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### **An exploratory study on the use of game-based learning using Microsoft Kinect to teach oncology phase I clinical trial designs**

Alan E Bilisland<sup>1</sup>, Caroline Kelly<sup>2</sup>, Jennifer Roccisana<sup>3</sup>, James Paul<sup>2</sup>, Rob Jones<sup>2</sup>, Joanne Edwards<sup>4</sup>, Torsten Stein<sup>3</sup>, and Katherine West<sup>5</sup>

1 – Glasgow Experimental Cancer Medicines Centre, Institute of Cancer Science, University of Glasgow

2 – Cancer Research UK Clinical Trials Unit, Institute of Cancer Science, University of Glasgow

3 – Molecular Pathology, Institute of Cancer Science, University of Glasgow

4 – Experimental Therapeutics, Institute of Cancer Science, University of Glasgow

5 – School of Life Sciences, University of Glasgow

#### **Background**

Phase I trials are the first stage in drug development. Major objectives include determining toxicities of new agents and maximum tolerated dose (MTD) for later clinical stages. The 3+3 design is most common, although support is growing for newer “model-based” designs. One criticism of these is their complexity. To investigate gamification in teaching these designs to Cancer Science students, a computer game using Microsoft Kinect motion sensing was used to supplement existing lectures.

#### **Methods**

The game objective is to find MTD of “drug X”. Groups of 3-5 receive a draft trial protocol, pre-clinical toxicology report, and instructions for allometric scaling to human dose. Players first decide dose ranges to investigate. Using the game, patient cohorts are recruited, administered drug X, and toxicities checked. Players decide if dose limiting toxicity (DLT) is observed and whether to dose-escalate/de-escalate, expand the cohort, or stop. Each group plays a different trial design. Feedback was taken using a questionnaire investigating technology interaction, group working, learning outcomes and engagement.

#### **Results**

The game was tested with 3 student cohorts using different control methods (student-led, tutor-led, or mixed). 7/10, 7/8, and 12/21 students gave consent for analysis of their responses. Across cohorts, learner engagement items scored particularly highly. Nearly all also reported improved understanding of the concepts of DLT and MTD. Many also reported

improved understanding of different phase I designs. Mann-Whitney analysis of responses under the different control conditions revealed few significant differences. Our favoured approach is mixed-mode control.

### **Conclusions**

In the clinical trials education literature, studies of active learning approaches appear to be sparse. We have not yet formally evaluated student-reported learning improvements in a test/re-test setting. However, positive feedback across items of our questionnaire suggests that students value the activity. We envisage potential future extensions to the game addressing aspects of phase I design beyond recruitment and dosing.