P-40

TITLE: MODELLING AND SIMULATING MR GUIDED WORKFLOW FOR ENDOVASCULAR AND CARDIOVASCULAR PROCEDURES.

AUTHORS: Fabiola Fernández-Gutiérrez[1], Avril Barclay[2], Thomas Martin[3], Graeme Houston[2], Andreas Melzer[1]

[1]Intitute for Medical Science and Technology, University of Dundee, Dundee, Scotland, UK
[2]Clinical Radiology Department, Ninewells Hospital, Dundee, Scotland, UK
[3]Cardiology Department, Ninewells Hospital, Dundee, Scotland, UK

ABSTRACT CONTENTS:

PURPOSE: Since the 70s, simulation has been used in radiology environments to improve efficiency, e.g. decreasing waiting lists. Few authors explored radiology interventions and just focussed in particular aspects such as staff patterns or breaks. This project aims for a more detail study of workflow of the procedures, focussing on endovascular and cardiovascular interventions (ECVI), in order to provide a methodology and a visual environment based on discrete event simulation for the development of optimal workflow under MRI guidance.

MATERIALS/METHODS: The project was divided into five parts: data collection, statistical analysis, conceptual modelling of workflow, validation of the radiology model and simulation of MRI scenarios. Data has been collected manually from Iliac Angioplasty and Stenting (IAS), and Percutaneous Coronary Angioplasty and Stenting (PCAS) (Ninewells Hospital, Dundee, UK). Each record contains general patient information, number and roles of the clinical personnel involved, supplies used and an event log for different phases of the procedure. IBM SPSS 20.0 was used for a descriptive statistical analysis of the data and a study of possible mathematical relations between intervals collected for each phase in the interventions was undertaken using Eureqa II (Formulize). Flow diagrams helped in the conceptual design of the workflow process for X-ray guided procedures. Role Activity Diagrams (RAD) were used to describe the interactions among staff members involved in each phase.

RESULTS: Preliminary findings highlight a high variability of the data in certain phases of both procedures. In addition, the study of possible relations between phases reveals that the timings collected are independent between each other. Models were implemented in Delmia Quest and were validated running a hundred simulations with different random numbers. Similar results to the data collected were obtained, e.g. time for treatment (min) in IAS for clinical record was 11.44 ± 8.26 and for simulations was 12.73 ± 2.689. The differences in the standard deviation can be reasoned by the much higher number of simulations and the outliers of the clinical records.

CONCLUSION: Simulation of workflow in health systems is potentially an advantageous tool for searching of the optimal alternative in re-engineering processes. For ECVI, analysis and simulation of workflow can help to reduce variability found in the current data and to improve the use of

supplies experience. The independence found for individual intervals allows the re-design of procedures when we change from an X-Ray driven environment to a scenario that integrates different imaging modalities under MR guidance. This is currently a work-in-progress.