E-Medicine: transforming healthcare with information and communication technology

K Ganapathy*

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The second decade of the 21st century, will probably be best known, for the radical transformation of healthcare, using Information and Communication Technology (ICT), particularly in emerging economies. WHO defines e-Health as "... the cost-effective and secure use of Information and Communications technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research ..." (Resolution 58/28 of the World Health Assembly, Geneva, 2005).

E-Health alone can bridge the health divide between the haves and the have nots. Today, we are on the threshold of a revolution—a revolution called "Information Medicine". This will soon become personalised and participative. ICT applications in healthcare will probably be as important as advances in diagnosis and treatment. In spite of the obvious benefits, the use of IT in the healthcare industry is far less than its use in banking, commerce, travel, automobile or almost any other industry. While the financial service industry spends 10–12% of its budget on IT, the healthcare industry spends only 2–3%. Recognising the change in technological innovations, more hospitals are now adopting ICT to improve the quality of healthcare delivery. ICT bridges distances and provides access to clinical knowledge leading to better quality healthcare. Disseminating information and knowledge management with ICT will empower all stakeholders. This will improve outcomes quicker and more cost effectively, than only developing better drugs, better surgical procedures or improved diagnostics. In the future integrated health records of patients, smart cards, radiofrequency identification tags to track patients, medication management, etc will form the core of the healthcare system. Introducing new technology in an existing healthcare system is one of the foremost challenges of Digitising. "Digitising" a medium-sized hospital involves integrating 300-plus applications supporting thousands of processes. There are literally thousands of processes at play simultaneously in a hospital at any given time.

Process redesign to increase efficiency and efficacy is mandatory in the fast-changing healthcare environment. Hospitals are people-intensive enterprises and capacity of the people to embrace change is a major challenge. The functional requirements for adequate automation support of clinical healthcare activities far exceed those of any other industry. For instance, most industries do not need to maintain 24/7, 365-days-a-year service with absolutely no tolerance of downtime. Ultimately, healthcare is delivered by people for people. The capacity for staff to accept and embrace change will make or break solutions because people are the implementing the solutions. Large investments in money and time are required.

Clinical applications of e-Health include Electronic Health Records, TeleConsultations, Clinical Decision Making Support Systems, Vital Signs Monitoring Services, TeleHomeCare, Ambulatory e-Health—smart clothing, e-Wear, e-Clothing, ePrescribing, e-Nursing, e-dissemination of personalised healthcare and professional Continuing Education using e-Learning tools: Health Information Systems, LifeTime Health Records/EMR, Pharmacy Information Systems, Electronic Claims Systems, Laboratory Information Systems, Interfacing with Diagnostic Equipments, ICT in Health Administration, and Identification and Tracking Solutions.

Healthcare in the second decade of the 21st century will essentially be DIY—Do It Yourself. Patients will no longer be passengers in a vehicle driven by doctors. They will increasingly be responsible for their own health. Real time access to electronic information on new technologies and treatments will make them empowered patients. They will not just be checking their BP and blood sugar but critically reviewing different treatment options! Medicine of the future will be wireless. Implanted devices will be able to communicate directly with the monitoring systems located hundreds of thousands of miles away. Blue tooth-enabled devices will communicate with insulin pumps implanted in the body and insulin will be automatically released when required even without the knowledge of the subject. Today telemedicine is slowly making inroads into healthcare. Tomorrow it will be mHealth (the broad term deployed in the use of the ubiquitous ever increasing all pervading mobile phone in providing healthcare).

The first generation of e-Medicine enthusiasts should not forget that technology should be used as a support to treat patients, not viewed as a goal in itself. The challenge today is not confined to overcoming technological barriers, insurmountable

**President, Sr Consultant Neurosurgeon, Apollo Telemedicine Networking Foundation, President, Telemedicine Society of India.*

Correspondence: K Ganapathy, Sr. Consultant Neurosurgeon, Apollo Hospitals, 320 Anna Salai, Adjunct Professor IIT Madras, Tamilnadu DR MGR Medical University & Anna University, Chennai – 600035. E-mail: drkganapathy@gmail.com

though they may appear. It is true that available technology still has considerable scope for improvement. Rather the challenge is why, where and how, to implement which technology and at what cost. A needs assessment is critical. The take off problems, facing e-Medicine is legion. It is our dream and hope that within

the next decade e-Medicine will be an integral part of the Indian healthcare system. What is required is not implementing better technology and getting funds but changing the mindset of the people involved. E-medicine in India should only be a mouse click away!

Journal Scan

Moreno C, Hodgson K, Ferrer G, Elena M, Filella X, Pereira A, et al. Autoimmune cytopenia in chronic lymphocytic leukaemia: prevalence, clinical associations and prognostic significance. *Blood* 2010;116:4771–6.

Prognosis of patients with chronic lymphocytic leukaemia (CLL) is variable. Despite the increasing importance of biomarkers in prognostication, clinical staging systems remain the backbone for assessing the prognosis. None of the staging systems includes origin of cytopaenia when assigning a stage. However, to ascertain the outcome of patients with CLL in advanced clinical stage, the origin of cytopaenia can be important because of prognostic and treatment considerations. Little is known about the causes and clinical implications of autoimmune (AI) cytopaenia in patients with CLL.

This study conducted at hospital clinic of Barcelona seeks to determine prevalence, characteristics, clinical correlates and prognostic significance of AI cytopaenia in patients with CLL. Seventy of 960 patients (7%) included in the study over a period of 28 years had AI cytopaenia of which 49 had AI haemolytic anaemia, 20 had immune thrombocytopenia (ITP) and 1 patient had both. The prognostic clinical and biological characteristics found to be significantly associated with AI cytopaenia were: a high lymphocyte count, short lymphocyte doubling time (LDT), advanced clinical stage, higher bone marrow infiltration, high serum B2 microglobulin levels, zeta associated protein 70 (ZAP70) and CD38. No differences were observed according to time at which cytopaenia was detected (i.e., at diagnosis, during course of disease). No significant differences were found in the overall survival of patients and in median survival of patients with Binet stage A and B at diagnosis, with/without AI cytopaenia. On comparison between Binet stage C-immune and C-infiltrative, bone marrow infiltration and serum β 2M levels were significantly higher in stage C infiltrative. Patients

with stage C immune responded significantly better to corticosteroids and had significantly better survival than stage C infiltrative disease (median survival of 7.4 years in C-immune vs 3.7 years for C-infiltrative; $P=0.02$). The survival analysis of patients according to the Binet staging showed the following median survival; stage A, 10 years; stage B, 6.3 years; stage C, 3.9 years ($P<0.01$). when stage C immune was included in the overall analysis as a distinct category median survivals were as follows: stage A, 10.2 years; stage B, 5.6 years; stage C immune, 7.4 years and stage C infiltrative, 3.7 years ($P<0.01$).

The mechanisms underlying immune cytopaenia in CLL include auto-antibodies, drug-related (purine analogues, fludarabine) and imbalances in immune-surveillance mechanisms. The authors conclude by highlighting the significantly different outcome of patients with advanced disease based on the origin of cytopaenia and emphasises the inclusion of stage C immune group in the prognostic categorisation of patients with CLL. Though from prognostic point of view, the development of autoimmune cytopaenia does not significantly influence prognosis in the whole group of the patients. Importantly, however, patients presenting with advanced disease related to an immune mechanism have better prognosis than patients in whom advanced stage reflected a high tumour burden only (infiltrative variant). This entails us to reach the cause of cytopaenia in a case of CLL during a routine work-up (differentiate between immune vs infiltrative cytopaenia). All cases of cytopaenia in CLL should routinely undergo a direct antiglobulin test (DAT) for IgG/C3 apart from reticulocyte count, serum haptoglobin, lactate dehydrogenase and platelet count to rule in/out an autoimmune cytopaenia.

Contributed by

Wg Cdr P Kinra*, Surg Lt Cdr N Dogra⁺, Col J Kotwal[#]

*Reader, ⁺Resident, [#]Prof, Dept. of Pathology, Armed Forces Medical College, Pune – 411040.