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MILLENNIUM FEATURE
The major changes in medical practice in the 20th century

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In the 45 years that I have spent in hospital practice and academic medicine in Malta and abroad, I have marvelled at the explosion of medical knowledge and the changes of medical practice that have taken place throughout the years. One could truly say that there were more advances in medicine in the last 60 years than there had been in the previous 500 years. Indeed the medical breakthroughs of the last 50 years have probably saved more lives than those of any epoch since medicine began.

In the 1930s, the Civilian General Hospital was the Central Hospital in Floriana. St Luke's was planned in 1927 when the population of Malta was 230,000; the foundation stone was laid in April 1930 and it was planned to have 450 beds. The work was interrupted during the World War Two and by the time it was fully commissioned in 1950, the bed status was increased to 536 beds. Even at the time it did not solve the problem of accommodation. If one reads the report of the Chief Government Medical Officer for the year 1951, he mentioned the problems of overcrowding even at a time when the number of patients admitted during that year was 2,917 and the total number of attendances at the outpatient department was 14,952. These figures are a far cry from those of 1999 when there were 43,518 inpatients and 181,818 outpatient attendances!

In the 1930s and 1940s, the major threats to life in Malta were tuberculosis, tetanus, pneumonia, meningitis, polio, brucellosis, typhoid, septicaemia and rheumatic fever. The only anti-infective agent available at the time was the sulphonamide Prontosil discovered by Domagk in 1935. At that time, the digitalis glycosides were used in heart disease and the major life-saving therapeutic agent was insulin, which was introduced in 1923 by Banting and Best for the treatment of Diabetes Mellitus. Penicillin, discovered by Fleming and first tried in mice in 1940, was used for the first time on Maltese patients by the late Professor P P De Bono in 1942 after he had obtained a small supply from the British Army Hospital at Mtarfa (Paul Cassar, personal communication). This heralded the introduction of other antibiotics, of which, in 1999 there were over 100. By 1955, Tetracycline and Chloromycetin were added to Pencillin and Sulphonamides, which were already available. Streptomycin and other anti tuberculosis drugs such as PAS and INAH were also introduced. The major infections in Malta (brucellosis, typhoid, diphtheria, typhus and pulmonary tuberculosis) were being brought under control. The Poliomyelitis vaccine became available in Malta in 1955. Since that time, progress in the therapeutics of infectious diseases have resulted in the elimination of many of these diseases. Smallpox has been eradicated and poliomyelitis nearly wiped out. Vaccines have also helped to control measles, rubella, tetanus, diphtheria, influenza and other infectious diseases. However, since the 1980s, we have seen the emergence of new infections such as AIDS and also the re-emergence of an old one, tuberculosis. One must not forget that improved sanitation and social standards/status were major factors in bringing infectious diseases and infant mortality under control. One can safely say that in the last 50 years, the so-called age of infections has given way to the age of chronic diseases. The diseases affecting the community today are diseases of multiple aetiology and long duration.

During the latter half of the last century, there has been a veritable pharmacological revolution. In the mid-fifties, one of the first major advances was the introduction of the first group of oral diuretic agents – the thiazides. This was then followed by the introduction of other major drugs such as the beta-blockers, oral hypoglycaemic agents, calcium reflux blockers and ACE Inhibitors. A major break-through was the use of cortisone in 1950 at the Mayo Clinic by Kendal and Hench for Rheumatoid Arthritis. The availability of steroids made it feasible to capitalise on the growing understanding of the immune system and the availability of immuno-suppressants opened the possibility for transplant surgery; indeed the first heart transplant was carried out in 1967 by Chris Barnard. The pharmacological revolution, however, affected a much wider field. It produced psychotropic drugs like Chlorpromazine, which was the first effective medication for mental illness.

W are now in the era of designer drugs. Scientists are using tools to design drugs from scratch and the key to this development was the recognition and isolation of cell receptors. Receptor-based drug design focuses on the synthesis of ligands that have the specific ability to bind to a particular type of cell receptor, which is responsible for the drug's therapeutic effect. Sumatriptan, a drug for migraine, stimulates a receptor that leads to the constriction of the dilated vessels responsible for the migraine attack. Similarly, the new class of anti-asthmatic drugs - the anti-leukotrienes – block the specific receptor that produces bronchospasm. Moreover, there is now a new class of drugs consisting of human protein manufactured through genetic engineering. Examples of such drugs are hormones that are identical to the ones produced by the body; erythropoietin, which is used for the treatment of anaemia of chronic renal failure, was the first human hormone produced in this fashion.

Following the discovery of X-rays at the turn of the century, the dramatic increase in the pace of medical discovery in 1950s and the early seventies witnessed the introduction of non-invasive techniques such as Endoscopic procedures, Laparoscopic techniques, Ultrasound, Computed Tomography and Magnetic Resonance Imaging. The medical benefits of these new non-invasive measures had a major impact on clinical practice. Indeed with laparoscopic surgery, patients experienced substantially less post-operative pain and required far shorter hospitalisation and recovery period. One should add that the marked advances in anaesthesia have contributed to these successful outcomes.

One of the most dramatic advances was the use of the artificial kidney for the treatment of renal failure by Scribner in the early 1960s. This technology, highly effective, was the first really very expensive treatment and as such the forerunner of the introduction of other highly priced technologies such as Intensive Therapy Unit, Coronary Care Unit, coronary bypass graft surgery and angioplasties for ischaemic heart disease, hip and knee replacements for osteo-arthritis, vitreo-retinal surgery and ultrasound machines that use shock waves to break up kidney stones. Moreover transplantation of the kidney, liver, heart, lungs, pancreas and bone marrow have made it possible to treat previously hopeless diseases.

The highly visible progress in clinical medicine had put in the shadow another scientific revolution that was taking place at the same time. It started with the discovery in the early 1950s by Francis Crick and James Watson that the DNA molecule was configured as the double helix. In the 1940s, the DNA molecule was already recognised as the vehicle, which carried the crucial genetic information. In the Human Genome Project, it is intended to identify all the genes in the nucleus of a human cell. This scientific collaborative study is planned to be finalised by the year 2005. As of the mid-1997, 2,700 genes of known function have been cloned. The genes associated with hereditary diseases such as Cystic Fibrosis, Duchenne Muscular Dystrophy and Huntington's disease have been identified as well as those of some cancers and inherited forms of Alzheimer's disease. Within the next 10 to 20 years, molecular biology will be exploiting the critical role that genes play in human health and disease. Gene science will become an inseparable component of health care. Screening programmes utilising DNA technology together with pre-emptive treatment targeting vulnerable groups are a realistic probability. New technologies for locating and identifying human genes will provide opportunities for diagnosis at the level of the genotype with the expectation that more specifically directed treatment regimes and preventive actions may be employed. Perhaps these can be used in tackling the challenge of ageing.

These activities will greatly change the practice of medicine. The practice and technology associated with gene science will have wide ranging financial, social and ethical implications and these have to be resolved before one can make any progress.

In the next 10 to 20 years, the era of bio-engineering will reach great heights in areas like miniaturised instrumentation, novel uses of biological material and laboratory production of human tissue using cell culture techniques. There will also be progress towards artificial intelligence components to assist in clinical decision making. Molecular medicine will begin to fulfil its potential especially in areas of diagnosis and screening. Imaging with fast CT and fast MRI will make it possible to detect coronary artery disease in the early stages. Fast MRIs will also be used to detect lung cancers too small to be detected by current techniques; indeed it is estimated that lung cancer growth takes two years before it is detected by a chest X-ray. Positron Emission Tomography (PET), which in most places is still a research tool, may afford an early and accurate diagnosis of many illnesses such as cancer and mental disease. Conventional laboratories may face competition from laboratories built on a single computer chip, which will permit its use at the patient's home or a doctor's clinic.

Use of the internet has already resulted in an increasingly demanding and knowledgeable patient. One can also envisage a situation where the power of the computer and the universality of the internet connections will make tele-medicine on a global scale a reality. The growing practice of tele-medicine puts this technology to work by allowing physicians to consult on treatment of patients even hundreds of miles away. Computers that make use of artificial intelligence may potentially be useful tools for analysing difficult medical problems and advising physicians on the patient's diagnosis. However, I strongly hold the view that the computers will not be able to replace the physician well-trained in medical problem solving. Such skills will continue to be vital as even the best designed programmes for clinical problem solving will not be able to weigh all the human, social, psychological and environmental factors. The integration of all the information with the decision making process can only be carried out after a good history is obtained by a competent and humane physician. As an eminent Harvard physician so well stated, '*The secret of care of the patient, is caring for the patient.*'

It is a credit to the Maltese medical profession that it has been able to keep abreast of the medical progress that has been taking place. I strongly believe that this would not have been possible if Malta did not have its own University and Medical School.

The era of modern medicine is full of promise and excitement. However, it is vital that the invasion of the patient's privacy should not be allowed to take place under the guise of progress. This danger to privacy does exist and we must therefore tackle the ethical and social issues that accompany medical progress. We must never lose sight of the fact that we should be the guardians of our patients' best interests.