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Answers

■ discourse markers ■ stance markers

Digital technologies in medicine

Digital technologies began to be used in medicine for administrative and specialist tasks from around the mid-1960s. At that time, the technology took the form of very large, costly computers, often stored in the basements of hospitals because of their bulk. Their main use – the automation of simple repetitive tasks – was not well suited to the complex nature of medicine. **For this reason**, practical uses for computers in hospitals were largely limited to administration, such as data processing for bills and invoices. **However**, as computers began to become slightly smaller and less bulky they began to be used in specialized areas more directly related to medical research and practice. **For example**, the US National Library of Medicine used a computer to create a printed index of articles published in medical journals. This was a very early example of medical informatics. Computers **also** began to be used in laboratories in simple tests and for making results available.

From the early 1980s onwards, computers began to be used much more widely in healthcare, and their range of uses also increased. New computers such as the IBM PC were much smaller and cheaper than previous models. **As a result**, computing became much more accessible, and more hospitals and medical practices were able to afford to buy one of these devices. **In addition**, new software made it easier to computerize whole areas of administrative work, such as managing patient records. Electronic patient records offered huge advantages over paper records in terms of saving on storage space, providing very quick access and enabling backups to be made with relative ease. Reports produced by running queries on patient records could help manage healthcare provision more effectively, **as well as** providing valuable new sources for medical research. By the end of the 1980s, most hospitals and practices had at least one computer handling patient records.

The growth of internet connectivity in the 1990s and 2000s contributed to another phase of development in digital technologies in medicine. One way in which it did this was by providing greater potential for the sharing of patient data. **For example**, PACS (picture archiving and communication systems) used sensors to capture X-ray images on digital media (instead of on film), and these images could now be easily accessed by doctors at different locations. The internet **also** enabled the growth of telemedicine (medicine at a distance), allowing patients to consult with a specialist doctor without needing to travel. Surgeons could **also** now monitor live video of an operation at a distance and provide advice or support for specialized procedures. **However**, while many of these developments represented useful technical possibilities, unresolved legal and ethical issues often slowed down the rate at which they became part of service delivery.

The power of computers, and the capacity and cost of data storage, continued to increase. By the beginning of the 2020s, large amounts of digital data linked to individual patients were being stored routinely. This data included information which was traditionally included in patient records, such as details about a patient's medical conditions, treatments and outcomes. **However**, the records also now contained digital images and detailed reports of tests which could include genetic sequences. The availability of this type of data in a digital format provided greater opportunities for research into personalized medicine, studying how individuals responded to specific treatments. **In addition**, artificial intelligence (AI) systems could now analyze patient data and diagnose conditions from test results or images. When they work effectively, these systems can help to improve service delivery – for example, by increasing the speed and accuracy with which doctors use images to diagnose diseases. **Unfortunately**, AI is not always reliable. In some cases, AI systems may not identify signs which an experienced doctor will notice.

The relationship between medicine and digital technologies has grown more complex over time, raising many ethical and practical issues. The possibilities offered by the internet have made it necessary to address what patient data should be shared and how this should be regulated in law. Many of these issues have not been fully addressed, **However**, and the continuing growth in the quantity and complexity of patient data only makes this more difficult. For example, where increasingly detailed information about individual patients is available, such as DNA sequences, it becomes more difficult to balance the need for patient confidentiality with the potential benefit to other patients. **Similarly**, where AI systems are used for diagnosis or to recommend treatment, a key issue is how much trust doctors can place in their reliability and where responsibility for a final decision lies. Digital technologies have the potential to continue to make a huge contribution to medicine, but their further development will require ongoing debate and careful monitoring.