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CONCEPTS IN THE REAL WORLD

HOSPITAL VISIT

The following highlights numerous links between the *Atlas of Human Imagination* and a visit to the hospital:

- Imhotep's work included not only architecture, but also anatomy, medicine and surgery – he was one of the earliest recorded physicians
- Homer's epics are the earliest texts in Western literature to describe battlefield first-aid, emergency medicine, analgesics and anesthesia
- Buddha's teaching was very much about self-healing, including meditation, mindfulness and psychological well-being
- Hippocrates's oath remains the key foundation of medical practice and clinical observation to this day

- Archimedes invented the rotating screw that moves and delivers fluids in medical devices, like dialysis machines and blood pumps
- Alhazen's concept of vision is the first description of how our eyes work and gave birth to modern ophthalmology
- Fibonacci's series appears in heart rhythms and neural activity, both regularly monitored and modelled in hospitals
- Al-Jazari's miniature automata are early precursors to the robotic equipment and sensors seen in hospitals today
- Gutenberg's printing press helped share information amongst physicians to accelerate learning and medical studies
- Michelangelo's art was heavily focused on anatomy and bodily proportions, which are all relevant to medicine today
- Da Vinci's detailed works on dissection, the cardiovascular system and foetuses were the foundation of modern anatomy
- Gibert's basic understanding of magnetism gave rise later to complex magnetic scanning equipment, like MRIs in hospitals
- Shakespeare's plays have many hundreds of medical references to disease, fever, plague, drugs, potions, poisons, herbal remedies, surgery and death
- Galileo invented the "*pulsilogium*", the first ever time-keeping device for measuring a patient's pulse rate
- Bacon believed that improving human health was one of science's highest goals, and regularly wrote about medicine
- Harvey's pioneering studies of anatomy proved conclusively that the heart is the blood pump in the human body, connected to arteries and veins
- Descartes's medical work saw the human body as a complex mechanical automaton, with pumps, valves and tubes playing key roles
- Pascal's work on pressure led him to invent the medical syringe which is used in hospitals every minute of the day
- Leeuwenhoek's first microscope allowed him to study bacteria, microbes, spores and algae, making him the father of microbiology

- Newton's work on light, optics, colour and lenses greatly furthered our understanding of ophthalmology and corrective lenses
- Pachelbel's music was played to hospital patients in convalescence for its soothing, calm, therapeutic effects
- Linnaeus's taxonomy system is one of the cornerstones of biology, influencing all of pharmacology and medicine
- Euler's equations for fluid flow are regularly used today to model blood flow, blood pressure and hemodynamics
- Lavoisier's chemical elements and the law of conservation of mass are essential to modern biochemistry
- Goethe's *Urpflanze* concepts are early expressions of evolution, biological development and morphological medicine
- Blake's poetry often focused on hospitals, mental institutes and the awareness that social conditions greatly affect health
- Jenner's concept of inoculation led to the eradication of smallpox – a major breakthrough for vaccine treatment
- Volta's first battery is the precursor to all batteries used in hospital backup-power supplies and even pacemakers
- Gauss's bell curve and normal distribution is the basis of all modern biostatistics used in medicine and hospitals
- Berzelius's work is a foundation stone in biochemistry; and he also discovered proteins, urea, organic acids and various standardised drugs
- Beethoven's hearing loss drew much attention from physicians, helping improve understanding of deafness and audiology
- Faraday's electromagnetism is widely used today in hospital equipment like ECGs, MRIs and electrotherapy
- Lovelace's computer algorithms are the basis today of all hospital software, databases and bioinformatics
- Joule's studies of energy are critical for the study of metabolism, calorie intake and heat production in the body

- Boole's logic system underpins every digital device in a hospital from a nurse's stopwatch to a heart monitor
- Marx's studies were important for social medicine, protecting workers from pollution, overwork, malnutrition and poor living conditions
- Kelvin's work on absolute zero paved the way for cryogenics which are regularly used in hospitals for MRI scanners
- Nightingale's medical, statistical and nursing studies led to arguably the biggest reforms of healthcare ever seen in the modern era
- Tyndall's light scattering is used today in hospital imaging techniques like endoscopy, tissue microscopy and blood testing
- Kirchhoff's studies provided the foundation for all bioelectric circuits such as cardiac electrophysiology (ECG)
- Darwin's discovery of evolution and natural selection is one of the key tenets of biology, later leading to inheritance and genetics
- Pasteur's germ theory and sterilisation techniques are perhaps the most important contributions to immunology in hospitals
- Mendel's law of inheritance gave birth to our understanding of genes, and later DNA and the whole topic of genetics
- Mendeleev's periodic table led to many new discoveries in chemicals, drugs, pharmacology and hospital treatments
- Verne's novels often included extreme human conditions and survival medicine, like deep-sea diving and polar expeditions
- Maxwell's equations are at the heart of hospital equipment, like ECGs, MRIs, laser surgery, electrotherapy and optical diagnostics
- Monet's failing eyesight drew much attention to vision impairment, cataract treatment and light and colour perception
- Gaudi's natural architecture emphasised sunlight, good ventilation and air quality – all integral to hospital design today
- Tesla's work on AC electricity now powers all hospitals and hospital equipment around the world

- Nansen's work on neuroscience was seminal, as were his physiological studies of hypothermia in extreme cold conditions
- Arrhenius's work on electrolytes like Na^+ , K^+ , Ca^{2+} and Cl^- are critical to fluid therapy and the treatment of dehydration
- Curie's radioactivity work is now crucial for radiotherapy and cancer treatment in hospital oncology departments
- Planck's quantum theory underpins all physics in nuclear spin and magnetic resonance is essential for diagnostic radiology and MRI
- Freud is the founder of psychoanalysis and had a large impact on medicine, particularly in mental health, psychiatry and psychotherapy
- Einstein's theories and his photoelectric effect underpin all X-ray detectors, imaging sensors and photonics technologies in hospitals today
- Ramón y Cajal is the father of neuroscience and helped our understanding of brain structure and function
- Gropius's *Bauhaus* movement was important for the functional, safe design of hospitals, and they in fact designed many hospitals
- Marconi's wireless radio is still used today for walkie-talkies, pagers, ambulances, field hospitals and disaster relief
- Dirac's concept of antimatter is crucial for the invention of positron emission tomography (PET scanners) in hospitals
- Turing's universal computation is the blueprint of all digital computing, underpinning the whole medical industry and beyond
- Meitner's nuclear work is the basis of radioisotopes used in diagnostic imaging (PET, SPECT) and targeted radiotherapy
- Waddington's epigenetics is now important for congenital disorders, developmental abnormalities and birth defects
- von Neumann's computer architecture is critical today for all medical informatics and electronic health records
- Bardeen's transistor switch is the electronic backbone of every computer and practically every medical device in hospitals

- Shannon's theories underpin signal processing and noise reduction, applied in all MRIs, EEGs, ECGs and other diagnostic tools
- Buckminster Fuller's geodesic domes are regularly used in modular hospitals, emergency shelters and field clinics
- Feynman's quantum world underpins radiation therapy planning, including all electron, proton and heavy particle therapy
- Franklin's diffraction study of DNA's structure helped create the modern world of genetics and gene-therapy
- Hopper's programming languages and compilers are still the basis of all hospital computer systems today
- Huxley's novels like *Doors of Perception* influenced research into human perception, psychedelics, mental health therapies and consciousness studies
- Leakey's discovery of hominids provided insight into human anatomy, skeletal development, and evolutionary physiology
- The Beatles' songs often referred to doctors, medicine, drugs and profound mental health struggles, like in the song *Help!*
- Goodall's unique primatology studies, neurology and conservation work are important milestones in modern life sciences
- von Braun's Moon missions helped develop many of the life-support and telemedicine systems seen in hospital today
- Lovelock's inventions in gas-monitoring are used to this day for measuring air quality, respiratory health and epidemiology
- Hawking's ALS disease drew attention from the medical community, helping study motor neurone diseases and their rehabilitation
- Mandelbrot's fractals appear in many biological systems including the branching structure of lungs and blood vessels
- Dawkins's work on gene-centred evolution guides research into antibiotic resistance, viral evolution and vaccines today
- Berners-Lee's creation of the internet underpins everything related to hospital informatics, patient records and online data

- Wilmut's cloning studies are highly relevant to modern stem cell research, regenerative medicine and therapeutic cloning
- Hinton's AI work is now having big impacts in hospitals, including better medical imaging, diagnostics and predictive medicine
- Hadid's unique style of architecture has been used to design many new hospitals and clinics around the world
- Doudna's CRISPR gene-editing is now being used to cure sickle cell anaemia, muscular dystrophy and cystic fibrosis, globally