The Ongoing Crisis in Medical Device Education for Healthcare Professionals:
Breaking the Viscous Circle Through Online Learning

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ABSTRACT

A well-documented issue in healthcare is the unsatisfactory level of competence in the effective and safe use of medical devices among practicing healthcare professionals. The roots of the problem lie in the fact that medical devices are developing at a much faster rate than the requisite educational provision. As a result, undergraduate healthcare students carry out their medical device training under the supervision of practitioners-trainers who are themselves not sufficiently competent, creating a viscous circle where lack of competence breeds further incompetence. This circle can only be broken if the practitioner-trainers themselves are educated. However, owing to clinical workload the latter often cannot attend face-to-face educational programs. The problem can be resolved through online learning. This article expounds on the issue and describes an online programme by which the present author is attempting to address the problem.

Keywords: Curriculum Development, E-Learning, Healthcare Professional Education, Medical Devices, Medical Education, Occupational Safety, Patient Safety, Physical Agents, Portfolio

INTRODUCTION

The unsatisfactory level of competence in the effective and safe use of medical devices among practicing healthcare professionals is well documented. The root of the problem is the fact that medical devices are developing at a much faster rate than the required educational provision. This leads to the feelings of apprehension, often bordering on trepidation, with which many healthcare professionals approach the medical devices which they use routinely in their clinical practice (Almerud, Alapack, Fridlund, & Ekebergh, 2008; Barnard, 2000). A corollary to this is that many undergraduate healthcare students in many countries undertake medical device training under the supervision of practitioners who themselves lack competence and confidence in the use of medical devices. This creates a viscous circle where lack of sufficient ability in one generation of users leads to further incompetence in subsequent generations. The circle can only be broken if we educate the

practitioner-trainers themselves. However, owing to clinical workload and other reasons the latter often cannot attend face-to-face educational programs. The problem can be resolved through online learning. This article first defines medical devices (which includes a much wider group of healthcare technology items than what most people are aware of), discusses briefly patient and occupational safety issues associated with the use of medical devices, analyses the present situation regarding education of healthcare professionals in this area, and finally provides a description of a specific online learning module that the author delivers at his university and which seeks to tackle the problem - in the hope that it would help fellow academics in similar circumstances to address the issue in their own particular milieu.

MEDICAL DEVICES

Medical devices are defined in EU legislation as: "any instrument, apparatus, appliance, material or other article, whether used alone or in combination, including the software necessary for its proper application intended by the manufacturer to be used for human beings for the purpose of:

- Diagnosis, prevention, monitoring, treatment or alleviation of disease,
- Diagnosis, monitoring, treatment, alleviation of or compensation for an injury or handicap,
- Investigation, replacement or modification of the anatomy or of a physiological process,
- Control of conception,

and which does not achieve its principal intended action in or on the human body by pharmacological, immunological or metabolic means, but which may be assisted in its function by such means" (EC, 1993). Medical devices also include in vitro medical devices which are defined as "any device which is a reagent, reagent product, kit, instrument, equipment or system, whether used alone or in combination, intended by the manufacturer to be used in vitro for the examination of samples derived from the human body with a view to providing information on the physiological state, state of health or disease, or congenital abnormality thereof" (EC, 1998).

Some familiar examples are anaesthetic machines, CT scanner, dental instruments, dressings, endoscopes, examination gloves, intravenous administration sets and pumps, pacemakers, artificial hearts, surgical instruments, syringes and needles, ultrasound imaging equipment, urinary catheters, defibrillators, patient monitors, blood glucose measuring devices, cholesterol test kits, pregnancy test kits, adjustable beds, patient transfer equipment, hearing aids, prescribable footwear, walking aids, wheelchairs, contact lenses, cholesterol test kits, pregnancy test kits, and thermometers. Indeed, the number of different medical devices presently in clinical use runs into thousands. There is a range of complexity and in general the higher the complexity of the device and the higher the number of user options the steeper the learning curve.

Safety Issues Associated with Medical Devices

Safety issues associated with medical devices may arise from physical, chemical and biological agents. Physical agents linked to medical devices involve energy sources such as electricity, x-rays, vibration, laser lights, magnetic fields, static electricity, pressure or vacuum, electromagnetic fields and high or low temperatures. Chemical agents associated with medical devices include residual disinfectants / sterilants, contrast agents used in medical imaging (e.g., vascular endothelial and smooth muscle damage by microbubble-based ultrasound contrast agents, adverse reactions to iodinated contrast agents used in x-ray imaging), waste anesthetic gases, and acrylic substances used to secure prostheses to bone during orthopedic surgery. Risk from biological agents may arise through contact with blood and body fluids oc-

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