

Decision-oriented HTA for comparing Three-Dimensional (3D)/Two-Dimensional (2D) laparoscopic display systems in a variety of pediatric surgical procedures

ABSTRACT

Laparoscopic procedures have become increasingly popular. The use of 3-dimensional (3D) vision might aid in performing laparoscopic procedures. The aim of the study is to show the main results of applying the “Decision-oriented Health Technology Assessment” (doHTA) method for the assessment of 3D laparoscopic system compared to conventional two-dimensional (2D) laparoscopic system to support the decision-making process about the choice to adopt the new technology in the Hospital.

DoHTA is a new implementation of the EUnetHTA Core Model®, which integrates the Multi-Criteria Decision Analysis (MCDA) using the Analytic Hierarchy Process (AHP). A decision tree covering all the relevant assessment aspects of 3D laparoscopic systems has been derived and weighted by means of pairwise comparisons. Subsequently, another pairwise comparison list was set up to compare both alternative technologies with respect to every lowest indicator.

DoHTA results have quantitatively shown how 3D laparoscopic system appears to be as safe as 2D laparoscopic system in many surgical procedures and how it seems to offer many benefits for surgeons, such as reduced eyestrain, headaches, or other side effects than 2D vision. 3D system is also suitable in reducing the mean error rate, also thanks to the stereoscopic depth perception, that is lost in 2D vision. From the technical perspective, the analysis has indicated the reduction in median instrument path length, an enhancement of median motion smoothness, and the decrease in grasper frequency with the 3D display. However, the comparative cost-analysis has pointed out that 3D procedure cost was slightly higher than its comparator.

Based on the appreciation of such results, especially taking into account the positive technical and clinical features, we conclude that 3D system may be a good alternative to 2D system. Indeed, the doHTA results have led to a confident decision to implement 3D laparoscopic system in the hospital.

Keywords: Health Technology Assessment, doHTA, three-dimensional (3D) laparoscopic system

1. Introduction

Videolaparoscopy born as a diagnostic examination to view organs and tissues through the insertion into the abdominal cavity of an optical instrument called a laparoscope. This technique is nowadays used for both diagnosis and surgical treatment of diseases of intraperitoneal organs, in fields as gynecology, urology, general surgery and other

specialized surgery. Traditional, 2D, video systems for laparoscopy provide the surgeon a two-dimensional image, where information on spatial depth can be derived only from secondary spatial depth cues and experience, that eventually translates into greater complexity and longer execution time of interventions. Although the advantage of stereoscopy for surgical task efficiency has been clearly shown, there isn't yet a validated assessment and a common agreement about the advantages of 3D systems into clinical routine.

2. Hypotheses/Objectives

The purpose of the study is to gather evidence on safety, clinical efficacy, technical feasibility, cost-effectiveness of performing laparoscopic surgery comparing 3D and 2D display systems in a variety of pediatric laparoscopic procedures in order to empower decision makers to choose more knowingly between both alternatives.

3. Research Design/Methodology

The assessment of 3D display systems (in a variety of pediatric surgical procedures) was performed with the Decision-oriented HTA (DoHTA) method [1], a method that integrates the EUnetHTA CoreModel©, and Analytic Hierarchy Process (AHP). This method aims to deliver valued, contextualized and shared outputs to direct and support health care decision-making especially in the hospital. Following AHP mathematical methods, a global score is determined delivering a consequent ranking between the alternatives. Finally, sensitivity analysis was performed to test the stability of the alternatives' ranking. Indeed, this work illustrates how the sensitivity analysis could improve decision makers' knowledge and drive them towards the best performing alternative.

4. Limitations

The method presents the possibility of bias due to selection of experts. To overcome such issue, it is essential to involve in the assessment all those professionals representing hospital sectors potentially affected by the implementation of the new technology.

5. Conclusions

DoHTA results of 3D system have highlighted the most relevant characteristics of 3D system compared to conventional 2D system, hence reporting the potential benefits and challenges of this new technology as well as the potential implications of incorporating this system into surgical practice.

Moreover, sensitivity analysis has also confirmed that the doHTA results associated to the best technology (3D laparoscopic system) are robust; this has led to a confident decision for recommending it in the hospital.

6. Key References

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