SOCIETY OF AMERICAN GASTROINTESTINAL AND ENDOSCOPIC SURGEONS (SAGES)

REQUEST FOR PROPOSAL

FLS SKILLS AUTOMATED SCORING

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APRIL 15, 2024

REQUEST FOR PROPOSAL

TABLE OF CONTENTS

SECTION I. INTRODUCTION

The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) is initiating a Request for Proposal (RFP) from qualified firms to develop the Fundamentals of Laparoscopic Surgery (FLS) Skills Automated Scoring system (System).

This Request for Proposal requires firms to outline their interest and capabilities for developing a video-based product to score the technical skills component of the SAGES FLS exam, along with pricing projections specific to each requirement and timelines for delivering the overall product. Interested firms may submit a proposal for some or all the services described within this RFP. SAGES reserves the right to withdraw the RFP from the bid process at any time.

I.I. BACKGROUND

SAGES is a not-for-profit professional membership organization which represents a worldwide community of surgeons that bring minimal access surgery, endoscopy and emerging techniques to patients in every country. Representing over 7,000 surgeons and allied health professionals, SAGES' mission is to provide leadership in surgery, particularly gastrointestinal and endoscopic surgery, in order to optimize patient care through education, research, and innovation.

The educational programs SAGES develops teach and assess the knowledge needed for a wide range of experience levels including: nurses, surgical residents, fellows, and practicing physicians. SAGES' educational portfolio offers onsite and online courses to physicians in the United States, Europe, and parts of the Middle East and Asia. Combined, they serve approximately 5,000 new users a year and up to 2,500 returning users. Programs are administered by 20 staff members and more than 100 Subject Matter Experts (SMEs).

FLS is one of the flagship SAGES programs. FLS is designed to teach and assess the knowledge and skills fundamental to performing laparoscopic surgery. FLS is a standard component of general surgery residency training in the U.S and is a requirement for Board Certification in Surgery. The program includes web-based didactic content and a high-stakes exam. The exam consists of a manual skills exam performed on a proprietary simulator training box and a multiple-choice exam that is hosted on a partner system. About 3400 FLS exams are administered a year, along with an additional 240 retests of the manual skills test. The majority of the exams are administered at 85 certified testing centers across the US.

I.II. PROBLEM

The FLS technical skills exam currently requires a trained proctor to oversee the performance of the FLS exam. SAGES and the testing centers invest resources in training proctors and making sure they remain eligible to administer the exam. Proctors are responsible for scheduling exams,

confirming the identity of test takers, monitoring the test session, reading instructions aloud to the examinee, and recording task time for each task and recognizing and recording errors. Once the exam is completed, the proctor is responsible for mailing the test takers' work product and recorded times to the SAGES office for scoring. SAGES pays the center where the proctor is employed an honorarium for each exam.

The mailed work product, recorded times, and errors are then used by SAGES to grade the exam. The work product consists of two Penrose drains that have been sutured and a cut out circle of gauze. The final score is calculated with a proprietary metric and emailed to the test taker as a pass/fail result.

The current system is cumbersome and subject to human error. It is reliant upon the availability and willingness of participating facilities to hire and maintain proctors. There are geographic areas where proctors and test centers are not as easily reached depending on proximity to test takers' home institutions. This process also assumes the work product will not be lost or damaged in the mail.

I.III. PURPOSE

SAGES is requesting a system that automates the current processes used to deliver and score the FLS technical skills exam. The System should provide a streamlined and easy user experience and take into account accessibility for the hearing impaired. It must be cost effective and sustainable for a minimum of 10 years with assessments every 3 years to determine the overall viability and changes needed mid-stream with SAGES maintaining the option to request changes in off years if necessary.

This RFP does not constitute an offer of contract, nor will SAGES be liable for any costs incurred by respondents in preparation and submission of information in response to this RFP. SAGES reserves the right to cancel this RFP at any time, reject all or part of a proposal or to award multiple development firms.

I.IV. RFP SCHEDULE

All interested proposers must email a letter of intent to john@sages.org stating their interest and intention to bid by: **May 15, 2024**. At that time, prospective vendors should also send a signed copy of the SAGES Non-Disclosure Agreement (See Appendix C). Questions regarding the RFP may be submitted by email to john@sages.org or by calling 310-437-0544 Ext. 116. SAGES will send out a Q&A form at regular intervals so that all interested parties receive the same information.

Activity	Due Date
Request for Proposals available	April 15, 2024

Email to SAGES stating your interest (letter of intent)	May 15, 2024
Proposals Due to SAGES	July 15, 2024
Preliminary Evaluation	August 2024
Proposer Demonstration/Interviews	September 2024
Contract Negotiations	October 2024
Award of Contract	November 2024

I.V. CRITERIA FOR SELECTING A VENDOR

The winning vendor will be selected primarily on their qualifications, approach, and strong grasp of the project needs based on this RFP. Associated costs must also be proportionate to the proposed solution.

SAGES will evaluate proposals based on the following criteria:

- Solution meets requirements of the RFP,
- Solution ensures a streamlined user experience and accessibility,
- Solution is cost effective and sustainable for a minimum of 10 years,
- Firm has relevant product experience and qualifications,
- Firm is adaptable and flexible in providing some customization as needed,
- Firm's customer service and Service Level Agreement (SLA).
- Pricing
    - Please provide pricing in a manner that fits your business model. SAGES would prefer a model that resembles what other partners use which includes fees for:
        - Implementation
        - Per user/test
        - Storage
        - Customization

I.VI. SUBMITTAL REQUIREMENTS

Proposals must be submitted online at: https://www.sages.org/rfp-fls-skillsgrading and include the following:

- Description and qualifications of project team
- Description of the services you will provide/activities you will perform to produce each deliverable
- Estimated project timeline broken into two parts
    - Develop timeline
    - Implementation timeline
- Cost estimate for each requirement described in Section III – The FLS SKILLS AUTOMATED SCORING System
- Total estimated project cost
- Samples of past work

SECTION II. SCOPE OF SERVICE

The scope of services set forth in this Request For Proposals represents an outline of the services that SAGES anticipates the successful proposer to perform, and is presented for the primary purpose of allowing SAGES to compare proposals. The precise scope of services to be incorporated into the development agreement shall be negotiated between SAGES and the successful proposer. Proposers are encouraged to suggest any changes to the scope (as a part of the proposal) to better achieve SAGES' stated project objectives and deliverables.

- **Project Management –** The coordination of all services conducted by the proposer. The person fulfilling this role will work directly with the SAGES project manager and must have previous project management or team lead experience. Expected responsibilities include scheduling all project meetings, providing SAGES with a project schedule, and bi-weekly status reports that outline the overall project status as well as any roadblocks, or potential delays to the agreed upon project schedule and cost.
- **Business Analysis –** The coordination, elicitation and documentation of all requirements. Requirement meetings may be held over the phone, in-person at the SAGES offices in Los Angeles, CA or another mutually agreed upon location. The person fulfilling this role must be willing to travel to conduct requirement meetings, have excellent verbal communication skills, and be comfortable working with our rotating executive management team.
- **UI/UX Design –** The coordination, layout and design of all mockups and prototypes of system workflows and development of the approved designs**.** The person fulfilling this role must be skilled in user experience design, be willing to travel to requirement meetings, have excellent verbal communication skills, and be comfortable working with executive management.
- **Programming/Software Engineering –** The development of all approved requirements and integration of partner systems with special attention paid to scalability and reliability. The person(s) fulfilling this role is expected to point out potential flaws in the approved workflows flows/requirements/designs before development begins.

- **Data Management –** The entity fulfilling this role will be responsible for storage of all data and conveyance of data to be scored.
- **Data Security** - The entity will follow local and international laws regarding test-taker privacy, confidentiality and data sharing specific to the geographic location from which the data were procured.
- **Quality Assurance –** SAGES requires the proposer to conduct rigorous system testing to ensure the quality of System before it is made live. The person(s) fulfilling this role will be responsible for testing all approved requirements. They must verify that requirements have been met and are error free before SAGES conducts user acceptance testing. The severity of errors (Critical – Low) and the priority/urgency in which they will be resolved must align with project objectives.
- **Software Training/Documentation –** The training of SAGES on all aspects of the system. Training may happen via webinar or in-person at the SAGES offices in Los Angeles, CA or another mutually agreed upon location. The person fulfilling this role must be willing to travel to conduct training and have excellent verbal communication skills.

II.I. OBJECTIVES

The objective of the FLS SKILLS AUTOMATED SCORING project is to implement a system that will automate the delivery and scoring of the FLS skills exam without a proctor. The system will integrate with the existing SAGES FLS skills simulator and monitor the test taker as well as obtain appropriate performance data to be able to accurately assess their skills exam.

The system will:

- Administer the skills test without the need for trained proctors.
- Assess test taker performance in a manner that is equal to or better than the current methodology.
- Record individual test takers performance data in a mutually agreed-upon database for extraction by SAGES staff for final pass/fail determination.
- Eliminate the need to keep and mail the work product from the FLS skills test (two penrose drains and circle cut gauze)
- Provide test security by validating the test taker's identity (in compliance with all applicable laws and regulations) and monitoring of the test taker to make sure that test security is maintained throughout the technical skills assessment. Identity data should be kept no longer than required to validate the user's identity.
- Integrate the automated assessment with the SAGES partner systems through Application Programming Interface (API)s.
- Provide live customer support.

Additional objectives of the system that would be considered enhancements include:

- Decrease the per-test cost to SAGES associated with current test administration.
- Decrease the cost to test centers associated with current test administration.
- Decrease the cost to test takers associated with current test administration.

II.II. DELIVERABLES

The following list of deliverables is intended to serve as a structure for proposer responses, including costs and timeline. Proposers are free to make additions that they believe will further assist SAGES in reaching its objectives. The proposer will be expected to deliver:

1. **Requirements –** elicitation process that result in well defined, validated use-cases, functional and non-functional system requirements.
2. **Prototype or Mockups –** a visual representation of the user interface and workflows.
3. **Implementation Plan -** a description of how the solution will be deployed, integrated with other systems, and managed once live.
4. **FLS SKILLS AUTOMATED SCORING System –** the product of building the approved requirements and prototypes/mockups.
5. **Verification –** testing process that confirms the System reflects the approved requirements and is error free.
6. **User Documentation –** complete wiki/documentation of the System and how to use it for the following roles below. User roles included below:
    a. Test Taker - the person who takes the exam.
    b. Test center administrator - the person who schedules the exam at the test center once they receive the request from an eligible test taker.
    c. Test center facilitator - (can be the same as the test center administrator) the person who makes sure that the test materials and equipment are set up and functioning properly so that the test taker can take the exam.
    d. SAGES program administrator - the person at SAGES who receives test data from each exam and oversees the process of taking the data and converting it to a final score/assessment of pass/fail, as well as the notification of the test taker of the result. They are also the ones responsible for final determination of eligibility of the test taker to register for the exam.
7. **Training –** the process of teaching SAGES staff to use the System.

II.III. PROJECT TIMELINE

SAGES anticipates that this project will take between two and three years to complete. Proposers are encouraged to align with this timeframe and explain any activities that may push the project out past it. SAGES expects features to be rolled out as they are completed and declared usable and functional. SAGES believes that the timeline should afford multiple checkpoints at which both parties can evaluate the project and make sure it is moving in an appropriate direction. SAGES is proposing several such deliverables checkpoints below but would encourage proposers to propose checkpoints of their own, including relative dates. During this time both the developer and SAGES would have exclusive rights to the data being used and the intellectual property being produced.

PHASE I: Development and Pilot November 2024 to November 2026	
Requirement	**Comment**
Video monitor of test taker	Should have video assessment of the user that can determine if user is following instructions
Video monitor of Box	Should have video assessment of the inside of the box trainer so that it can determine if tasks are completed correctly
Task time	Should determine the correct task time to begin and end timing
Task errors	Should accurately determine if and what kind of errors are committed during the task performance
Task score	This will be determined by SAGES, based on the data provided by the vendor.
User interface/experience to provide test taker instructions	Should direct user on the instructions of all tasks
Test taker validation	Validates that the correct user is taking the test
Data and user activity tracking including work materials[3]	Should gather, encrypt and hold or convey data from the test
Integrate with partner technologies via API	● Should require test takers to input their First Name, Last Name and Email. ● Should send the final Skills score to OWLS. ● Should retrieve scheduling information from Webassessor. ● Before pilot ends, should create test

	taker accounts in automated System using Webassessor test appointment information.
Scoring validation	Compare test scores and pass/fail determination of automated assessment to current methodology during pilot phase

See Appendix B for API specifications.

PHASE II: Customization and Implementation November 2026 to December 2026		
Requirement	**Priority**	**Comment**
SAGES branding	Must have	For the instructions
User interface and experience: Advanced	Must have	Updates based on pilot testing
Decrease test center costs	Nice to have	
Decrease SAGES' costs	Nice to have	
Decrease test-taker's cost	Nice to have	
Live customer support	Must have	
Business continuity plans	Must have	
Fail-over procedures	Must have	
Uptime guarantees	Must have	
Support response time guarantees	Nice to have	
Periodic scoring data audits	Must have	As the testing changes, we will need to continue to evaluate its validity
Migration plan	Nice to have	

SECTION III. THE FLS SKILLS AUTOMATED SCORING SYSTEM

III.I. USER JOURNEY

The test taker logs into sages.org (SAGES membership database), Single Signs-On to OWLS (SAGES Learning Management. System) to purchase the exam, and then Single Signs-On to Webassessor (SAGES Written Exam Management. System) to schedule a test appointment. On the day of the exam, the test taker visits a SAGES test site and completes the FLS Skills exam on the automated System. The automated System should then securely transmit required data, either scored or not yet scored depending on the System functionality, to SAGES or a partner system for reporting. Depending on the System solution, SAGES FLS Program Administrator or a partner system will then use the data to determine if the test taker passed the exam and issue credits and certificates as appropriate. It should be noted that 92% of test takers pass the FLS Manual Skills on their first attempt. Those who do not pass must purchase a second voucher and register for a retest. The automated System must associate retests with the same account the test taker used for their first attempt.

III.II SKILLS EXAM BOX

The FLS Skills Exam is taken on the FLS Simulator (the Box) pictured below in Figure 1. The Box includes two trocar ports through which various instruments are used to manipulate materials inside the Box. There is an integrated camera that streams video from inside the Box to a monitor mounted outside the Box simulating a laparoscopic procedure. The System will need to work with the Box but the System can make modifications to the Box. Video output from the Box is delivered via RCA connector as a composite / CVBS signal (NTSC 30i). SAGES will not require that the System be integrated into the Box.

Figure 1

Test takers should be able to activate the System. The system should confirm the test takers identify through a means of authentication (see Appendix B for SAGES SSO API). The physical setup of the

system and tasks will be handled by personnel at the testing center. However, the System should provide the test taker with instructions for each task and generally guide the test taker through the exam.

III.III SKILLS EXAM TASKS

Currently, test takers must complete five (5) skill tasks inside the Box. Pictures of the tasks and detailed explanations are included in Appendix A. Each task includes instructions that the test taker must follow. In some cases, not following instructions causes an immediate failure while in others, the test taker's score is affected. The tasks are also timed, and the time needed to complete a task is used to calculate the final score. The System must be able to time each task, determine if the test taker followed the instructions and, for tasks that have errors, determine which and how many of the errors were committed. The system must retain times and scores for individual tasks. Retaining images/video of the exam session for post exam reviews and grievance is preferred. If video/image recordings of the exam session are included, they must be retained for 1 year. All other data are retained indefinitely and must be exportable via .csv or similar and should ideally be queryable via a user-friendly interface.

III.IV SKILLS EXAM ENVIRONMENT

The System will be used to administer and grade the FLS Skills exam. The Exam is administered at SAGES-approved test sites around the world with the vast majority of sites being in the United States and Canada. Test sites are primarily hosted by hospitals and university-based simulation centers that provide Internet access required for exam administration. Although institutions may be required to modify their network to accommodate the automated scoring hardware, SAGES would prefer to keep the technical requirements the same. The number and location of testing sites will vary over time so the solution must be scalable.

SECTION IV. ABOUT OWNERSHIP AND LICENSING

IV.I SAGES OWNERSHIP AND CONTROL

SAGES holds exclusive ownership of the FLS program, a cornerstone of our mission to leading surgical education. This ownership extends to, for example, any FLS-related assessments, scoring algorithms, testing equipment or technologies and all videos developed under our purview, ensuring that the administration of the FLS test remains under our direct control and consent.

IV.II DEVELOPMENT AND OWNERSHIP OF TECHNOLOGY

In our strategy to automate the FLS Skills Assessment, it is important to delineate the funding and ownership structure of the developed technology. Should SAGES decide to fund the development, it is understood that the resulting technology will be wholly owned by SAGES. This approach underscores our commitment to maintaining the highest standards and control over the assessment process.

IV.III INTELLECTUAL PROPERTY (IP) STRATEGY

Collaboration with external developers may vary; if a technology developer independently creates a solution for the FLS assessment, the IP ownership can be negotiated. This could result in either co-ownership between SAGES and the developer or exclusive ownership by the developer, depending on the terms agreed upon. This flexibility ensures that we can engage with innovative solutions while safeguarding SAGES' interests.

IV.IV LICENSING MODEL

Central to our collaborative strategy is the licensing model, through which SAGES will grant technology developers the right to apply their solutions to the FLS assessment. This model not only ensures that SAGES maintains overarching authority over the FLS program but also opens a pathway for innovation and improvement in assessment technologies. Although SAGES prefers a licensing model based on a per exam fee, we are open to negotiations involving other business models.

IV.V DATA RIGHTS AND INNOVATION INITIATIVES

SAGES will retain all rights to the data generated through the development and ongoing application of the technology in FLS tests. This includes the exclusive right to use such data for further research, development, and innovation within our educational programs. Importantly, SAGES may decide to utilize these data to host annual computer vision challenges. These challenges will not only foster innovation in the field but also continuously enhance the accuracy and effectiveness of the FLS Skills Automated Scoring System, aligning with our goal to remain at the forefront of surgical education technology.

APPENDIX A - DESCRIPTION OF FLS TASKS

The FLS Skills Exam consists of five tasks. The tasks are described below along with general descriptions of scoring. This video demonstrates all five tasks. Please also see the setting up the Box video and setting up the tasks video for more information.

Peg Transfer (Figure 2) simulates using grasping tools to transfer objects laparoscopically. Users must use two graspers, one in each hand. They then use the graspers to pick up each of the objects, transfer them from one hand to the other and drop them on a peg on the other side. Once all of the objects are transferred from one side to the other, they do the task in reverse. Timing begins when the user picks up the first object and ends when the user transfers the last object back to the side on which they began. A penalty is assessed if the user drops an object outside the camera's field of view and they cannot attempt to pick up the object that is dropped outside the field of view. Any

object dropped inside the field of view is not a penalty and can be picked up and used to complete the task.

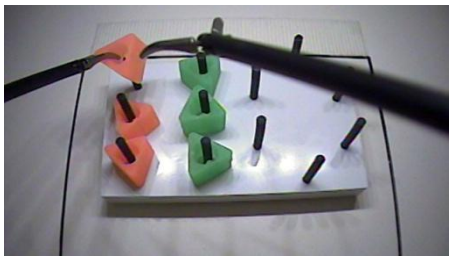

Figure 2 - Peg Transfer

Precision Cutting (Figure 3) simulates using cutting tools to dissect tissue. Users must use a grasper and a cutting instrument. They can use them in either hand and can pull out the instruments and switch hands whenever they want. Their goal is to cut along the pre-marked pathway without cutting outside the marked pathway. All deviations from the pathway are added up and marked as a penalty based on the cumulative area by which they deviated. This is a timed task with timing beginning as soon as the user cuts and ends when the user completely frees the marked gauze.

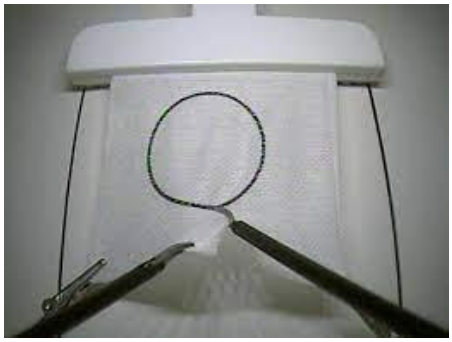

Figure 3 - Precision Cutting

Ligating loop (Figure 4) simulates tying a ligating suture loop around tissue. The user must use a grasper and pre-tied ligating loop pusher. A piece of foam, representing tissue, has a mark on which the user must place the ligating loop suture. They must tighten the loop on the mark and then cut away the extra suture material. Any deviation of the loop from the mark on the foam is measured and scored as a penalty. Knot security is also scored. This is a simple yes or no question. If the knot is secure, no penalty is applied. If it is not, a penalty is applied to the score. The task is timed beginning when the first instrument appears on the monitor and ending when the unnecessary suture is cut.

Figure 4 - Ligating Loop

Suture with Extracorporeal Knot (Figure 5) simulates tying a suture knot outside the body and then pushing that knot onto the tissue. The user will use two graspers, a knot pusher and a cutting instrument. They can switch instruments and hands whenever they need to do so. All scoring is done inside the box. They must throw and secure three knots. A Penrose drain with a slit is used to simulate the tissue. The Penrose has two marks on either side of the slit and the user must drive the suture needle through those marks to close the slit. Penalties are assessed for any deviation of the suture material from the two marks on the Penrose, for not properly closing the slit in the drain, and for a knot that slips or comes apart when tension is applied to it. Additionally, it is an automatic failure of the task if the Penrose detaches from the block to which it is attached, or if the user tears the Penrose while suturing. After closing the slit in the Penrose with the three knot throws, the user must cut both ends of the trailing suture. This task is timed beginning when your first instrument is visible on the monitor and ending when both suture tails have been cut.

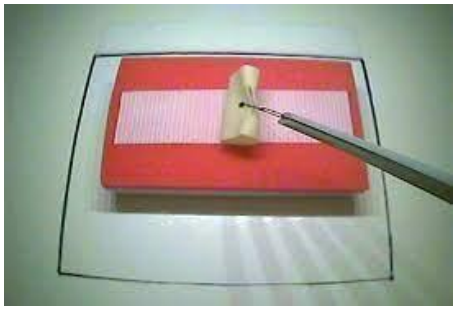

Figure 5 - Extracorporeal Knot

Suture with Intracorporeal Knot (Figure 6) simulates tying a suture knot inside the body. The user will use two graspers, a knot pusher and a cutting instrument. They must tie two different types of knots. They must switch instruments between throws so as to demonstrate that they can tie knots with both hands. All scoring is done inside the box. They must throw and secure three knots. A Penrose drain with a slit is used to simulate the tissue. The Penrose has two marks on either side of the slit and the user must drive the suture needle through those marks to close the slit. Penalties are assessed for any deviation of the suture material from the two marks on the Penrose, for not properly closing the slit in the drain, and for a knot that slips or comes apart when tension is applied to it. Additionally, it is an automatic failure of the task if the Penrose detaches from the block to which it is attached, or if the user tears the Penrose while suturing. After closing the slit in the Penrose with the

three knot throws, the user must cut both ends of the trailing suture. This task is timed beginning when your first instrument is visible on the monitor and ending when both suture tails have been cut.

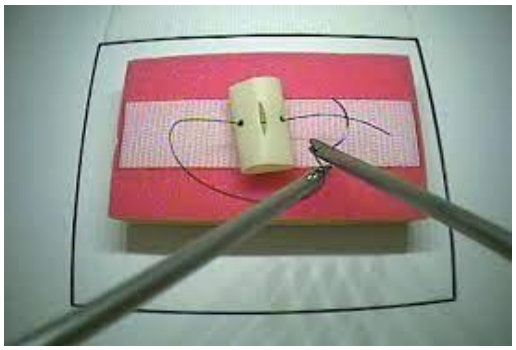

Figure 6 - Intracorporeal Knot

APPENDIX B - PARTNER SERVICES APIs

Webassessor

- Used for test taker scheduling
- https://www.kryterion.com/wp-content/uploads/2023/07/IntegrationAPISpecification_20230719.pdf

Google Sheets

- Currently used to hold the scoring and timing data
- https://developers.google.com/sheets/api/guides/concepts

SAGES.org

- Used for test taker authentication
- https://developer.wordpress.org/rest-api/using-the-rest-api/authentication/

CrowdWisdom

- Developers of the OWLS learning management system
- Download PDF

APPENDIX C - NON-DISCLOSURE AGREEMENT

- Must be submitted with letter of intent
- See attached file for NDA