution. This will allow a patient's treatment to vary according to these subsequent test results.

***What areas of patient care does this relate to:***
This is largely going to be used in secondary care.

***How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?***
While it is unclear on how the roles and functions of clinical staff will change, changes in patient demand mean the biggest impact will be on the number of staff required. Staff working in genomic and genetic services (e.g. pathologists and scientists, including bioinformaticians) will experience increased demand, both due to more requests for existing tests, and increased tests and sequencing as understanding of genomics improves. Genetic analyses are complex and relatively time-consuming. More of existing staff's time will be dedicated to these analyses, which also contributes to the need for more staff.

Oncologists may need more time to deal with the increasing complexity of which tests to order, and to interpret what the results would mean for alternative treatment options. However, given the more precise diagnosis, this could save oncologists' and nurses' time by reducing the time spent on giving unnecessary or inappropriate treatments. For example, among patients with lung cancer that has a mutation in the EGFR gene, as many as 80-90% show evidence of response to targeted medicines, compared to only 20-40% responding well to non-targeted chemotherapy[17].

***What are the implications of these changes for the skills required? For which professions or sub-specialisms are these likely to be particularly significant?***
A range of professions are likely to be impacted: biomedical and clinical scientists, laboratory technicians, pathologists, genetic counsellors, oncologists, haematologists, bioinformaticians.

Current staff involved in the diagnosing, characterisation and treatment of cancer will need to be upskilled to be able to order the right tests and to interpret the results. New posts will have to be created so that genetic services keep up with patient demand.

We have identified 3 key challenges for the workforce associated with increased molecular diagnostics and genomic testing:

- **Increasing healthcare professionals' awareness** of existing and changing cancer pathways, and planning. The genomics education programme seeks to address this but has had its budget cut from £5 million per annum to £1 million per annum.[18] Adequate, sustainable funding must be provided to educate the general healthcare professional workforce on the impact of a rise in genomics.
- **Short-term capacity**. It is crucial that there is adequate provision of key workforce roles specific to precision medicine. An increase in volume of patients accessing molecular diagnostics and testing for genetic faults will lead to an increase in workload for genetic counsellors and relevant staff within molecular pathology. There are major skills gaps in the UK for such roles, including bioinformaticians, clinical geneticists and genetic counsellors.[19] The gap in the genomics workforce was highlighted in HEE's Cancer Workforce Plan (Phase 1), in which there was a commitment to ensuring the NHS has 'sufficient staff with the right skills to deliver access to cancer genomic analysis [and] the stratification of treatments', and to undertake further analysis.
- **Long-term workforce planning**. Workforce planning should account for the modelling Health Education England (HEE) Genomics Education Programme are undertaking to understand required training numbers across professions.

### *What does this mean for the selection, curricula, education, training and lifelong learning of current and future staff?*
In oncology and haematology, genomics is being introduced in the curricula. Pathologists are also a key group who will require extensive Continuing Professional Development (CPD). It has been reported by the 17 clinical champions at the Joint Committee of the Royal Colleges on Genomic Medicine that there is not enough expertise within their speciality, at a general level.[20]

The general workforce will require CPD interventions to increase their knowledge relating to aspects of genomics. This could be general and targeted at the wider workforce or more detailed and targeted at specialist and highly specialist workforce—for example with further efforts in whole genome sequencing beyond the 10,000 Genomes project. There will need to be CPDs aimed at helping staff communicate effectively with patients about the use of their genetic data.

More medical consultants will have their competence in genomic medicine assessed during revalidation. Royal Colleges should be consulted when determining future curricula, terms and conditions and training.

### 5. Innovative Radiotherapy

### *What is the technology change:*
Radiotherapy uses radiation to kill cancer cells. Over 120,000 patients have radiotherapy every year. Previous modelling of demand has suggested that 40 – 50% of people affected by cancer should receive some form of radiotherapy as part of their treatment.[21] Malthus modelling predicts future demand for

radiotherapy to be relatively stable, suggesting that just over 40% of patients should receive radiotherapy over the next ten years.

There are several different innovations within radiotherapy. Many of these will require more complex planning, which takes more time. These include:

- Hypofractionation

Radiotherapy given over a smaller number of doses (i.e. via fewer 'fractions') than standard radiotherapy. Clinical trials have suggested that the way in which breast and prostate cancer are commonly treated can be significantly shortened whilst remaining just as effective. These cancers have therefore been recommended for the hypofractioned approach. The recommendation for breast cancer treatment has changed from 25 fractions per patient to 15[22] and it is standard practice to deliver this to breast cancer patients. Trials are also ongoing to test the use of just 5 fractions for breast cancer patients. For prostate, the CHHiP trial recommended reducing the number of fractions per patient[23] and the PACE trial is investigating whether this can be reduce further[24]. It is worth noting that in many centres this is already happening for prostate cancer treatment and by 2027 is likely to be common practice. In fewer doses, it is even more important that planning is extremely accurate so as to maximise the dose to tumour and minimise the dose to healthy tissue.

- Intensity Modulated Radiotherapy Treatment (IMRT)

IMRT precisely targets tumours, making it more effective and producing fewer side effects for patients. CRUK wants all patients that would benefit to receive IMRT. It is often used to treat head and neck cancers, but the UK Radiotherapy Board projects that it has the potential to be used in many more areas. The UK Radiotherapy Board also estimates that over 50% of radically treated patients should receive IMRT[25], but latest figutes estimate access to be around 44%. There is also still significant variation in access across England.[26] Treating patients with IMRT will make the planning of the treatments longer.

- Stereotactic Radiotherapy (SABR)

SABR is a 'way of giving radiotherapy to a tumour from many different directions to target the treatment very accurately'[27] and is often used for smaller areas such as the lung. It is able to give fewer fractions at a higher dose. This is already being used across the UK, but discussions with the clinical experts suggest that the use of SABR would increase by 50% by 2022 for the relatively small number of patients who are eligible for this.

- Proton Beam Therapy

Proton beam is a special type of radiotherapy which has minimised effects on surrounding tissue, making it particularly recommended to treat cancer in growing children. There are two high-energy NHS proton beam centres being set up in the UK, due for completion in 2018. One will be in London (at UCL) by 2020 and one in Manchester, but they will treat patients across the UK. Due to the innovative treatments that will be delivered at these centres, radiotherapy staff in other centres are likely to be interested in working at these new centres. Patients using these centres may need to be accommodated and receive their chemotherapy at the same time period as their proton beam radiotherapy.

- MR-Linac *(in research)*

This new equipment would combine imaging and radiotherapy. This could reduce the need for as much imaging conducted separately from treatment during radiotherapy planning. It might also be more

effective because it allows delivery of the radiotherapy to move in response to the body. For example, using MR-LINAC when a patient has lung cancer means that the movement of the tumour as the patient breathes can be tracked, and the radiotherapy delivered at a higher dose because healthy tissue is avoided.

***What areas of patient care does this relate to:***
Secondary care.

***How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?***
Greater usage overall because of increased patient numbers will increase demand on the radiotherapy workforce.

- **IMRT:** in the short-term, while the workforce becomes familiar with IMRT it could take twice as long for radiotherapy planning to take place. We assume that in 5 years' time, the benefits of IMRT are likely to be fully established in many areas and take between 20-50% more time to plan than currently.[28]

- **SABR**: there is an expected increase in use of 50% for eligible patients, increasing planning and delivery time. Clinical staff will therefore be spending more time planning and executing some cancer treatments as a result of new technologies.

***What are the implications of these changes for the skills required?  Which professions will most likely be impacted?***
These innovative types of radiotherapy can be more complex and therefore require great planning time. Therapeutic radiographers, clinical oncologists, clinical technologists and medical physicists will be the most impacted.

***What does this mean for the selection, curricula, education, training and lifelong learning of current and future staff?***
There are likely to be more staff needed in all the professional groups involved in planning and delivering radiotherapy, and their education will need to address the breadth of innovative radiotherapy techniques.

For more information, please contact Ben Moore, policy adviser via ben.moore@cancer.org.uk

**Appendix: Questions from Topol Review**

- *How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?*
- *What are the implications of these changes for the skills required?*
- *Which professions will most likely be impacted?*
- *What does this mean for the selection, curricula, education, training and lifelong learning of current and future staff?*

1. Which technology does your submission relate to?
    o Genomics; including genetic testing and counselling;
    o Digital medicine; including the use of smartphones or computers for telemedicine or remote care, apps, wearables, virtual reality, bionanotechnology and point-of-care diagnostic tests;
    o Artificial intelligence, especially machine learning, and robotics.
    o Other technologies

2. Which areas of patient care does your submission relate to?
    ○ Primary and community care
    ○ Secondary care (including emergency care)
    ○ Mental health
    ○ Care of the frail and elderly
    ○ Other

3. Is this about: work you've done/a projected scenario

4. How is this technology likely to change the roles and functions of clinical staff and those working with them in the clinical environment over the next two decades?

5. What are the implications of these changes for the skills required? For which professions or sub-specialisms are these likely to be particularly significant?

6. What does this mean for the selection, curricula, education, training and likely learning of current and future staff?
   Particularly in the areas of
    ○ The content of continuous professional development and expectations for lifelong learning
    ○ Selection of students
    ○ Undergraduate curricula content – what subjects/areas might need to be reduced as well as introducing new areas
    ○ Postgraduate education and training – both core and specialist areas

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