**An American Board of Surgery Pilot of Video Assessment of Surgeon Technical Performance in Surgery**

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ABS Pilot of VBA

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Mini Abstract:

The American Board of Surgery undertook a pilot of video-based assessment (VBA) of surgical technical skills relevant to board certification. 274 surgeons actively participated in the pilot using one of three commercially available platforms. Participants were surveyed following the pilot and supported pursing VBA as part of the certification process.

Abstract:

Objective:

The American Board of Surgery sought to investigate the suitability of Video-based Assessment (VBA) as an adjunct to certification for assessing technical skills.

Summary Background Data:

Board certification is based on successful completion of a residency program coupled with knowledge and reasoning assessments. Video-based Assessment is a new modality for evaluating operative skills that has been shown to correlate with patient outcomes following surgery.

Methods:

Diplomates of the ABS were initially assessed for background knowledge and interest in VBA. Surgeons were then solicited to participate in the pilot. Three commercially available VBA platforms were identified and used for the pilot assessment. All participants served as reviewers and reviewees for videos. Following the interaction, participants were surveyed regarding their experiences and recommendations to the ABS.

Results:

4,853/25,715 diplomates responded to the initial survey. The majority were not familiar with VBA, nor the tools used for operative assessments. 274 surgeons actively engaged in the subsequent pilot. 169 surgeons completed the post pilot survey. Most participants found the process straightforward. 74% of participants felt that the feedback would help their surgical practice. The majority (81%) remain interested in VBA for CME credits. 70% felt that using VBA in continuous certification (CC) could improve surgeon skills. Two-thirds of participants felt VBA could help identify and remediate underperforming surgeons. Identified barriers to VBA included limitations for open surgery, privacy issues and technical concerns.

Conclusions:

VBA is promising for an adjunct to the current board certification process and should be further considered by the ABS.

Introduction:

Technical skills directly impact patient outcomes [1] and means to scale surgical coaching and technical skills feedback are lacking. [2] At its inception in 1937, The American Board of Surgery (ABS) based life-long board certification on membership in founding surgical societies or rank of at least associate professor at an approved United States or Canadian medical school. Surgeons who had limited their practice to surgery for at least 15 years were also eligible to petition for certification without examination. Early-on, diplomates were observed directly in clinical practice as part of the certification process, but this practice was quickly discarded as impractical. [3]The first written examination (Part I) was delivered in 1937, and the first oral exam (Part II) was delivered in May 1938. [4] Still today, board certification includes initial written and oral examinations, supplemented by periodic “continuous certification” written assessments. Technical assessment currently comes from the surgical residency program directors who certify successful completion of an accredited residency program, including assessment of technical skill. Despite the comprehensive cognitive skills certification process from the ABS, at no time has the board rigorously assessed the technical aspects of surgical performance. With the advent of reliable and secure intraoperative video capture technology, training and life-long learning curricula have evolved to incorporate video-based appraisals of surgeons in practice. [5] These modalities may offer opportunities to include technical skills assessment as part of certification.

 Following the landmark Birkmeyer et al. study published in 2013, where the authors showed a correlation between de-identified video technical skill assessment and patient outcomes in bariatric surgery, [1] there has been increasing interest in video-based assessment as a means to assess technical performance in surgery. Others have demonstrated similar correlations in varied surgical specialties [6-12]. Video assessment of generic operative skill has also been proposed. There is significant variability in how video assessment is operationalized [5]. Review of segments and unedited videos have both been proposed. Raters can be highly trained, crowd sourced, or even employ artificial intelligence algorithms. Generic rubrics for assessment such as the objective structured assessment of technical skill (OSATS) [13] have also been employed for video analysis. The OSATS rubric focuses the reviewer on evaluating the performers bimanual dexterity, tissue handling, depth perception, efficiency, and instrument control. Procedure specific video review templates have also been developed [14, 15]. There is also a lack of consensus if formative or summative assessments

are most appropriate for video analysis. Despite these areas still in development, video-based assessment (VBA) is growing in popularity.

 In response to these trends in assessment and education, multiple individual institutions and training centers have embraced VBA. VBA is reportedly used for graduated advancement and even credentialing of practicing clinicians in some centers. However, Board-level systematic incorporation of VBA has not been achieved. To address this, the ABS instituted a task force in 2020 to evaluate existing VBA platforms to evaluate the value of VBA in the certification process. We describe the outcome of the ABS VBA pilot study and offer future thoughts for the direction of incorporating VBA into Board certification practices.

Methods:

The VBA Taskforce was initiated by the ABS in 2020. The Taskforce was constructed from executives from the ABS, Council members, delegates from professional societies, private practice surgeons, and advisors who translated early VBA evidence into scalable assessment solutions. The ABS VBA Taskforce set three initial goals: 1) Survey the ABS diplomates to assess baseline knowledge of video assessment in surgery; 2) Pilot with ABS diplomates using commercial VBA platforms currently employed for video assessment in the United States; 3) Survey the pilot participants following completion of the VBA trial.

Baseline Assessment of Surgeons in Practice with VBA

The Taskforce developed a survey with questions ranging from clinical practice patterns to knowledge and/or experience (if any) with any VBA protocols and technologies. The Taskforce was also interested in future VBA perspectives of the Diplomates and what sorts of challenges and concerns Diplomates may have with incorporation of a new continuous certification initiative. For the initial survey, administered through Survey Monkey (surveymonkey.com), five questions were delivered to all certified diplomates of the ABS through email contact. (Supplemental Table 1). These questions were developed collaboratively the VBA taskforce.

VBA Pilot Program

*Participants*

The database of respondents from the initial survey assessing ABS diplomate interest and knowledge was used to solicit a small subset of VBA pilot participants. Respondents were invited to participate through two successive emails in a pilot whereby the Diplomates could submit videos of surgeries they performed and, in a blinded manner, review videos of other surgeons to give feedback on the surgical skills demonstrated in the videos using the OSATS framework for scoring plus specific comments and suggestions on technique. [13] All participants were encouraged to serve as both reviewer and reviewee. To reduce the likelihood of any breach of confidentiality, pilot participants only submitted and reviewed video from endoscopic (camera’s eye) video within body cavities. Both laparoscopic and robotic approaches were considered acceptable.

*VBA Platforms*

The ABS solicited partner vendors to participate in the pilot. After initial screening of proposal respondents, platforms with current commercial use in the United States were considered further. To maintain impartiality to the available commercial VBA platforms, the Taskforce asked each vendor to provide the Taskforce members with portals to trial the platforms for both video-uploading user experience and video review functionality. After the Taskforce considered ease of use and video uploading, responsiveness of the vendors to inquiries, flexibility of platform to use the assessment tools agreed upon by the Taskforce, and readiness to scale to the pilot participants, the Taskforce partnered with three VBA platform vendors. (Caresyntax (Berlin, Germany), C-SATS (Seattle, WA) and Surgical Safety Technologies (SST, Toronto, Canada)). All pilot participants were randomly assigned to one of these three partner platforms. Videos uploaded were assessed for technical skills through each platform’s best available procedure- agnostic skills assessment, with or without artificial intelligence aided assessments. Pilot Diplomates were trained on the assigned platform and asked to complete uploading of 3 videos and reviewing of 6 videos. Throughout the pilot, each vendor provided Diplomates with training on the respective platforms through one-on-one and group virtual sessions, some of which were also attended by the Taskforce members to gauge thoroughness and professionalism of the sessions. Participants received self-assessment CME waivers for their participation in the pilot.

*Post-Pilot Survey*

Following completion of the pilot, a survey of pilot participants was performed to assess barriers to participation and satisfaction with the process. The ABS Taskforce tallied the number of videos uploaded, videos reviewed, and total participation.

Results:

Over 25,000 Diplomates were sent the initial survey with 4,853 respondents for a completion rate of 15.9%. For demographics of the initial survey respondents, please see Table 1. (Table 1)

This sampling was broadly representative across Diplomates. Fifty-four percent of respondents were not at all familiar with video-based skills assessment. An additional 36% were only somewhat familiar. The majority of respondents (54-77%) were not at all familiar with survey tools for technical assessment, peer or expert video-based skills assessments, or crowd sourced video assessments. Despite this low level of knowledge at baseline, 55% were willing to participate in a pilot of these technologies.

Five hundred and forty-six Diplomates were solicited to participate in the pilot and evenly divided amongst the three participant platforms. 182 surgeons were assigned to each platform, but only 274 surgeons actively engaged in the pilot. Pilot participation was increased for platforms with regular vendor engagement of assigned surgeons. 100 for Platform A and 112 for Platform B versus 62 for Platform C. Full participation statistics are shown in Figure 1 and Table 2. (Figure 1, Table 2)

For the pilot completion survey, 546 surgeons were queried with a 31% response rate. Demographics are detailed in Table 3 (Table 3). We did not differentiate active pilot participants in terms of response rates. Thirty-one percent of respondents were academic surgeons, 38% hospital employed, 24% independent practice, 1% military and 5% other (mostly large private group practice). Thirty percent of respondents reported being assigned to Platform A, 30% Platform B and 13% Platform C. Twelve percent of respondents reported they did not sign up and 10% dropped out for personal or institutional obstacles.

Some comments in the survey about barriers to adoption included:

* + My hospital’s firewall would not let me install the software needed to participate, so even though I wanted to, it was not logistically possible.
	+ I had difficulty uploading videos due to hospital error with recording and saving videos.
	+ There were several barriers to recording and editing and uploading for me. Many patients did not consent to recording

Sixty-three percent of participants found training for uploading videos helpful, and 69% found training for reviewing helpful. Fifty-five percent thought uploading was straightforward, although 17% did not. Sixty-six percent thought reviewing was straightforward, but 14% did not. Almost three-quarters (74%) of participants who were able to complete the pilot felt that the feedback they received from peer reviewers would help their surgical practice. With almost two-thirds (64%) responding that they learned techniques or skills from the pilot that will help them improve their surgical practice. Additional feedback is detailed in Figure 2. (Figure 2) Despite this, just over one-quarter (28%) of participants felt that uploading videos remains a challenge and 26% felt that hospital legal policies were a barrier.

After completing the pilot, an overwhelming majority of respondents (81%) remain interested in participating in VBA for CME credits, and only 8% disagreed. Seventy percent felt that using VBA in continuous certification (CC) could improve surgeon skills, and 15% did not. The remaining 10-15% in both categories stated they needed more information to make a stronger statement. Eighty-five percent of respondents would participate in VBA if it reduced the time to complete other CC requirements, and 88% would participate if other requirements were waived.

Two-thirds of participating surgeons felt VBA could be helpful to identify and remediate underperforming surgeons. Seventy-seven percent of respondents felt that VBA should be part of CC and 58% felt it should be pursued for initial certification. More than half of the respondents (58%) believed that use of VBA could improve patient outcomes.

Despite the positive support for VBA, several barriers were identified. Most participants felt that barriers in privacy, technical challenges, policy, consent, liability, impact of trainees and risk adjustment were all concerns. A large proportion of surgeons, 86%, were also concerned about barriers to open surgery VBA. (Figure 3)

Discussion:

Technical skills assessment of surgeons is relatively new, and it has yet to be broadly employed in the process of surgical certification. This pilot has demonstrated the feasibility and some of the obstacles to adoption of video assessment as part of the continuous certification process.

Video assessment is not unique to the field of surgery and is widely employed in professional sports[16], or for trouble shooting in the aviation industry[17]. We also have all seen how body camera recordings can be used to assess performance in law enforcement. Video use in these fields has been used both for performance enhancement and protection of the public. The alternative would be in-person surgical proctoring or appraisal which can average over $1000/case if one includes the time of the proctoring or coaching surgeon and the travel costs of the coach. (personal communication Thomas Lendvay)

Broadly in surgery, VBA has been shown to correlate with adequate training in a new procedure [5] and to identify performance outliers in highly technical specialties [1]. Once underperforming surgeons are identified, surgical coaching has also been employed. [18] Collaboratives such as ones in Wisconsin for General Surgery, in Michigan for Urology and General Surgery, and Colorectal Surgery in Illinois have successfully allowed surgeons to share video for coaching and review as a means for statewide patient care improvement.

 [19-23]

The procedures evaluated in this pilot were performed using laparoscopic or robotic platforms with recording capabilities. These represent only a percentage of surgical cases currently performed by ABS Diplomates and are not available for some surgical specialties. New modalities for image capture may be required to include open surgical procedures. One example of this is the Storz Vitom product, which essentially places a laparoscopic camera without the attached laparoscope in an open surgical field, so it is not obstructed by the operating surgeons. Head mounted cameras are another option. Rubrics for analysis of these open procedures are also not as clearly developed. As we broaden the scope of procedures analyzed, matching of specialty between reviewer and reviewee must also be considered to optimize impact.

For purposes of the pilot, we used readily available assessment rubrics, primarily focusing on the OSATS methodology.[13] While this has been broadly employed in surgical assessment, it is unclear if there are better assessments for formative feedback. In addition, evaluations utilizing artificial intelligence (AI) are available on many platforms and can offer additional and possibly helpful feedback. These were not employed as part of this pilot. Procedure specific rubrics in some key operations have also been developed that may offer more specific and actionable results.

In addition, our pilot participants performed as both reviewer and reviewee for this program. As video assessment becomes more widely employed, or stakes become higher for the resulting assessments, rater training and reliability must be assessed. Scalability concerns also exist unless AI can also be used to offload reviewers. In addition, costs will potentially increase if paid reviewers are required, as used for routine assessments on some of the tested platforms. These costs are not an insignificant hurdle for wide-scale adoption. Even without paid reviewers, we have yet to define what widespread adoption of video assessment would cost. If VBA becomes part of board certification, who will bear these costs?

Limitations of this pilot assessment were many. The ABS chose only to assess three commercially available platforms with previous US experience. Other platforms may offer alternative and/or improved functionality for video assessment. In addition, non-commercial and in-person assessments, such as a coached review on a personal laptop, can also be used for VBA and were not employed in this pilot. The pilot participants were a subset of ABS Diplomates who expressed an interest in VBA. It is logical that the support of the process was magnified in this participant group. In addition, participants were incentivized with CME for pilot participation potentially leading to more favorable responses.

Despite these limitations, it appears reasonable to continue exploration of existing video assessment platforms as part of continuous certification for formative purposes. This initial proposal is a low stakes exam, where the purpose is participation and feedback. As with any quality program, the process of participation and measurement was felt by surgeons to have a possible potential benefit on their delivery of patient care. As procedure specific rubrics are developed and validated, VBA may also play a role in initial certification or focused practice designation. [14, 15]

The use of video assessment to improve surgical performance may also be enhanced with incentives or commendations for participants, both as reviewers or reviewees. Allowing these activities to fulfill Continuing Medical Education (CME) requirements is one possible incentive that could encourage participation. This warrants further discussion.

Following this pilot, the ABS appreciates the value of VBA as a potential for engagement in evaluation of actual technical performance. VBA likely plays a role in surgical assessment, and warrants inclusion in the process of surgical certification.

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Supplement 1. Pre-Pilot Survey Questions.

|  |  |
| --- | --- |
| Q1. Please indicate your level of familiarity with the following types of technical skills assessments. | 1) General survey tools for assessment of technical skills (e.g., Global Evaluative Assessment of Robotic Skills, GOALS, OPRS, or OSATS) via an ‘in-person’ expert review2) General survey tools for assessment of technical skills (e.g., Global Evaluative Assessment of Robotic Skills, GOALS, or OSATS) via VBA expert review"3) Peer/Expert video-based skills assessment4) Peer/Expert live proctoring5) Peer/Expert coaching6) Simulation7) Crowd-sourced assessments of technical skills (e.g., CSATS)8) Procedure specific: Task error analysis (e.g., OCHRA) |
| Q2. Please indicate the degree to which you agree with the following statements about the potential use of VBA for feedback in continuous certification: | 1) I am familiar with the VBA literature2) I would have interest in participating in VBA for CME credits3) I believe that the use of VBA in continuous certification would improve surgeon technical skills4) I would have interest in participating in VBA if it reduced the amount of time that I needed to spendto meet continuous certification requirements5) I would have interest in participating in VBA if it resulted in the waiver of other continuous certificationrequirements6) I would have interest in participating in VBA if it could help to identify and remediate underperformingsurgeons7) I believe that the use of VBA would improve my experience with the board and continuous certification8) I believe that the use of VBA would improve patient outcomes9) I believe that VBA should be incorporated into the initial certification process |
| Q3. Some surgeons are already using VBA as part of their own development or coaching. There are surgeons who do not have exposure and may perceive barriers to doing VBA. Please indicate the degreeto which you believe the issues below might be potential barriers to using VBA: | 1) Surgeon privacy2) Technical challenges in recording a video3) Hospital policy on recording4) Patient informed consent for recording5) Liability/litigation6) Inaccurate measurement7) Board certification status8) Loss of privileges9) Costs10) Time11) Appropriate risk adjustment12) Limitations of open surgery (i.e., need for a camera)13) Bias of residents helping with procedure |
| Q4. Would you be interested in participating in a pilot of video-based assessment of technical skillswhere your videos are rated and you receive feedback? | Y/N |
| Q5. Would you be interested in participating in a pilot of video-based assessment of technical skillswhere you provide ratings and feedback to other surgeons? | Y/N |

Table 1. Demographic characteristics of initial survey respondents

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Demographic Variable** | **N Non-Respondents** | **% Non-respondents** | **N Responders** | **% Respondents** |
| \*Years In Practice\* |   |   |   |   |
| <=10 | 6603 | 25.7% | 1185 | 24.4% |
| >11-20 | 7209 | 28% | 1365 | 28.1% |
| >=21 | 11903 | 46.3% | 2303 | 47.5% |
|   |   |   |   |   |
| \*Specialty\* |   |   |   |   |
| Generalist | 19291 | 75% | 3404 | 70.1% |
| General Surgeon + Specialty | 6424 | 25% | 1449 | 29.9% |
|   |   |   |   |   |
| \*Gender\* |   |   |   |   |
| Male | 19690 | 76.6% | 3723 | 76.7% |
| Female | 6025 | 23.4% | 1130 | 23.3% |
|   |   |   |   |   |
| \*Total\* | 25715 | 84.1% | 4853 | 15.9% |

Table 2. Participation by platform

|  |  |  |  |
| --- | --- | --- | --- |
|  | Platform A | Platform B | Platform C |
| # Surgeons Contacted | 184 | 180 | 182 |
| # Surgeons Opted out pre-enrollment | 14 | 0 | 3 |
| # Surgeons opted out post-enrollment | 2 | 20 | 0 |
| # Surgeons engaged | 97 | 111 | 54 |
| # Surgeons who uploaded videos | 29 | 31 | 10 |
| # Videos uploaded | 73 | 139 | 24 |
| # Surgeons who assessed videos | 55 | 57 | 0 |
| # Videos assessed | 179 | 121 | 0 |
| # Surgeons who assessed > 1 video | 22 | 46 | 0 |
| # Surgeons who can’t record | 8 | 1 | 0 |

Table 3. Demographic characteristics of pilot participant survey

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Demographic Variable** | **N Non-Respondents** | **% Non-respondents** | **N Responders** | **% Respondents** |
| \*Years In Practice\* |   |   |   |   |
| <=10 | 128 | 34.7% | 51 | 28.8% |
| >11-20 | 99 | 26.8% | 53 | 29.9% |
| >=21 | 142 | 38.5% | 73 | 41.2% |
|   |   |   |   |   |
| \*Specialty\* |   |   |   |   |
| Generalist | 259 | 70.2% | 133 | 75.1% |
| General Surgeon + Specialty | 110 | 29.8% | 44 | 24.9% |
|   |   |   |   |   |
| \*Gender\* |   |   |   |   |
| Male | 292 | 79.1% | 149 | 84.2% |
| Female | 77 | 20.9% | 28 | 15.8% |
|   |   |   |   |   |
| \*Total\* | 369 | 67.6% | 177 | 32.4% |

Figure legends

Figure 1. Pilot Participation by Group (%)

Fig 2. Pilot Participant Opinion on VBA

Figure 3. Concern about feasibility of VBA for open surgery (% of respondents)