



# A19 Improving Medical Device Availability, Cost-Effectiveness and Safety: A19



## Online Courses on Principles, Application, Support and Management

John Tobey Clark (PI)<sup>1</sup>; Luis Vilcahuaman<sup>2</sup>; Rossana Rivas<sup>2</sup>; Tatiana Molina Velasquez<sup>3</sup>  
<sup>1</sup> Biomedical Engineering/Nursing & Health Sciences, University of Vermont, (Burlington, USA)  
<sup>2</sup> Health Technopole CENGETS, Pontificia Universidad Católica de Peru (Lima, Peru)  
<sup>3</sup> Biomedical Engineering, Universidad CES (Medellin, Colombia)

### THE PROBLEM

The impact of medical devices globally has been a significant improvement in health and quality of life. However, **critical problems must be solved to improve the safety, cost-effectiveness and availability of medical devices.**

- **Institute of Medicine** report *"To Err Is Human"* cites nearly 100,000 lives lost due to medical errors
- **US Congress**, *"Technological Change and the Growth of Healthcare Spending"* showed the primary reason for a doubling in healthcare cost over the past 30 years was **technology**

In developing countries, problems with medical devices are amplified. Weak after sales support from manufacturers and distributors and limited maintenance budgets are common. The World Health Organization and various NGOs report high percentage of medical devices are not being used. The reasons include clinicians not trained on the operation or clinical application, facility issues, and disrepair due to no parts, documentation, or trained service staff.

**Capacity building must occur in the developing world to give nations the skills and tools to positively change this area.** Technical staff must be trained to service medical devices and support clinicians, clinical staff will benefit from education on medical device proper operation and patient safety issues, and administrators must actively plan and manage health technology.

### THE SOLUTION – Online Training

Telecommunications technology and the use of the Internet is expanding rapidly in the developing world. For example, most Latin America countries have a higher per capita cell phone subscription rate than the USA. Internet usage is common using governmental, educational and commercial locations. Advantages of online training over the classroom education include:

- **Accessibility 24 hours a day, 7 days a week - whenever students are available**
- **International expertise can be used with a global reach**
- **The power of the World Wide Web is harnessed**
- **No costs or lost time for travel to classes**



### METHODS

Through grant funding<sup>A</sup> two online, interactive courses were developed for staff in hospitals - **Patient Care Equipment & Technology** and **Advanced Medical Equipment Systems**. Faculty from University of Vermont, Pontificia Universidad Católica de Peru, and Universidad CES collaborated to produce and offer the courses in English and Spanish covering:

- Healthcare – environment of care, healthcare technology, regulations/standards, and preventing and resolving problems,
- Anatomy and physiology,
- Engineering principles and electronic/computer concepts,
- Focused sections on technologies – *electrocardiography, blood pressure monitoring, pulse oximetry, fetal/neonatal monitoring, defibrillators, pacemakers, infusion technology, ventilators, all imaging modalities from x-ray to MRI to ultrasound, clinical laboratory systems, electrosurgery, lasers, robotic surgical systems, physical therapy equipment, and clinical information systems – PACS, electronic health record, and telemedicine.*

Each device topic includes sections on *Principles, Application, Patient Safety, Common Problems and Solutions, Maintenance and Technology Management.*

### RESULTS

The initial English course has been taught in the USA since 2007. The courses were translated to Spanish and adapted for use in Latin America in 2008.

- The courses have been taught at Pontificia Universidad Católica de Peru, Universidad CES, and University of Vermont
- Students have included hospital maintenance staff, BMETs, engineers, nurses, administrators, and clinical technologists, along with engineering and allied health students
- Participants have been from the nations of Colombia, Peru, Mexico, Venezuela, Uruguay, Costa Rica, Bolivia, Brazil, Uruguay, Paraguay, Chile, Argentina, Puerto Rico, Dominican Republic, Barbados, Jamaica, Grenada, Antigua, St. Lucia, Belize, British Virgin Islands, St. Vincent, St. Kitts, France, Spain, China, and the USA have taken the courses<sup>B</sup>
- **There have been over 750 student participants**



### EVALUATIONS

The course evaluations completed after the courses showed the following summary results:

- Students: 80% engineers, maintenance, technicians, 10% nursing, 10% miscellaneous
- Met expectations, relevant, well organized – 92%
- Discussion Board questions and responses rated highly
- Course well organized – 92%, 8% neutral
- Course relevant – 92%, 8% neutral
- Topics at right level – 95%
- Assignments at right level – 75%, 17% difficult, 8% easy

Outcomes: As a result of the courses,  
• **Are you better able to perform your job? 100%**  
• **Do you feel that you are or will be able to improve the support and management of medical devices and systems? 100%;**  
• **Service highest rated, other areas - Safety, Application and Management**



### Health Technology Course Sequence

In addition to the initial Patient Care Equipment and Advanced Medical Technology courses, an online **Healthcare Technology Life Cycle: Planning and Management** curriculum was created. The three online courses and a fourth hands-on laboratory course make up the **Health Technology Course Sequence** at the University of Vermont. [http://learn.uvm.edu/?Page=healthcare\\_tech.php](http://learn.uvm.edu/?Page=healthcare_tech.php)

### Future Activities

All courses are updated annually to keep up with changes. Additional translations to Portuguese and French are planned with adaptations to Portuguese and Francophone speaking countries. Funding is being actively sought for these adaptations.

### Contact information

John Tobey Clark: [tobey.clark@uvm.edu](mailto:tobey.clark@uvm.edu)  
Luis Vilcahuaman: [lvilcah@puvp.edu.pe](mailto:lvilcah@puvp.edu.pe)  
Rossana Rivas: [rivasperupvp@gmail.com](mailto:rivasperupvp@gmail.com)  
Tatiana Molina Velasquez: [tmolina@CES.EDU.CO](mailto:tmolina@CES.EDU.CO)



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