Applying Educational Theory into Fibreoptic Intubation Training

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Patient safety in airway management is of paramount importance. Fibreoptic intubation (FOI) is a key skill in airway management. The 4th National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society (NAP4) identified many cases where fibreoptic intubation was indicated but not performed resulting in harm to this group of patients.[1] The most likely cause is under confidence with anaesthetists avoiding the technique and choosing an alternative higher risk strategy. A structured training programme is likely to provide increased opportunity to learn and maintain the skill as well as inspire confidence in the technique. This article looks at educational theories that underpin FOI as a procedure and how anaesthetists can optimise learning through modern teaching methods.

Is the 'see one, do one and teach one' approach still suitable?

Technical skills in anaesthetics have classically been taught using the apprenticeship model of 'learning by doing' also known as the 'see one, do one and teach one' approach.[2] This model is based on the perception that experience facilitates learning whilst promoting trainee autonomy and education. This model has many flaws, including learning in unsafe environments, an impact on patient safety and lack of evaluative tests to ensure competence.[2] The ethics of 'practicing' on a patient is well documented and requires at the very least, patient consent.[3] In addition, fibreoptic intubation is a complex skill and should be taught using step by step approach. Table 1 outlines the problems associated with the 'see one, do one and teach one' approach.

Table 1: Problems associated with a traditional method of 'see one, do one and teach one' approach

Problems with the 'learning by doing' model
1. High risk and stressful environment - not favourable for learning
2. Does not allow repeated practice
3. Lack of rigorous evaluation, feedback and change of behaviour
4. Impact on patient safety
5. Not suitable for a complex procedural skill
6. Lack of training in human factors

Application of instructional design theory teaching FOI

Traditional methods of teaching and learning the technique of FOI can be modernised to ensure that learning is constructive and takes place in a safe environment with no risk to patient safety. It is a complex procedural skill, hence a step by step approach should be used. At a given stage, four to five steps can be taught and at a subsequent stage more steps can be added.

One educational model that lends itself well to the teaching of FOI is instructional design theory. It is defined as 'the practice of instructional experiences which make the acquisition of knowledge and skills more efficient, effective, and appealing.'[4] We have used a modified ADDIE (analysis, design, development, implementation, evaluation) process to build this model which allows participants to gain the knowledge and skills to perform an FOI competently.

As with any procedural skill, gaining competency and becoming an expert are two separate elements. At the first instance we are aiming to achieve competency in FOI. Once the competency is achieved a deliberate practice, regular evaluation, feedback, modification of behaviour based on feedback and further practice will lead to expertise.[5]

The FOI learning cycle (Fig. 1) is based on the 5Es concept (engage, explore, explain, extend and evaluate).

Phase 1 (Analysis): The tutorial is the first phase of the learning cycle of FOI and includes case-based learning. This is an engagement stage where the student's interest is captured, and the topic established. This enables the student to analyse existing knowledge and to understand why he/she needs to learn the skill. The applied clinical science and clinical application of the procedural skill is discussed at this stage.

Phase 2 (Design): This phase allows the student to experience FOI using multiple anatomical and non-anatomical simulation models, including use of a virtual bronchoscope trainer, dexter endoscopy trainer and the Oxford fibreoptic teaching box. At this stage the student has an opportunity to design his own learning to become proficient in the technical elements of handling the fibreoptic scope. The student gains the psychomotor skills and manual dexterity required for handling the fibreoptic scope. The teacher will use a checklist scoring system to evaluate various steps involved at this phase. The feedback and reflection enable the student to improve further. Following satisfactory evaluation of these initial steps, under close supervision, the student moves on to practice endoscopy on various virtual clinical scenarios of increasing complexity. At the end of this phase, the student understands the common technical problems encountered in various clinical situations. Some of the decision-making skills are also incorporated at this stage. A virtual scenario of significant airway obstruction at glottic or subglottic level will teach the student not to proceed with endoscopy but to choose an option of surgical airway as the primary option. Following the satisfactory completion of phase 2, the student moves on to phase 3.

Phase 3 (Development): The third phase helps to develop practical skill by performing flexible naso-endoscopies under close supervision on awake patients in ENT clinics. This helps promote confidence and acquire the fine motor skills needed to perform AFOI. It also allows common questions to be answered helping refine the student's understanding. Satisfactory completion of the first three phases of learning prepares the student for safe practice in the operating theatre environment and ensures patient safety.

Phase 4 (Implementation): At this stage the student has the opportunity to implement the knowledge and skills of FOI in a more familiar environment. The skills acquired in phase 3, are now consolidated in an operating theatre environment, where under direct supervision the student can undertake FOI in both anaesthetised and awake patients.

Phase 5 (Evaluation). At this stage the student has gained sufficient competency and is ready to undertake the procedure unsupervised. The student has the opportunity to self-evaluate the competency of FOI, particularly when faced with a complex difficult airway. From this stage onwards, regular practice is essential to avoid skill deterioration. The student now undertakes the additional role as teacher. Once he/she reaches the stage of a competent teacher the learning cycle is complete. However, to gain expertise in FOI, deliberate practice, evaluation, modification of behaviour and further practice is essential.

During all phases of the cycle the student is expected to reflect and refine their understanding in knowledge, skills and behaviour. This cycle is based on Kolb's experiential learning model (ELM) where concrete experience and observation and reflection of that experience are the foundations to learning.

It is important to highlight that learners learn at varied rates. FOI in an awake patient is a procedure of varying complexity (depending on the pathology of the patient) and competence cannot be gained by performing an 'x' number of AFOIs. Instead we use a mastery learning approach where we expect students to master each phase before moving on to the next and competence is not based on time or number of procedures done. Mastery learning is extremely successful when implemented in this way.[6] This ensures competence and more importantly confidence when the student performs FOI unsupervised in the operating theatre.

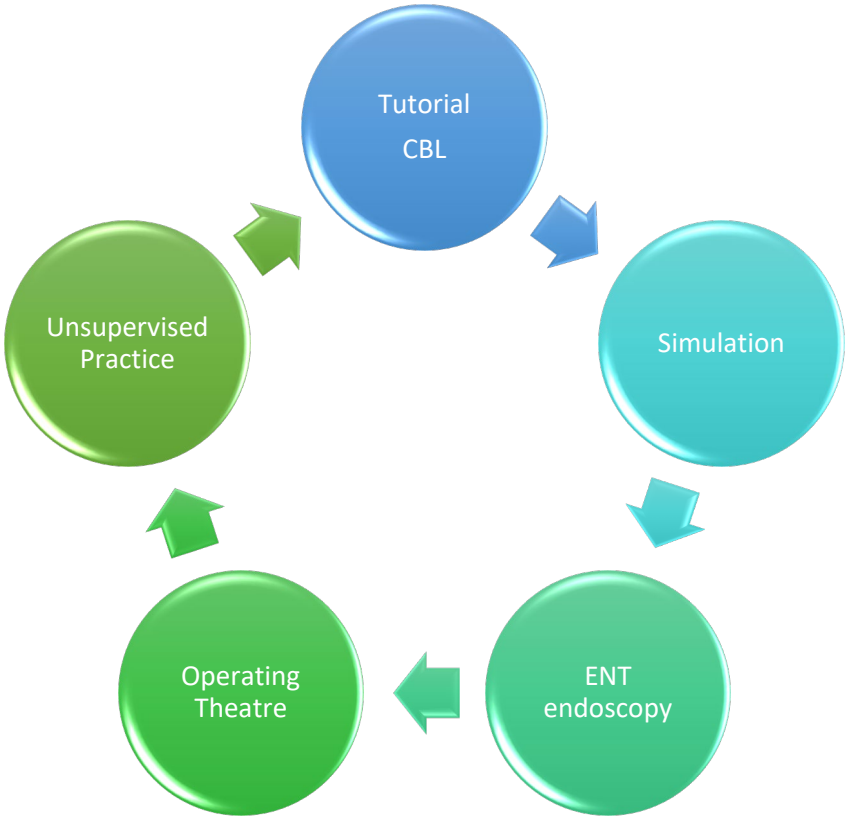

Figure 1: The educational cycle of learning AFOI

FOI in an awake patient is a complex procedural skill that requires knowledge, skill and attitude to a high standard. Traditional methods of learning cannot give students the tools they require to safely practice this skill. The educational cycle of learning involving five discrete phases ensure students gain confidence and competence in a safe environment.

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