Clinical Engineering Status in Paraguay

Ministry of Public Health / Health Sciences Research Institute
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As in most developing countries, technological development in the health care system of Paraguay has been based on the transfer of technologies designed for developed countries (PAHO, 1998). In many cases, this technology transfer was incomplete, as it was not contextualized (organizational, economic, social and cultural settings) to the country.

In the past two decades, some of the common problems in the health care system were the following:

- Scarcity of many basic technologies
- Excessive and indiscriminate use of expensive HCT
- Lack of policies and standards to regulate the introduction and use of HCT
- Underdevelopment of support technologies
- Inequalities in access to available HCT
- Scarcity of human and financial resources
- A shortage of professional and technical staff (i.e., clinical engineers [CEs] and biomedical equipment technicians [BMETs])

Problems such as a lack of HCT policies and standards; uncoordinated donor programs; shortages of, and inadequately qualified, human resources; and suboptimal managerial capacities are consequences of scarce resources, institutional weaknesses, and insufficient capacity to absorb and maintain new technology in the country (Galvan and Isaacs, 1999).
Survey reports (Galvan and Isaacs, 1999) showed that only 51.1% of basic medical devices of selected health facilities, 10 of the secondary care hospitals (second referral level), and 48 of primary care hospitals (first referral level), were in proper working condition. This situation is a direct consequence of the absence of a maintenance program and shortage of, as well as inadequate training, of maintenance technicians. For performing maintenance in the selected hospitals, there were available only BMETs (13%) and self-taught technicians (87%) but no clinical or biomedical engineers.

To develop a comprehensive clinical engineering practice in Paraguay, the Biomedical Engineering and Imaging Department of the “Instituto de Investigaciones en Ciencias de la Salud-UNA” (Health Sciences Research Institute) proposed a feasible and sustainable strategy based on survey results (Galvan and Isaacs, 1996, 1997), with the key focus on HCT policy, financing and human resource development, as well as maintenance system development. The final outcome will only be as successful and strong as the quality of effort and skill applied to the key issues.

Viewed from a practical perspective, this preliminary country analysis showed that, over the implementation period of HCTM, the evidence gathered demonstrates that 90% of the contingency plan of the health technology policy for the period 2013-2017 has been achieved with the general improvement in the state of HCT. In general, improvement of planning system focusing on an appropriate HCT system and its management was reached at the Ministry of Health through the implementation of the HCT development plans.
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Telemedicine
Through technological innovations based on information and communication technologies (ICT), advantageous telemedicine systems can be developed to improve the health care of remote populations that do not have access to specialist physicians (Basogain, Galvan et al.; 2010). In the context of universal coverage and the efficient use of available resources in public health which should be directed towards greater equity in the provision of services, greater concern for the effectiveness and usefulness of health technologies, there is a favorable opportunity to develop telemedicine towards an integrated ecosystem to improve health care in remote locations without access to specialists.

The telemedicine experience in Paraguay (Galvan et al., 2017) between 2013 and 2017 shows that technological innovation in public hospitals through telediagnosis can facilitate the universal coverage of diagnostic services at relatively low cost, the economic sustainability of the public telediagnosis system and the development of systems resilient in rural and isolated communities of the country, where these are not available.

Human Resource Development
To overcome the critical situation of scarce qualified staff for HTM in the country, the Biomedical Engineering Department of the Health Science Research Institute (IICS / National University of Asuncion) has played an essential role for the development and implementation of the education program for clinical engineers, BMETs and master in biomedical engineering.
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Human Resource Development (cont.)
Regarding the training of BMETs, since 2008 a two-year training program were instituted at the National Institute of Health of the Ministry of Health. Thus, today it is estimated more than 60 licensed BMETs are working in the hospital field.
The clinical engineering (CE) training program includes a five-year polyvalent training at the National University of Asunción (Polytechnics Faculty). Furthermore, a one-year training practicum at hospitals (in clinical engineering departments) or in industry is necessary to enable the clinical engineers to fulfill their roles. Education of clinical engineers started in Paraguay in 2000. Thus, today it is estimated that more than 65 specialized professionals are working in the field of clinical engineering.
Furthermore, since 2011 exist a Master Course Program in Biomedical Engineering developed between the Basque Country University (Europe) and the National University of Asuncion (Paraguay) with 60 European Credit Transfer System (ECTS). Thus, today it is estimated more than 20 masters working in the field of research, academy and clinical engineering.
After fulfill the education and training program the BMET, CE and Master in Biomedical Engineering get a five-year valid license from the Ministry of Public Health for registration and permission to work as health staff at the hospitals and health research centers. Today, there are more than 200 clinical technician working in hospitals, and service companies in Paraguay (32.5% CE, 30% qualified BMET, and 37.5% self-taught).
Paraguayan Society of Biomedical Engineering
The society was established in 2014 and now has 55 members. The majority (38) are clinical engineers and 17 students of clinical engineering. Thus, today it is estimated that 28 professionals found jobs in the private sector (medical device providers, CE-services) and 10 are working in public hospitals. In the field of CE-education are working 8 members and 4 CE in research (1 PhD and 3 Master in biomedical engineering).
Pedro GALVAN  
ScD., Dipl.-Ing. Biom., ACCE  
M: ibiomedica@iics.una.py

Head of Telemedicine Direction / Biomedical Engineering Department  
Ministry of Public Health / IICS-UNA