DSC
Dental Schools Council

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Clinical Skills Development –The Essential Role of Simulation in Development of the Dental Workforce

Purpose of this Paper:

The purpose of this paper is to introduce clinical simulation as an essential part of clinical teaching in Dentistry as part of the development of the required breadth of clinical skills. Simulation has a dynamic and iterative inter-dependency with clinical practice that adds value and rigor to clinical education and continuing professional development, with enhancement of the breadth of opportunities to ensure patient and public safety and give confidence in the profession.

Dental Students as the Operator Delivering Patient Care:

Any patient who sits in a dental chair is placing their trust in the healthcare professional(s) delivering care. Where the student is the operator delivering patient care – the norm in undergraduate programmes – this reflects a confidence and belief that there will be benefit without detriment to the patient's well-being. This central role in delivering care contrasts with the approaches used to develop healthcare students outside of dentistry. Altruism can be a driver for patients consenting to student involvement with recognition that they are contributing to development of the future workforce. The trust displayed by these patients must be underpinned by an appropriate and robust quality assurance framework that delivers patients safety and meets the changing expectations of our society. Our undergraduate students are the first stage of workforce development and are an investment in our professional colleagues of the future.

Clinical Simulation adds Value to Patient Care

Clinical simulation has a crucial and changing role in supporting development of skills and rehearsal for performance of specific events (Figure 1). The importance of clinical simulation is reflected in advances across the breadth of healthcare. For example, in England this is reflected in the Health Education England (HEE) 'National Strategic Vision for Simulation and Immersive Technologies'[1] and related documents.

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[1] National Strategic Vision for Simulation and Immersive Technologies HEE (2020) link

In dental education and professional development clinical simulation is not a substitute for actual patient care, but a means to enhance it. Dental education was an early adopter of simulation; phantom heads with natural teeth embedded in plaster were in use in the 1800s. Phantom head rooms are run as clinical areas. Clinical simulation has been a gateway to patient treatment clinics for decades. In recent years, however, simulation development in dentistry has not kept pace with current capabilities. To some degree this reflects that Dentistry has been slow to develop simulation that incorporates digital and technological advances in the way that other operative healthcare has. This is changing, but, nonetheless, **simulation and clinical activity in current undergraduate dental education should be reconceptualised as having a dynamic, integrated and iterative inter-dependency as opposed to simulation being simply viewed as a unidimensional gateway to clinical activity.**

Figure 1. Clinical simulation acts as a filter that adds value to dental education and professional development. Within each period in dentistry, advances in dental materials and equipment together with their application to patient care have changed. The realities and future possibilities arising from digitalisation are driving a step-change in how clinical simulation impacts on workforce development and patient care. The clinical simulation filter increasingly offers new opportunities and will continue to develop to add further value.
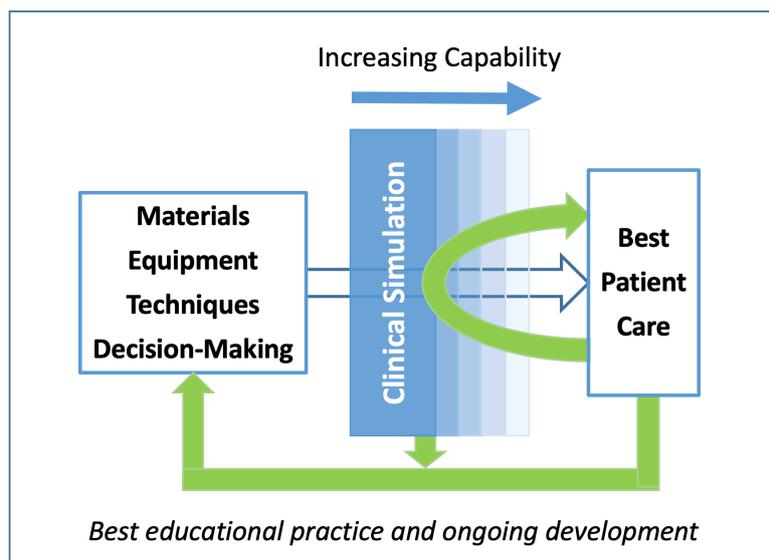
Examples of how simulation can enhance training and help maintain and develop clinical capability throughout a professional career include, but are not limited to:
- Developing competence in technical skills, gradually adding complexity and setting this in the context of holistic clinical scenarios, replicating clinical encounters with a high degree of authenticity
- Allowing for deliberate practice in response to identified learning needs
- Prevention of de-skilling in relation to rarely practiced skills, including preparation for complex procedures
- Exposure to infrequently encountered clinical problems

Thus, it can no longer be considered that there is a clear divide between the "artificial" simulated event and patient facing clinical training placements, something that is clearly recognised in the education of many other healthcare professionals. The reality of this was significantly highlighted during the pandemic, where innovation in simulation became a necessity in the continuity of clinical education. Simulation also offers potential assessment approaches with a new focus and rigour that inform decision-making about attainment of milestones and progression, adding confidence to patient and public protection.

Innovation is driving advances in digitalisation and associated technology to underpin an enhanced educational offering. Examples are provided in Table 1. Some of these are already in use, whereas others are at earlier stage and require further development yet show the direction of travel.

Summary

Dental education has moved on from clinical simulation being a gateway to teaching clinics. The point has been reached where the integration of clinical practice and clinical simulation with associated assessments are reality within a period of innovation and change. The pandemic has highlighted that there is clear scope, together with a need, to bridge the current capability gap through realising the potential of clinical simulation and delivering added value to workforce development within the over-arching need to ensure public and patient safety and give confidence in the profession.

Table 1: Examples of clinical simulation applications in dentistry that include those already in use and others at an earlier developmental stage. This table should not be considered comprehensive or inclusive of all current practices or developments, but indicative of how clinical simulation is changing and is increasingly embedded in workforce development.

Approach	Overview	Assessment Added Value	Applications - examples include
3D-printing	Range of techniques including inexpensive 3D-prints with more complex (and expensive) 3D-printing approaches restricted to very specific applications that add value to what has been the common standard in dental education.	Yes	- Anatomically accurate teeth that include printed 'caries' (not physical spaces). - Anatomically accurate teeth that include a pulp space that extends to the root apices. - Full upper and lower dental arches with replaceable teeth that are based on real patient cases with case complexity and associated information (clinical records, radiographs and photos) reflecting the educational need. - Rehearsal of planned treatments specific to a named patient ahead if the actual procedure being undertaken as part of clinical care.
Haptics	Mixed reality technology that creates an accurate sensation of real-life touch coupled to virtual images with wide –ranging applications that can dove-tail with 3D-printing approaches to add a new dimension to dental education.	Yes	- Spatial control and accuracy of fine motor skills. - Anatomically accurate teeth. - Full upper and lower dental arches based on real patient cases with case complexity and associated information (clinical records, radiographs and photos) reflecting the educational need. - Rehearsal of planned treatments specific to a named patient ahead if the actual procedure being undertaken as part of clinical care.
Immersive Technologies	A wide range of different technologies that give an experience of being immersed in an environment that permits interaction with simulated objects. Of the 3 approaches in this table, this group is at the earliest stages of development, but can be expected to take an increasingly important role over time.		- Motor skill development - Rehearsal of procedural protocols - Clinical rehearsal - Patient or clinical team interactions