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History of Developments in Medicine and Other Branches in the Last 50 Years or So

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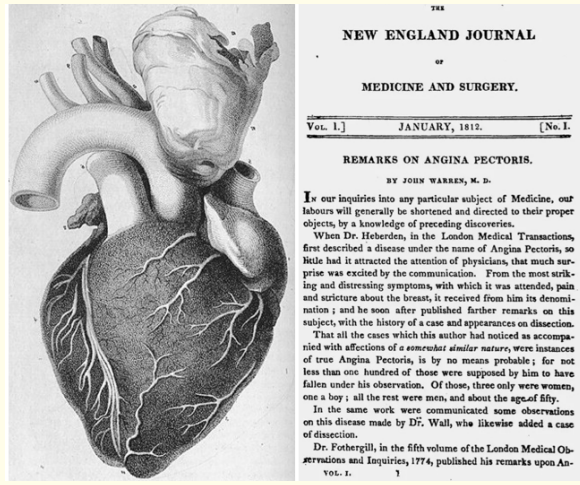
I begin this article with the description of the birth of the two most influential medical journal of the present – the *Lancet* and the *New England Journal of Medicine* (*NEJM*). They are now indispensible for expanding our medical knowledge in various fields. Unhesitatingly, I should admit at the outset, this is an overview, NOT comprehensive review, of the milestones of developments in medicine. A number of important fields remain outside my discussion.



THE
NEW ENGLAND JOURNAL
OF
MEDICINE AND SURGERY.

Vol. I.] JANUARY, 1812. [No. I.

REMARKS ON ANGINA PECTORIS.

BY JOHN WARREN, M. D.

In our inquiries into any particular subject of Medicine, our labours will generally be shortened and directed to their proper objects, by a knowledge of preceding discoveries.

When Dr. Heberden, in the London Medical Transactions, first described a disease under the name of Angina Pectoris, so little had it attracted the attention of physicians, that much surprise was excited by the communication. From the most striking and distressing symptoms, with which it was attended, pain and stricture about the breast, it received from him its denomination; and he soon after published farther remarks on this subject, with the history of a case and appearances on dissection.

That all the cases which this author had noticed as accompanied with affections of *a somewhat similar nature*, were instances of true Angina Pectoris, is by no means probable; for not less than one hundred of those were supposed by him to have fallen under his observation. Of those, three only were women, one a boy; all the rest were men, and about the age of fifty.

In the same work were communicated some observations on this disease made by Dr. Wall, who likewise added a case of dissection.

Dr. Fothergill, in the fifth volume of the London Medical Observations and Inquiries, 1774, published his remarks upon An-

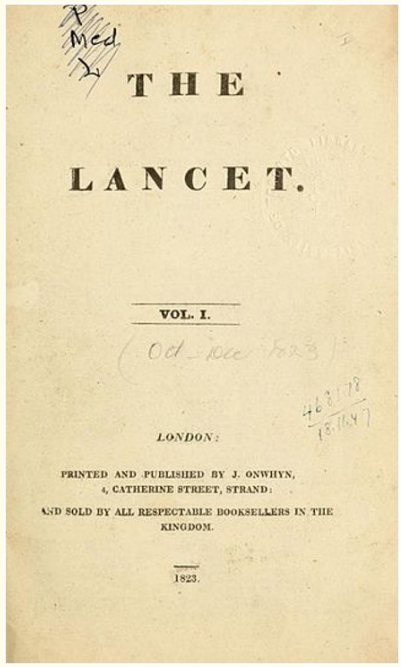
VOL. I.

(Illustration from "Cases of Organic Diseases of the Heart and Lungs," by John C. Warren, April 1, 1812, Issue of the *Journal*).

An important historic step has been taken by *NEJM* since the end of 2023 – that to review its bitter and shameful relationships with slave trade, eugenics, racism and so on. In the *Journal*'s words – "the *Journal*'s relationships to slavery and racism were complicated. Its founders' families had profited from slavery. Its authors wrote casually about slavery. And it provided a prominent forum where physicians perpetuated race hierarchies before and after the Civil War. It is essential that this complicity be recognized. The *Journal*'s engagement with slavery illustrates how medical theories, practices, and institutions influenced, and were influenced by, social and political injustices. The effort to reckon with this history must be sincere, deliberate, and persistent [1]".

Below is a picture slave auction house used in the above-mentioned article.

(From the Library of Congress – https://loc.gov/pictures/resource/cwpb.03351/).


THE

LANCET.

VOL. I.

LONDON:

PRINTED AND PUBLISHED BY J. ONWHYN,
4, CATHERINE STREET, STRAND:

AND SOLD BY ALL RESPECTABLE BOOKSELLERS IN THE KINGDOM.

1823.

(First issue of the *Lancet* -1823 – the Two Journals with the Highest Impact Factors – *Lancet* 168.9 & *NEJM* 176.082 respectively).

In the first issue of the *Lancet* the founder editor Thomas Wakley raised a seemingly revolutionary issue – "IT has long been a subject of surprise and regret, that m this extensive and intelligent community there has not hitherto existed a work that would convey to the Public, and to distant Practitioners as well as to Students in Medicine and Surgery, reports of the Metropolitan Hospital Lectures ... In conclusion - we respectfully observe, that our Columns will not be restricted to Medical intelligence, but on the contrary we shall be indefatigable in our exertions to, render "THE LANCET" a complete Chronicle of' current Literature [2]".

It is a daunting task to chart out so many ramifications of medicine spanning last 50 years within a few words or small space. However, to begin with, the emergence of "hospital medicine" from the last two decades of the 18th century to the first two decades of the 19th century (in the Paris hospitals) was the crucial watershed in the development of modern scientific medicine. It rested on three pillars – autopsy, bedside/clinical learning and accumulating medical statistics [3]. By the 1780s, the patient's narrative was no longer the focus of inquiry in the infirmary [4]. Following Xavier Bichat's discovery of tissues as the sites of diseases – ***organ localization of diseases*** – and the discovery of the stethoscope by Laennec in 1816, the new medicine began to shed off its old humoral legacy. Owsei Temkin, in his celebrated essay, reminds us – "Surgery, for many centuries, had relied on an objective anatomical diagnosis. In turning to a localized pathology, medicine adopted a point of view prevalent among surgeons. In part at least, the reorientation of medicine was due to an increasing approximation between medicine and surgery during the 18th century, with pathological anatomy and experimental physiology *as a common ground cultivated by both disciplines* [5]". However, for brevity of space, would like to give some sketches in the development of medicine in major fields only.

It should emphasized here that in Indian perspective, the rise of hospital medicine was made possible through the foundation of the first India/Asian medical college for training modern European advanced theories and practices was actually an "engrafted" one because of the fact that unlike European developments here there was no social movement or the churning from below for new knowledge system [6].

Medicine

Arguably, ANTIBIOTICS should come first. While the Scottish scientist Alexander Fleming made the initial discovery of penicillin in 1928 and further antibiotic discoveries were made in the 1940s, the medical application and further development of antibiotics really took off in the 1960s. This has resulted in dramatic declines in death rates and serious ill-health arising from infection.

Since its first introduction in 1895 IMAGING may be regarded second in this order. The development of CT and MRI scanning revolutionised the manner in which the body can be scanned in order to detect disease (i.e. cancer) and inform treatment in a range of disease areas. The University of Aberdeen conducted the first clinical whole-body MRI scan in the world in August 1980.

From the starting point modern medicine – hospital medicine – gradually transcended to the levels of "laboratory medicine [7]", "techno-medicine" and now what is being called "precision medicine" – "In the decades ahead, the pace of biomedical discovery will accelerate. The state of an individual person will be characterized with increasing precision from the molecular level to the genomic level to the organ level and by interactions with medications, nutrients, the microbiome, therapeutic devices, and the environment. This *precision medicine* will become possible because of huge data sets on large populations, with millions of characterizations of each person. Study populations will grow to millions, which will allow observational studies with novel statistical methods that will allow discovery of useful, reproducible patterns and relationships from these data [8].

In 1970, the first "Catheterization of the heart in man with use of a flow-directed balloon-tipped catheter" was published. ***In 1981***, series of reports on the outbreak community-acquired *Pneumocystis carnini* pneumonia (now known as HIV) were published, ***in 1982*** - Willem Johan Kolff performs the first artificial heart transplant, ***in 1985*** – Automated DNA sequencer – Leroy Hood and Lloyd Smith, ***1985*** – Polymerase chain reaction (PCR) – Kary Mullis, 1985 – Surgical robot – Yik San Kwoh, ***1985*** – DNA fingerprinting – Alec Jeffreys, ***1985*** – Capsule endoscopy – Tarun Mullick, ***1986*** – fuoxetine HCl – Eli Lilly and Co. in ***2000*** – The Human Genome Project draft was completed, ***in 2006*** – First HPV vaccine approved, ***in 2011*** – First successful Uterus transplant from a deceased donor in Turkey, ***in 2013*** – The first kidney was grown *in vitro* in the U.S., ***in 2013*** – The first human liver was grown from stem cells in Japan.

These are some glimpses in development of medicine in last 50 years or so. As a result, while talking about "*precision medicine*", societies will come to accept that comprehensive knowledge of disease, prevention, and effective treatment is ***an essential public good***. To remember, the medicine of the future will not, of course, solve all problems, and it cannot prevent violent or self-destructive human behaviors. Patients will continue to rely on physicians and the medical community for the guidance, support, and help that only a skilled and caring heath professional can deliver. The medical community must provide direction to ensure that powerful new technologies are used *to benefit the health of all*.

A few words about the ***development in vaccines in last 50 years*** should also be mentioned. After Jenner, Pasteur and Max Theiler (attenuated yellow fever virus by means of serial passage in mouse and chicken embryos ***in 1937), fourth breakthrough*** occurred in 1980, when Stanford biochemists Richard Mulligan and Paul Berg published findings from their experiments that involved *transfecting* monkey kidney cells with an *Escherichia coli* gene and thereby causing mammalian cells to make a bacterial protein. *Recombinant DNA technology was born*. After the introduction of Salk's inactivated polio vaccine, for example, the incidence of polio dropped from 29,000 cases in 1955 to fewer than 900 in 1962. With the introduction of Sabin's live attenuated vaccine in the early 1960s, polio was eliminated from the United States. Since its licensure in 2006, the bovine–human *reassortant rotavirus vaccine* has virtually eliminated rotavirus, preventing up to 75,000 hospitalizations and 60 deaths per year. During the 2019–2020 influenza season the influenza vaccine prevented an estimated 7.52 million infections, 3.69 million medical visits, 105,000 hospitalizations, and 6300 deaths in the United States.

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In 2018, *Nature* published an important research paper "mRNA vaccines – a new era in vaccinology [10]". The authors commented – "Important future directions of research will be to compare and elucidate the immune pathways activated by various mRNA vaccine platforms, to improve current approaches based on these mechanisms and to initiate new clinical trials against additional disease targets". SARS-CoV-2 has given that possibility. Moreover, according to the paper, "Important future directions of research will be to compare and elucidate the immune pathways activated by various mRNA vaccine platforms, to improve current approaches based on these mechanisms and to initiate new clinical trials against additional disease targets [11]".

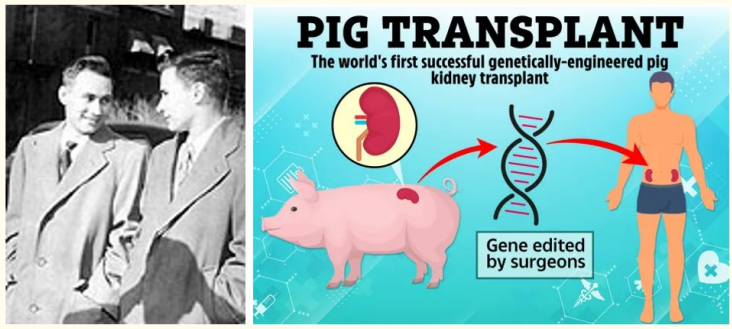
Surgery

Before the advent of anesthesia and Listerism (asepsis) Robert Liston was acclaimed to be the fastest surgeon in the world [12]. With a humorous tone, Atul Gwande narrates his feat – "Spectators in the operating-theater gallery would still get out their pocket watches to time him. The butler's operation, for instance, took an *astonishing 25 seconds from incision to wound closure*. (Liston operated so fast that he once accidentally *amputated an assistant's fingers along with a patient's leg*, according to Hollingham. The patient and the assistant both died of sepsis, and a *spectator reportedly died of shock*, ***resulting in the only known procedure with a 300% mortality***) [13]".

Humour apart, surgery began to progress through an increasingly important process of refinement and professionalization. Specialization was likewise an important force. But the most striking story of surgery in recent decades is how firmly it has become estab-

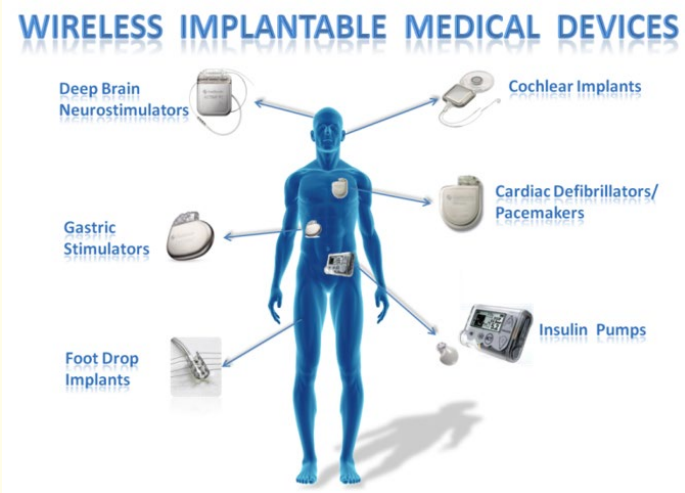
lished as an essential tool for helping people live long and healthy lives. Virtually no one escapes having a condition for which effective treatment requires surgery — a serious orthopedic injury, a cataract, a tumor, obstructed labor, joint failure, severe cardiac disease. Today, surgeons have in their arsenal *more than 2500 different procedures*. Meanwhile, the practice of surgery itself will continue to change. Prognostication is a hazardous enterprise. But if the past quarter century has brought minimally invasive procedures, the next may bring the elimination of invasion. Gwande remarks – "The possibilities are tantalizing. A century into the future, a surgeon will tell the tale — that is, if the world still makes such people [14]".

Another important addition to medical developments is the first successful human kidney transplantation by Joseph Murray in 1954 to the latest genetically engineered pig kidney transplantation in a human body [15].



(1954 – Joseph Murray and genetically engineered pig kidney, 2024).

A tabulation of implantable medical devices is also important. David Schneider has comprehensively dealt with this issue [16].



Schneider observes – "Healthcare is expensive because technological breathroughs are costly; patients who have health insurance can afford pricey solutions, and *hospitals are happy to provide therapies that booster their bottom line*" [17].

What if innumerable people across the globe are without any high-priced insurances? American experience tells us a horrific story. "Shocked" wouldn't be accurate, since we were accustomed to our uninsured patients' receiving inadequate medical care. "Saddened" wasn't right, either, only pecking at the edge of our response. And "disheartened" just smacked of victimhood. After hearing this story, we were neither shocked nor saddened nor disheartened.

We were simply appalled [18]. Authors remorsefully comments – "We find it terribly and tragically inhumane that Mr. Davis and tens of thousands of other citizens of this wealthy country will die this year for lack of insurance [19]".

Midwifery

One of the most striking developments in the field of midwifery can be depicted thus – "Women at high risk for single-gene disorders or aneuploidies who want to avoid these births but find pregnancy termination unacceptable may choose preimplantation genetic diagnosis. In this process, a single blastomere is removed from each of the embryos created by means of IVF and ICSI and studied with the appropriate molecular genetic techniques to enable transfer into the uterus of only genetically normal embryos. Recognition that measurable quantities of cell-free fetal DNA appear in the maternal circulation very early in gestation has resulted in successful noninvasive prenatal diagnosis of single-gene disorders in fetuses of women known to be at risk [20]". To add here, arguably, the most significant advance is that most professionals and parents consider the fetus as a separate individual and a potential patient in his or her own right. Indeed, once the fetus is recognised to be at risk the perinatal outcome is better than in an apparently low risk pregnancy. Advancements in science and medicine over the past 50 years have paved the way for the "Perinatal Revolution"—recognizing the unborn child as a separate patient and offering life-saving care before birth. These changes did not happen overnight. In years past, obstetricians had to rely on maternal reports of fetal movement because there was no ultrasound technology available to see the unborn child inside the womb.

But there is a cautionary note – "While those of us who provide care assume a greater stewardship role over costs and value for patients who currently have access to care, *we must negotiate for adequate societal resources to bring care to those who are currently without it*. As necessary and important as these achievements will be, they will seem somewhat selfish and parochial if we do not also find ways to reduce the burden of perinatal morbidity and mortality in areas of the world that presently have outcomes that are similar to those in the United States a century ago. Science and technology will undoubtedly help extend and deliver care in new ways; however, more fundamentally, *progress in global obstetrical health will depend on developing the infrastructure, political will, and culture that value the health of women and their pregnancies* [21]".

Additionally, briefly speaking, in dermatology, the therapy of resistant vitiligo got revolutionised by grafting viz, Thiersch's grafts, epidermal grafts (by suction of freezing blisters) and minigrafting by punch. More and more procedures like nail surgery, single hair transplantation, dermabrasion, laser surgery, etc are being increasingly carried out by the dermatologists.

Some of the Important Milestones of Cancer Reasearch

1975 Hybridomas and monoclonal antibodies - Tracking of cancer statistics by SEER program, ***1976*** Cellular origin of retroviral oncogenes, ***1979*** Epidermal growth factor and receptor, ***1981*** Suppression of tumor growth by p53, ***1984*** G proteins and cell signalling, ***1986*** Retinoblastoma gene, ***1990*** First decrease in cancer incidence and mortality, ***1991*** Association between mutation in APC gene and colorectal cancer, ***1994*** Genetic cancer syndromes Association between *BRCA1* and breast cancer, ***2000*** Sequencing of the human genome, ***2002*** Epigenetics in cancer MicroRNAs in cancer, ***2005*** First decrease in total number of deaths from cancer, ***2006*** Tumor stromal interaction, ***2015*** Talimogene Laherparepvec, ***2017*** CAR T-Cell Therapies, ***2017*** Genomic Profiling Tests, ***2018*** NCI-Sponsored TAILORx Clinical Trial, ***2020*** International Pan-Cancer Analysis of Whole Genomes.

Important aspects remaining outside the gamut of this article

(1) Evolving Roles of the Medical Journal, (2) History of Health Law, (3) Development in Hospital Costs and Mortality, (4) Developments in Diabetic Care, and (5) Health as Human Right against its very broad horizon and a few more.

Regarding patient-doctor relationship the crux of the question has been has been aptly summarized as – "Clinical research is no longer regarded as a *side benefit* of providing patients with clinical care, but rather as a compatible but distinct activity that requires us *to view patients as partners in the process of advancing medical knowledge*. And finally, the greatest challenge still lies largely before us, as we will struggle in the years to come to balance the personal advocacy that all patients rightfully expect from their physicians with the equally *compelling obligation of physicians to see that health care resources are used wisely in ways that are efficient and fair* [22]".

In an another study it is observed – "Due to conservatism, modern technologies appear last in the healthcare industry. Nevertheless, we live in an exciting and inspiring time for medicine. Invariably, progress in health care is directly linked to politics, demographics, economics, and climate change [23]".

Concluding Remarks

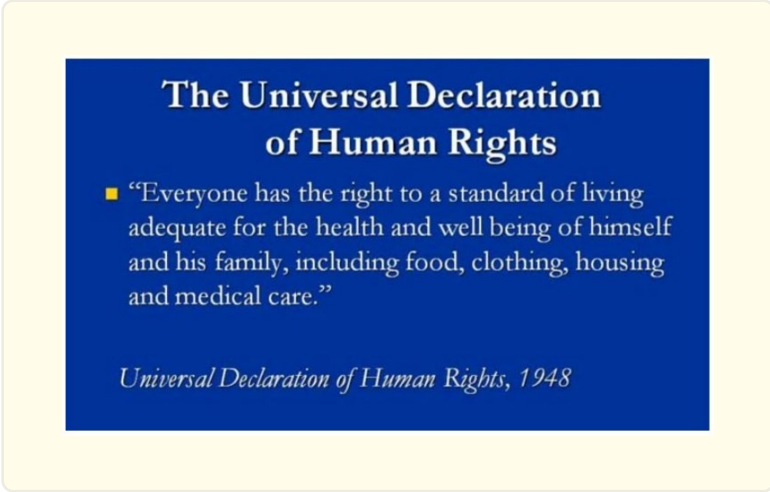
The right to health is a fundamental part of our human rights and of our understanding of a life in dignity. *The right to the enjoyment of the highest attainable standard of physical and mental health*, to give it its full name, is not new. Internationally, it was first articulated in the 1946 Constitution of the World Health Organization (WHO), whose preamble defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". The preamble further states that "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition". The 1948 Universal Declaration of Human Rights also mentioned health as part of the right to an adequate standard of living (art. 25). The right to health was again recognized as a human right in the 1966 International Covenant on Economic, Social and Cultural Rights.

Declaration of Alma-Ata, 1978 – Which Constitutes a Distinct Watershed in the Area of Health and Human Right

The Declaration affirms the crucial role of primary health care, which addresses the main health problems in the community, providing promotive, preventive, curative and rehabilitative services accordingly (art. VII). It stresses that access to primary health care is the key to attaining a level of health that will permit all individuals to lead a socially and economically productive life (art. V) and to contributing to the realization of the highest attainable standard of health.

The right to health is also recognized in several regional instruments, such as the African Charter on Human and Peoples' Rights (1981), the Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights, known as the Protocol of San Salvador (1988), and the European Social Charter (1961, revised in 1996).

The American Convention on Human Rights (1969) and the European Convention for the Promotion of Human Rights and Fundamental Freedoms (1950) contain provisions related to health, such as the right to life, the prohibition on torture and other cruel, inhuman and degrading treatment, and the right to family and private life. Finally, the right to health or the right to health care is recognized in at least 115 constitutions. At least six other constitutions set out duties in relation to health, such as the duty on the State to develop health services or to allocate a specific budget to them [24].



Foot Notes

1. Davis S Jones., et al. "Slavery and the Journal – Reckoning with History and Complicity". NEJM 389 (2023): 2117-2123.
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