Video games as a method of training basic laparoscopic skills

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Abstract

Introduction

The use of video games has been proposed as an alternative to shorten the learning curve of basic laparoscopic skills. However, it is not yet clar how useful this practice is.

Methods

We searched in Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others. We extracted data from the systematic reviews, reanalyzed data of primary studies, conducted a meta-analysis and generated a summary of findings table using the GRADE approach.

Results and conclusions

We identified three systematic reviews including eight primary studies, of which four were randomized trials. We concluded video games training could help shorten the learning curve of basic laparoscopic visuospatial skills measured in a virtual platform, but the certainty of the available evidence is low.

Problem

Both reduced training time with living patients and rapid technological progress have changed surgical training in recent years. New forms of training have been implemented, such as of simulators or virtual reality exercises, especially in the field of minimally invasive surgery. The practice of video games could help acquire surgical skills, since it involves fine motor skills and familiarity with the use of 2D images to represent 3D realities. The possibility of training these skills through video games provides a new alternative for improvement. Despite the enthusiasm generated by these new tools, the evidence supporting its actual efficacy is a matter of debate.

It is currently unclear what is the role of the conversion of arthrodesis to total knee arthroplasty.

Key messages

- The use of video games might shorten the learning curve of basic laparoscopic skills, but the certainty of the evidence is low.

About the body of evidence for this question

What is the evidence. See evidence matrix in Epistemonikos later	We found three systematic reviews[1-3] that included eight primary studies[4-11], of which four were randomized trials[4-7]. This table and the summary in general are based on the latter, since observational studies, even though reinforcing the positive association between use of video games and performance in basic laparoscopic skills, did not increase the certainty of the existing evidence. We only included systematic reviews evaluating mass-market consoles such as Nintendo Wii, Playstation or XBox. Thus, other video game formats such as virtual reality simulators or other virtual models were excluded.
What types of patients were included*	The trials included medical students without experience in laparoscopic surgery[5,6] and novice residents of surgery[4,7].
What types of interventions were included*	The type of intervention used in all trials consisted of training with popular video games for a certain period of time. Three trials[4,6,7] measured the acquisition of basic laparoscopic skills with video games using a laparoscopic simulator and one trial[5] used an animal model. The average duration of game sessions was of 25-30 minutes per day. All trials compared against non-use of video games as a form of training, so in that period the control group did not practice with any method.
What types of outcomes were measured	Each trial used a different method for measuring basic laparoscopic skills pre- and post-training with video games, both in virtual simulators or in animal models. In the different trials, follow-up was one[6], two[5], or five weeks[4,7].

* The information about primary studies is extracted from the systematic reviews identified, unless otherwise specified.

Methods

To answer the question, we used Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others, to identify systematic reviews and their included primary studies. We extracted data from the identified reviews and reanalyzed data from primary studies included in those reviews. With this information, we generated a structured summary denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos) using a pre-established format, which includes key messages, a summary of the body of evidence (presented as an evidence matrix in Epistemonikos), meta-analysis of the total of studies when it is possible, a summary of findings table following the GRADE approach and a table of other considerations for decision-making.

Summary of Findings

The information on the effect of video games as training for basic laparoscopic surgical skills is based on four randomized trials involving 99 surgeons or students[4,5,6,7].

All trials reported laparoscopic skills, but none of the reviews presented data that could be re-analyzed or pooled in a meta-analysis, so the conclusions are presented as they were reported by the systematic reviews identified.

The summary of findings is as follows:

- The use of video games might improve basic laparoscopic skills in professionals or students in training, but the certainty of the evidence is low.

Video games for training basic laparoscopic skills

Patients People in laparoscopic surgery training
Intervention Video game practice
Comparison No practice of video games

Outcome	Effect	Certainty of evidence (GRADE)
Basic laparoscopic skills	Three trials [4],[6],[7] reported an increase in laparoscopic basic visuospatial ability and one [5] found no effect.	⨁⨁◯◯[1,2] Low

GRADE: Evidence grades of the GRADE Working Group (see later).

[1] The certainty of the evidence was downgraded in one level for inconsistency, since different trials reached different conclusions.
[2] The certainty of the evidence was downgraded in one level for risk of bias, since most trials were not blinded and it is not clear whether random sequence generation and concealment were appropriate.

Follow the link to access the interactive version of this table (Interactive Summary of Findings – iSoF)

About the certainty of the evidence (GRADE)*

⊕⊕⊕⊕
High: This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.

⊕⊕⊕◯
Moderate: This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate.

⊕⊕◯◯
Low: This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.

⊕◯◯◯
Very low: This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.

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* This concept is also called 'quality of the evidence' or 'confidence in effect estimates'.

† Substantially different = a large enough difference that it might affect a decision

Other considerations for decision-making

To whom this evidence does and does not apply

To whom this evidence does and does not apply The evidence presented in this summary is broadly applicable to those who are in training of basic laparoscopic surgical skills. It is possible that in surgeons with more experience or training, the effect might be less or none.

It does not apply to people training basic laparoscopic skills by using other types of video games (virtual reality, laparoscopic simulation).

About the outcomes included in this summary

The selected outcomes are those considered critical for decision making, according to the opinion of the authors of the summary, which coincide, in general, with those presented in the systematic reviews identified.

Balance between benefits and risks, and certainty of the evidence

The risk/ benefit balance could be slightly favorable for video games, since it is an intervention without major known adverse effects and could have benefits in the initial stage of learning basic laparoscopic skills. However, the level of certainty is low.

Resource considerations

The cost of this intervention is relatively high, which is particularly important if students or institutions have to acquire the consoles.

As an addition to the training of basic laparoscopic skills of students, it might be estimated as having a slight positive cost/ benefit balance, but the evidence is too limited to be certain.

What would patients and their doctors think about this intervention

Faced with the evidence presented in this summary, students who want to practice basic laparoscopic skills may be inclined to supplement their training with the use of video games. The limitation on the evidence-base might influence the decision, especially in cases where there are costs associated with the implementation of this intervention.

Differences between this summary and other sources

This summary reached to similar conclusion than most systematic reviews identified, which are cautious due to the limitations of the existing evidence.

No international guidelines making recommendations about this question were found.

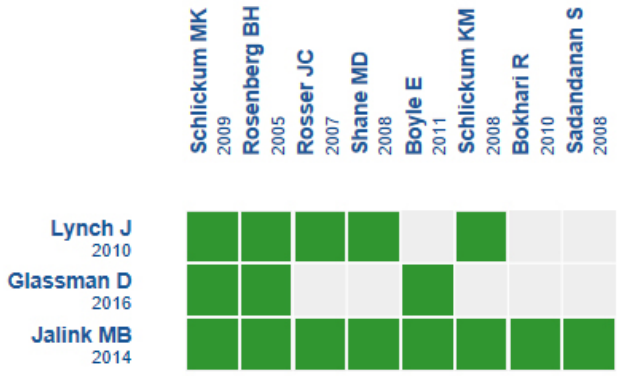
Could this evidence change in the future?

The probability that future research changes the conclusions of this summary is high, due to the low certainty of the evidence.

We did not identify ongoing trials evaluating this question in the International Clinical Trials Registry Platform of the World Health Organization, nor systematic reviews in development in the PROSPERO platform.

How we conducted this summary

Using automated and collaborative means, we compiled all the relevant evidence for the question of interest and we present it as a matrix of evidence.



An evidence matrix is a table that compares systematic reviews that answer the same question.
Rows represent systematic reviews, and columns show primary studies.
The boxes in green correspond to studies included in the respective revisions.
The system automatically detects new systematic reviews including any of the primary studies in the matrix, which will be added if they actually answer the same question.

Follow the link to access the **interactive version:** Video games as a method of training basic laparoscopic skills.

Notes

The upper portion of the matrix of evidence will display a warning of "new evidence" if new systematic reviews are published after the publication of this summary. Even though the project considers the periodical update of these summaries, users are invited to comment in *Medwave* or to contact the authors through email if they find new evidence and the summary should be updated earlier.

After creating an account in Epistemonikos, users will be able to save the matrixes and to receive automated notifications any time new evidence potentially relevant for the question appears.

This article is part of the Epistemonikos Evidence Synthesis project. It is elaborated with a pre-established methodology, following rigorous methodological standards and internal peer review process. Each of these articles corresponds to a summary, denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos), whose main objective is to synthesize the body of evidence for a specific question, with a friendly format to clinical professionals. Its main resources are based on the evidence matrix of Epistemonikos and analysis of results using GRADE methodology. Further details of the methods for developing this FRISBEE are described here (http://dx.doi.org/10.5867/medwave.2014.06.5997)

Epistemonikos foundation is a non-for-profit organization aiming to bring information closer to health decision-makers with technology. Its main development is Epistemonikos database

www.epistemonikos.org.

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