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# Enhanced readiness for hospital discharge following the implementation of a video version of a mind mapping health education strategy

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## Abstract

The objective of this study was to investigate the effect of a video version of a mind mapping health education strategy for patients undergoing radical prostatectomy. We included patients from two surgical wards (referred to as wards 1 and 2). Routine perioperative health education was conducted in surgical ward 1. In surgical ward 2, routine perioperative health education was conducted in 2019, and a new health education strategy was implemented in 2020. A pre-post difference-in-differences design was employed to compare changes in readiness for hospital discharge and the quality of discharge teaching between the target and control groups. A total of 253 subjects were included in this study. Following implementation of the new strategy, the total score of readiness for hospital discharge increased from 155.02 to 167.37 ($p = 0.007$). The total score of the quality of discharge teaching increased from 145.97 to 156.03 ($p < 0.001$). In addition, favorable changes were observed for all metrics of readiness for hospital discharge in the target group. The implementation of the new strategy was also associated with an increased total score (18.25; 95% confidence interval (CI): 9.56–26.94; $p < 0.001$) and delivery (14.85; 95% CI: 8.94–20.76; $p < 0.001$) of the quality of discharge teaching. Thus, the implementation of our strategy can significantly improve readiness for hospital discharge and the quality of discharge teaching for patients undergoing radical prostatectomy.

## Keywords

Radical prostatectomy; Mind mapping; Patient education; Readiness for hospital discharge

## 1. Introduction

Prostate cancer has the second highest incidence rate of all male cancers worldwide. In 2020, the International Agency for Research on Cancer (IARC) reported an estimated 1.4 million new cases of prostate cancer and approximately 375,000 deaths worldwide that were attributed to prostate cancer. The incidence of prostate cancer differs between countries. The incidence rate in countries with a high human development index (HDI) is three-fold higher than that in countries with a medium and low HDI. The age-standardized incidence rates by world standard population were reported to be 37.5/100,000 and 11.3/100,000 men for countries with a high HDI and for those with a medium and low HDI, respectively. In contrast, the mortality rates of these countries are small; the age-standardized mortality rates by world standard population were reported to be 8.1/100,000 and 5.9/100,000 men, respectively [1].

Radical prostatectomy (RP) is the standard treatment for localized prostate cancer. Due to its good clinical efficacy, major guidelines recommend RP as the first-line treatment for prostate cancer in many countries, including the United States, European countries, and China [2–4]. At present, RP can be performed using open, laparoscopic or robot-assisted methods. Regardless of the method deployed, a range of postoperative complications may occur, including urinary incontinence (UI), incision infection, bleeding, urinary tract infection, deep venous thrombosis, obturator nerve injury and sexual dysfunction [5]. UI is a common adverse reaction to RP. If patients are not trained in the methods used to manage indwelling catheters or the rehabilitation of micturition function, postprostatectomy incontinence (PPI) can develop and exert serious effects on physiology, psychology and the patient's quality-of-life [6].

The readiness for hospital discharge scale (RHDS) is used to evaluate whether a patient can undergo rehabilitation after hospital discharge. This scale not only represents a prediction of the safety of the transition period after discharge but also a self-perception of whether a patient is ready for discharge. Effective discharge preparation is known to have a positive effect on patient outcomes [7]. Previous research has shown that a range of factors can influence RHDS scores, including the quality of discharge guidance, sex, marital status, educa-


  

tional level, length of hospital stay, and receiving rehabilitation instructions after discharge [8]; however, few studies have proposed intervention measures.

In this study, we developed and implemented a video version of the mind mapping health education strategy and used the difference-in-differences model to investigate the clinical effects of this strategy. We hypothesized that the video version of the mind mapping health education strategy would effectively improve the RHDS quality of discharge teaching scale (QDTS) scores of patients undergoing RP.

## 2. Methods

### 2.1 Study design

Two surgical wards were included in our study (referred to as wards 1 and 2). We used a pre-post difference-in-differences design to compare changes in the RHDS and QDTS scores following implementation of the video version of the mind mapping health education strategy. Commencing in January 2020, standardized as time zero for each surgical ward, we collected outcome data from the preceding 12 months and the subsequent 12 months.

### 2.2 Target and control groups

Subjects in both groups were continuously enrolled; that is, patients who underwent RP in ward 1 from January 2019 to December 2020 remained in the control group while patients who underwent RP in ward 2 from January 2019 to December 2020 remained in the target group. The inclusion criteria were as follows: (1) patient underwent radical resection of prostate cancer; (2) patient was $\geq$18 years-of-age; and (3) patient provided informed consent. The exclusion criteria were as follows: mental disorders, hearing impairment, visual impairment and any condition that could affect normal communication. Data were collected from patients in both groups on the day the patients were discharged.

### 2.3 Intervention

For the control group (ward 1), we conducted routine perioperative health education in during the whole study period. For the target group (ward 2), routine perioperative health education was conducted in 2019, and the video version of the mind mapping health education strategy was implemented in 2020.

Four types of routine perioperative health education were used in this study: (1) oral instructions on the day of admission, including an introduction to the environment, along with work and rest time; (2) details on preoperative precautions (such as dietary requirements and personal preparation) the day before the operation; (3) postoperative nursing instructions, including body position, details to ensure the prevention of catheter slippage, and information on dietary requirements; and (4) instructions on nursing the indwelling catheter, the usage and dosage of medicine, micturition function exercises, healthy lifestyle instructions, psychological adjustment and follow-up requirements on the day of discharge.

The video version of the mind mapping health education strategy in this study was co-developed by doctors and nurses and uploaded onto a bedside tablet computer (Fig. 1); instructions were also provided on the tablets. The implementation process consisted of the following four steps. First, preoperative education was provided on disease etiology, clinical manifestations, respiratory function exercise methods, diet and intestinal preparation. Second, postoperative education was provided on diet, body position, activities and effective sputum excretion methods. Third, self-care and rehabilitation education were provided prior to discharge, including information on daily life guidance, catheter care, medication guidance, emergency treatment, psychological relief, along with the selection and use of UI supplies. Fourth, instructions were provided on how patients could contact health professionals, the methods used to ensure the reimbursement of medical expenses, and the methods that could be used to access online nursing services. The duration of each health education session was 30 min. At the end of the education period, patients and caregivers were asked to practice home catheterization nursing care under the guidance of specialist nurses.

### 2.4 Outcome metrics

The RHDS was used to investigate the perceptions of patients with regards to their readiness for hospital discharge. The original English version of the RHDS-Adult Form was developed by Weiss and Piacentine (2006) and Weiss *et al*. [9] (2007) and translated into Chinese by Xianqiong Feng in 2016. The Cronbach's alpha reliability estimate was 0.97. Pearson's correlation coefficients between subscale factors and the total scale ranged from 0.81 to 0.97 [10]. The QDTS was used to measure educational preparation for discharge. This instrument was also developed by Weiss and Piacentine (2006) and translated into Chinese by Xianqiong Feng in 2016 [9]. The Cronbach's alpha coefficient of the Chinese version of the QDTS was 0.96; Pearson's correlation coefficients between subscale factors and the total scale ranged from 0.80 to 0.95 [11].

Our primary outcome metrics were changes in RHDS and QDTS scores. The RHDS included total score, expected support, coping ability, knowledge and personal status. The QDTS included total score, content needed, content received and delivery.

### 2.5 Statistical analysis

Data are presented as numbers and percentages for categorical variables while continuous data are expressed as means $\pm$ standard deviations (SDs), unless otherwise specified. Intergroup differences were compared using the Chi-squared test or Fisher's exact test for categorical variables and one-way analysis of variance (ANOVA) for continuous variables.

We employed a generalized linear model to evaluate the comparative effects of implementation on outcome metrics between the video version of the mind mapping health education strategy and normal health education. In our model, we included a pre-period *vs.* post-period indicator flag, a video version of the mind mapping health education strategy *vs.* usual health education indicator flag, and the interaction between the period and the type of health education indicators. We also adjusted for age, Gleason score, length of hospital stay,

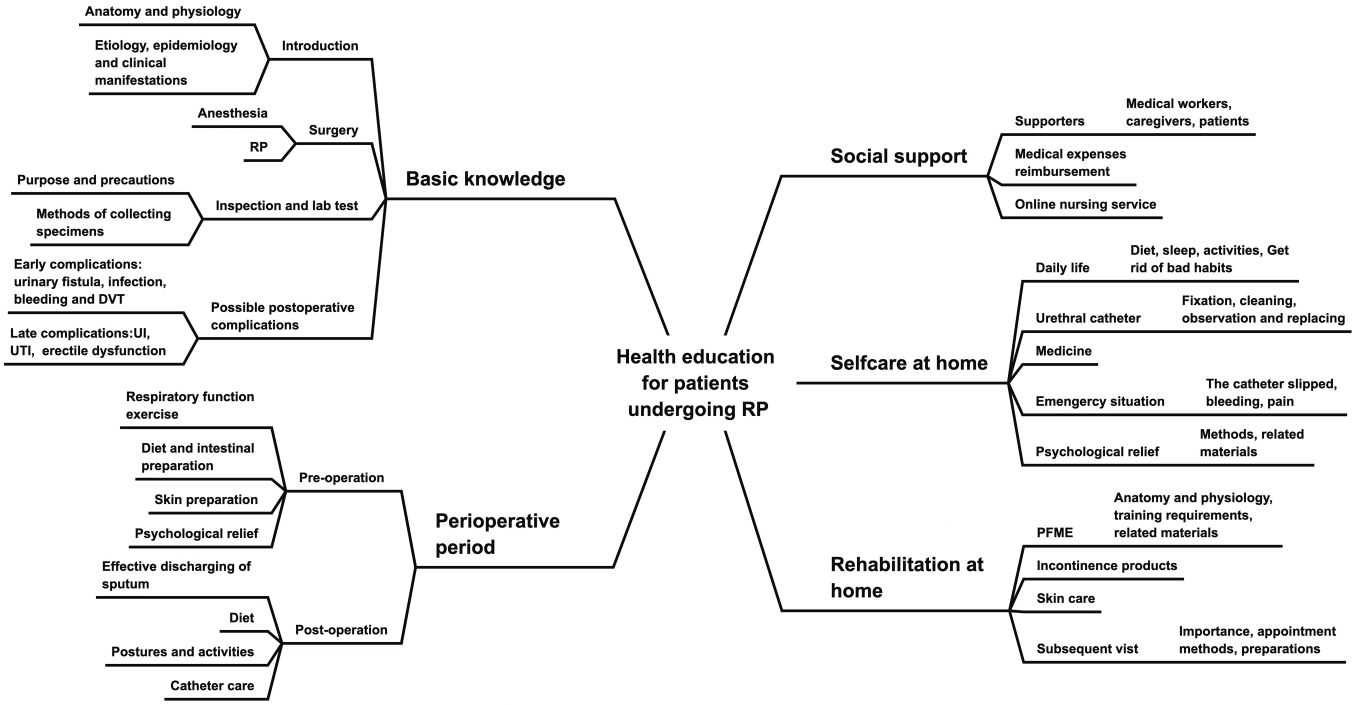


**FIGURE 1. Health education for patients undergoing RP.** RP: radical prostatectomy; UI: urinary incontinence; UTI: urinary tract infection; DVT: deep vein thrombosis; PFME: pelvic floor muscle exercises.

marital status, working and living conditions, educational level and the type of surgery and payment. $p < 0.05$ was considered statistically significant.

## 3. Results

A total of 253 subjects were included in this study. Of these, 132 patients were in the target group, and 121 patients were in the control group. Table 1 summarizes the baseline characteristics of all participants and provides some indications related to the factors that may have acted as confounding factors in the main analysis. In the control group, we did not observe any significant difference in baseline characteristics when compared between the pre-period and post-period. However, the length of hospital stays in the post-intervention period tended to be longer for patients in the target group. In addition, subjects who were admitted in the post-intervention period in this group were less likely to be married.

Most metrics in the target group demonstrated significant changes between the pre-implementation and post-implementation phases (Table 2). The total RHDS score increased from 155.02 to 167.37 ($p = 0.007$); in addition, coping ability, knowledge and personal status also improved significantly. Similarly, the total QDTS score increased from 145.97 to 156.03 ($p < 0.001$); furthermore, significant improvements were detected for content needed, content received and content delivery. In comparison, we did not observe any significant changes in RHDS or QDTS scores when compared between the pre-implementation and post-implementation phases in the control group.

As shown in Table 3, we identified favorable changes for all metrics of the RHDS in the target group when compared with the control group. For example, the implementation of the video version of the mind mapping health education strategy was associated with an increased total RHDS score (34.43; 95% confidence interval (CI): 19.58–49.27; $p < 0.001$). In addition, the implementation of the video version of the mind mapping health education strategy was associated with an increased total score (18.25; 95% CI: 9.56–26.94; $p < 0.001$) and delivery score (14.85; 95% CI: 8.94–20.76; $p < 0.001$) on the QDTS. However, we did not identify any significant changes in the content needed or content received among our study patients.

## 4. Discussion

The incidence rate of prostate cancer ranks first in China. Research has shown that prostate cancer accounts for 3.35% of the total incidence of malignant tumors among men and for 2.1% of the mortality rate due to malignant tumors among men [12]. Following RP, patients may face a series of problems, including the improper care of urinary catheters, catheter slips, UI, incontinence dermatitis, sexual dysfunction and the requirement of daily diet or activities [13, 14]. These problems often cause patients to feel a strong sense of powerlessness and inferiority; this may affect disease prognosis [15]. Therefore, developing methods to improve the preparation of patients for discharge have been a key academic focus for some time. In the present study, we developed and implemented the video version of the mind mapping health education strategy and evaluated its effect using a pre-post difference-in-differences design. Analysis showed that the video version of the mind mapping health education strategy effectively improved the quality of preparation and guidance in patients prior to discharge.

The RHDS evaluates four aspects that determine whether

**TABLE 1. The baseline characteristics of patients in the control group and mind mapping-based health education group. Data provide some indications relating to the factors that may have acted as confounding factors in the main analysis.**

| Characteristic | Usual health education | | | Mind mapping-based health education | | |
|---|---|---|---|---|---|---|
| | Pre-period (n = 55) | Post-period (n = 66) | *p* Value | Pre-period (n = 62) | Post-period (n = 70) | *p* Value |
| Age | 69.29 ± 8.08 | 66.85 ± 6.50 | 0.068 | 67.47 ± 9.31 | 69.27 ± 6.60 | 0.198 |
| Gleason score | 6.76 ± 0.43 | 6.61 ± 0.49 | 0.066 | 7.65 ± 1.24 | 7.84 ± 1.11 | 0.336 |
| Length of hospital stay | 12.05 ± 4.64 | 11.55 ± 3.32 | 0.484 | 11.15 ± 4.42 | 13.17 ± 4.16 | 0.008 |
| Marital status | | | | | | |
| Married | 45 (81.80) | 55 (83.30) | 0.656 | 56 (90.30) | 52 (74.30) | 0.045 |
| Divorced | 1 (1.80) | 3 (4.50) | | 1 (1.60) | 7 (10.00) | |
| Widowed | 9 (16.40) | 8 (12.10) | | 5 (8.10) | 11 (15.70) | |
| Living condition | | | | | | |
| Alone | 4 (7.30) | 10 (15.20) | 0.113 | 4 (6.50) | 11 (15.70) | 0.419 |
| With offspring | 14 (25.50) | 23 (34.80) | | 23 (37.10) | 20 (28.60) | |
| With spouse | 6 (10.90) | 1 (1.50) | | 3 (4.80) | 7 (10.00) | |
| With spouse and offspring | 31 (56.40) | 32 (48.50) | | 32 (51.60) | 32 (45.70) | |
| Education level (yr) | | | | | | |
| ≤6 | 12 (21.80) | 11 (16.70) | 0.181 | 13 (21.00) | 10 (14.30) | 0.184 |
| 7–12 | 31 (56.40) | 33 (50.00) | | 31 (50.00) | 33 (47.10) | |
| ≥12 | 12 (21.80) | 22 (33.30) | | 18 (29.00) | 27 (38.60) | |
| Employment status | | | | | | |
| Employed | 5 (9.10) | 12 (18.20) | 0.217 | 5 (8.10) | 8 (11.40) | 0.851 |
| Retired | 45 (81.80) | 49 (74.20) | | 52 (83.90) | 55 (78.60) | |
| Other | 5 (9.10) | 5 (7.60) | | 5 (8.10) | 7 (10.00) | |
| Type of payment | | | | | | |
| Medical insurance | 30 (54.50) | 39 (59.10) | 0.441 | 32 (51.60) | 42 (60.00) | 0.265 |
| Self-payment | 25 (45.50) | 24 (36.40) | | 29 (46.80) | 28 (40.00) | |
| Other | 0 (0.00) | 3 (4.50) | | 1 (1.60) | 0 (0.00) | |
| Operation | | | | | | |
| ORP | 9 (16.40) | 5 (7.60) | 0.514 | 7 (11.30) | 4 (5.70) | 0.347 |
| LRP | 46 (83.60) | 16 (92.40) | | 55 (88.70) | 66 (94.30) | |

*ORP: open retropubic radical prostatectomy; LRP: laparoscopic radical prostatectomy.*

**TABLE 2. Outcome metrics for patients in the control group and mind mapping-based health education group. This Table shows changes in RHDS and QDTS scores between the pre-implementation and post-implementation phases.**

| Outcome Metrics | Usual health education | | | Mind mapping-based health education | | |
|---|---|---|---|---|---|---|
| | Pre-period (n = 55) | Post-period (n = 66) | *p* Value | Pre-period (n = 62) | Post-period (n = 70) | *p* Value |
| Readiness for hospital discharge | | | | | | |
| RHDS | 153.53 ± 20.94 | 152.36 ± 12.66 | 0.707 | 155.02 ± 32.15 | 167.37 ± 18.67 | 0.007 |
| Expected support | 47.40 ± 8.95 | 46.82 ± 4.81 | 0.650 | 47.13 ± 15.53 | 48.57 ± 11.02 | 0.536 |
| Coping ability | 54.93 ± 4.85 | 56.56 ± 6.67 | 0.133 | 56.34 ± 8.22 | 63.79 ± 5.99 | <0.001 |
| Knowledge | 21.16 ± 6.71 | 19.83 ± 5.13 | 0.220 | 20.84 ± 7.05 | 23.64 ± 3.58 | 0.004 |
| Personal status | 30.04 ± 7.97 | 29.15 ± 6.93 | 0.515 | 30.71 ± 5.56 | 31.37 ± 4.82 | 0.465 |
| Quality of discharge teaching | | | | | | |
| QDTS | 145.51 ± 19.00 | 144.30 ± 18.37 | 0.724 | 145.97 ± 18.12 | 156.03 ± 11.18 | <0.001 |
| Content needed | 49.09 ± 6.47 | 49.21 ± 6.87 | 0.921 | 48.47 ± 6.41 | 50.79 ± 6.04 | 0.034 |
| Content received | 43.58 ± 10.38 | 43.47 ± 10.24 | 0.953 | 43.24 ± 9.28 | 47.07 ± 7.60 | 0.010 |
| Delivery | 101.93 ± 12.22 | 100.83 ± 12.62 | 0.631 | 102.73 ± 11.39 | 108.96 ± 8.59 | <0.001 |

*RHDS: readiness for hospital discharge scale; QDTS: quality of discharge teaching scale.*

**TABLE 3. Difference-in-differences for patient outcome metrics after the implementation of mind mapping-based health education. This Table shows the changes in all RHDS metrics in the target group when compared with the control group.**

| Outcome Metrics | *β* | 95% CI | *t* | *p* Value |
|---|---|---|---|---|
| Readiness for hospital discharge | | | | |
| RHDS | 34.43 | (19.58, 49.27) | 4.57 | <0.001 |
| Expected support | 17.07 | (9.91, 24.23) | 4.70 | <0.001 |
| Coping ability | 5.03 | (0.71, 9.35) | 2.30 | 0.023 |
| Knowledge | 7.77 | (4.16, 11.38) | 4.24 | <0.001 |
| Personal status | 4.56 | (0.67, 8.45) | 2.31 | 0.022 |
| Quality of discharge teaching | | | | |
| QDTS | 18.25 | (9.56, 26.94) | 4.14 | <0.001 |
| Content needed | 1.76 | (−1.51, 5.03) | 1.06 | 0.291 |
| Content received | 3.40 | (−1.38, 8.19) | 1.40 | 0.163 |
| Delivery | 14.85 | (8.94, 20.76) | 4.95 | <0.001 |

*CI: confidence interval; RHDS: readiness for hospital discharge scale; QDTS: quality of discharge teaching scale.*

patients can make a safe transition from hospital to home following discharge: disease knowledge, personal status, coping ability after discharge, and expected support [16]. Studies have shown that health education can exert a considerable impact on a patient's readiness for discharge [8]. Min mapping is a graphics technique created by Tony Buzan that can facilitate the integration of old and new knowledge. Mind maps emphasize the understanding and relationships of ideas instead of memorization and focus, thus promoting critical thinking skills. Previous studies showed that mind mapping is effective in patients suffering from chondropathy [17]. Although conventional health education emphasizes an understanding of a disease, it ignores the comprehensive social needs of patients. In comparison, the video version of the mind mapping health education strategy provides information relating to disease knowledge, relevant skills, social support and other important details; collectively, these can provide targeted, predictable and comprehensive health guidance for patients. Furthermore, considering that patients with RP need to recover at home following discharge, in this study, we specifically developed pelvic floor muscle training materials and psychological relief materials that were embedded in the video and could be downloaded at home. Compared to conventional health education, our analysis showed that the video version of the mind mapping health education strategy improved the efficacy of health education.

Patient discharge plans and discharge guidance have always been important tasks in nursing [18]. Some previous studies have shown that making individualized discharge plans, evaluating patient needs, and carrying out effective and complete discharge guidance from the time of patient admission can improve the quality of discharge guidance and a patient's readiness for discharge [19, 20]. During conventional health education, patients are required to passively receive large amounts of information over a short period of time [21]. In addition, most patients with prostate cancer are elderly and differ widely in terms of their cognitive and educational levels; moreover, often, the efficiency of knowledge transmission is low. By processing words into video, the video version of the mind mapping health education strategy makes the content relating to health education more vivid and distinctive. Furthermore, combined with the hierarchical concept of mind mapping, knowledge is delivered in a more logical manner. This strategy can guide nurses to implement this process in a step-by-step manner without omitting key content. In addition, the video version of the mind mapping health education strategy is stored in an electronic tablet placed by the patient's bed; this is convenient for the nurses to conduct health education sessions, and also for the patients to learn by themselves. Considering that discharged patients require catheter care at their home following RP, nurses are especially encouraged to demonstrate catheter care practices when playing the videos. Following teaching sessions, patients or caregivers were invited to practice home catheter care using simulated teaching aids. This ensured that timely corrections could be made to ensure that the relevant skills were mastered prior to patient discharged. Our analysis showed that the total QDTS scores, guidance skills, and effect dimensions significantly improved following implementation of the video version of the mind mapping health education strategy.

This study was subject to some important limitations that need to be considered. First, we only evaluated the RHDS and QDTS prior to patient discharge. Both of these outcomes are short-term metrics. Future studies are now needed to evaluate the effect of the video version of the mind mapping health education strategy on longer-term outcomes, especially the functional recovery of patients after discharge. Second, this was not a randomized clinical trial, and the patients were not randomly allocated to the target or control group. Thus, our analyses may have been influenced by residual confounding and baseline differences. However, over a 2-year period, we successfully evaluated the implementation of the program in a real-world setting. Thus, we successfully demonstrated the feasibility of the video version of the mind mapping health education strategy for patients in future larger-scale studies.

## 5. Conclusions

Our analyses showed that the video version of the mind mapping health education strategy was convenient, logical and effective for the delivery of health education. This strategy provides us with a practical tool for undertaking health education and receiving health education information. Moreover, this strategy significantly improved the RHDS and QDTS scores prior to patient discharge.

### AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

### AUTHOR CONTRIBUTIONS

ALT and FLX—designed the research study. YHX—performed the research. YZ—provided help and advice on making videos. LD—analyzed the data. ALT, YHX and FLX—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by Ethics Review Board of Tongji University and conducted in accordance with the Declaration of Helsinki (approval number: 418). The patient data was maintained with confidentiality. Informed consent was exempted from the retrospective collection of patients' information.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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