spectrum topical antibiotic cover, oral vitamin C at 1 - 2 g/day, topical cycloplegia and topical steroids.

Further reading

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The role of simulation training in ophthalmology

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The application of new learning technologies in medical education has escalated in recent years. Simulation is currently utilised globally for teaching, learning and assessment across all healthcare disciplines. In the past decade, medical schools have increasingly included clinical simulation technology in their programmes.[1] Scalese[1] uses the term 'simulation-enhanced medical education', which describes the role of simulation as enhancement of and supplementary to current curricula, but not replacing real patients. Michael Gordon, as quoted by Scalese, emphasised that clinical simulation for medical education should comprise the following three essential components: (*i*) curricula with clearly identified objectives and educational content; (*ii*) simulation integrated as a required component of the curriculum; and (*iii*) assessment as to whether the students have mastered the content and attained the objectives.

The use of simulation in medical education provides unique opportunities for increasing the quality of the educational experiences of students.[2]

In the Institute of Medicine report, *To Err is Human: Building a Safer Health System,* it is recommended that team training programmes can improve safety, because people make fewer mistakes when they work in teams.[3] Teamwork within a multiprofessional group is an essential complementary aspect of technical skills training to improve quality and patient safety. Simulation-based team training addresses the interrelated conceptual levels of team work, focusing on the learning needs at the level of the individual, the team, the organisation and the healthcare system, and it is advised that it should be incorporated into curriculum development programmes.[4]

Simulation in ophthalmology education and training can be used for the training of undergraduate medical and healthcare students and registrars specialising in ophthalmology, as well as in continuing professional development (CPD).

Simulators

High-fidelity human patient simulators can blink their eyes and have normal and abnormal pupil reactions. However, the specific training for ophthalmology will benefit more by using the simulators listed below. The various simulation modalities available are summarised in Fig. 1.

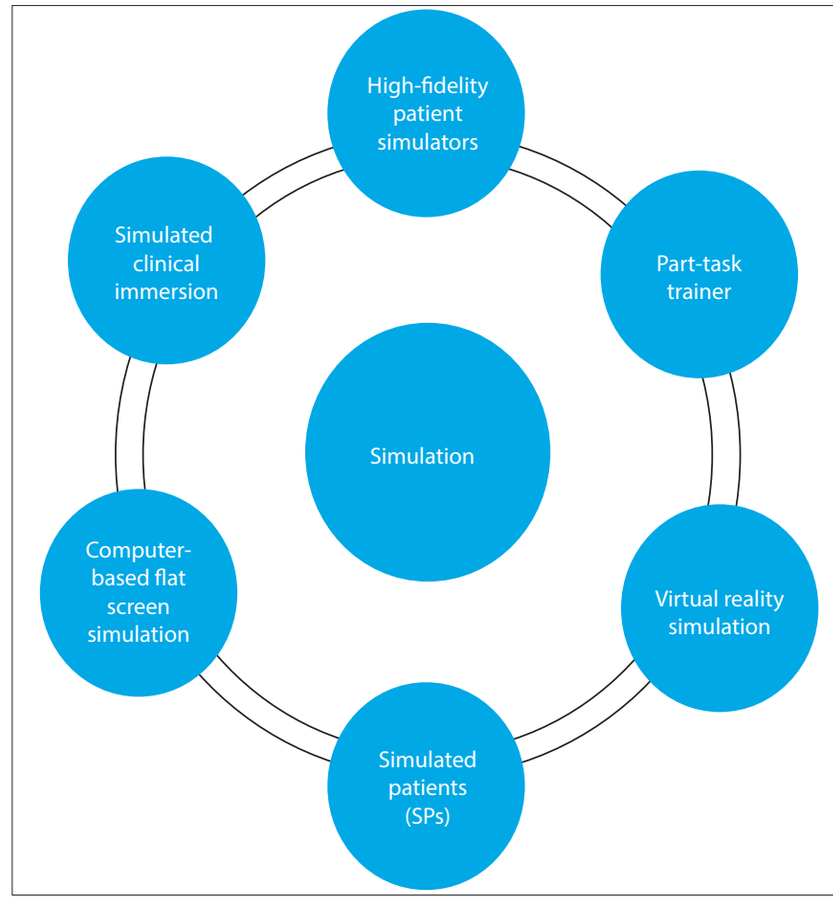

Fig.1. Simulation modalities.

Part-task trainers

The use of a simulator, especially for the training of fundoscopy techniques, is valuable for novices in eye examination. Simulators that are available include a head with eyelids that can be lifted, pupil size that can be adjusted and different slides that can be used to simulate various retinal conditions. These simulators are especially beneficial when students start with fundoscopy training, as it can be quite uncomfortable for real patients to be examined by numerous students. These part-task trainers are also very useful for assessing technique, and examinations are standardised by using slides. Procedural skills simulation can be used to train students to perform certain procedures, such as suturing a cornea or eyelids, using skills trainers or organic animal organs.

Flat screen simulation

Flat screen simulators include examination techniques, e.g. visual acuity tests, colour vision, Amsler grid and tests for astigmatism. Students can learn procedural and surgical techniques using flat screen simulation. It can be successfully employed for e-learning, where training sessions use lecture slides that include audio-video enhancement, which can be applied for content delivery. Clinical reasoning skills can be developed with flat screen simulation. Assessment is possible as long as security measures are built into the assessment opportunities.

Fig. 2. The Eyesi Ophthalmic Surgical Simulator (image courtesy of Eyesi).

Virtual reality

Virtual reality can be used for the training of surgical skills and technical competencies. Simulators include surgical instruments and computer software allowing virtual operations, where students have the opportunity to practise certain aspects of surgical procedures repeatedly until they have mastered the operation or a part thereof. A virtual eye is mounted on a mannequin head and an operating microscope through which virtual images are projected. The computer allows accurate tissue response and provides realistic simulation of procedures, similar to the real procedures. The Eyesi Ophthalmic Surgical Simulator (VRMagic, Mannheim, Germany) is the only widely available model for medical simulation.[5] These simulators are excellent for vitreo-retinal surgery training with the aid of the posterior segment training model, and for cataract surgery, using the anterior segment training model.[6] The system has a touchscreen monitor, so that a supervisor may observe and offer feedback during the procedure. Patient safety and ethical aspects of practising on real patients are thus significantly improved. These simulators can be used for assessment and the computer software gives electronic feedback to the student and supervisor. The Eyesi Ophthalmic Surgical Simulator is shown in Fig. 2.

Virtual reality indirect ophthalmoscopes are available with pre-programmed virtual images of various retinal conditions to train registrars in the technique of indirect ophthalmoscopy, to recognise the pathology and to make retinal sketches.

Standardised patients

Standarised patients can be used to train students in technical and non-technical skills. Technical skills include procedures such as fundoscopy, visual acuity and other diagnostic procedures. Training in non-technical skills is important, but can pose challenges to educators. The CanMEDS Framework, designed by Frank and Danoff,[7] makes provision for the following seven roles of healthcare workers: (*i*) medical expert; (*ii*) communicator; (*iii*) collaborator; (*iv*) manager; (*v*) health advocate; (*vi*) scholar; and (*vii*) professional.[7]

Standardised patients are actors or collaborators who can be trained to play the role of a patient, family member or colleague. Certain skills and abilities, such as breaking bad news, professionalism, team work, health promotion and communication skills with patients, colleagues or other healthcare professionals, can be trained and assessed by making use of standardised patients. From another perspective, standardised patients can be trained to assess the professionalism and communication skills using a checklist provided by the educator.

Simulation in clinical immersion

Simulation of the environment plays an important role in the fidelity of a simulation. Therefore, simulation in clinical immersion recreates the actual environment. The recreation of a clinic or an operating theatre enhances the reality of the simulation, which can furthermore be performed in an authentic clinical environment. Vision simulators (made from spectacles or safety goggles), simulating conditions such as cataract, glaucoma, macular degeneration, etc., can be used to immerse healthcare students into the experiences of visually impaired patients, by asking the students to perform everyday tasks like making tea or a sandwich.

Discussion

The use of simulation as a required component of a curriculum improves clinical skills and competence and patient safety, and helps students practise in a safe, non-

threatening environment to improve their skills and competence, resulting in shorter surgery times and fewer complications. However, non-technical skills will also be enhanced with simulation, because with debriefing activities educators can help students understand what happened during a specific scenario. This will result in changing students' behaviour and explore personal and professional values in the context of their professional role.[8]

Ophthalmology training will benefit from simulation-enhanced education and training at both undergraduate and postgraduate level. Simulation creates opportunities for team training and reproducible, standardised, objective settings for formative as well as summative assessment. Simulation-based medical education provides opportunities for best practices in terms of care and training, error management and patient safety.[9]

Conclusion

Simulation offers a safe environment where students are allowed to repeatedly practise a range of clinical skills without putting patients at risk. Comprehensive simulation environments allow a move away from isolated tasks to more complex clinical situations, recreating many of the challenges of real life.

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