UK Renal Association response to Topol Review Call for Evidence 2018

The Topol review is calling for evidence in a number of different technology areas. I would recommend the RA submit on the following themes, either standalone or through the Royal College of Physicians:

1. Genomics
2. Digital Medicine
3. Artificial Intelligence, especially machine learning and robotics

Theme 1: Genomics

Which area(s) of patient care does your submission relate to?
Secondary Care

Is this a case report about: (work you've already done. A projected scenario)
A projected scenario

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?
Recent improvements in the cost, speed, and availability of genome technologies mean that "next generation sequencing" (NGS) techniques are beginning to move out of the research laboratory and into the clinic room. In nephrology, targeted sequencing of genes with known disease associations has been used to aid diagnosis, particularly in paediatric patients, for some time. There is increasing interest in the use of NGS technology in relevant patients with chronic kidney disease (CKD). A recent study used whole exome sequencing (WES) in patients with a high prior likelihood of inherited CKD and found genetic disorders in 22 of 92 patients (PMID: 29204651). The authors noted that follow-up regimens were adjusted, potential live related kidney donors submitted to enhanced screening, and major changes made to patient treatment, as a result of the WES data obtained.

What are the implications of these changes for the skills required? For which professions or sub-specialisms are these likely to be particularly significant?
Routine use of NGS data will require healthcare professionals (HCPs) to gain greater understanding of the vocabulary and information content of genomic data. A particular area of interest here may be around the predicted pathogenicity of identified variants, and how this may remain uncertain even in the face of robust sequencing data. This is likely to be particularly relevant to HCPs caring for, and advising individuals considering transplantation from a potential related donor, and those considering a family.

What does this mean for the selection, curricula, education, training, and lifelong learning of current and future staff?
Recent evidence suggests that primary care physicians may be able to appropriately manage and communicate NGS results, of uncertain clinical utility, to their patients after just 6 hours of focused training (PMID: 28654958). This suggests that embedding understanding and

interpretation of NGS data into training of HCPs at all levels may enable the future workforce to apply this data safely to clinical practice. Research identifying novel genetic variants that may be implicated in kidney disease is likely to progress at pace in the near future. As a result, structured programs allowing lifelong learning by clinicians involved in interpreting NGS data will be important.

Theme 2: Digital Medicine

Which area(s) of patient care does your submission relate to?

Secondary care

Is this a case report about: (work you've already done. A projected scenario)

Work already done

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?

A number of UK renal units are now running virtual or digital nephrology clinics. These take various forms across the UK, some depending only on email, others involving hospital consultants interfacing directly with the primary care electronic health record (EHR). The typically rapid response time seen in these services has proved popular with GPs, although prospective evaluation of the efficacy of these services in managing the complications of CKD, preventing its progression, and avoiding unplanned starts to dialysis is currently lacking.

It is likely that provision of virtual CKD clinics will grow. Therefore increasing numbers of clinicians will need to become proficient in the assessment and management of patients with CKD based upon EHR data alone.

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

At present, little or no formal training is provided to nephrologists in the virtual assessment of patients. Given the relative infancy, and current lack of a standardised approach to virtual clinics, formulating and appraising training would currently be difficult. Once a standard model of virtual CKD services emerges, training and service provision in this area could be provided by a wide range of HCPs.

What does this mean for the selection, curricula, education, training, and lifelong learning of current and future staff?

Virtual assessment of patients using EHR data alone, and sharing this assessment with patients and other HCPs is likely to become an increasingly important skill. Incorporating training for this into undergraduate and postgraduate curricula will therefore be essential, but requires a consensus around best practice in these areas that is currently lacking.

Theme 2: Artificial Intelligence (Machine Learning)

Which area(s) of patient care does your submission relate to?

Secondary

Is this a case report about: (work you've already done. A projected scenario)
A projected scenario

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 increasing interest in applying machine learning (ML) approaches to problems of prediction in medicine. Nephrology is a data rich specialty with a number of issues that would benefit from reliable predictive algorithms, e.g. response to immunosuppressive treatment in glomerular diseases, or rate of eGFR decline in CKD. However, training data for ML algorithms derived from patient populations, as opposed to the exact replicates available in imaging data, may make ML models unreliable on datasets of the scale available in the NHS. It is likely that the maximum utility of ML approaches in nephrology will not be achieved until data sharing agreements are in place to allow curation of a large, high dimensional dataset derived from numerous geographical locations in the UK.

What are the implications of these changes for the skills required? For which professions or sub-specialisms are these likely to be particularly significant?
Increasing numbers of publications in this field mean that HCPs, who may wish to apply the predictions of ML algorithms to patients under their care, will need to be able to critically appraise the applicability and accuracy of these algorithms to their patient populations.

What does this mean for the selection, curricula, education, training, and lifelong learning of current and future staff?
This means that HCPs will almost certainly need knowledge of the differences between traditional statistical and ML approaches, and the scenarios in which one approach may outperform the other. The optimum way to impart such knowledge, which is usually underpinned by statistical and computational skills not held by the majority of HCPs, is as yet unknown.