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Opinion

A Short History of Cataract Surgical Training

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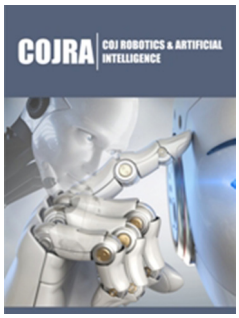

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Abstract

Machine Learning techniques are powerful in many different domains. For application in sensitive areas where humans are involved, the requirements regarding model understanding are strict. Currently, methods are developed that help understanding and allow drawing conclusions from the observations. Decision plots and counterfactual explanations give information about the model output, the impact of single features can be estimated. This is already a beneficial first step towards model transparency. However, there are no methods yet that use this gained knowledge as a feedback to update the model accordingly in a straight-forward manner.

Keywords: Deep learning; Bias; Fairness; Explainable AI

Introduction

Evaluation of surgical skills in a standardised fashion has always been difficult. Cataract surgery is a type of microsurgery with a learning curve for every novice surgeon [1]. Traditionally this learning curve had to be overcome through a mentor based on-patient teaching system in which a trainee surgeon was introduced to the technique by initially observing and then sequentially taking over steps of the procedure from its mentor until independence is reached. Successful efforts to standardise skills have been made using the "Objective Structured Assessment of Cataract Surgical Skill" tool [2] and also Video based scoring systems [3] have been evaluated. Although they prove reliably, they are not consistently used due to the large amount of time required to carry them out. It was not until the recent years where a reinforcement of patient rights placed surgical practice into a legal dimension. This paradigm shift created pressure to adapt surgical training as it was now necessary to justify surgical procedures and complications. This led to the development of dry labs, which is a form of training on plastic model eyes, and wet labs for which often porcine eyes were used. This form of training offered a safe hands-on experience to learn mainly the procedural aspects of the surgery and therefore managed to flatten initial spikes in complication rates on the cataract surgery learning curve. However, as there are many differences to human eyes, this sort of lab training did not allow to truly master the surgery [4]. After the advent of computers in the 1990, a concept which was already common for aircraft pilot training entered the realm of surgery: Simulation training. This technological progress allowed for a virtual simulation of the surgery providing the user a safe and realistic replica.

This technological advance has been demonstrated to lower complication rates and therefore increases patient safety. According to date from the Royal College of Ophthalmologist, simulator training led to a 38% reduction in the first- and second-year surgeon's posterior capsule rupture rate [5]. Simulator training has become widely accepted as a tool for training to reduce complication rates and stress level of the trainee and the whole team [6]. It has found entrance in teaching curricula and access to a simulator is possible for most large institutions in the western world. However, the technology has not replaced on-patient training and no fusion between virtual and real-life training has been achieved

so far. This is about to change in the near future with the recent advancement of immersive technology and artificial intelligence. Artificial intelligence has already found entrance in ophthalmology and is used for analysis of retinal images and visual fields. The main novelty with those innovations is to bring simulation and training inside the operation theatre rather than keeping it separate from it. Immersive technologies such as virtual reality googles already allow augmentation of reality not only for gaming, but also for applications in training in various contexts from anatomy teaching to business applications.

References

1. Spiteri A, Aggarwal R, Kersey T, Benjamin L, Darzi A, et al. (2010) Phacoemulsification skills training and assessment. Br J Ophthalmol 94(5): 536-541.
2. Golnik KC, Beaver H, Gauba V, Lee AG, Mayorga E, et al. (2011) Cataract surgical skill assessment. Ophthalmology 118(2): 427.e1- 427.e5,
3. Saleh GM, Gauba V, Mitra A, Litwin AS, Chung AKK, et al. (2007) Objective structured assessment of cataract surgical skill. Arch Ophthalmol 125(3): 363-366.
4. Taylor JB, Binenbaum G, Tapino P, Volpe NJ (2007) Microsurgical lab testing is a reliable method for assessing ophthalmology residents surgical skills. Br J Ophthalmol 91(12): 1691-1694.
5. Jacobsen MF, Konge L, Bach-Holm D, La Cour M, Holm L, (2019) Correlation of virtual reality performance with real-life cataract surgery performance. J Cataract Refract Surg 45(9): 1246-1251.
6. Ferris JD, Donachie PH, Johnston RL, Barnes B, Olaitan M (2020) Royal college of ophthalmologists' national ophthalmology database study of cataract surgery: report 6. the impact of eyesi virtual reality training on complications rates of cataract surgery performed by first and second year trainees. Br J Ophthalmol 104(3): 324-329.