ANOVA analysis showed no statistically significant difference with the CM group (44.63% +/- 19.56%) compared with the CM+3DM group (44.63% +/- 19.56%) compared with the CM+3DM group (44.63% +/- 15.76%, p=0.019). Mixed ANOVA analysis showed no statistically significant interaction between groups and pre/post testing on scores, F(2,49)=1.62, p=0.196. Post hoc testing confirmed a significantly greater improvement in scores for the 3DM group compared with the CM group (p=0.020) or the CM+3DM group (p=0.019).

Discussion and Conclusions: 3D printed materials may offer an alternative to cadaveric material where such material is unavailable for cultural, ethical, cost or practical reasons. This study demonstrates they can act as effective teaching tools for learning external cardiac anatomy. Rather than only showing equivalent results in our post-tests, the 3DM group achieved better scores than the other groups suggesting that in some way the 3DM models may improve the teaching of anatomy. 3D printed anatomy models show at least equivalence and perhaps improved teaching of undergraduate anatomy.


Introduction: Three-dimensional (3D) printing is an emerging technology that allows the production of high-resolution, anatomically-accurate, full coloured specimens. It has the potential to provide cost-effective and readily producible teaching materials utilising data from scanned images (McMenamin, et al., 2014). As a novel teaching tool there is currently little evidence assessing its use in medical education. We conducted a pilot study to assess the performance of 3D printed models for use in teaching external cardiac anatomy compared to cadaveric material either alone or in combination with the new 3D prints.

Methods: With approval from the Monash University Human Research Ethics Committee a double-blind, randomised controlled trial was conducted on volunteer first year undergraduate medical students with no prior formal teaching of cardiac anatomy. A pre-test was administered to assess baseline knowledge of external cardiac anatomy. The subjects were randomised into 3 groups and were provided either cadaveric materials (CM), 3D printed materials (3DM), or both cadaveric and 3D printed materials (CM+3DM). Using these materials, participants were directed to complete a series of self-directed learning activities focusing on external cardiac anatomy (size, position, shape, boundaries, chambers and coronary vessels). Following this, participants were administered a post test on external cardiac anatomy written by a blinded non-investigator third party.

Results: Fifty three participants attended the pre-test and randomisation, with a total of 52 post-tests completed. Age, gender, and time since completion of secondary education were statistically equivalent for all three groups. There was no difference in pre-test scores among the three groups (p=0.231), however mean post-test scores were significantly different (p=0.01). The 3DM group obtained significantly higher mean post test scores (60.83% +/- 14.92%, p=0.02) or the CM+3DM group (44.63% +/- 15.76%, p=0.019). Mixed ANOVA analysis showed no statistically significant interaction between groups and pre/post testing on scores, F(2,49)=1.62, p=0.196. Post hoc testing confirmed a significantly greater improvement in scores for the 3DM group compared with the CM group (p=0.020) or the CM+3DM group (p=0.019).

Discussion and Conclusions: 3D printed materials may offer an alternative to cadaveric material where such material is unavailable for cultural, ethical, cost or practical reasons. This study demonstrates they can act as effective teaching tools for learning external cardiac anatomy. Rather than only showing equivalent results in our post-tests, the 3DM group achieved better scores than the other groups suggesting that in some way the 3DM models may improve the teaching of anatomy. 3D printed anatomy models show at least equivalence and perhaps improved teaching of undergraduate anatomy.


Introduction: In situ simulation (ISS) involves conducting simulations in the actual patient care unit. Based on the much-discussed topic of learning in context, ISS is expected to increase fidelity and thereby learning. No previous qualitative studies have explored participant experiences of ISS and off site simulation (OSS) (i.e. simulation in training rooms). This study attempts to shed light on the general assumption that context and fidelity are a determinant for how different kinds of simulation are experienced (1) and to determine the correctness of the assumption that ISS is a more effective learning tool than OSS. Research question: How does the setting in simulation-based medical education (OSS or ISS) affect...
the perceptions and learning experience of healthcare professionals?

**Methods:** We used focus groups and content analysis. Participants were twenty-five healthcare professionals (obstetricians, midwives, auxiliary nurses, anaesthesiologists, nurse anaesthetist and operating room nurses), participating in four focus groups. They were recruited due to their exposure to either ISS or OSS in a multiprofessional randomised trial (2). Setting was the department of obstetrics and anaesthesia, Rigshospitalet, Copenhagen.

**Results:** Initially participants preferred ISS, but this changed after the training when the simulation site became of less importance. There was a strong preference for simulation in authentic roles. These perceptions were independent of the ISS or OSS setting. Several positive and negative factors in simulation were identified, but these had no relation to simulation setting. Participants from ISS and OSS generated a better understanding of and collaboration with the various health professionals and provided individual and team reflections on learning. ISS participants described more experiences that would involve organisational changes than the OSS participants did.

**Discussion and Conclusions:** Many aspects related to the authenticity of the learning experience are important in simulation, but the physical setting of the simulation as ISS and OSS showed to be the least important. The only difference was that ISS participants talked more about issues that would involve organisational practical changes. ISS and OSS participants did, however, go through similar individual learning and team learning experiences. Based on findings from these focus groups the simulation settings in situ and off site were of minor importance for individual and team learning. In situ simulation had more organisational impact and provided more information’s for organisational practical changes than off site simulation. The physical fidelity or context of the in situ and off site simulation were less important, and off site simulation can be used provided all other authenticity elements are respected. These conclusions are in alignment with current discussions about fidelity and context in the medical education literature (1).


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**Allies or adversaries? Identity work in medical student narratives of participation in patient care-related activities**

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**Introduction:** Professional identity formation is a fundamental aspect of a medical student’s education, and is integral to every learning interaction. Identity is a social and cultural phenomenon that emerges as people interact in particular contexts; hence it is inherently relational. It is important to investigate how and what kinds of identities emerge during medical education, with what implications for future practice [1]. In this paper we examine identity in relation to the movement towards a more collaborative approach to involving patients in medical education. Evidence suggests that when helping students gain access to patients during care-related activities, doctors frequently disregard valid consent processes [2]. This paper explores the relationship between student, teacher and patient identities as constructed in medical student narratives about learning in the context of patient care.

**Methods:** This paper reports on one aspect of an ethnographic study investigating medical student and patient identity formation. Data were gathered over a nine-month period of fieldwork in a teaching hospital, and comprised observations of bedside tutorials and ward rounds, interviews with students, tutors and patients, and texts including handbooks, lecture notes and critical incident reports. Themes emerging from the initial examination of the data were explored more deeply by subjecting selected excerpts to a dialogic narrative analysis based on the theory of Bakhtin. This method focuses on how a story was produced and performed in a particular context, including how narrators construct identities as they position themselves in relation to story characters.

**Results:** Analysis of the data revealed that doctors customarily avoided following proper consent processes when securing student access to patient care-related activities. When students were invited during research interviews to reflect on how patients were approached, they acknowledged doctors’ common failure to follow proper consent practices, but often presented arguments justifying this practice. In the process patients were often characterised as adversaries. One student’s story of an incident during a ward round is presented to illustrate how the doctor is characterised as an ally, but the patient is portrayed as an oppositional figure because she does not behave as expected.

**Discussion and Conclusions:** It is understandable that students will come to identify more with doctors than with patients as their clinical education progresses. However, when their teachers or supervisors relate to patients as though they are liable to thwart students’ desire for clinical experience, using deceptive or coercive practices to procure their involvement, this
can lead students to also relate to patients as if they were adversaries, as a result of their identification with the doctor. This is likely to have undesirable implications for their future practice and limits the potential for patients to be involved as willing participants. Unless they acquiesce to students’ involvement they risk being cast as transgressive. Opportunities can be created for students and their teachers to reflect critically upon how they approach patients, for example in post-event debriefings or reflective groups. This could promote more active and collaborative patient participation in students’ learning, while supporting the ongoing identity work of students and their teachers.


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Knowledge development of students in a problem-based course using preclinical patient contacts

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Introduction: Medical experts have access to elaborate and integrated knowledge networks consisting of biomedical and clinical knowledge, interacting closely in clinical reasoning(1). These coherent knowledge networks enable them to generate more accurate diagnoses in a shorter time and to comprehensively explain patient features, using clinical rather than biomedical knowledge(1). Students should be explicitly instructed to acquire this knowledge by confronting them with varied real patient contacts, since they tend to jump to diagnosing without trying to understand the underlying mechanisms and because they find it difficult to apply their knowledge to various patient problems. Findings from an observational study of problem-based small group discussions revealed that real patient contacts stimulated students to discuss biomedical knowledge and clinical knowledge and that students made links between biomedical and clinical knowledge(2). This study, however, did not reveal if this resulted in coherent and integrated knowledge networks and neither if students were able to transfer their knowledge to new patient problems. So, we wanted to explore the development and transfer of knowledge of third-year students (i.e. their last preclinical year) in a problem-based course with real patient contacts.

Methods: We conducted a pre-post course measurement in which third-year medical students think out loud while diagnosing different types of paper patient problems, and explain the underlying pathophysiological mechanisms of the patient features before and after a 10-week PBL course with real patients. Four pairs of paper patient cases were used, describing the same problem type, i.e. underlying pathophysiological mechanism, per pair. Two problem types were discussed during the course (i.e. course cases) and two problem types were beyond the content of the course (i.e. transfer cases). The verbal think-out-loud protocols and explanations were qualitatively and quantitatively analyzed in comparison to model answers. Data were analyzed in SPSS using ANOVA repeated measures in a 2 (pre- versus post-measurement) x 2 (course versus transfer cases) x 2 (problem-type) within-subject design. Results with a significance level of < .05 are reported.

Results: Diagnostic accuracy increased, case processing time decreased, and students used less biomedical and clinical knowledge during diagnostic reasoning. The quality of the pathophysiological explanations increased. Students used more model concepts, made more links between model concepts and used less wrong concepts and links. Besides, students used more concepts in their explanations after the course, especially biomedical concepts. The effects were generally less strong for transfer cases as compared to the course cases.

Discussion and Conclusions: Students’ diagnostic accuracy and the quality of their knowledge networks as shown in their pathophysiological explanations were better after the 10-week course, suggesting that students integrated biomedical and clinical knowledge during the course. Furthermore, the reported differences across cases demonstrate that transfer is complex and time-consuming.

We suggest offering students many varied real patient contacts with the same underlying pathophysiological mechanism and encouraging students to link biomedical and clinical knowledge.