Radiation Dose Informatics: Using the Tools of Six Sigma to Improve Radiation Exposure Prescription

New commercial software products can capture patient exposure information, store these data and web enable reports to provide users with radiation prescriptions from diagnostic x-ray exams, including CT and Fluoroscopy. These tools provide highly relevant patient specific and summary information that is enormously useful and actionable for ensuring that the intended exam exposure took place in fact. Radiation dose to organs can be computed for CT exams and skin dose can be computed for Fluoroscopy use.
Excursions from intended prescriptions can be easily identified for a facility, device, protocol or patient.

Six Sigma (SS) is well suited as the contextual approach of using these software tools as the improvements in accuracy and optimal prescription of x-rays for diagnosis deal with the unwanted variability that a 'process' driven service inherently generates. Basic SS concepts introduced in this talk derive from DMAIC, the organized approach for systems engineered changes having improvements in quality as the goal. Data show that prescriptions of x-ray as currently configured with these devices allow for wide ranges of patient exposures (machine outputs). At its basis, the range of patient size, geometry of patient positioning and the image quality needs of clinically needed but widely ranging types of diagnostic exams or therapeutic interventions with fluoroscopic and CT. Included in the measures of observed variability is the complexity of operator selectable device controls. This increases the opportunity for non-uniform training of staff leading to further variations from the ideal. Six Sigma recognizes that the primary need is to reduce variability from the intended dose prescription goal. It embraces team involvement, continuous improvement, standardization, and education as basic to improving outcomes. DMAIC (Define, Measure, Analyze, Improve, and Control) notes that it is not the individual but the process which is faulty. Specific examples of data gathered by these software tools will be used to show how one can monitor, understand and facilitate improvements for CT and Fluoroscopy.

MOC Course Objectives

Objective 1. To review the key concepts of Six Sigma as a tool for the strategic approach of refining x-ray exposure prescriptions with CT and fluoroscopy.

Objective 2. To demonstrate several powerful, newly available and important software tools that allow key Six Sigma concepts to be addressed, including the ability to provide:

a. Measures of variability in a process, not as a human fault
b. Quantified measures of quality prescription
c. Records of Patient data that are timely and thus actionable
d. User specific behavior training tools

Objective 3. To give specific examples of the use of informatics in reducing variability of x-ray exposure prescription, including:

a. Patient Centering/CT Radiographs
b. Technologist virtual teaching tool for CT
c. Physician virtual teaching tool for Fluoroscopy
d. Protocol Specific Fluoroscopic and CT Exposures