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An innovative approach to inculcate analytical and non-analytical clinical reasoning among medical students

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more about the discussed conditions. On the other hand, digital photographs represent the basic tool of many modern educational methods (online dermatology courses, problem-based learning), and may have a place in teledermatology (Whited et al. 1998).

Despite these advantages of digital photograph-based teaching, we emphasize that this modality is not a substitute for formal clinical teaching; it is rather a good supplement.

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Thomas the Tank Engine significantly improves the understanding of oxygen delivery and hypoxaemia

Dear Sir

Physiological concepts are often poorly understood with students 'knowing' but not 'understanding' (Berlucchi & Di Benedetta 2000). Therefore with respect to oxygen delivery and hypoxaemia we have used images of Thomas the Tank Engine delivering coal to improve comprehension (Cosgrove et al. 2006). To evaluate the process we presented two 30-minute lectures to Year One Medical Students. The control lecture was a conventional presentation; the study lecture contained additional images of Thomas the Tank Engine. LREC approval was unnecessary; HiT Entertainment-UK granted permission to use the imagery. Students were randomised into four groups (A $n=73$, B $n=56$, C $n=59$, D $n=53$). Groups A and B received the control lecture, while C and D the study lecture. Groups A and C undertook a pre-lecture MCQ to assess background knowledge. All students completed a post-lecture MCQ and qualitative evaluation of the lecture. Evaluation scores (out of 20 for the MCQs) were collected using an ARS-KEEpad system and compared using the Mann–Whitney U-test. A p-value ≤ 0.05 was regarded as significant.

The post-lecture MCQ scores failed to demonstrate any evidence of gender stereotyping or priming (A vs. B, $p=0.6$ and C vs. D, $p=0.4$.) Both lectures significantly improved post-lecture MCQ scores ($p<0.001$.) Group A had a significantly higher pre-lecture MCQ score compared to group C (median 16 vs. 12, $p<0.001$); there was no difference post-lecture between A and C (median 18 vs. 17, $p=0.4$). Qualitatively the imagery also made the lecture significantly *more organised* ($p=0.006$), *interesting and stimulating* ($p<0.001$) and *improved understanding* ($p<0.001$.) At 6 months there was no significant difference in MCQ scores ($p=0.4$). Groups A and B had the same median MCQ score at 6 months as group A pre-lecture MCQ ($p=0.9$). Groups C and D had a significantly higher median MCQ score at 6 months compared to group-C pre-lecture ($p<0.001$).

In conclusion, analogous imagery significantly improved aspects of understanding hypoxaemia and in students with lower levels of background knowledge, the imagery allowed them to attain knowledge levels similar to their peers and minimised knowledge decline-ratio at 6 months. Thus compared to a didactic lecture, imagery of Thomas the Tank Engine delivering coal can provide an improved structure for lecture delivery and knowledge retention, assisting medical students in engagement with learning and understanding the processes of oxygen delivery and hypoxaemia. The improvement in scores post-lecture can also assist the lecturers (both registered with the General Medical Council) in their revalidation process.

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An innovative approach to inculcate analytical and non-analytical clinical reasoning among medical students

Dear Sir

Clinical reasoning is a cognitive process by which clinicians diagnose illnesses and manage them and is considered as the

primary determinant of clinical competence (Charlin et al. 2000). Over the past 15 years, research directed to better understand this complex, multifaceted skill has led to the consensus that clinicians generally use two types of approaches in clinical reasoning: analytical and non-analytical (Pelaccia et al. 2011). Non-analytical reasoning is a tacit, heuristic approach that is based on previous experience (Pelaccia et al. 2011). It matches a specific clinical presentation under consideration with previously encountered similar cues, signs and situations. The advantage of this type of reasoning is that it is effortless, quick and a decision is made at the subconscious level. By contrast, analytical reasoning is a rational assessment of the clinical problem based on in-depth analysis of potential causes. The decision is based on conscious application of rules that have been acquired through learning. The advantage of this type of reasoning is that the decision is made after consideration and elimination of several possible causes, thereby increasing the accuracy of diagnosis.

At the College of Medicine, Alfaisal University, we have developed an innovative approach which allows students to develop both heuristic and analytical reasoning using a case-based method of learning. In this approach, both students and the experienced clinical tutor will work as a group to solve a clinical case without prior knowledge of the diagnosis. Both students and tutors are presented with the clinical case and a complete medical record of it. The group works together to analyse the available information and reach a definitive diagnosis. During the process the tutor will share with the students his experiential reasoning regarding the case. After the correct diagnosis is revealed to the group they will discuss the clues which led them to the diagnosis and distractors which were misleading them. In this method since the tutors are unaware of the final diagnosis of the case, they are using their heuristic as well as analytical skills to solve the problems alongside students.

The approach of using experienced clinical tutors to work with novices to solve a clinical case is currently used successfully at Alfaisal. This represents an innovative case-based approach which inculcates both heuristic and analytical thinking.

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A proposed program for revising training in diagnostic and interventional cardiac catheterization using a didactic lecture series and virtual reality simulation

Dear Sir

Cardiac catheterization is an invasive cardiology procedure learned during cardiology fellowship. The current paradigm of training cardiology fellows in the skills required for cardiac catheterization involves direct patient contact/care, i.e., learning on patients in an "apprenticeship" model (Gallagher & Cates 2004). In most cardiology programs, there is no formalized curriculum, despite the existence of knowledge and competency standards. At the University of Pittsburgh we have endeavored to develop a more complete training process for cardiology fellows in the adult learner model, which will enable them to meet the Accreditation Council for Graduate Medical Education's (ACGME) six core competencies while achieving a higher level of learner satisfaction. To accomplish this, we first performed a task analysis of training components in cardiac catheterization. We then performed a targeted needs assessment of our graduating fellows ($N=11$), which showed poor learner satisfaction with current teaching and a need for simulation training, averaging a 2.2 and a 4.0, respectively, on a 5-point Likert scale. We then used the content of the task analysis, the data from the needs assessment, and the guidelines created by ACGME and Core Cardiology Training Symposium to create a comprehensive invasive cardiology curriculum using the latest in modern technology. Identified learner needs were molded into a workable and deliverable curriculum in invasive cardiology using an active, adult learner format addressing all three major learner domains (knowledge, psychomotor, and affective). The final curriculum involved: (1) delivery of didactic lectures via a web portal to improve fellow knowledge in core areas of cardiology, (2) virtual reality cardiac catheterization simulation to improve psychomotor skills, and (3) formative feedback from cardiology attendings on performance of cardiac catheterization with real patients. This curriculum was initiated at the University of Pittsburgh in July 2011 and will end its pilot phase in July 2012. We anticipate the data generated will show that innovative use of technology utilized in an adult learner format can improve the abilities and satisfaction of interventional cardiology trainees. This curriculum can serve as a model for other