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Original Article

Preoperative Airway Management Checklist: The Transfer of Knowledge Into Clinical Practice by Video-based Feedback

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ABSTRACT

Objective: A preoperative checklists guide was issued in 2008 by the American Society of Anesthesiologists (ASA) to improve patient safety. We aimed to determine the applicability and effectiveness of video-based feedback for the transfer of knowledge into clinical practice by using this guide.

Methods: Ten anesthesia residents were divided into two groups according to their seniority, under two years and over two years. Once the preparation, anesthesia induction and airway management steps were completed, video-based feedback was given according to the ASA checklist. The knowledge level and skills of the residents were evaluated. Two months after the video-based feedback, all steps were repeated in another patient. The results were compared with a checklist score. Each guideline item was analyzed.

Results: The ages of participants varied between 27–34 years (28.9±2.28 years), five were female, and five were male. Results of the pre and post video-based feedback evaluations of the residents were statistically similar in the senior and junior groups. The post-feedback achievement score in both groups was significantly higher than the pre-feedback achievement score ($p<0.05$).

Conclusion: It has been shown that the ASA Checklist Procedure before airway management during general anesthesia induction can be successfully put into clinical practice with video-based feedback. We concluded that patient safety could be increased by the integration of this method into the routine anesthesia resident training program.

INTRODUCTION

Undesirable but preventable events frequently occur in the operating rooms in health services.[1] Patients requiring airway management have a possible risk of developing hypoxia, cardiovascular collapse and other complications.[2] In patients with hypoxia, organ dysfunction may lead to the development of severe brain damage and sometimes even death of the patient. Airway management problems include inadequate equipment availability, inadequate planning and insufficient personnel training and experience.[3] Many clinicians recommend more adoption and the use of checklists and standardized practices to reduce such complications.[4] In a clinically challenging and stressful environment, in the case of standardized equipment and patient preparation, awareness increases and it becomes more easier to focus on patient care. Supporting the checklists put into clinical use before the procedures to be performed with the training may be useful for reducing the possible complications. Different training methods can be used to make the checklists understandable and quickly applicable, one of which is the feedback practices. Feedback can be verbal, written, or video-based. Video-based feedback is the method by which the performance of a task is recorded. Video-based feedback provides objective evidence of a person's performance because it provides accurate and real-time data[5] and also helps participants to demonstrate their actual performance. Video-assisted

feedback reduces anxiety and improves team collaboration.[6]

Video-assisted feedback is widely used by educators in various fields of medicine, as well as for educational purposes in many fields. In recent studies, it has been shown that it is possible to gain technical skills in practice with video feedback, such as cardiopulmonary resuscitation or surgical procedures.[7,8]

Inadequate control of the anesthesia machine and other anesthesia equipment is a common cause of the possibility of anesthesia errors and associated complications.[9] Therefore, many approaches have been developed for the control before anesthesia applications, and it is aimed to increase patient safety by creating checklists. The American Society of Anesthesiologists (ASA) issued a pre-anesthetic checkout procedure in 2008 as a guide.[10] However, there are difficulties in increasing the availability of guidelines in clinical settings. In this prospective study, our hypothesis is that after the application of video-based feedback, the resident success rate and the availability of the guideline in clinical settings can be increased.

MATERIALS AND METHODS

Following the Ethics Committee approval (KUGOKAEK 2018/111) and informed consent of the participants, this prospective controlled study was performed in the operating rooms of the Anesthesiology and Reanimation Clinic of our hospital between February and May 2018. Ten residents having a work experience of 23 to 46 months in Anesthesiology and Reanimation Clinic were included in this study. The exclusion criteria included refusal to participate in this study, refusal of video recording, awareness and daily use of the ASA Checkout list. At the beginning of this study, the participants were asked to perform the controls related to the anesthesia machine and other equipment before general anesthesia induction without any information about the ASA checklist. The participants were recorded with a video camera while they completed the pre-anesthetic assessment. After the participants reported that they had completed the self-check, the applications were evaluated according to the ASA checklist (Table 1). Their performance was scored as 1-unsuccessful, 2-insufficient and 3-successful for each item in the manual. All anesthesia induction and preparation steps were evaluated and recorded by the same two observers (Fig. 1). Afterwards, the participants were informed by the 15-item ASA checklist. All items were checked daily, while 2, 4, 7, 11, 12, 13, 14 and 15th items were checked before each use. After informing about the checklist, we shared the video recording with the participant and discussed according to the manual. The first stage of this study was completed by applying this method to all physicians. After the feedback was given, the record was deleted immediately. Two months after the completion of the first stage, the same participants were asked to apply the checklist before another general anesthesia induction. In the meantime, all the stages were recorded again. After the participant was ready, the second video recording was also evaluated according to the checklist and scored as 1-unsuccessful, 2-inadequate and 3-successful.

Table 1. The list of items to be completed daily

Item to be completed	
Item #1:	Verify Auxiliary Oxygen Cylinder and Self-inflating Manual Ventilation Device are Available & Functioning
Item #2:	Verify patient suction is adequate to clear the airway
Item #3:	Turn on anesthesia delivery system and confirm that ac power is available.
Item #4:	Verify availability of required monitors, including alarms.
Item #5:	Verify that pressure is adequate on the spare oxygen cylinder mounted on the anesthesia machine
Item #6:	Verify that the piped gas pressures are ≥ _50 psig
Item #7:	Verify that vaporizers are adequately filled and, if applicable, that the filler ports are tightly closed.
Item #8:	Verify that there are no leaks in the gas supply lines between the flowmeters and the common gas outlet
Item #9:	Test scavenging system function.
Item #10:	Calibrate, or verify calibration of, the oxygen monitor and check the low oxygen alarm.
Item #11:	Verify carbon dioxide absorbent is not exhausted
Item #12:	Breathing system pressure and leak testing.
Item #13:	Verify that gas flows properly through the breathing circuit during both inspiration and exhalation.
Item #14:	Document completion of checkout procedures.
Item #15:	Confirm ventilator settings and evaluate readiness to deliver anesthesia care (ANESTHESIA TIME OUT)

Statistical Analysis

The statistical analysis was performed using IBM SPSS Statistics 24. Independent Samples T-test was used for binary comparison of seniority groups. Paired Samples T-test was used to analyze the test results before and after video feedback. A chi-Square test was used to analyze discrete variables. The results were evaluated at a 95% confidence interval and $p<0.05$ at significance level. This study was conducted with 10 patients in the 95% confidence interval, and the effect size was determined as 1.64 with a power of 93%.

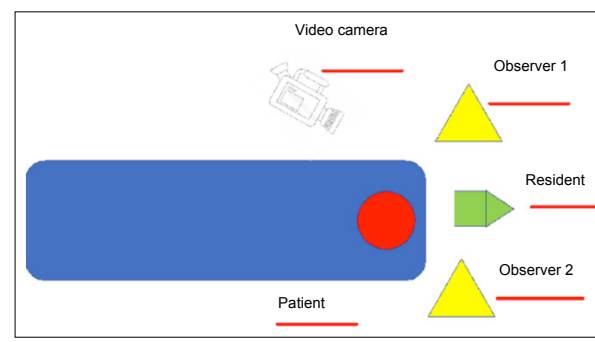

Figure 1. Layout of the facilities used for data capture in this study.

Table 2. Demographics and mean scores of participants

	Work experience ≤27 months (n=5)	Work experience ≥28 months (n=5)	p
Gender			
Female	3	2	1.00*
Male	2	3	
Age (years)	27.8±0.84	30.0±2.83	0.160**
Mean score before video based feedback	1.61±0.15	01.64±0.19	0.834**
Mean score after video based feedback	2.24±0.29	2.35±0.30	0.549**

*Chi-square test: values are given as frequency (percentage).
**Independent samples t-test: values are given as mean±standard deviation.

Table 3. Mean success scores before and after video based feedback

	Before video based feedback (n=10)	After video based feedback (n=10)	p
Success Score	1.62±0.16	2.29±0.29	<0.0001*a

aPaired samples t-test: values are given as mean±standard deviation.
*P<0.05: Significant difference between groups.

RESULTS

The study included five female and five male participants aged 27–34 years (mean 28.9±2.28 years). None of the participants were excluded from this study. Twenty scores were analyzed. There was no statistically significant difference between the seniority of the participants. There was no statistically significant difference between the two groups concerning their ages. The participants were evaluated in two different groups. The seniority groups were found to be statistically similar for the success scores before and after video feedback (Table 2).

The success scores of the participants after the video feedback were significantly higher than the scores of the pre-video feedback (p<0.05, Table 3). The highest achievement score was observed in Item # 2 and Item # 8, while the lowest success score was observed in Item # 10 and Item # 13 (Fig. 2).

Figure 2. The success rate following the training based on video feedback.

DISCUSSION

In this prospective randomized controlled trial, we evaluated the use of ASA Recommendations for Pre-Anesthesia Checkout Procedures and the effectiveness of video feedback on learning and practicing. The measured success rates of the participants were significantly increased after video feedback.

Checklists allow to establish many standard approaches before implementation and to implement these approaches in an order.[11] In a review,[12] effective feedback is reported to be a two-way process. In order for the success to be achieved, the person who is receiving it must also be in a learning environment that will reflect his/her actions. In this study, we have created a learning environment with face to face verbal feedback, and we have enabled the permanent changes to be realized with an environment where they share their ideas, contribute and discuss. We paid attention to ensure that the feedback was directive and specific. The scores were compared before and after video-based feedback. After video-supported training, it was found that there was a significant difference in the application of the checklist and it was applied more successfully. Previous research has shown that quantitative improvement has not been achieved using video-based feedback.[13] In this study, we kept our study group homogenous and included only a group of residents, which resulted in a higher success rate. In this way, we put forward both quantitative and qualitative improvement.

Al-Jundi et al.[14] showed that the use of video feedback contributed positively to the development of surgical hand skills. Abbott et al.[15] revealed that personalized video feedback improved laparoscopic surgical skills more than repeated task practice. In another study, it was concluded that e-feedback is as effective as video-based feedback.[16] However, the unique feature in our study was that we also evaluated the usability of the guide information in the clinical setting. This was the main aim of re-measuring the scores two months after the first evaluation, and the success rate increased significantly.

In the study, it has been shown that some of the substances in the checklist have more success, especially in items 2 and 8. The parameters related to the suctioning and leaks in the gas supply lines were among the parameters that received the highest success score. On the other hand, the subjects they were most resilient in assisting their learning period and daily practice, including the calibration of oxygen monitor and verification of the gas flows properly through the breathing circuit. Our findings revealed that training and awareness should be provided for the residents to learn the anesthesia machine check out properly. We evaluated their performance two months later. However, by evaluating the annual performances of the participants, it was concluded that this information should be gained in the long term.

Anesthesia induction is a complex procedure, open to the complications and can be even chaotic. Optimal preparation is important since unexpected airway management, anaphylactic drug reactions, or respiratory system complications such as laryngospasm or bronchospasm may develop. With video feedback, it is possible to improve patient care and to integrate it into the clinical setting.[17]

Limitations

This study has several limitations. Firstly, we did not include a control group that did not receive video-based feedback in this study. A group that did not take video feedback could have had additional evidence to support the improvement of results. The small sample size was another limitation of this study. The observers were not blind during this study. The blinded nature of the rating system was not available. The feedback from faculty members, who had no knowledge of the participants, could provide a more objective evaluation of the results. A longer assessment interval could be provided.

CONCLUSION

As a result of our study, video-feedback supported training increased the success rate of using "ASA Recommendations for Pre-Anesthesia Checkout Procedures". We concluded that video feedback could be incorporated into formal anesthesia curricula for the improvement in clinical knowledge.

Ethics Committee Approval

Approved by the local ethics committee (KUGOKAEK 2018/111).

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: T.Ş., AM.Y., A.S., K.T.S.; Design: T.Ş., AM.Y., A.S., K.T.S.; Supervision: T.Ş., AM.Y., A.S., K.T.S.; Materials: T.Ş., AM.Y., A.S., K.T.S.; Data: T.Ş., AM.Y., A.S., K.T.S.; Analysis: A.S.; Literature search: T.Ş.; Writing: T.Ş.; Critical revision: K.T.S.

Conflict of Interest

None declared.

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Ameliyat Öncesi Hava Yolu Yönetimi Kontrol Listesi: Video Bazlı Geribildirim İle Bilginin Klinik Pratiğe Kazandırılması

Amaç: 2008 yılında Amerikan Anestezistler Biriliği (ASA) tarafından hasta güvenliğini artırmak amacıyla bir ameliyat öncesi kontrol listesi kılavuzu yayımlandı. Çalımamızda bu kılavuzu kullanarak bilginin klinik pratiğe aktarılması için, eğitim sürecinde kullanılan video bazlı geri bildiriminin etkinliğini ve uygulanabilirliğini belirlemeyi amaçladık.

Gereç ve Yöntem: On anestezi asistanı, kıdemlerine göre iki yıl altı ve iki yıl üstü olmak üzere iki gruba ayrıldı. Hazırlık, anestezi indüksiyonu ve hava yolu yönetimi tamamlandığında, ASA kontrol listesine göre video bazlı geri bildirim verildi. Asistanların bilgi ve beceri düzeyleri değerlendirildi. Video bazlı geri bildirimden iki ay sonra bir başka hastada tüm basamaklar tekrar edildi. Sonuçlar kontrol listesi skoru ile karşılaştırıldı, her bir kılavuz maddesi analiz edildi.

Bulgular: Katılımcıların yaşları 27–34 aralığında (28.9±2.28 yaş) beşi kadın beşi erkekti. Kıdemli ve kıdemsiz asistanların video bazlı geri bildirim öncesi ve sonrası değerlendirme sonuçları benzerdi. Her iki grupta da geribildirim sonrası başarı puanı, geribildirim öncesi başarı puanından anlamlı derecede yüksekti ($p<0.05$).

Sonuç: Genel anestezi indüksiyonu sırasında, hava yolu yönetimi öncesindeki ASA kontrol listesi prosedürünün video aracılı geri bildirim ile klinik pratiğe başarıyla kazandırılabileceği gösterildi. Bu metodun rutin anestezi asistan eğitim programına katılmasıyla hasta güvenliğinin artırılabilceği sonucuna varıldı.

Anahtar Sözcükler: Anestezi; eğitim; geri bildirim; kontrol listesi.