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Behind the scenes of a new researcher

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EDITOR NOTE

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Dear Editor

In this letter I would like to share an insight into the unseen life behind a new researcher.

After my BSc in Medical Imaging Science in 2007, I have been working as a radiographer in many clinical sites. These include working in public hospitals and in private imaging practices. I have learned clinical skills with a focus on various imaging modalities, such as general radiography, emergency department radiography, Computed Tomography (CT), operating theatre imaging, including imaging for electrophysiology and vascular interventional procedures.

My interest in vascular intervention has led to the decision to return to university and pursue a higher degree by research. Potential project topics were discussed with my academic supervisors and after reading the literature, it was decided that my research project will focus on the use of three-dimensional (3D) printed models for guiding endovascular stent/stent graft repair in patients with cardiovascular disease such as coronary artery stenosis, carotid artery stenosis, aortic aneurysm and renal artery stenosis.

3D printing technology is increasingly used for improving the learning experience for doctors training in vascular intervention procedures and is proving to be a very encouraging tool for medical education when compared to the current methods [1-4].

As part of the clinical pathway the patient may be required to have medical imaging of some form such as a CT, which is a routine imaging modality used for diagnosis and Pre-surgical planning. These scans produce CT datasets that are ideal for reconstruction into 3D images of high resolution for disease detection and surgical planning such as preoperative planning of endovascular aneurysm repair (EVAR) and follow-up of aortic aneurysms[5]. However, due to the high radiation dose associated with CT scanning, it is clinically important to develop protocols for minimising radiation exposure to patients and operators. The use of 3D printed models can be part of this protocol.

The importance of using a 3D printed model in EVAR is outlined by Huang, et al. who Reported the use of a 3D printed model of an abdominal aortic aneurysm in a clinical setting[6]. The 3D printed model was then aligned to the stent graft so that the position of the fenestration for the renal artery could be maximised with regard to the placement of the graft. Their study represented the first reported clinical case using this novel application and found that it can improve the effective placing of the fenestration. Some more studies were available recently through the encouragement of their early work[7,8].

Research Gap Identified

Mitsouras, et al,. emphasised that 3D models should be produced to give a similar haptic response to human body tissues and this will be addressed in this research. They also reported that models closely representing the patients' anatomy in complex presentations, could reduce the patient's operating time and decrease the possibility of morbidity or death[9]. My study will aim to include assessment of the trainees' enrichment of learning and confidence by using patient specific 3D printed models. This is an area lacking scientific evidence to prove the clinical value of 3D printed vascular models and my research will tackle this gap.

There is still much research to be done as the novel resins used in the printing continue to develop[10]. This increases the need to evaluate these 3D printed models' application in simulated clinical training and education. This has great potential to improve pre-surgical planning, in particular in the interventional radiology practice as it requires operators

or trainees to develop practical skills and confidence before operating on real patients. This will be addressed in my study by developing personalised 3D printed vascular models with use of flexible printing materials to replicate realistic vascular anatomy and pathology.

Reflection on Re-Entry to University

Curtin University has stringent requirements for the research students who start their career by pursuing a higher degree by research. There are online learning modules to complete covering a variety of areas such as responsible conduct, breaches of code, planning of research, data selection analysis, scholarly publication, communication and social responsibility, and conflicts of interest. Ethics approval requires complete outlines of what is to be said to clinicians, how the models are to be used and how the questionnaires are to be implemented. Further online learning is to be completed in the responsible conduct of human participation, the care and use of animals in research, handling of intellectual property and the control of what information can be exported.

Other online learning contents covering Australian consumer law, equal opportunities, health and safety, cyber security and work essentials are similarly required to be completed by the new researcher. By attending and completing these modules, I have broadened my knowledge in conducting scientific research; in addition to becoming familiar with what is required for the research student to comply.

Whilst covering the re-entry requirements by the University, it is also beholden on the new researcher to keep abreast of developments in software required for different aspects of presenting the research. There will always be more in the future, and a further six months of part-time study has passed.

Submissions for Approval and Milestone Presentation

After six months of enrolment, it is time to prepare all documents for submission and approval, and also complete the Milestone 1 presentation. Obtaining ethics approval is not an easy task as it involves a considerable amount of time in preparing relevant documents including participant consent form, risk assessment, survey questionnaire design, data management plan, as well as the research integrity training. It is a learning progression to seek ethics approval, especially during the process of addressing the reviewer's comments.

Developing the research proposal is a learning curve. I have read the latest literature in similar research fields, including the use of 3D printing technology in medicine, specifically in aortic disease and how 3D printed models assist surgeons to plan endovascular stent grafting procedures. Once the research question is identified, the next step is the research methodology, which addresses the specific objectives. I have enriched my knowledge on how the 3D printing technology can be used currently in many areas, from medical teaching and education to simulation of surgical procedures and enhancing clinical communication, as well as using some software tools such as 3D Slicer and Mimics for image processing and segmentation [11-12]. After several drafts and revisions, a final research proposal was developed.

The next step of my study was to deliver the Milestone 1 presentation, which was a rewarding experience. I had not presented formally since I obtained my BSc degree 16 years ago and was given the opportunity to do a rehearsal with my supervisor and another academic colleague from our school prior to the formal presentation. I received beneficial and constructive feedback on improvements and found it very helpful. The presentation then took place in a lecture theatre with a few staff from Curtin Medical School in attendance. Surprisingly, the presentation went quite well and I attributed this to my supervisor, careful preparation and most importantly the relevance of the project to my clinical experience in interventional radiology.

The journey from a clinical practitioner to commencing a research study has been an enjoyable one. I have equipped myself with new knowledge and skills on how to conduct a scientific research study; though there is still a lot to learn and a long way to go before completing my research degree. My clinical skills complement my study and make the process of research very fulfilling. Accordingly, the research outcomes will have a direct impact on current practice such as improving training and educational programs on interventional radiology procedures; and guiding surgical planning and treatment of vascular diseases. I hope my experience and personal views will encourage more graduates to consider pursuing research studies in the future

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