INTRODUCTION

It is common sense in the last four decades that qualified biomedical engineers (BEs) are essential to improve the development of any Industrial Complex and Innovation in healthcare technology. More recently, the Secretariat of Science, Technology and Strategic Inputs of the Ministry of Health of Brazil has not only recognized it but has invested in structuring training centers as well as specialized training in the man-agement and skills to support research projects that promote the profes-sional formation. The rapid changes in the technological reality that BEs have to deal with make his/her training quickly obsolete or at least insufficient.

How can manufacturers of medical equipment and products, manage-ment providers and regulatory Governmental agencies signal the Universities the new qualifications that BEs need to have?

Are the Universities open to accept and incorporate changes in their courses and ways the professionals are trained?

Classical definition

Biomedical Engineering is the professional field of engineering that uses multidisciplinary expertise in the areas of electronics, mathematics, com-puter science, physics, chemistry and biology, in order to solve problems in the areas of biology, medicine and management of technological resources in health.

Present Situation

In current understanding, Biomedical Engineering is:
• An inherently interdisciplinary domain (solutions rely on a professional with expertise in various areas);
• Relatively recent;
• Evolving as the technological problems become more complex (as well as the solutions).

Working activities
• The Biomedical Engineering works in the areas of health informatics, hospital and clinical engineering, biomedical instrumentation, bio-materials and artificial tissues that make up the complex of health technology;
• Develops, specifies, installs, maintains and manages processes, de-vices, equipment and systems for dental-medical-hospital diagnosis and therapy and rehabilitation of human mobility;
• Develops activities of metrology and electromagnetic compatibility in biomedical instruments / environment;
• He/she should consider patients safety, ethics and environmental and social impact.

Concerns in formation of Biomedical Engineers
• Curricula must meet governmental guidelines;
• Strong investment in basic disciplines and practical (lab) content;
• A multidisciplinary approach cannot be implemented with simple "union" of researchers from different areas (≠A∩);
• The integration between areas should be a curriculum concern (not rely on the students’ ability to make the "synthesis");
• Poor feedback from employers:
Do not know exactly what BEs are, and what they could be;
Employers need to recognize BEs as a "plus" (and not a restricted specialty).

Brazil has continental dimensions (8.5 millions of km²), with strong population and economic discrepancies among its five geographic regions. The map below shows the amount of graduation courses (MS and PhD) in traditional public and private universities (black), and universities having BE under-graduation courses (red).

Now the efforts will be in medical devices. Recently, four medical PDP devices were established: Intrauterine Device (IUD), Diagnostic Kit, Hearing Aid and Coils. Intrauterine Device was the first medical PDP device. With the perspective of growing access, it aims to guarantee that more women will be assisted. Diagnostic Kit is a product including chips to detect multiple diseases. Hearing Aid devices belong to the Health of People with Deficiency programme. The coils are a critical product in neurology, as in 2011 Brazil had an alert of shortage of this product, thus a PDP was established to ensure national technology and the supply.

Present and Future Factors affecting the desired skills of BE
• Technologic
Confluence of technologies;
Miniaturization (nanotechnology, moletronics…);
Telemedicine, e-health, homecare; Information Technology.
• Economics and Administration
Regulatory forces;
Technology assessment;
Risk management;
Cultural and demographic changes.
• Epidemiologic
Changes in the population profile (ageing, sedentary, self-medication)
Climate changes, climate disasters

How to know about the new qualifications BEs must have?
• Hold events of interest to partners in a coordinated manner with other related associations in Brazil and other countries;
• Participate in standardization committees related to BE: AAMI, IEC, ISO, etc.;
• Attend the governmental committees that decide policies for healthcare technology and resource allocation for R & D in BE (Ministry of Health; Ministry of Science, Technology and Innovation; National Agency for Sanitary Vigilance; development agencies, etc.);
• Encourage discussion on Technological Innovation in BE (BE role, basic and applied research themes, curricular adjustment);
• Participation entities that decide on HR training in BE (Ministry of Edu-cation and Culture, ACCE, CAPES, etc.);
• Participation in the construction of a Latin American Journal of Biomedical Engineering.

How to bring Universities and BE training centres to this reality?
• Changes in the curricula and disciplines
• Changes in the evaluation metrics for teachers/researchers
• Newpedagogic tools (outside class, distance and e-learning courses)

ACKNOWLEDGEMENTS