When the NHS was introduced, it was said that it would care for people ‘from the cradle to the grave’. 75 years later, how does this apply to pathology?

By Sam Parsons

Imagine, for a moment, that you are dead. What remains of your person lies in a mortuary. Why you have passed is a mystery. Perhaps of little consequence to you now, but of utmost consequence to those you left behind. Who is there to advocate for you, who will search for answers in your stead?

It is the pathologist.[1,2]

Let us rewind, now – back to the start. Imagine yourself a matter of days old. We see pathology again is with you, ‘in the cradle’. A few drops of blood are taken from your heel and sent for analysis in the lab. The National Health Service (NHS) first trialled testing newborns in this way in 1961, for the metabolic disorder phenylketonuria; today the programme has expanded to screen all babies in the UK for a total of nine conditions, including sickle cell disease and cystic fibrosis.[3,4] The programme has improved the lives of thousands by catching these diseases early.

In addition to the heel prick test, Genomics England is currently working on integrating cutting-edge genomics into newborn care. Researchers are planning to sequence the genomes of 100,000 babies, to search for actionable genetic conditions. This will enable timely diagnosis, and facilitate swift access to treatment and care, ultimately leading to improved outcomes and enhanced quality of life for both infants and their families.[5]

During adult life, the likelihood that you will require a blood test is high. These tests, too, fall under the purview of pathology and are one of the most frequently utilised in the NHS. They are used to help diagnose a vast array of conditions such as anaemia and infection and are crucial in monitoring conditions such as diabetes. They can even help prevent future problems for example by screening for high cholesterol. Today, by leveraging the latest technologies, the limits of this humble intervention are being pushed into new frontiers. So called ‘liquid biopsies’ use a blood sample to search for tumour-specific DNA fragments or

circulating tumour cells; these can be analysed for specific mutations that help guide treatment decisions.[6]

Pathology services are cited to be a critical component of around 70% of all clinical interventions.[7] As we develop through our lives most of us will require their input in some manner. Organs occasionally cease to function normally. Growths, whether a blemish on the skin or enlargement of an ovary, may be of uncertain significance. Without a diagnosis the course of treatment is uncertain, and the scope for fear and anxiety is high. In such instances, biopsies are taken, or tissue is excised. It was in 1847, close to a hundred years before the establishment of the NHS, that the discipline of pathology first began to take form when Rudolf Virchow published *Die Cellularpathologie* ('The Cellular Pathology'). This work established the concept that all living tissues are composed of cells, and that the source of disease is ultimately derived from their dysfunction.[8] It is based on these fundamental observations and subsequent discoveries that the modern-day pathologist looks down the microscope at a biopsy you might have had taken, and examines the shape and arrangement of cells to try to reach a diagnosis.

The understanding of cellular dysfunction has informed much of modern medicine in the NHS, including the development of screening programmes such as the smear test. Cervical screening involves taking a sample of cells from the cervix and examining them under a microscope for abnormalities that might indicate either cancer or pre-cancerous changes. Since the programme's introduction in 1988, the incidence of cervical cancer decreased rapidly.[9] It is now estimated that screening in England prevents around 70% of cervical cancer deaths.[10]

These are some of the myriad ways pathology cares for people in a direct manner, such as by analysing blood samples or examining tissue under microscopy. However, what is more is that pathology stands sentinel over the populace *in toto*. Consider, for example, in 1996 when a group led by Bob Will and including pathologist James Ironside published a seminal report describing the then new acquired human prion disease, variant Creutzfeldt-Jakob disease.[11] From their work rigorous control measures were employed to reduce the risk of exposure to people from the food chain or contamination from medical procedures, saving many lives.[12] In a similar vein, more recently pathologists played a crucial role during the COVID-19 pandemic, contributing to the process of diagnosis and in understanding the virus's effects.[13] Pathology thereby silently protects us all by actively monitoring for and responding to threats to our health from numerous avenues.

In conclusion, the NHS was founded on the principle of providing lifelong care to the population. At its inception in 1948, antibiotics, chemotherapy, and transplantation were unavailable or in their infancy. Compared to today, blood tests and radiographs were crude; computed tomography and magnetic resonance imaging were not yet invented.[14] Neither were modern tissue processing techniques such as polymerase chain reaction or immunohistochemistry. Diphtheria and polio were still common diseases. In the nearly 75 years of the NHS, pathology has assumed an increasingly crucial role.

The discipline of pathology is an indispensable pillar of healthcare in the NHS, providing a wide range of vital services that encompass everything from routine blood tests to complex biopsies that can make the difference between life and death. As a protector of public health, pathology plays a crucial role in monitoring and responding to emerging threats and keeping the entire population safe. The NHS has a comprehensive network of specialists standing ready to support patients throughout every stage of life: from perinatologist to obstetrician, neonatologist to paediatrician, from general practitioner to geriatrician. If these specialties can be seen as the organs of the NHS – pathology, then, is the vascular network that connects them and supplies them with lifeblood. Ultimately, it is through the tireless efforts of pathologists and their colleagues that the NHS can fulfil its enduring pledge to provide compassionate care to all, from cradle to grave.

References

1. Armstrong S. A Matter of Life and Death: Conversations with Pathologists. Dundee, United Kingdom: Dundee University Press Ltd; 2008.

2. Burton JL, Underwood J. Clinical, educational, and epidemiological value of autopsy. The Lancet. 2007 Apr 28;369(9571):1471–80.

3. Boyd MMM. Phenylketonuria: City of Birmingham Screening Survey. The British Medical Journal. 1961;1(5228):771–3.

4. Pollitt RJ. Newborn blood spot screening: New opportunities, old problems. Journal of Inherited Metabolic Disease. 2009;32(3):395–9.

5. Newborn Genomes Programme [Internet]. Genomics England. 2021 [cited 2023 Apr 3]. Available from: https://www.genomicsengland.co.uk/initiatives/newborns

6. Nikanjam M, Kato S, Kurzrock R. Liquid biopsy: current technology and clinical applications. Journal of Hematology & Oncology. 2022 Sep 12;15(1):131.

7. Report of the Second Phase of the Review of NHS Pathology Services in England [Internet]. 2010 [cited 2023 Mar 26]. Available from: https://webarchive.nationalarchives.gov.uk/ukgwa/20130124044941mp_/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_091984.pdf

8. Virchow RLK. Die Cellularpathologie in ihrer Begründung auf physiologische und pathologische Gewebelehre. Berlin: August Hirschwald; 1858. XVI, 440, 27.

9. Albrow R, Kitchener H, Gupta N, Desai M. Cervical screening in England: The past, present, and future. Cancer Cytopathology. 2012;120(2):87–96.

10. Landy R, Pesola F, Castañón A, Sasieni P. Impact of cervical screening on cervical cancer mortality: estimation using stage-specific results from a nested case–control study. Br J Cancer. 2016 Oct;115(9):1140–6.

11. Will RG, Ironside JW, Zeidler M, Cousens SN, al et. A new variant of Creutzfeldt-Jakob disease in the UK. The Lancet. 1996;347(9006):921–5.

12. Ritchie DL, Peden AH, Barria MA. Variant CJD: Reflections a Quarter of a Century on. Pathogens. 2021 Oct 30;10(11):1413.

13. Calabrese F, Pezzuto F, Fortarezza F, Hofman P, Kern I, Panizo A, et al. Pulmonary pathology and COVID-19: lessons from autopsy. The experience of European Pulmonary Pathologists. Virchows Arch. 2020 Sep;477(3):359–72.

14. NHS England » NHS History [Internet]. [cited 2023 Mar 26]. Available from: https://www.england.nhs.uk/nhsbirthday/about-the-nhs-birthday/nhs-history/