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# Development of a Multimedia Tutorial to Educate How to Assess the Critical View of Safety in Laparoscopic Cholecystectomy Using Expert Review and Crowd-Sourcing

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## Abstract

We sought to determine the feasibility of developing a multimedia educational tutorial to teach learners to assess the critical view of safety using input from expert surgeons, non-surgeons and crowd-sourcing. We intended to develop a tutorial that would teach learners how to identify the basic anatomy and physiology of the gallbladder, identify the components of the critical view of safety criteria, and understand its significance for performing a safe gallbladder removal. Using rounds of assessment with experts, laypersons and crowd-workers we developed an educational video with improving comprehension after each round of revision. We demonstrate that the development of a multimedia educational tool to educate learners of various backgrounds is feasible using an iterative review process that incorporates the input of experts and crowd sourcing. When planning the development of an educational tutorial, a step-wise approach as described herein should be considered.

**Summary Sentence:** A multimedia educational tutorial can be developed using a step-wise, iterative approach to teach learners how to assess the critical view of safety in laparoscopic cholecystectomy.

**Educating Learners How to Assess the Critical View of Safety**

Educating learners of myriad backgrounds and with variable health literacy is a challenging task. Patient education and patient safety are both burgeoning areas of focus in healthcare. Surgeons educate patients and their families about complex surgical disease, operative technique, expectations, risks, and follow up on a daily basis. This requires tremendous time and effort and is often repetitive in the clinical setting. A number of professional societies have developed excellent patient education reading materials[1-2]. Videos have been adopted as alternative methods for educating patients and learners on complex medical conditions with good success[3-6]. Laparoscopic cholecystectomy is one of the most common surgical procedures performed in the United States. Thus, it was chosen as the subject of our goal to create an educational multimedia tutorial for laypersons and learners of various backgrounds. We sought to determine the feasibility of developing a multimedia educational tutorial to teach learners to assess the critical view of safety through an iterative review process involving expert surgeons, non surgeons and crowd-sourcing. We intended to develop a tutorial that would meet the following learning objectives.

Learning Objectives:

1. Viewers will be able to identify the basic anatomy and physiology of the gallbladder.

2. Viewers will be able to identify the components of the critical view of safety criteria and its significance for performing a safe gallbladder removal.

**Video Development**

An outline was created by the authors to identify the essential components needed to meet the aforementioned learning objectives.

Components Identified:

1. Basic hepatobiliary anatomy

2. Gallbladder disease basics

3. Laparoscopic cholecystectomy background and importance

4. Operative steps

5. Definition and importance of the critical view of safety

6. Criteria used to rate the critical view of safety

7. Photos and video to demonstrate these concepts

The authors reviewed this outline until agreement was reached regarding content. Video and photo contributions were provided by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) Safe Cholecystectomy Task Force[7]. A PowerPoint presentation was reviewed by the authors and finalized after group consensus was reached. These slides, photos and operative video were incorporated into a video including accompanying voiceover to create Video 1.0 for review. The authors prepared the assessment questions shown in Table 1 for reviewers to answer after watching the video.

For each round of review and assessment we reviewed the proportion of correct responses for each question and used grounded theory to identify common problems raised by the free response results. Video 1.0 was reviewed by 10 anonymous, volunteer, non-surgeons. The authors reviewed the results obtained from this pilot review. We made

improvements to the video including the incorporation of additional examples to demonstrate the components of the critical view of safety and a summary at the end of the video emphasizing the three components of the critical view of safety again. Video 2.0 incorporated these improvements. Video 2.0 and the same assessment questions were then reviewed by 54 anonymous, volunteer Amazon Mechanical Turk crowd-workers. The results and feedback generated by the crowd was then used to modify the video to its final version.

**Viewer Comprehension and Next Steps**

Results from survey respondents viewing Video 1.0 and Video 2.0 are summarized in Table 2. The final video can be viewed at the following publicly available URL: https://vimeo.com/190486987/7f1e614ad9. We found that with each round of review, we identified areas for improvement based on the reviewers performance on the post-test and the written feedback they provided. We demonstrate that the development of a multimedia educational tool to educate learners of various backgrounds is feasible using an iterative review process based on the input of experts and crowd sourcing. When planning the development of an educational tutorial, one should consider this step-wise approach. We acknowledge that no testing for reliability or validity evidence was done in this process. Future work is needed to determine the reliability and validity of this method of multimedia tutorial development.

**References**

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**Table 1. Assessment tool to measure the reviewers understanding of the multimedia educational tutorial.**

1. An ideal laparoscopic cholecystectomy is:
   a. Removal of the gallbladder with a bile duct injury
   b. Removal of the gallbladder without a bile duct injury
   c. Removal of a bile duct with a gallbladder injury
   d. Removal of a bile duct without a gallbladder injury
2. Choose the 3 components of the critical view of safety:
   a. Cystic plate clearance
   b. Two structures connected to the gallbladder
   c. Exposing the common bile duct
   d. Hepatocystic triangle clearance
3. Why is achieving the critical view of safety important?
   a. It prevents bile duct injury and arterial injury
   b. It prevents bile duct injury and gallbladder injury
   c. It prevents gallbladder injury and arterial injury
   d. It prevents gallbladder injury and bile duct injury
4. Please choose one regarding the length of the video:
   a. The video was too long
   b. The video was too short
   c. The video was just right
5. What would you change about the video? (free response)
6. How confident do you feel after watching the video that you can assess the critical view of safety in a laparoscopic cholecystectomy video using the criteria provided? (Likert type scale).
   1. Not confident
   2. Somewhat confident
   3. Neutral
   4. Confident
   5. Very confident

**Table 2.** Assessment results generated by reviewers from each iteration of the video.

| | Video 1.0<br><br>*Percent Correct Responses*<br>n = 10 | Video 2.0<br><br>*Percent Correct Responses*<br>n = 54 |
|---|---|---|
| **Question 1** | 90% | 91% |
| **Question 2** | | |
| Cystic plate clearance | 90% | 98% |
| Two structures connected to the gallbladder | 70% | 94% |
| Exposing the common bile duct | 20% | 13% |
| Hepatocystic triangle clearance | 100% | 94% |
| **Question 3** | 100% | 76% |
| **Question 4**<br>*Percent reporting video length was "just right"* | 100% | 78% |
| | | |
| **Question 5**<br>*Identified Common Themes* | 1. Transitions were too fast<br>2. Provide more examples<br>3. Highlight structure as it is described | 1. Speaker was monotone<br>2. Provide more examples<br>3. Use higher quality images<br>4. Longer transitions |
| **Question 6**<br>*Percent confident or very confident* | 70% | 61% |