

Virtual Reality Video Promotes Advance Care Planning Effectiveness

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Abstract

Introduction: In 2019, the Patient Autonomy Act has gone into effect, allowing Taiwanese citizens to establish an advance decision(AD) with legal effect. In an effort to secure more realistic and accurate perception of patients as the basis for them to explore their values, a VR video was developed to supplement the traditional way of decision making before advance care planning(ACP). **Methods:** Participants were asked to complete pre-test questionnaires and were then asked to read a handout with information about life-sustaining treatment and the legal process of making an effective AD. Participants then viewed a six-minute 360-degree VR video on a portable VR headset with a smartphone inside to play it and then completed the post-test questionnaire followed by feedback on the help of the VR. **Results:** Of the 120 participants, 71.1% had heard about of AD. The increased percentage of the certainty of their preferences for the five kinds of life-sustaining treatments before and after participants read the handout and viewed the VR video was noted. **Conclusion and Discussion:** The decrease in the number of participants who couldn't make decision indicates indicate that VR video may be helpful for users to make decision and clarify users' preference. According to feedback of VR video, highly agreement also lied in its help of equipping users with better understanding of medical scenarios and it is a good decision aid tool for preparing our users before ACP.

Introduction

In January 2019, the Patient Autonomy Act of Taiwan (hereafter as "the Act"), the first of its kind in Asia, has officially gone into effect, allowing Taiwanese citizens to establish an advance decision (hereafter as "AD") with legal effect. An AD enables someone, while still capable, to refuse specified medical treatment for a time in the future when they may lack the capacity to consent to or refuse medical treatment¹. According to the Act, advance care planning (hereafter as "ACP"), consultation with the medical team is request by law before establishing a formal AD aims to ensure the wishes, values, and preferences of a patient about future care and treatment be respect when they lose capacity^{2 3}.

Being one of the seven trial hospitals entrusted by Ministry of Health and Welfare since the Act was passed at the end of 2015, our hospital (a medical center at southern Taiwan) had completed about one hundred ACP cases during the trial period, with observation that our citizens had strong desire of self-determination in end-of-life medical decision but equipping insufficient knowledge of medical treatments, clinical scenarios, life education and legal literacy. There is a great deal of clinical knowledge and legal terms that have to be explained and presented in a way that general public can understand before the ACP clinic. In the past, the medical options are typically written on the handout forms provided for patients prior to the clinic and only short conversations between medical teams and patients before patients make their choices. However, the imagination of medical treatments and future disease status merely based on words in the reading materials and verbal communication are insufficient for patients to truly clarify their values for end-of-life decision. To better this situation, several video decision aids have been introduced to advance care planning to improve the accuracy and certainty of end-of-life decision making and have been confirmed valuable on helping patients increasing their knowledge of medical

treatments and their imagination of diminishing state of health by presenting clinical scenarios for patients in a visual way, as well as allowing patients to clarify their values with more certainty on their medical decisions^{4 5 6 7}.

Video decision aid enables patients to be more informed and confident about their medical decision making by presenting visual images. In an effort to secure more realistic and accurate perception of patients as the basis for them to explore their values and preferences for end of life treatment, a VR video was developed by our team in 2017, to supplement the traditional way of decision making before ACP outpatient clinic. Virtual reality is a computer technology that providing users with an experience taking place within simulated and immersive environments, which are very close to the real world. The lifelike environment of virtual reality allows more realistic participation of users with the potential to facilitate emotional responses⁸. The impact of emotion in decision making is recognized^{9 10}. With the simulated environment created by VR, it is possibly easier for users to understand the scene of life-sustaining treatments and to arouse vicarious emotion of users, which will make their decision making more accord with their true values. Currently, the VR technology has been recognized by several studies as an effective tool in therapy for rehabilitation, clinical surgical training, pain management and diagnostic tool in clinical medicine^{11 12 13 14 15 16}. However, none of video decision aid for ACP is designed with VR technology at present. This research aims to apply VR video as a patient decision aid for ACP to supplement the traditional handout forms based on the potential of VR technology and its previous success in medical education. In this study, we examined whether VR video can help users make end-of-life decision and clarify their values by comparing their choices for end-of-life medical treatments and collecting and their feedbacks of research experience.

Methods

PARTICIPANTS

A total of 120 participants were recruited from a convenience sample of patients and their relatives, staffs and community residents at the health promotion catchment area of three institutions. These comprised a medical center, a long-term care institution, and a community activity center in Tainan, Taiwan. Recruitment occurred between January 23, 2019 and May 10, 2019. Eligibility criteria of participants included age over twenty and capability in reading and verbal communication. Written informed consent was obtained from all eligible participants prior to the research after explanations concerning the study's purpose, methods, protection of anonymity and freedom to withdraw. Institutional Review Boards from Chi-Mei Medical Center approved all study procedures. (IRB approval number: 10710-008)

DESIGN

Participants were asked to complete written questionnaires of pre-test eliciting sociodemographic information, past experiences for medical decision-making, as well as individual preference for different kinds of treatment options when they meet the clinical conditions prescribed by the Patient Autonomy Act, namely terminal illness, irreversible coma, permanent vegetative state, severe dementia and other incurable acute and critical diseases that will be announced by the central competent authority in the future. The sociodemographic data included gender, age, and level of education. The past experiences included knowledge of advance decision(AD) and do not resuscitate(DNR), self-reported completion of DNR, experiences of caring for loved ones with terminal illness and experiences of making medical decision for them on whether to use life-sustaining treatment and artificial and hydration at that time. The treatment options consisted of five, included CPR, life-sustaining treatment, antibiotics, blood transfusion, and artificial nutrition and hydration. Participants who were unable to decide whether to use it or not when they are under specific clinical conditions, unconscious or unable to clearly express his or her wishes may choose the “uncertain” item. The questions of individual preference for treatments were set intended to observe if there is any difference on participants’ decisions after the intervention. The process of the study is shown in the diagram below. (Figure 1.)

Participants were then asked to read a handout form published by Hospice Care Foundation of Taiwan with clear information on it including the introduction of the new law and the illustration of the legal process of making an effective advance decision (AD) to help the participants to realize the fundamental right of making medical choices for themselves.

Having had the general knowledge of advance decision, participants then viewed a six-minute VR video on a portable VR headset with a smartphone inside to play it. The 360-degree VR video was filmed and developed by the team of our members of palliative care center with experts from different professional backgrounds including physicians, nurses, senior social workers, and psychologists to ensure the comprehensiveness of the presented clinical information and scenarios to participants. Technical expertise was provided by a commercial company which specialized in VR techniques. The designed video allowed participants to immerse themselves in the complete clinical process of typical end-of-life care, with the scene changed accordingly, starting from CPR to intensive care unit, followed by withdrawn life-sustaining treatment, hospice ward care and hospice home care with a first-person perspective as a patient with COPD from the beginning to the end and also displayed the soul of this patient at the end of this film to reflect the spiritual care. The displayed film features physicians, nurses, psychologists as well as relatives, so that apart from medical scenarios in different settings, the process of exploration of value and reach of consensus among family members were also displayed at the same time.

Participants then completed the post-test questionnaire. Identical questions were reassessed regarding individual preference for treatment options when they are under specific clinical conditions, unconscious or unable to clearly express his or her wishes, followed by feedback on the help of the provided decision aid on a 5-point Likert scale (ie. Strongly agree, agree, neutral, disagree, strongly disagree). The nine questions of feedback was developed on the basis of research by Hossler et al. (2011), evaluated the effect of VR video on preparing ones to open a discussion with doctors, family and others, choosing a

spokesperson, clarifying ones' value and preference regarding medical treatments, equipping ones' understanding of medical scenarios and AD as well as making end-of -life decisions. Validity of the whole questionnaire was established by using a panel of experts including two palliative doctors, one oncologist, one judge and one chair professor of Chi-Mei medical center, to review the wording, content and constructs.

Figure 1. Diagram of the research design

STATISTICAL ANALYSIS

Participants' characteristics and past experiences for medical decision-making were described using descriptive statistic with frequency distributions. Participants' feedbacks with VR based decision aid after the intervention was summarized using mean and standard deviations. All the analyses were implemented using SPSS 22, and the significance level was set at $\alpha = .05$.

Result

STUDY PARTICIPANTS

Baseline characteristics of participants are presented in Table 1. The majority was female(69.2%), age between 40 and 49 (33.3%) and highly educated(86.7% some college or higher). Approximately four-fifths of participants reported having heard of "Do Not Rescue Form" (79.2%), with 18% of them had signed a DNR permit, and over 70% of participants had heard about of "Advance Decision". (71.1%).

More than a quarter of participants(26.7%) reported having the experience of caring for loved one with terminal illness until death and were primary caregivers, while half of the participants having this experience without serving as a primary caregiver on the first line, and 23.3% were those stated having no such experience.

Among all the participants, there are 15% and 20% reported having made decision for their loved ones on whether to use life-sustaining treatment and whether to use artificial nutrition and hydration respectively.

Table 1. Baseline characteristics of participants

PREFERENCE FOR TREATMENT OPTIONS

Figure 2 illustrates the change of the percentage of individual preference for the five medical treatments respectively before and after participants read the handout and viewed the VR video.

Figure 2. Distribution of participants preferences for CPR(a), LST(b), antibiotic(c), BT(d), and ANH(e) before and after reading a handout and viewing the VR video. Abbreviations: CPR = Cardiopulmonary

Resuscitation; LST = life-sustaining treatment; BT = blood transfusion; ANH = artificial nutrition and hydration.

CPR preference

The proportion of individual preference for not to use CPR after reading the handout form and viewing the VR video increased to 76.7% from 65.8%, with fewer participants decided to use CPR and fewer participants were uncertain about whether to use CPR, constituting 8.3% and 15.0% of the total respectively.

Life-sustaining treatment preference

Participants who chose for not using life-sustaining treatment before and after the intervention made up 66.7% and 77.5%. Meanwhile, the proportion of who were uncertain after the intervention had decreased from 27.5% to 15% accordingly. However, the percentage of whom deciding to use life-sustaining treatment had a slight increase from 5.8% to 7.5% after the intervention.

Antibiotics preference

Preference for not to use antibiotics after the intervention had risen to 71.7% from 54.2%, with fewer participants decided to use it, standing at 9.2% in comparison with 18.3% before the intervention, and those who were uncertain about this decision making made up the remaining proportion, saying 27.5% and 19.2% before and after the intervention respectively.

Blood transfusion preference

Distribution of participants who chose to use and who were uncertain about whether to use blood transfusion was the same, standing 25.8% each. Decreasing percentages after the intervention were presented in both groups, with 16.7% and 15.8% respectively. The proportion of those who decided not to use blood transfusion had reached 67.5% from 48.3% after the intervention.

Artificial nutrition and hydration preference

Participants with decision of not to use artificial nutrition and hydration had risen from 57.5% to 76.7% after the intervention. The proportion of whom decided to use it and whom were uncertain had dropped from 15% to 8.3% and from 27.5% to 15% respectively after the intervention.

FEEDBACK WITH THE DECISION AID

Across the 9 items collecting feedbacks from participants' experience (where 1 = strongly disagree, 5 = strongly agree), the highest rated item was "After the intervention, you think that it increased your knowledge about advance decision(AD)" (4.41 ± 0.54); the lowest rated item was "After the intervention, you think that it helped prepare you to discuss your wishes with your family" (4.29 ± 0.56). Overall, based on the outcome of asked nine questions, the intervention was generally recognized by participants for its help of making decision. (See Figure 3.)

Figure 3. Feedback with decision aid

Conclusion And Discussion

This study provides an innovative VR video approach to assist with the prework of ACP. To our best knowledge, our study represents the first decision aid for ACP with VR technology.

When facing with the possibility of meeting one of the five prescribed clinical conditions under the Patient Autonomy Act, before watching the VR video, approximately a quarter of participants were uncertain on the decision of whether to use or refuse life-sustaining treatments. However, figures of percentage of whom were uncertain for decision making had decreased to lower than one-fifth on each treatment options after watching the VR video. Meanwhile, preference for not using these medical treatments had the opposite trend after the videos watching. The findings of our research were consistent with previous research which aimed at enriching patient understanding of worsening health states and better informing decision making with the use of video decision aid¹⁷.

End-of-life decision making has never been an easy task for people, especially in Asia cultures where talking the issues of death and making plan of dying were taboos. To respect will of patients with terminal illness and their right on self-deciding medical treatment, the Hospice Palliative Care Ordinance of Taiwan had passed for years, with spirit of promoting hospice palliative care and dying with dignity. Therefore, we can learn from the pre-intervention questionnaire that there were almost four-fifth participants having heard about DNR order. Before watching the VR video, among the five prescribed medical treatments, participants who refused to use LST and CPR constituted the first and second largest proportion, this may be the result of effective of advocating DNR order in Taiwan in recent years because with these terms were shown in the DNR order, and were more familiar for participants in Taiwan. The Patient Autonomy Act, in addition to patients with terminal illness, extends to the subjects who have irreversible coma, permanent vegetative state, severe dementia, as well as other incurable acute and critical diseases that will be announced by the central competent authority in the future, with five clinical decisions for patients to make. Preference for not using these medical treatments had made up the largest number both in pre-intervention and post-intervention, the figures of it in all medical options kept increasing after viewing the VR video. The decrease in the number of participants who couldn't make decision indicates after watching VR video indicates that our decision aid may be helpful for users to make decision and the increase in the number of participants who couldn't make decision demonstrates

that our decision aid may help clarify users' preference and value. These results are consistent with our purpose of research and prior studies of video decision aid for ACP in patients with cancer¹⁷.

It is interesting to note that participants who decided to use LST after watching the video had a slight increase even the refusal rate also increase. The real perspective for LST and whether the participants realize the real meaning of LST should be clarified in further study.

The use of decision aids for medical decision making has been proved helpful in improving people's knowledge regarding treatment options in previous studies¹⁸. Feedbacks collected from participants on this tool was positive with highly rating, suggests that it is a useful tool for well preparing the users for ACP, insofar as study participants report being highly agreed with how this VR video help 1) prepare them to discuss with family, medical team and others, 2) make end-of-life decisions 3) choose a spokesperson 4) clarify their preferences for medical treatments and their values 5) have better understanding of medical scenarios and increased knowledge of advance decision.

The complexity of medical scenarios makes it relatively hard for ordinary people to image and to have the accordingly feeling about them. In response to this, we set a storyline for our video, the background changed from ICU to home hospice from the first-person perspective, which makes user personally on the scene to experience life-sustaining treatments, hoping that the medical scenarios and emotional responses showed in the VR Video have a chance to be more in line with reality. According to feedback of VR video, highly agreement also lied in its help of equipping users with better understanding of medical scenarios. Developing a storyline with the patient-centered shooting in ACP video has also recognized highly meaningful for patients and family members for better preparing them for a major surgery¹⁹. Besides, in the process of development, we collected professional opinions from medical staffs as well as our members of interdisciplinary team including psychologists and senior social workers based on their experience in our trial ACP cases. The way doctors spoke in the film followed the disease state with the options of hospice care progressively. At the end, we received feedback from participants that the VR video helped prepare them to discuss their wishes with their family and doctors.

Previous studies have revealed the gap between the recorded advance decision and the real wish of patients at the end of their life in the traditional way to present ACP information for patient such as verbally communicating the given scenario between medical team and patients²⁰. Advance care planning involves far more than merely establishing an AD within preference of certain treatments, factors that matter include family dynamics, emotional response and the values of patients, which were elements we emphasized in our VR film. Finally, participants reported the highest satisfaction in the helpfulness of the VR video to increase knowledge about advance decision from their feedback, which accords with our purpose of developing this decision tool, aiming at preparing users for ACP.

In response to the implementing of Patient Autonomy Act, we developed a decision aid to promoting this Act as well as preparing users to the ACP clinics. It could be of interest to carry out future projects using similar patient perspective VR scenes under different disease settings. Further qualitative study of the

users' experiences is conducting and promoting series survey of using this VR film experiences in the community is needed.

Abbreviations

ACP(advance care planning), AD(advance decision), VR(virtual reality), DNR(do not resuscitate), CPR(cardiopulmonary resuscitation), COPD(chronic obstructive pulmonary disease)

Declarations

-Ethics approval and consent to participate: Institutional Review Boards from Chi-Mei Medical Center approved all study procedures. (IRB approval number: 10710-008)

-Consent for publication: The consent form are available from the corresponding author on reasonable request.

-Availability of data and material: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

-Competing interests: Not applicable

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-Authors' contributions: The corresponding author is the main and only author

-Acknowledgements: Not applicable

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Table 1

Due to technical limitations, Table 1 is only available as a download in the supplemental files section.

Figures

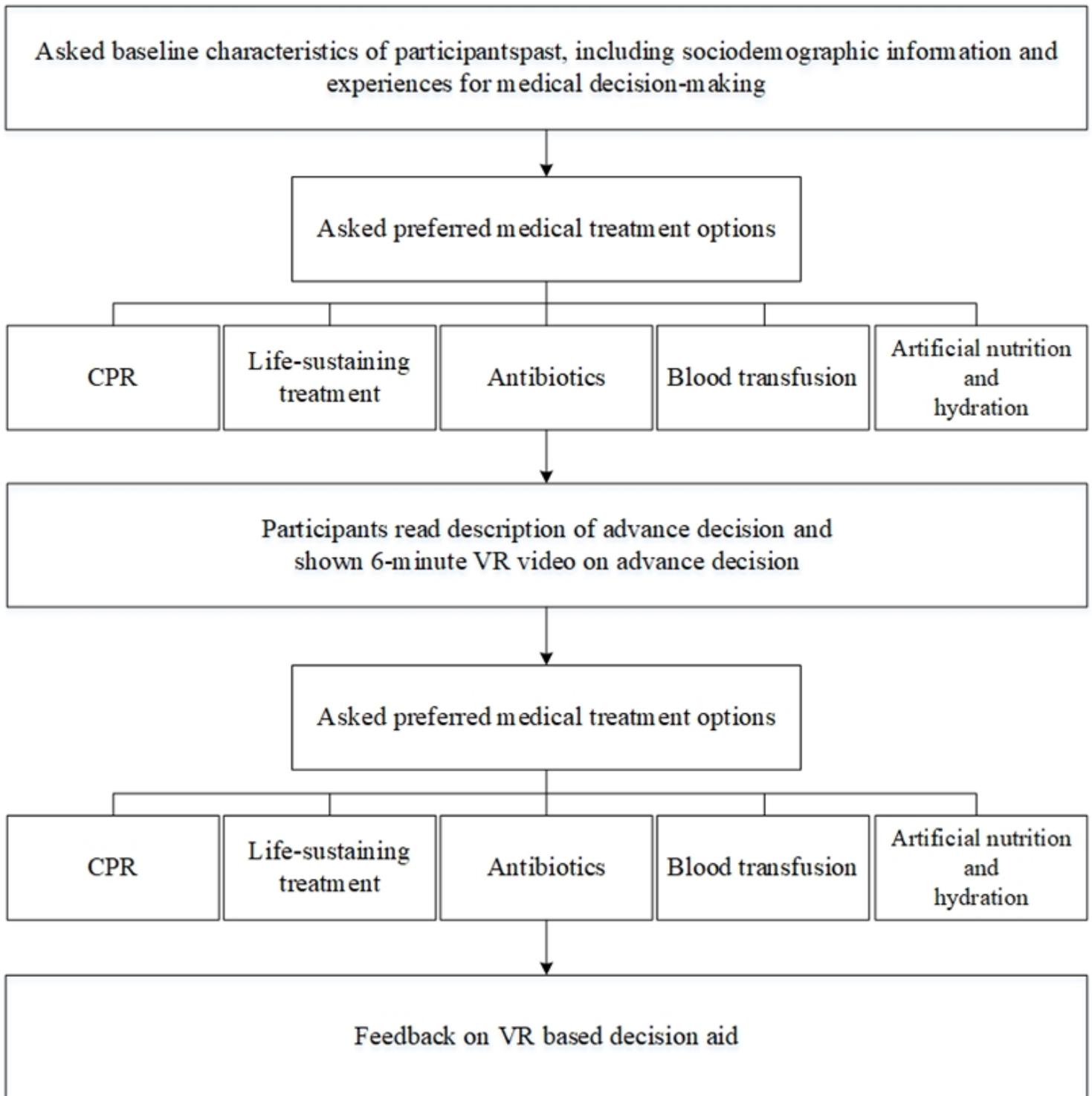


Figure 1

Figure 1 displays the flow chart of the whole research design. All answered pre-test questionnaires containing 5 choices about life-sustaining treatment options and artificial nutrition preference, read the handout and 6-minutes VR video and then answered the post-test questionnaires with identical questions on the pre-test one.

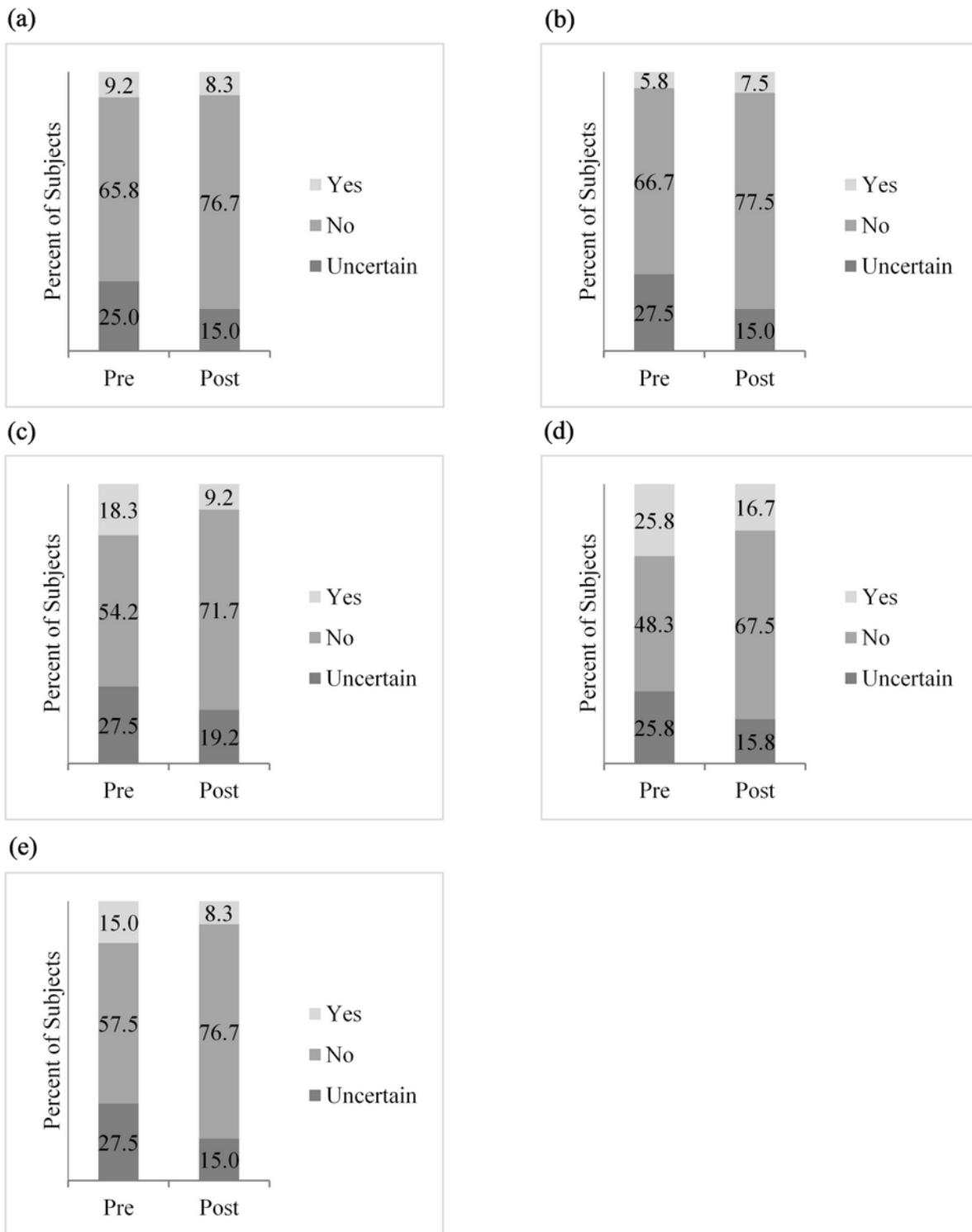


Figure 2

2. Figure 2 showed VR video help participants to choose the medical options with more certainty. Participants' characteristics and past experiences for medical decision-making were described using descriptive statistic with frequency distributions and the significance level was set at $\alpha = .05$. In the results, the percentage of certain choice about CPR, life-sustaining treatment, antibiotics, blood transfusion, artificial nutrition and hydration increased and uncertainty decreased. Besides, the

percentage of choosing NO these kinds of medical treatments when they are severe ill also increased expect the option of life-sustaining treatment.

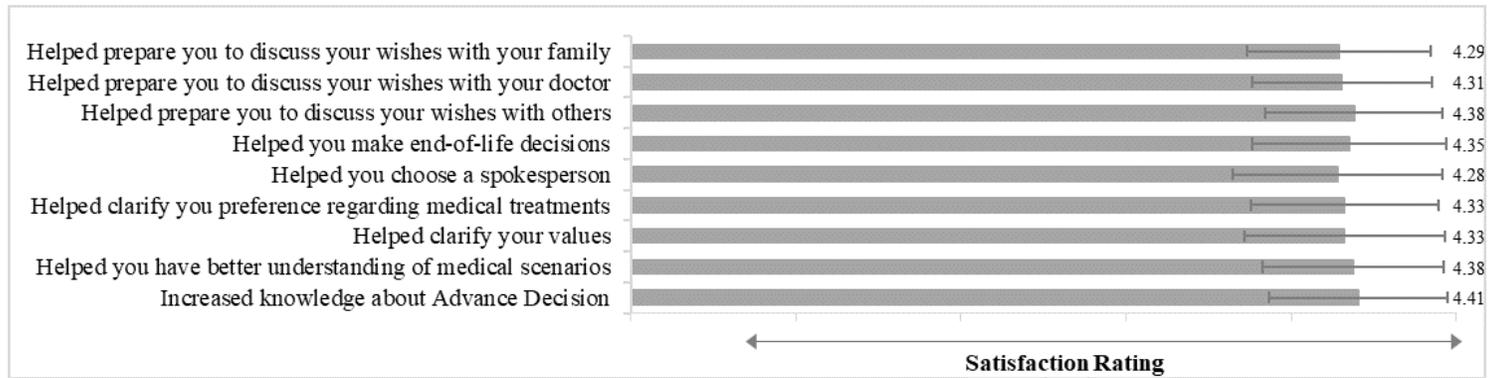


Figure 3

3. Figure 3 revealed that participants think VR video is a useful patient decision aid. The result of feedback on the help of the provided decision aid using a 5-point Likert scale (ie. Strongly agree, agree, neutral, disagree, strongly disagree). The data was summarized using mean and standard deviations and the analyses significance level was set at $\alpha = .05$. Nine questions about the tool's value, the help on discussing with others and clarifying their preference, the knowledge equipment all revealed positive change.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [supplement1.png](#)