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TEACHING & LEARNING SURGICAL SKILLS IN THE OPERATING ROOM

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BACKGROUND

Learning and acquiring surgical skills are of paramount importance to surgical competence in surgical disciplines. Currently, there is much interest to study and refine the teaching and learning of surgical skills informed by theory and empirical evidence.

One popular theory of skills acquisition is the *cognitive apprenticeship model* of cognitive motor learning. This model of skills acquisition is derived from the *traditional apprenticeship model*. In the traditional model, the majority of cognitive motor learning for surgical skills are initiated and practiced within the operating room (OR), whereby the 'master' (attending surgeon) performed a psycho-motor skill which is first observed by the 'apprentice' (resident). The latter then goes on to attempt the skill under the guidance and help from the master. As the apprentice gradually acquires skills and knowledge necessary to deal with increasingly complex and diverse tasks, the dependency on the master decreases. While this traditional model is applicable if the process of carrying out a task or skill to be learned is easily observable, it is inadequate for learning surgical skills that has many 'non-observable' aspects. In applying the cognitive apprenticeship model (CAM) to teaching and learning of surgical skills, it is recognized that while technical skills might be observable, it is the thinking and reasoning that must be emphasized, and are integral to the skills. The CAM model also adopts the premise that learning and instruction are influenced by social processes that incorporate active participation within organized environments and activities (i.e. 'situated learning' within 'community of practice'). These are important principles that are very applicable to surgical learning.

The CAM has six components: modeling, coaching, scaffolding, articulating, reflection and exploring.

Component	Features
Modelling	Expert (teacher) performs skill, learner observe & build conceptual model of the processes required to accomplish it
Coaching	Teacher observes learner performing the skill; offers hints, feedback, reminders, & further modelling
Scaffolding	Teacher supports learning according to skill level; organizes activities to assist learner to progress to next level. Support gradually removed (fading) until learner is able to accomplish task alone.
Articulation	Learners articulate their knowledge by: reasoning, problem-solving, questioning; explaining what they are doing & why they do it that way. Teacher assists in process
Reflection	Learner critique their own performance & problem-solving processes; compare with those of expert, or another learner
Exploration	Learner develops a mode of problem solving on their own – adapt to new problems

Table 1. Components & features of the Cognitive Apprenticeship Model (CAM) that are used to support & organize learning activity

PURPOSE

The aims of this study are: (1) to evaluate the extent to which the teaching and learning of surgical skills in the Singhealth Otolaryngology residency are aligned to this model, and (2) to explore areas for improvement.

METHODS

Subjects & Context

Eight Senior Residents from the SingHealth Otolaryngology residency were recruited from Changi General Hospital for this study over three 6-month periods. They were observed for the entire duration of various routine surgeries that they performed as the first surgeon under direct supervision with different faculty. The faculty and residents were blinded to the study.

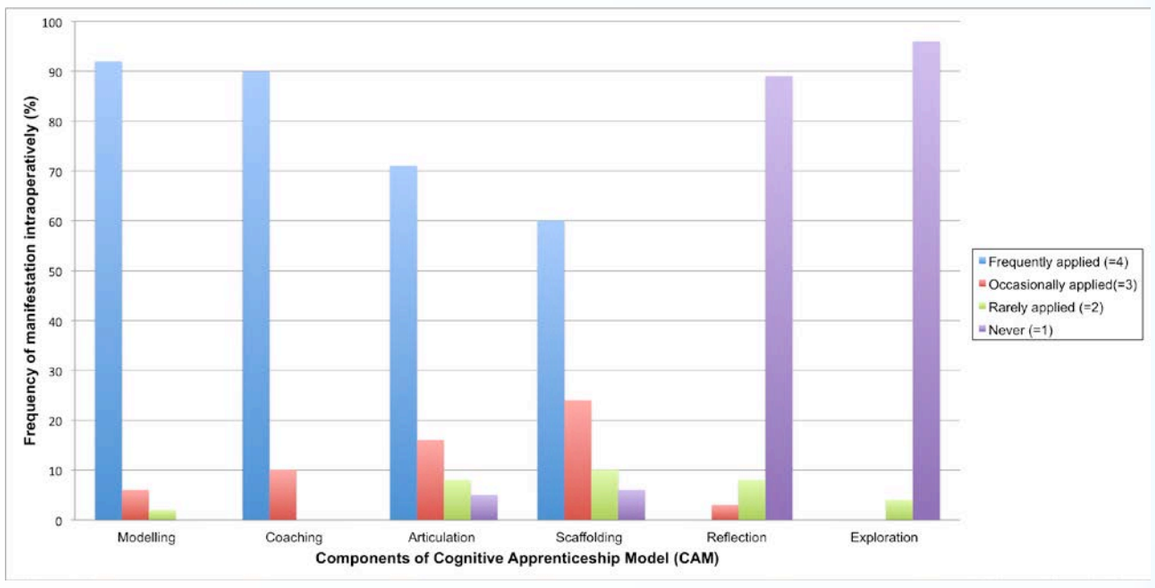
Residents (n = 8)	Senior residents (R3 – R4)
Types of Surgeries	1. Endoscopic sinus surgery 2. Hemithyroidectomy 3. Myringoplasty (open) 4. Cortical mastoidectomy
Total number of surgeries (n = 15)	1. Faculty & residents blinded 2. Observed during surgery 3. Teachable moments noted 4. Components of CAM recorded & scored

Scoring & evaluation

The interactions between the mentor and residents were noted and recorded by the same independent observer – the extent to which each of the six components of the cognitive apprenticeship model was manifested was scored on a 4-point scale: 4 = frequently applied / 3 = occasionally applied / 2 = rarely applied / 1 = never. The scores are then expressed as a percentage of all the teaching moments.

RESULTS

The most commonly manifested component of the cognitive apprenticeship model in this study was: ''modeling'. This was followed by 'coaching' and 'articulation'. 'Scaffolding' was less common, while 'reflection' and 'exploration' were rarely manifested.



DISCUSSION

It appears that the teaching and learning of surgical skills in the OR are somewhat aligned with the CAM. However, the emphasis is more on the technical ('How') aspects of the skills and less on the 'cognitive' ('Why', 'When', 'What') aspects, as illustrated by the frequency of manifestation of the components. While it is possible that some components might be manifested outside the observed period, the value might be diminished as the immediacy, situated-ness and contextual elements might be lost.

These findings might have far-reaching consequences as the residents' learning might be suboptimal, and they might not be able to internalize and transfer the skills acquired if no scaffolding, reflection or exploration are applied or facilitated (adequately) during their learning.

Limitations

1. Small number of study subjects and faculties from Otolaryngology Residency. This is inherent to the nature of the Otolaryngology Program that has an intrinsically small number. Continued study and extension to other residency programs and/or other institutions will be vey useful and insightful
2. Different types of surgeries surveyed. The chances of more guidance being offered with increased complexities of surgery may affect the results. However, given the routine nature of the surgeries as well as the similar seniority of the residents within the group, the impact of this factor is limited.

CONCLUSION

Teaching and learning of surgical skills in Otolaryngology residency proceeded largely according to the CAM of cognitive motor skills learning. However, the processes are focused mainly on the technical aspects, and less on the reasoning and internalizing aspects. Further and more in-depth studies should be conducted to elucidate these processes in other institutions and programs. Appropriate strategies (e.g. instructional design, faculty and residents development, institutional policies) could be formulated accordingly to enhance surgical teaching and learning in the OR.

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