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Editor's Desk

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Four years ago, I had the privilege of meeting a distinguished retired scientist couple from Mysuru, Drs. D. Rajagopal Rao and Vijaya Rao. Their generous endowment helped set up a laboratory for biomedical research in the Centre for BioSystems Science and Engineering in IISc. That was not the only gift they gave. I had a personal gain in my interaction with them when Dr. Rajagopal Rao mentioned, in a conversation over dinner, a book with a tantalizing title *The Rise and Fall of Modern Medicine*, which he said I must read. He even took the trouble of writing the name of the author 'James Le Fanu' on a paper napkin. I promptly got a copy of the book which was the second edition published in 2011, while the first edition was in 1999. More than a decade after the first edition, the author proclaimed in the preface to the second edition that "the pattern of rise and fall… still holds". I was curious to know what 'fall' the author was referring to, although I could well imagine the 'rise'.

At about that time, Prof. Vijay Chandru, the guest editor of this issue, sowed the seed of a 'digital hospital' in my head. I simultaneously read Le Fanu's book, which chronicles the history of modern medicine in the twentieth century, and browsed the internet for information on the latest advances in telemedicine and digital health in the twenty-first century. The book is a well-researched and well-articulated tome of 500 pages as compared to the tidbits of incoherent information one can glean from the internet. The contrast was jarring at times not because I was reading about the same subject as it developed in two different centuries or because of the difference between an organized printed book and haphazard online sources, but because of the conspicuous differences in perspectives and approaches to the same problem—to heal patients.

Le Fanu refers to the 3 decades from the 1940s as the period of rise of modern medicine. He describes the factors and the mindset that led to 12 big triumphs from the discovery of antibiotics and steroids to the development of open-heart surgery, implants, and transplantation. The major factor that made these breakthroughs possible, he notes, is the dawn of the new ideology of clinical science wherein clinicians were engaged in unraveling the mysteries of biology and inventing diagnostic and therapeutic devices. In the decades that followed, this led to cornucopia of new drugs as well as medical devices of three kinds, namely, life-sustaining, diagnostic, and surgical. This success that improved medical practice significantly, Le Fanu argues, paradoxically also brought with it four "perverse consequences" that led to modern medicine's fall: "*disillusioned doctors, the worried well, the soaring popularity of alternative medicine, and the spiraling costs of healthcare*."

According to Le Fanu, the doctors are disillusioned because of "over-specialization, routine use of instruments and techniques (e.g., coronary artery bypass grafts), and monotonous work that did not challenge their mental acumen". As a result, Le Fanu writes, "…medicine is duller, as can be readily ascertained by contrasting the sparkle and interest of medical journals from two or three decades ago with those of today." The 'worried well' are those who are 'well' but are 'worried' that they might not be. Their anxiety is due to disconcerting health directives issued by the medical community at a dizzying speed concerning hidden dangers of food and lifestyle. He calls it 'healthism', "a medically inspired obsession with trivial or non-existing threats to health". The rise of the interest in alternative medicine, Le Fanu says, "might be explained by the undivided attention offered by its practitioners which, to many, might seem preferable to being expensively over-investigated and over-treated in a hospital bed." The economic burden on the patient can be easily understood because "the more medicine can do, the higher will be its cost." Hospitals became multi and super specialty mansions that escalated costs.

The aforementioned four ailing aspects of modern medicine are not the only ones that worry Le Fanu. He laments that Big Pharma "rules with limited new drugs" and doctors "prescribe more than they actually do." He is equally

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concerned about the unwelcome consequences of the epidemiological approach (which he calls the seducing social theory of medicine) and what he describes as 'the new genetics', one that has "failed to fulfil the expectations held out for them."

In the background of the uplifting and grim tales of rise and fall of modern medicine in the later part of the twentieth century, I could not avoid the feeling of exhilaration and hope coupled with a tinge of disappointment and caution as I look at the developments in the twenty-first century.

At the outset, we must recognize the difference between medical research and healthcare delivery even though they are inextricably intertwined. Advances in medicine surely translate to patient care. But the accessibility and affordability of healthcare have become increasingly out of reach of the poor and the rural population, especially in countries like India. The middle class in the urban areas and the rich in the rural areas are no better. Emergency care is a problem that cuts across all sections of the population in India. While bridging the rural–urban divide in healthcare is one challenge, the untapped—often not even collected—health data not feeding back to medical research is an equally formidable problem.

Before the advent of the plethora of medical diagnostics, a doctor assessed a patient's health through a physical examination and a substantive conversation with the patient. This engagement with the patient sometimes triggered research leading to remarkable discoveries, cortisone being an example. While medical diagnostics should continue to be used to determine patient's condition, the example also highlights the importance of clinicians being involved in research. The most compelling reason for this is that they have access to an invaluable resource—live patients with illnesses. Today, both doctors and patients, some say, are cogs in the wheels of hospital work-flows. An experienced and erudite person opined that "the trouble with the big hospitals began when patients are seen as customers". The empathy and the healing touch of a doctor, which are far too important, are waning in the medical practice today. Can the new technologies of information, communication, data, analytics, AI, and robotics restore the lost faith? Can they facilitate and enrich medical research? Can these 'outsiders' to the field of medicine be the drivers of fundamental discoveries that identify the causative agents for diseases and develop cures? Can integrative health be achieved through the digital route? Can the assimilated health data replace a personal family physician who knows a person's health as well as you know your car? How do you protect the patient data? And finally, will healthcare be made accessible and affordable to all? Many of these hard questions are addressed in this issue directly or indirectly.

As you will see in this issue, the CoViD-19 pandemic has not only exposed the inadequacies of our health systems but also ushered in accelerated activity in telemedicine. But we should look beyond addressing the current needs in telemedicine and improving access and affordability of healthcare. Undeniably, the need of the hour is facilitating research in many aspects of healthcare for long-term benefits. With this goal in mind, IISc is embarking on a large initiative in digital health. A workshop on the subject was held last December just before the CoViD-19 pandemic struck. We wanted to understand the role an academic institution could assume in this endeavor. Speakers in the workshop, from India and abroad, touched upon several aspects of digital health from personalized and precision care, privacy and security of health data, to the omics revolution. The discussions in the workshop led to this thematic issue on digital health. I am pleased that some of the speakers at the workshop have contributed articles here. I thank them and all other authors for sharing their thoughts and for sparing their time. On behalf of the editorial board, it is my pleasant duty to express gratitude to Prof. Vijay Chandru who worked relentlessly in putting this issue together. Sincere appreciation is also due to numerous reviewers who helped with their insightful comments. Ms. Kavitha Harish and Prof. Kaushal Verma lent their unconditional support as always.

We have included a new feature in this issue—the *lead article*. Our editorial board recognized a problem with our journal because each issue has a different theme and hence general readers outside the special theme might not be interested in browsing through all of it. A lead article written for the non-specialists in a popular style, we thought, might help. Therefore, in this issue, two accomplished journalists, Rahul Nandan and Seethalakshmi S., have written an appetizing lead article on digital health.

In this issue, we have another special: a collection of short communications, including a book review—all related to the theme. These, along with the lead article and detailed review articles, we believe, give a comprehensive view of the current state of research and implementation efforts in digital health. The future hinges upon such ongoing efforts.

Contemplating the future, it is worth recalling an anecdote mentioned by Le Fanu in his book. Lord Horder, a decorated British physician of the last century, had asked "Whither Medicine?" even as the modern medicine was on its rising tide in 1940. Lord Horder had also suggested "Why? Whither else than straight ahead; forging still more weapons with which to conquer disease." Six decades later, Roy Porter, a pre-eminent medical historian and the Editor of *The Cambridge History of Medicine*, wondered "Today, who even knows where 'straight ahead' lies?" After two more decades, today, can we say the answer to "Whither medicine" is "towards digital health?" Would the new weapons be big health data, the omics, wearables, robotics, information technology, data analytics, AI, and all those that we read in this issue? Would digital health propel medicine to the next rising epoch? Read on. The articles in this issue may help you decide for yourself.

Publisher's Note

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