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SP086.5 - Dose enhancement during concomitant chemoradiotherapy using FDA approved concentrations of carboplatin and oxaliplatin nanoparticles

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Radiation boosting has been shown in a number of studies to be effective in the prevention of cancer recurrence. To further the effectiveness of this technique, we propose a new method of enhancing dose locally by administrating nanoparticles of carboplatin (CaNPs) and oxaliplatin (ONPs) as adjuvants to brachytherapy and external beam therapy (EBRT). To investigate the efficacy of this method, dose enhancement calculations were carried out to calculate the energy deposited by photoelectrons and Auger electrons produced by low energy photons from either (EBRT) or brachytherapy sources with CaNPs and ONPs. Our results show a significant increase in the dose enhancement for various carboplatin and oxaliplatin concentrations up to their allowed FDA limits.

SP087 - Educational and Professional Activities: Part 2

PRESIDENTS CALL

SP087.1 - The potential role of IFMBE in improving the state of medical equipment in developing countries

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In developing countries medical equipment is often non-functional. Well known reasons for that are donations of already broken equipment and lack of spare parts and consumables. It is to be expected that current state of the art medical equipment is even less suitable for donation, given the way they are designed to function under conditions that are hard to find in rural areas in low resource countries. The key to start solving these problems lies in improving technical education at all levels in these countries. This paper explores how the IFMBE can work together with several other institutions (WHO, local professional organizations, non-profit organizations, Ministries of Health and Education,...) to train and sustain a competent technical workforce that can do maintenance, repair, and design of biomedical equipment using locally available materials and knowledge.

SP087.2 - Biomedical Engineering Education through Outreach Programs in Hospitals

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Health expenditure is a measure of the share of activity related to health care, both preventive and curative. Industrialized Countries spend around 10% of Gross Domestic Product (GDP) [1] with a high 17.9% for the USA. Middle income Countries, such as Uruguay, have lower figures, but growing as does the dissemination of medical actions in larger portions of the population. More hospitals are build and more equipment are installed every year. Traditional Engineering Education is slow at developing Biomedical Engineering (BME) Programs, because initial demand is scarce and because existing Electrical or Mechanical Engineers usually take over specific functions after some training by equipment providers. Uruguay has a 120 years old University but is only starting to train BME graduates. Job offers greatly exceed qualified staff available, which led us to suggest urgent training programs based on an Outreach Program in Hospitals (OPH), therefore at low cost.

OPH based BME training is build upon existing Electrical Engineering and Systems Engineering Programs, using courses of maths, physics, chemistry, software development, electrical engineering and management. Six optional courses are added, from electronic design to medical image processing and management (DICOM, PACS), electrical safety standards, medical terminology, physiology and anatomy.

A full year design project of a biomedical equipment is assigned to groups of three students, to both foster collaborative attitude and to obtain a functional solution to a clinical instrumentation problem.

Students are then assigned in their fourth University year to a full time six months intern-ship in a Secondary Level Hospitals, where

BME is non existent. This is done within a University Outreach Program. As the only technological reference persons in the Hospital Director´s office, BME students face a variety of maintenance, purchasing, staff training, safety measures enforcement, documentation and installation/removal of equipment. Every student is assigned a remote instructor who acts as a reference available on call or otherwise. The instructors are University teachers in capital city Montevideo, while students are in remote (100 Km to 600 Km) hospitals, where a basic "intern-ship" salary is paid, in addition to feeding/lodging on premises.

Results of this low budget, OPH based BME program are promising with first graduations expected June 2015. The main results are (1) self confidence and sense of responsibility acquired by student (2) its low cost and (3) the interest of BME firms for future employment.

From the Hospital Point of view, equipment documentation, staff safety instruction and maintenance purveyors relations are the benefits so far.

This model of integrated, easily implemented BME Program based on University Outreach has the potential to be considered in other settings in Latin America, the Caribbean and elsewhere, where quick BME staffing requirements must be met at low cost, helping to reduce Health Expenditure.

[1] http://databank.worldbank.org/data/views/reports/metadataview.aspx

SP087.3 - Clinical Engineer: a health professional to recognize
Author(s):

Background
In latter years, Clinical Engineer's figure is taking on more and more importance in health technology management, due to his technical knowledge and capacity to interact with different fields professionals. Unfortunately, this situation does not reflect reality: in many low and medium income countries this figure does not exist and in many high income countries Clinical Engineer is not recognized as health professional, but very often compared as biomedical technician. Internationally Clinical Engineers, as subset of Biomedical Engineers, belong to Unit Group 2149 "Engineering Professionals Not Elsewhere Classified" under the International Standard Classification of Occupations produced by the International Labour Organization.

Objective
Clinical Engineers community is strictly collaborating with World Health Organization (WHO), in particular with Adriana Velazquez Berumen, Senior Adviser on Medical Devices, to recognize Clinical and Biomedical Engineer's figure worldwide.
The main aim is to stress the importance of Clinical Engineer in healthcare facilities. This work will be a chapter of Human Resources for Medical Devices, part of *WHO Medical device technical series*.

Methods
The approach used in this work analyses the main activities carried out by Clinical Engineer, in order to give awareness of all activities involving this figure. Therefore the analysis focuses on Clinical Engineer's role at national level, in particular within the Ministries of Health of different Countries. This analysis was possible through several statements by professionals who work at national level. Finally the analysis gives attention to Clinical Engineering's diffusion worldwide in the six WHO regions (*African Region, Region of Americas, Eastern Mediterranean Region, European Region, South-East Asia Region, Western Pacific Region*) through data from Clinical Engineering Societies around the world.

Conclusions
Clinical Engineer is without doubt a professional who needs to be recognized worldwide with more support. He is a fundamental resource in health technologies management and contributes both to healthcare organization and patient health.

SP087.4 - "Rehabilitation Enginering: Designing for Ability" - A summer outreach course for attracting talented high school students to the rehabilitation engineering field
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Motivation: We need to inspire talented students to pursue rehabilitation engineering, and develop the technologies that will help our aging population overcome disabilities and live fulfilling lives for as long as possible. Our team experiences a perennial challenge of attracting top-quality students to important yet often unglamorous facets of this field (e.g. supporting independent toileting for people with mobility challenges), partly because prospective students may not recognize these challenges, or see how they can be addressed through science and engineering. In response, we developed a week-long course in rehabilitation engineering for high-school students through the University of Toronto's "Da Vinci Engineering Enrichment Program", which we have led every summer since 2012.

Course structure: The course was designed provide students with memorable interactive experiences in a range of rehabilitation engineering applications. To discover accessibility challenges, students completed a "Built Environment Obstacle Course", where they navigated UofT while simulating mobility and vision deficits, then assessed how built environment features affected their experience. Students participated in hands-on demonstrations in Toronto Rehab's Challenging Environment Assessment Laboratories and Neural Engineering Lab to understand how engineering technologies are being applied to problems such as preserving hand dexterity in cold weather, and allowing people who are 'locked-in' to control their own environments. Guest speakers included engineers, clinicians and an entrepreneur who could communicate authentically to the students about the challenges, importance and rewards of developing and commercializing technologies to improve the lives of people with disabilities. The week culminated with a "Home-Care Design Challenge", focused on solving problems related to aging-in-place. These design problems were selected from real client case studies presented by a home-care field educator.

Student feedback: Students reported significant improvements in their understanding of key learning objectives (Figure 1). Students appreciated the Toronto Rehab visits, the diverse topics, the design challenges, and the instructional team's ability to make the content understandable, interactive, and relevant.

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