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Use of the American Academy of Ophthalmology Surgical Checklist and Implant Timeouts: An Online Survey of Connecticut Ophthalmologists

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Abstract

Objective: To characterize operating room practices among ophthalmologists in Connecticut pertaining to the use of the AAO surgical checklist and implant timeouts.

Methods: Ophthalmologists in Connecticut were emailed an anonymous web-based 15-question survey to inquire about their practice settings, knowledge of the AAO checklist, surgical errors, use of surgical checklists and implant timeouts, as well as perceptions about barriers to the use of surgical checklists.

Results: Of the 232 ophthalmologists contacted, 88 responded of which 16 were disqualified, leaving 72 surveys for analysis. The majority of the respondents belonged to private practice (85%) and had been practicing ophthalmology for >20 years (61%). More than 83% were unaware of the AAO sponsored ophthalmic surgical checklist. Approximately a third (36%) reported never using any surgical checklist and only 68% regularly used an implant timeout. At least 25% had one incident of a wrong implant/device or retained surgical item during their careers. Use of checklist was correlated with responder's belief that using a checklist would enhance patient safety (p=0.001) as well as with use of checklists during residency (p=0.02). There was no correlation between use of checklist and adverse events (p=0.26).

Conclusion: Despite proven utility of surgical checklists and implant timeouts in other surgical specialties, their use remains limited among ophthalmologists. Further research establishing effectiveness of surgical checklists and implant timeouts, as well as emphasis on their use during residency training, is needed to encourage wider acceptance among ophthalmologists.

Keywords: Surgical checklist; Implant timeout; Surgical errors; Patient safety

Introduction

Surgery has become an important component of healthcare, but along with recognition of its ability to enhance public health is growing attention to its potential for substantial harm if practiced unsafely. In light of this, the World Health Organization (WHO) established the Safe Surgery Saves Lives initiative in 2007 as the second of their Global Patient Safety Challenge topics. This initiative promulgated routine use of a surgical checklist to ensure systematic adherence to steps designed to promote safe surgical practice [1]. The Safe Surgery Saves Lives initiative led to an oft-cited 8-city prospective trial of a 19-item checklist, which showed reductions in complications and deaths after intervention [2] – a result that has since been reproduced by studies in other countries and practice settings [3].

The idea that surgical error rates can be improved by actionable changes to a system that facilitates errors is of particular relevance to the field of ophthalmology. First, ophthalmology accounts for a significant proportion of surgical volume. Cataract surgery alone is the most commonly performed surgical procedure in the United States Medicare population, and is projected to increase in the future [4]. Second, there is ample evidence of surgical errors in ophthalmology, referred to by the literature variously as "surgical confusions", "never events", and "sentinel events" [5-7].

The Veterans Health Administration (VHA) found that from 2001-2006, ophthalmology was responsible for the highest rate of operative adverse events amongst all surgical specialties in their centers [8]. While incorrect implantation of intraocular lenses (IOL) accounts for the majority of these errors, incorrect operations, incorrect eye blocks, incorrect eye on which the operation is performed, and retained surgical items are all reported surgical errors in ophthalmology [5-8]. Most authors concur that a substantial number of these errors- up to 85% in one case series [5] - are preventable, given an appropriate system-wide intervention.

In 2012, the Center for Medicare and Medical Services (CMS) mandated that all ambulatory surgical centers adopt a surgical checklist in practice. In response, the American Academy of Ophthalmology (AAO) and the Ophthalmic Mutual Insurance Company (OMIC) created a task force that designed a sample ophthalmic-specific surgical checklist modeled on the WHO checklist. The checklist is divided into tasks to be performed prior to anesthesia, prior to incision (in common practice, the "surgical timeout"), and prior to leaving the OR. It includes items standard to all surgeries, such as patient consent, verification of patient identity, surgical site marking, correct instrument count and so forth, as well as items that accommodate a wide range of ophthalmic procedures, such as oral confirmation of dyes, gases, and implants by both surgeon and nurse during a surgical time out before incision [9]. (For complete details, please see attached AAO checklist in Appendix A.) The task force emphasizes that this checklist is a template that ought to be personalized to the particular practice in which it is ultimately employed.

To date, we have found no published data on the rate of adoption of this AAO checklist or the effects of its use on the rate of adverse surgical events in ophthalmology. While evidence for the utility of checklists in surgery at large appears to be robust, evidence for its applicability in ophthalmology- and by extension, its strengths, weaknesses, and areas for improvement-is less clear. By studying the use of surgical checklists and implant timeouts in Connecticut, we hoped to elucidate patterns of use to contribute to this body of knowledge.

Methods

We designed an online survey using SurveyMonkey.com with a total of 15 questions aimed at characterizing the use of checklists and operating room practices among ophthalmologists in Connecticut. An email list of ophthalmologists licensed to practice in Connecticut was obtained from Connecticut Department of Public Health. A link to the survey was emailed to all 232 practitioners on the list. A reminder email was sent after two and six weeks from the initial invite. The survey was closed after a total of eight weeks from the initial invite.

A total of 15 multiple-choice questions and additional free-text comments where applicable were formulated for the survey. The questions were designed to inquire about respondents' practice settings, knowledge of the AAO checklist, surgical errors, use of surgical checklists and implant timeouts, as well as perceptions about barriers to the use of surgical checklists. All listed authors reviewed the questions for face validity and content validity. Pilot testing of the survey was performed on more than 10 Yale-affiliated ophthalmologists. A copy of the survey is attached in the supplementary materials.

This survey study was approved by Yale University Human Investigation Committee. A click-through informed consent was obtained at the start of the survey. All responses were collected anonymously and the respondents had the option to skip any question that they did not wish to answer. Respondents who did not agree to the informed consent or no longer perform surgeries were disqualified.

Data analysis and statistical tests were performed using Microsoft Excel. Conditional probabilities, along with 95th percentile confidence intervals, were determined for each survey question with respect to frequency of checklist use and incidence of adverse events assuming a normal binomial distribution. Confidence intervals were computed with the method proposed by Agresti-Coull [10]. P-values were determined using the Chi-Square Statistic to test the null hypothesis that a. frequency of checklist use and b. incidence of adverse events are not predicted by the different responses to a particular survey question. A p-value of less than 0.05 rejected this null hypothesis.

Results

A total of 88 out of the 232 ophthalmologists initially contacted via email responded (38% response rate). Of these, 16 were disqualified because they either did not consent to participation or no longer performed ophthalmic surgeries, leaving 72 surveys for analysis. Table 1 shows stratification of survey respondents by sub-specialty, practice type, time since graduating from residency, and operating room setting.

What is your ophthalmic sub-specialty?	
Comprehensive	36%
Cornea	14%
Glaucoma	13%
Oculo-plastics	13%
Retina	11%
Pediatrics	11%
Uveitis	1%
Other	1%
What is your practice type?	
Full-time Private	85%
Full-time Academic	7%
Private and Academic	5%
Other	3%
How many years have passed since you graduated from your ophthalmology residency?	
>20 years	60%
15-20 years	15%
11-15 years	7%
5-10 years	14%
<5 years	4%
What is your most common operating-room setting?	
Outpatient Surgical Center	61%
Hospital	35%
VA	1%
Other	3%
Stratification of survey respondents by sub-specialty, practice type, time since graduating from residency, and operating room setting.	

Table 1: Characteristics of survey respondents.

More than 83% of the respondents stated that they did not use a surgical checklist during their residency. About half (48%) of ophthalmologists responded "always" and a third (36%) responded "never" for utilization of a surgical checklist in their current practices. More than 83% reported being unaware of the AAO sponsored ophthalmic surgical checklist. Separate from a surgical checklist, only 68% reported conducting an operating room implant timeout immediately before putting in any sort of implant or device in the eye and only 37% reported requesting surgical items specific to their sub-specialty (e.g., scleral plugs or iris hooks) be added to the total surgical count before the case (Figure 1).

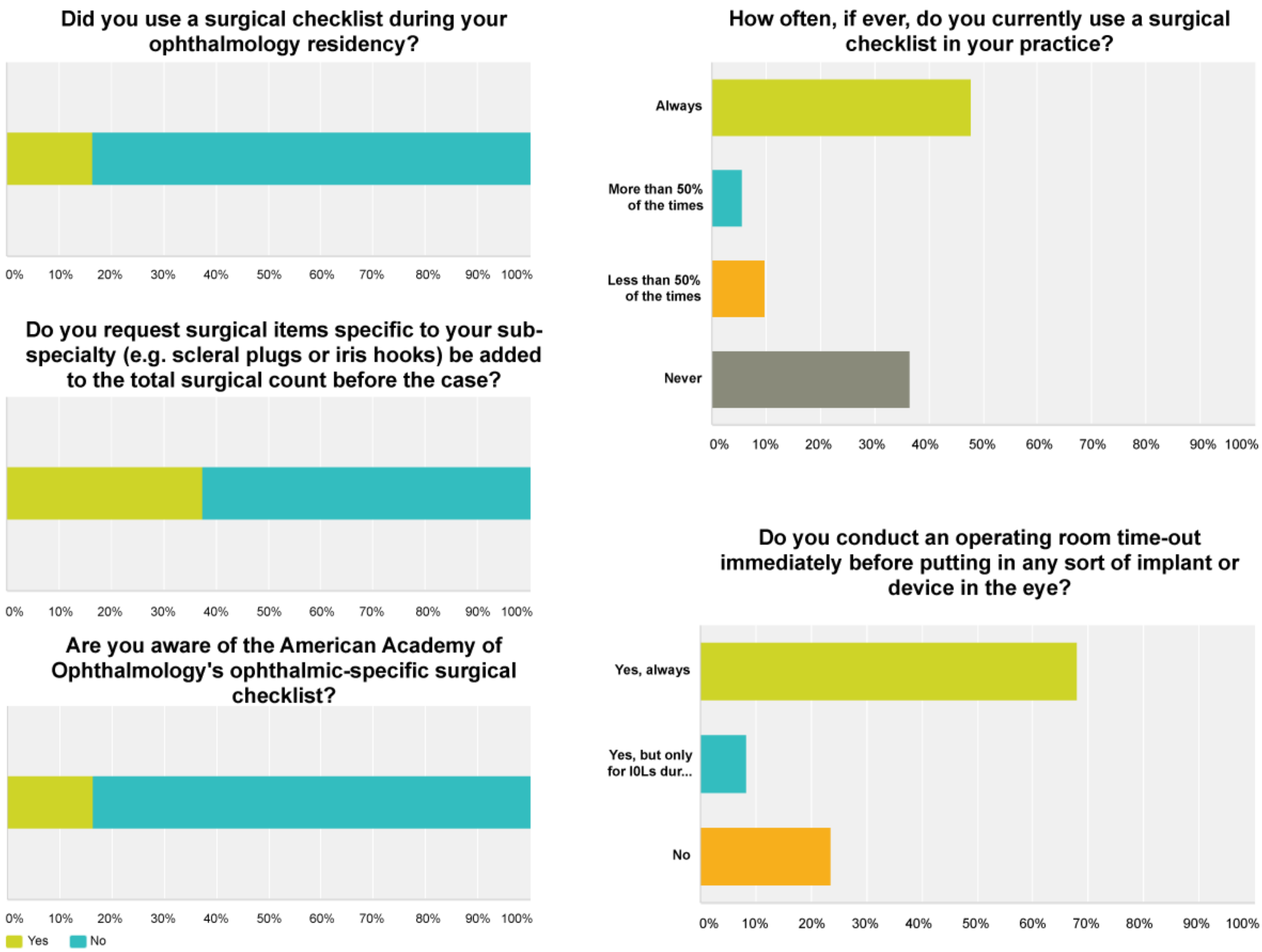

Figure 1: Survey responses to the use of surgical checklists and implant timeouts.

Approximately 25% of the respondents had had at least one incident of a wrong implant/device or retained surgical item during their careers. Almost all responders (87%) believe that the surgeon is ultimately responsible for adverse events in the OR such as a retained foreign body or a wrong implant (Data not shown).

Table 2 looks at the relationship between survey answers and the likelihood of the survey respondent using a checklist. Based on our data, the strongest predictive factor was the respondent's belief that using a checklist would enhance patient safety, with 68% of those who believed it enhanced safety using a checklist greater than 50% of the time, as compared to only 23% of those who did not believe checklist use enhanced safety (p=0.001). Use of checklists during residency also independently correlated with use of checklists (p=0.02). Those who used timeouts prior to implantation of devices and those who graduated from residency within the last 20 years also were more likely to use checklists (60% and 62%, respectively), but these distributions did not reach statistical significance (p=0.07 and 0.19, respectively).

Table 3 looks at the relationship between survey answers and the percentage of respondents who reported at least one incident of a wrong implant or retained surgical item. We found that regardless of use of surgical checklists, years of graduation since residency, use of timeout, or whether or not subspecialty items were added to surgical counts, the probability of reporting at least one adverse event was unchanged.

	Probability of using a checklist at least 50% of the time	95th percent confidence interval	Sample size	Chi-square p-value
Years since residency				
>20 years	0.46	0.32 - 0.61	41	0.194
<20 years	0.62	0.45 - 0.79	29	
Use of timeouts				
Yes	0.60	0.48 - 0.73	53	0.071
No	0.35	0.15 - 0.56	17	
Practice settings				
Hospital	0.44	0.26 - 0.62	25	0.269
Outpatient center	0.58	0.44 - 0.72	45	
Use during residency				
Yes	0.83	0.65 - 1.02	12	0.023
No	0.47	0.35 - 0.60	59	
Belief in enhancement in safety				
Yes	0.68	0.55 - 0.81	47	0.001
No	0.26	0.09 - 0.43	23	
The likelihood of the survey respondent using a checklist based on responses to a particular survey question using Chi-Square Statistic.				

Table 2: Responses to survey questions vs. frequency of use of checklists.

	Probability of at least one adverse event	95th percentile confidence interval	Sample size	Chi-square p-value
Years since residency				
>20 years	0.26	0.13 - 0.38	43	0.890
<20 years	0.24	0.10 - 0.39	29	
Use of timeouts				
Yes	0.24	0.13 - 0.35	54	0.659
No	0.29	0.10 - 0.49	17	
Frequency of checklist use				
>50%	0.30	0.16 - 0.44	37	0.261
<50%	0.18	0.06 - 0.31	33	
Subspecialty items added to surgical count				
Yes	0.22	0.08 - 0.37	27	0.673
No	0.27	0.14 - 0.39	45	
The likelihood of an adverse event based on responses to a particular survey question using Chi-Square Statistic.				

Table 3: Responses to survey questions vs. incidence of adverse events.

Discussion

Our survey results indicate that the use of surgical checklists remains limited among ophthalmologists. This is despite the persistently high number of ophthalmologists, 25% in our survey, committing system errors at least once in their surgical careers. Consistent with a previous study [11], there was no correlation between adverse events and the use of a checklist or timeout, which may signify the need for a more relevant ophthalmic surgical checklist than the ones currently in use. However, the AAO's effort [9] in 2012 that produced a template for such a checklist has largely gone unnoticed, as 83% of the ophthalmologists in the current survey reported being unaware of it. Our results also highlight the need for a cultural change if adoption of surgical checklists among ophthalmologists is to become universal.

The need for reducing surgical errors in ophthalmology is clear. In a Veterans Health Administration (VHA) report describing incorrect surgical events from 2000 to 2006, ophthalmology had the highest overall number and rate of surgical adverse events [8]. Even with presumed underreporting of such events, Simon et al. found 62 cases of "surgical confusions" upon review of the 900,000 eye operations performed in New York State between 2000 and 2005, a rate that is 10 times the six-sigma standard and unacceptably high for events termed "never events" [5]. A recent study from Hong Kong reported 12 "sentinel events" including cases of wrong eye, wrong prescription, wrong patient and surgery, and retained surgical items [7]. In our own survey, 25% of the respondents had had at least one incident of a wrong implant/device or retained surgical item during their careers. As the overall surgical volume in ophthalmology expands, the incidence of such errors is expected to rise unless there is a system wide intervention.

While there is ample evidence that surgical checklists significantly improve patient outcomes by enabling better surgical planning and communication among team members, data regarding their applicability in ophthalmology is scarce. Reduction in mortality ranging from 18 to 47% has been shown in different studies employing wide scale hospital use of surgical checklists [12,13]. A recent randomized trial assessing the use of surgical checklists demonstrated that patient morbidity resulting from surgical complications is also reduced, with a relative risk reduction of 0.42 (95% confidence interval, 0.33–0.50) [14]. Despite these recognized studies and CMS mandate, the self-reported rate of utilization of surgical checklists by ophthalmologists was low in our survey, with 36% of the respondents never using a surgical checklist and 24% not conducting an implant timeout. It is possible that checklists and timeouts are used by surgical centers mainly to satisfy the CMS mandate without the active involvement of surgeons required for team building and improving patient safety. The low adherence may also be explained by the yet unproven benefit of checklists in ophthalmology. For example, the rate of ophthalmology related adverse events remained high after the VHA implemented an intervention designed to improve communication and patient safety in the OR [11]. Similarly, we found no correlation between at least one incident of adverse event and the use of checklists or implant timeouts in our survey. These findings suggest that most current surgical checklists are likely not used with active involvement of surgeons and are not tailored for ophthalmic surgeries, perhaps reducing their utility.

The need for adoption of an ophthalmic-specific surgical checklist is paramount. IOL implants, the main reason ophthalmology remains first among surgical specialties in wrong implant errors [5, 8], exemplify the need for customizing surgical checklists for ophthalmic procedures. First, IOL measurements made in the surgeon's office are critical in preventing wrong implant errors. Not only should the IOL measurements be performed with accuracy and attention to any asymmetry with the fellow eye, it should be documented directly onto the patient's surgical checklist to be later compared against the IOL in the operating room. A dual, independent IOL selection process by a separate decision-maker as reported by Zamir et al. can further decrease the risk of error [6]. Second, for resident cases, even though an anterior chamber IOL as well as a sulcus IOL are also pulled as part of the pre-operative planning, we believe that only one IOL should be brought into the OR and checked against the documented IOL on the surgical checklist before administration of anesthesia. Third, both the type and power of the IOL, as well as the meridian in cases of toric IOLs, should be checked immediately before implantation. The inclusion of these three "checks" on the surgical checklist, as proposed by Zamir et al., will make the checklist more relevant, engaging, and useful to ophthalmologists. Similarly, surgical items specific to ophthalmology such as scleral plugs, corneal protectors, and iris hooks are typically not a part of the count on standard checklists. Retention of such surgical items has been published [7]. These surgical items should also be a part of the ophthalmic surgical checklist when applicable.

Lastly, there is a need for a cultural change to increase the utilization of surgical checklists among ophthalmologists. Studies have shown that high rates of adherence to checklists by ophthalmologists are achievable [15-17]. About 33% of our respondents stated that the most common barrier to using surgical checklists was that it never became a part of their practice. Our survey results also showed that ophthalmologists who believed in the effectiveness of surgical checklists and those who used checklists during their residency are more likely to use it (Table 2). For this reason, residents in training programs should be encouraged to regularly use surgical checklists so that it becomes habit before they start practicing in the community. Other barriers to the use of a standard surgical checklist included lack of its perceived benefit, irrelevance of the checklist to the procedure being performed, and time shortage. We hope that our study will aid in increased utilization by highlighting the need for a time efficient and relevant ophthalmic specific surgical checklist. As Gawande points out, implementation of an effective surgical checklist is a fluid process that requires constant monitoring and modification [3]. We therefore encourage pilot testing of an ophthalmic surgical checklist with emphasis on proper implant timeouts that can later be refined for use by all ophthalmologists. Upon establishing positive results on reducing surgical errors with such a pilot program, administrative bodies such as the CMS or the Joint Commission could then spearhead an effort to promote widespread education (such as through mandatory online training) and adoption.

Our study has several limitations. First, we extended our survey only to the ophthalmologists licensed to practice in Connecticut and therefore the results are not generalizable to other areas where practice patterns may be different. We had a survey response of 38% consistent with recently published survey studies in ophthalmology [18,19]. We do not report the percentage of cataract surgeons among our survey respondents. However, 75% of the respondents belonged to comprehensive, cornea, glaucoma, or pediatrics, and many of them are likely performing cataract surgeries or other procedures requiring implants. There may be selection bias in those who responded; specifically, it is possible that responders represented a population who find the topic to be important, thus artificially resulting in a higher percentage of people who use checklists, and find checklist use to be important to patient care. Second, the low absolute number of responses contributes to wide confidence intervals and lack of statistical significance between groups – in order to make conclusive statements about the trends observed, we would need a larger number of responses for a more robust data set. Third, the data for frequency of errors and adverse events are collected as absolute numbers; however, an ophthalmologist in practice for 5 years who reports one adverse event arguably has different implications compared to one in practice for over 20 years reporting the same number of events. Our study was not set up to examine these implications, but a future approach will be to assess rates of adverse events.

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