

**「What does Health Economics Request to Laboratory Testing」**

**— Opinion of IVDs Manufacturer Side —**

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**Summary**

The development of reagents for IVD testing and measuring instruments has made it possible to perform measurement at the bedside and to report the examination results to the medical practice within 30 minutes and is contributing significantly to speedy therapy and disease prevention through accurate diagnosis based on examination results.

While IVD testing data are involved in 64% of these medical interventions, the share of examination in total medical costs is a mere slightly less than 3%. Amidst the trend from treatment through prevention to personalized care, clinical examinations have come to play an increasingly more important role. Development of new examination items, commercial development and automation, and fostering the wider use of IT will lead to greater accuracy in the detection of the primary disease causes and of risk factors and of the examination results. The pursuit of technologic innovation of clinical examination will be contributory to the medical economy in the medium and long term.

**1. Introduction**

The 260 thousand physicians of the nation's 8,880 hospitals and 99,000 medical clinics receive 1.3 million in-patients and 1.4 million out-patients (for diagnosis, treatment, and observation) each day. Treatment through appropriate diagnosis based on sample data contributes not only to the aversion of aggravation of diseases but also to early disease detection and prevention, and clinical examination has thus become necessary for medical practice. While it is claimed that clinical examination data are involved in 64% of the assessment and determination of medical interventions the cost share of clinical examination in the overall medical costs is only a mere 3%. The presence and value of the medical preparations and equipment for in-vitro diagnosis provided by the companies in the clinical examination field cannot be described as being fully recognized because very little of it meets the public eye.

**2. Progress and Contribution of IVD testing Equipment and Reagents**

Many of the IVD testing of fifty years ago required the wisdom, experience, skill and physical strength of the medical technician and handwork was needed for the many processes until the examination result was obtained. Since, the appearance of the Technicon Corporation AutoAnalyzer on the market in 1950, equipment and reagent manufacturers have actively pursued the development of IVD testing automation, leading to the present widespread use of automatic analyzers. Fig.2 shows the topics, encountered in the course of equipment and

reagent progress in the clinical examination (IVD testing) field over the last half-century. Owing to the cooperation and efforts of the universities, research and medical institutions as well as of the reagent and equipment manufacturers, progress has been made in speeding up not only the pace of the development of automatic IVD testing equipment but concomitantly also the development of reagents such as hybrid enzyme systems, and in improving mass screening capability and accuracy and also in the extension of the number of examination items. But this is not all: through efforts to reduce reagent requirement to a micro-level and develop liquid reagents it has been possible to achieve a substantial reduction in the manpower required for examination and in the costs of examination equipment and reagent. This has made a major contribution to saving medical costs. Moreover, the use of much smaller sampling quantities has also been contributory to mitigation of patient stress. In the 1960s, AFP and CEA tumor markers were successively discovered and have played a vital role in cancer diagnosis, treatment and prognosis assessment. In the 1980s, factory production of monoclonal antibodies became possible. This and the development of new assaying systems using the immune system as the measurement principle such as the Enzyme Immunoassay (EIA), the Nephelometric Immunoassay (NIA) and the Turbidity Immunoassay (TIA) as well as the high-sensitivity techniques such as fluorescence and chemoluminescence came together to make it possible to detect and quantitatively assay micro and ultra-micro components. Furthermore, gene amplification techniques such as the PCR method made it possible not only to detect and quantitatively measure viral genes but also shed light on disease-related human gene mutation and made it possible to diagnose diseases of hitherto unknown etiology. This has made a substantial contribution to the development and promotion of treatment drugs.

### **3. Contribution to the prevention of post-transfusion hepatitis**

Mitigation of post-transfusion hepatitis can be taken as a specific example of the contribution the progress of clinical examination has made to medical treatment.

The introduction of tests for hepatitis B virus (HBV) and hepatitis C virus (HCV) for blood transfusion solutions has contributed much to the prevention of the spread of hepatitis infection. Prior to the cessation of the supply of transfusion blood from the Private Commercial Blood Bank using sold blood in 1964, post-transfusion hepatitis occurred at a high rate of 50% ~ 30%. In 1968, Ohkohchi et al. provided clear evidence of the relationship of serum hepatitis with Australian antigen and, the post-transfusion hepatitis causing virus (HBV) was found. The Japan Red Cross introduced the HBs antigen test (reversed passive hemagglutination) for testing transfusion blood fluids, and although the incidence of post-transfusion hepatitis dropped thereafter onset continued at a rate of 10 odd %. Being unable to determine the causal factor of the infection, the naming non-A and non-B type hepatitis was used. Researchers throughout the world vied with each other to discover the hepatitis-causing virus. Chiron Corporation discovered the hepatitis-causing virus (HCV) in 1988 and developed an HCV antibody test method. Now that various HBC and HCV related tests, including the gene amplification method (NAT) for testing transfusion

blood has been introduced, the incidence of post-transfusion hepatitis in Japan is reportedly 0.001%.

#### **4. Contribution of clinical testing to the medical economy**

The decrease in hepatitis patients due to the introduction of HBV and HCV related testing is calculated at approximately 210,000 persons per year. Since it costs roughly 2.6 million yen per patient per year in medical costs to treat using therapies such as interferon administration the resulting medical cost savings effect is 546 billion yen per year as compared with the case of non-performance of HBV and HCV tests. Furthermore, the improvement in the patients' quality of life associated with the ability to protect against hepatitis infection due to treatment (improvement of safety of surgery, decrease of damage due to medical intervention, safety of post-operative life course) and the contribution made to medical staff (decrease of damage due to medical accidents, and decrease in risk of litigation instituted against medical staff) are also important in terms of confidence and trust in the medical profession. The medical economy should not only be viewed merely in terms of the balance of revenues and expenditures but it should rather include an evaluation that encompasses derivative effects consequential upon medical interventions.

#### **5. Response to changes in the medical care environment and in medical policies**

In the wake of the progressive aging of the Japanese population and the changes in the structure of disease (decrease in infectious diseases and increase in chronic illnesses), the Medical Care Act has been revised in five consecutive stages since 1985 in an attempt to innovate the system of medical service provision. In recent years, policies have been adopted with a view to controlling national spending on medical services - moves motivated by factors such as the long-protracted economic standstill, the stagnation of the revenue growth rate, and the demographic trends of a low birth rate and population aging – and functional specialization of medical institutions and a review of sickbed categorization (general wards and convalescence wards) have taken place. The increase in “lifestyle diseases” associated with the changing pattern of the disease structure have led to an increased interest in the nation's medical care services and in the area of preventive medicine in particular the demand for health checks, thorough examinations with hospital stay, and voluntary examinations and tests has risen. Aware of their role and responsibility with regard to clinical examination for “disease prevention and early detection/early treatment” and for “prognosis management and prevention of recurrence,” reagent and equipment manufacturers are committed to technical innovation as a way to resolving these problems. Furthermore, it will be necessary to “expand personalized treatment” in order to expand the scope of effectiveness of medical care. In this regard, it will be important to create a research and development system that integrates the advances in gene examination technology, drugs, drug discovery and examination.

The ongoing value creation associated with clinical examination leads to an improvement in

the quality of medical services and in the quality of life of patients and, as a result, contributes substantially to the achievement of appropriate overall medical costs.

## **6. Conclusion**

The technical innovations that have taken place in the various fields over the past half-century have raised the standard of living of the nation and have fulfilled the basic conditions of a health and civilized life. Also in the medical area, an evolution has occurred from the treatment of diseases to medical care for maintaining and extending healthy and comfortable life. The technical innovations made so far in clinical examination (IVD testing) have contributed to the national health care services by providing in a speedy and accurate manner information necessary for diagnosis and treatment to the medical practice. The development of new examination items, commercial development and automation, and fostering the wider use of IT will contribute to detection of the causal factors of disease and of risk factors.

In this manner, promoting technical innovation in clinical examination will lead to a contribution to the medium- and long-term medical economy.

For the research institutions and the reagent and equipment manufacturer to maintain their interest and initiative it will be necessary also to resolve some political issues, including “incentives for reinforcing R&D”, “appropriate evaluation regarding new technologies and new examination items”, and “shortening the time for market introduction of new products”.

It is reasonable to expect that innovative technologies will be created through the joining-together of the existing companies in the clinical examination (IVD testing/testing) area with companies of different industries such as the IT and electronic equipment industries, including the communications and information sector. It is also believed that much greater development can be achieved by aiming for a contribution not only to domestic but rather to global medical care.