Assessment of Patient Awareness on Disease and Treatment after Applying Web-based Application for Treatment Outcome Tracking in nAMD and DME Patients Treated with Anti-VEGF: A Non-drug Interventional Study (A Retina Track)

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Abstract

Background: Neovascular age-related macular degeneration (nAMD) and diabetic macular edema (DME) require consistent follow-up and treatment adherence, often hindered by low patient awareness. This study evaluates the Retina Track application, a web-based tool, in enhancing and sustaining patient awareness compared to conventional educational methods.

Methods: A prospective study enrolled 110 patients undergoing anti-VEGF therapy for nAMD or DME at Thammasat University Hospital from 1st September 2021 to 1st February 2022. Patients were randomized into two groups: one receiving conventional education (n = 55) and the other using Retina Track alongside conventional methods (n = 55). Patient awareness was assessed using a standardized questionnaire covering five aspects: disease name, cause, risk factors, progression, and treatment. Data were collected at baseline, post-education, and at a 3-month follow-up.

Results: Both groups improved post-education, but the Retina Track group demonstrated superior long-term awareness. Disease name awareness increased by 12.8% and 16.4% ($p = 0.0017$) in the conventional and Retina Track groups, respectively. Awareness of disease cause improved by 38.5% in the conventional group and 34.5% in the Retina Track group ($p < 0.0001$). Risk factor awareness declined by 23.1% in the conventional group at 3 months but was sustained with a 20.0% increase in the Retina Track group ($p = 0.0358$). Disease progression awareness showed a significant 21.8% increase in the Retina Track group ($p = 0.0174$), while treatment awareness, though initially higher in the conventional group, declined sharply by 25.9%, in contrast with sustained awareness in the Retina Track group.

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Conclusion: The Retina Track application significantly enhances and maintains patient awareness, particularly in areas where conventional methods falter over time. These findings highlight the value of technology-assisted interventions in chronic disease management and support further research into long-term clinical impacts.
Keywords: Retina track, Application, nAMD, DME, Disease awareness
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Introduction

Neovascular age-related macular degeneration (nAMD) and diabetic macular edema (DME) are leading causes of irreversible vision impairment and blindness worldwide (8.7% and 7%, respectively),[1] especially with the growing elderly and diabetic population.[2-4] Likewise, AMD and diabetic retinopathy (DR) were categorized as important eye diseases that caused blindness in Thailand based on the Thailand medical service profile on eye disease 2011-2014.[5] nAMD and DME are leading causes of blindness among the population over 50 years in Thailand (2%[6] and 2-3[7] respectively). These diseases lead to profound effects on quality of life (QoL) for both individuals and healthcare systems.[2-8]

The current gold standard treatment of nAMD and DME is anti-vascular endothelial growth factor (anti-VEGF) therapy which shows its effectiveness in improving visual acuity, central subfield thickness (CST) and reducing retinal fluids. Clinical trials demonstrated a golden period of 3 monthly loading doses of anti-VEGF treatment, which is the period that consecutive treatment will provide the most benefit on both functional and anatomical outcomes.[2-4,8] Various studies examined the root cause for low adherence to the treatment for these diseases and found that disease awareness and knowledge plays an important role on patient compliance for treatment and follow up. Patient compliance and success rates for anti-VEGF therapy could be enhanced by raising awareness and knowledge relating to disease and management for patients and their caregivers.[9-13] Additionally, communication between patients and physicians provide a crucial advantage for improving patient's understanding in adherence and disease monitoring, which would lead to increased compliance and improved patient outcomes. For example, educating patients with wAMD about the likelihood of long-term VA maintenance might enhance the acceptance of an optimal treatment regimen.[14,15] Secondly, from the physicians' perspective, the high number of patients limits the physician from providing the patients education or explanation on disease and its management. Furthermore, unconsolidated patient charts make it difficult to capture overall treatment history and outcomes in a short period and then lead to increased time spent per patient.[16]

In recent years, technology has been increasingly incorporated into health care systems, e.g., drug dispensing systems, global monitoring equipment, telemedicine, electronic medical records and referral systems. This enables the development of tools and service systems for communicating between patients and healthcare providers. Technology can be used to assist in disease prevention, diagnosis, treatment, health check-up, and health management, including knowledge dissemination to target population.[17,18] The World Health Organization (WHO) calls "the use of information and communication technologies (ICT) for health" as "eHealth."[19] One of eHealth branch is "mHealth" or mobile health, which is defined as "medical and public health practices supported by mobile devices such as mobile phone, patient monitoring devices, personal and digital assistants (PDAs) and other wireless devices."[20] Application development is one of the phases to advocating mHealth.

In Thailand, the importance of eHealth has also been recognized. A strategy called health 4.0 has been launched with the goal of having active, healthy citizens, and people can receive convenient and fast service with higher quality. Technology systems enable the health information collection and analysis, resulting in availability of important data for analysis.

Healthcare providers can therefore work in a more professional network, resulting in an improved quality of care and reduction in both errors and cost. Additionally, the Ministry of Public Health can analyze trends in health of various patient groups to identify the most effective treatment at the lowest cost in disease management.[21]

In 2020, according to global statistics, 4.9 billion people or 63.2% of the global population had access to internet services.[22] In Thailand, the 2020 Household Survey of the Use of Information Technology and Communications reported that 63.6 million of Thai people aged 6 years or higher had internet access via desktop computer (PC/Desktop), portable computer (Notebook/Laptop), tablet (such as iPad, Galaxy Tab) or mobile phones, etc. There are approximately 66.7 percent internet users, and the rate of use is projected to be consistently increasing.[23]

Realizing this growth in technology, the retina clinic of Thammasat University Hospital has developed a web-based application, "Retina Track", to be used in eye health care. The Retina Track will comply with the clinical dashboard principle, which is designed to provide physicians with the relevant and timely information they need to inform their patients for improving the quality of patient care. Since various chronic diseases require continuous follow up with visual acuity (VA) and anatomical outcomes, the web-based application will help to provide consolidated patient monitoring outcomes and will be a tool for improving quality of communication between physicians and patients to resolve the unmet need mentioned above.[24-27]

These web apps will also provide convenience, speed and efficiency of monitoring treatment for providers as well as for patients to be equipped with increased disease awareness.[28]

Retina Track application layout will be made in two parts, namely the part for the provider (doctors and nurses) and the part for the service recipients (patients). The providers can input the treatment outcomes into the system, meanwhile the service recipients can read the consolidated treatment outcomes and information of the next follow-up only.

Treatment data were presented in a graph showing comparisons including VA, optical coherence tomography (OCT) result, intervention-surgery, anti VEGF intravitreal injection (IVT), and laser. The pilot application is planned for nAMD and DME. To the best of our knowledge, only few applications are currently available in eye health care, with limited use, in Thailand.

This study aims to assess the effects of this web-based application on patient awareness on disease and treatment using a patient awareness questionnaire which consists of questions on disease, cause of disease, risk factor, disease progression and treatment.[29-31] The results from this study would be useful for further development and implementation of a web-based application in real practice. A web-based application like Retina Track is expected to address the unmet need in nAMD and DME management, especially in the aspects of physician-patient communication and patient's disease awareness, and leads to improved treatment outcomes.

Methods

Study Design

In this single-site prospective study, the study intervention which is an additional tool for patients education (Retina Track application) will be applied in one arm (i.e., arm 2: Retina Track arm). Primary objective is to compare patient awareness score change after receiving two consecutive education sessions with a conventional approach versus education with additional content via the Retina Track application. The primary endpoint is the difference of mean patient awareness score change before (at baseline) and after receiving two consecutive disease management education sessions (at first follow-up visit) with conventional approach (arm 1) and with added on content on Retina Track application (arm 2). Secondary objective is to compare patient

awareness score change after receiving an education session with conventional approach versus the education with added on content on Retina Track application at index date. Secondary endpoint is the difference of mean patient awareness score change before (at baseline) and after receiving a disease management education session with conventional approach (arm 1) and with content on Retina Track application (arm 2) at index date. Overall, the study does not impose a therapy protocol, diagnostic/therapeutic procedure, or a visit schedule of the participants. All parameters collected in this study are a part of routine monitoring at the study site. Data is entered into the study database through relevant electronic case record forms.

The index date is defined as the date that patients receive their first introduction to the Retina Track application. Baseline defined as timepoint before receiving an education session at index date. The first follow-up visit generally takes around 1-3 months from the index date.

After obtaining EC approval from the study site, patients with anti-VEGF treatment visit for nAMD or DME were fully informed and invited to participate in the study. The date the patients receive first introduction of the Retina Track application will be considered as an index date for each patient.

Enrolled patients will be randomized 1:1 to two arms (arm 1: conventional approach and arm 2: Retina Track approach). Simple randomization using odd and even numbers will be applied. Randomization will be performed using Microsoft Excel 2022 by generating a column of random numbers using the formula. These random numbers will then be sorted in ascending order, and participants will be assigned to arm 1 (conventional approach) if their order corresponds to an odd number and to arm 2 (Retina Track approach) if their order corresponds to an even number. This method ensures an unbiased allocation process. Patients in both arms will be educated by retina specialists or retina nurses on their disease, progression, treatment and outcomes. All counselors will be trained for the same instruction on educational checklists and educational tools.

Arm 1

Patients will be educated with the materials routinely used in the clinic which include Amsler grid, disease knowledge pamphlet, eye anatomy model, etc., at index date and at first follow-up visit.

Arm 2

The Retinal Track group will participate in education sessions utilizing the Retina Track dashboard on the index date and during the first follow-up visit. Each patient will be introduced to Retina Track by a healthcare provider, who will also review the user manual with them as outlined below.

What is the objective of Retina Track?

Retina Track is a consolidated medical record, which can be accessed by both healthcare provider and patient. The objective is to provide consolidated treatment outcomes and information of the next follow-up for patients in order to enhance understanding of disease progression, treatment and treatment outcomes.

What is Retina Track?

Retina Track is a web-based dashboard showing consolidated medical records. The Retina Track application layout will be made in two parts, namely the part for the healthcare provider (doctors and nurses) and another part for healthcare recipients (patients). The healthcare providers can input the treatment outcomes into the system, meanwhile the patients can read the consolidated treatment outcomes and information of the next follow-up only. Treatment data will be presented in a graph showing comparisons including visual acuity (VA), optical coherence tomography (OCT) result, intervention-surgery, anti VEGF intravitreal injection (IVT), and laser treatments. [The picture of Retina Track will be shown to patients.]

How can patients understand each element of the Retina Track?

Healthcare provider will explain each element as below:

- What is VA and how does it reflect treatment outcome?
- What are OCT parameters (central subfield thickness [CSFT] and retinal fluid) and how do they reflect treatment outcome?
- What is the treatment that patients receive and how does it help?
- What is the rationale for the next visit and how is it important?

Assessments

Patients in both arms will be interviewed by study investigators or coordinators using an electronic questionnaire as follows:

- *Patient Awareness Questionnaire:* At index date (before and after the education session) and then at first follow-up visits (after the education session)

Questionnaires

Questionnaire was developed using the questions from relevant questionnaires used in previous studies from other countries. The details of each questionnaire are described below.

The questionnaire will undergo linguistic validation, including independent translation from English into Thai by a bilingual Thai native speaker and a bilingual native English speaker. After that, the Thai translated version will be independently back translated into English by another bilingual Thai native speaker and a bilingual native English speaker as well. All translators also work as ophthalmologists. After that, the draft Thai versions will be further validated with content validity by three retina specialists, and face validity by five patients. This process is aimed to ensure equivalence with the original versions and the understanding of both questionnaires among healthcare providers and patients.

Patient Awareness Questionnaire

This questionnaire will assess patients' awareness of the disease and its treatment. It has been adapted from previous studies on patient awareness and knowledge of nAMD and DME, including their treatments, to identify key aspects necessary for assessment. The questionnaire consists of 5 major items, which are considered essential information for nAMD and DME patients: disease name, cause of the disease, risk factors, disease progression, and treatment. The response options are "correct" and "incorrect," with equal scores (1 point) assigned to all questions. The total score from the questionnaire ranges from 0 to 5 (Appendix 1).

Population

Consecutive patients in whom anti-VEGF therapy are prescribed for nAMD or DME indication at the study site.

Inclusion Criteria

- Age ≥ 18 years old male or female
- Patients receiving anti-VEGF therapy for nAMD or DME for at least 3 months* and visiting the retina clinic at Thammasat University (TU) Hospital during September 2021 to February 2022.
- Patients who can access the Retina Track application (via mobile or other electronic devices).
- Patients who are able to read the content of Retina Track application on their electronic device.

**Almost all patients will receive 3 monthly loading for anti-VEGF as stated in rationale. As a consequence, patients will receive traditional knowledge education in this period. In order to mitigate bias on knowledge baseline, this study assumes that after 3 months, patients will pass the period of knowledge induction and should have maximal knowledge level from this period.*

Exclusion Criteria

- Enrolled in other clinical studies prior to baseline or will enroll in such studies during the study period
- *Refuse to* participate *in* this study or to use the application
- Cannot access the application
- Cannot come for follow up during the next 3 months
- Cannot read and speak Thai

Sample Size Estimation

This study aims to include patients fulfilling the selection criteria at the study hospital between 1 September 2021 and 1 February 2022, and the number of patients is estimated as 110.

As the primary endpoint is the difference in mean score change between the two arms, and the difference of one point is considered significant, the sample size is estimated as follows.

This study will require 48 patients per arm to achieve a power of 90% and a level of significance of 5% (two sided). In order to account for potential missing data or lost to follow-up (15%), the sample size is estimated as 110 (55 per group).

Data Analysis

All analyses will be performed by TU Hospital. Descriptive statistics will be used to summarize demographics, clinical characteristics, patient awareness score of healthcare provider and patients, and number of patient access into Retina Track application. Continuous data will be presented as mean (standard deviation, SD), median (interquartile range, IQR), minimum and maximum, and/or 95% CI of the mean, as appropriate. Categorical data will be presented as number (percentage). Factors potentially affecting the primary endpoint, e.g., patient demographics, will be also descriptively analyzed for their effects on the primary endpoint.

Comparisons of data between the two arms will be determined by Pearson chi- squared or Fisher's exact test for categorical data, and independent t-test or Mann-Whitney U test for continuous data, depending on normality.

Correlation analysis will be performed using Pearson's correlation or Spearman's rank correlation, depending on normality.

The significance level will be set at 0.05 for all analyses, unless otherwise indicated.

Results

The Patient Awareness Questionnaire consists of 5 items which are considered necessary information for nAMD and DME patients, i.e., disease name, cause of disease, risk factors, disease progression and treatment. The response options include "correct" and "incorrect". Equal score (1 point) will be given to all questions and then the range of total score from this questionnaire is 0-5.

Table 1: Comparative Study of Pre- and Post-Knowledge Acquisition and 3-Month Follow-Up Data of Respondents Who Subscribed and Did Not Subscribe to the Retina Track Application, Categorized by Disease Name Awarenes

Variable	Disease Name Awareness			Difference Before-After (P-value)	Difference Before-3 m (P-value)	Difference After-3 m (P-value)
	Before Knowledge Acquisition (percentage)	After Knowledge Acquisition (percentage)	3-Month Follow-Up (percentage)			
Subscribed to Retina Track Application	83.6	96.4	100.0	12.8 (0.0261*)	16.4 (0.0017*)	3.6 (0.1535)
Did Not Subscribe to Retina Track Application	87.2	100.0	100.0	12.8 (0.0208*)	12.8 (0.0208*)	0.0 (1.0000)

*Statistical significance set at p-value ≤ 0.05

From Table 1, in the group that subscribed to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease name awareness shows a significant increase of 12.8% after knowledge acquisition and 16.4% at the 3-month follow-up compared to before knowledge acquisition (p-value 0.0261, 0.0017, respectively). Other variables showed increases but were not statistically significant.

Table 2: Comparative Study of Pre- and Post-Knowledge Acquisition and 3-Month Follow-Up Data of Respondents Who Subscribed and Did Not Subscribe to the Retina Track Application, Categorized by Disease Cause Awareness

Variable	Disease Cause Awareness			Difference Before-After (P-value)	Difference Before-3 m (P-value)	Difference After-3 m (P-value)
	Before Knowledge Acquisition (percentage)	After Knowledge Acquisition (percentage)	3-Month Follow-Up (percentage)			
Subscribed to Retina Track Application	65.5	94.5	100.0	29.0 (< 0.0001*)	34.5 (< 0.0001*)	5.5 (0.0791)
Did Not Subscribe to Retina Track Application	61.5	100.0	97.4	38.5 (< 0.0001*)	35.9 (0.0001*)	-2.6 (0.3142)

*Statistical significance set at p-value ≤ 0.05

From Table 2, in the group that subscribed to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease cause awareness shows a significant increase of 29.0% after knowledge acquisition and 34.5% at the 3-month follow-up compared to before knowledge acquisition (p-value < 0.0001, < 0.0001, respectively). Other variables showed increases but were not statistically significant.

In the group that did not subscribe to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease cause awareness shows a significant increase of 38.5% after knowledge acquisition and 35.9% at the 3-month follow-up compared to before knowledge acquisition (p-value < 0.0001, 0.0001, respectively). Other variables showed decreases but were not statistically significant.

Table 3: Comparative Study of Pre- and Post-Knowledge Acquisition and 3-Month Follow-Up Data of Respondents Who Subscribed and Did Not Subscribe to the Retina Track Application, Categorized by Disease Risk Factor Awareness

Variable	Disease Risk Factor Awareness			Difference Before-After (P-value)	Difference Before-3 m (P-value)	Difference After-3 m (P-value)
	Before Knowledge Acquisition (percentage)	After Knowledge Acquisition (percentage)	3-Month Follow-Up (percentage)			
Subscribed to Retina Track Application	38.2	56.4	58.2	18.2 (0.0562)	20.0 (0.0358*)	1.8 (0.8472)
Did Not Subscribe to Retina Track Application	56.4	82.1	59.0	25.7 (0.0142*)	2.6 (0.8187)	-23.1 (0.0254*)

*Statistical significance set at p-value ≤ 0.05

From Table 3, in the group that subscribed to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease risk factor awareness shows a significant increase of 20.0% at the 3-month follow-up compared to before knowledge acquisition (p-value 0.0358). Other variables showed increases but were not statistically significant.

In the group that did not subscribe to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease risk factor awareness shows a significant increase of 25.7% after knowledge acquisition compared to before knowledge acquisition and a significant decrease of 23.1% at the 3-month follow-up compared to after knowledge acquisition (p-value 0.0142, 0.0254, respectively). Other variables showed increases but were not statistically significant.

From Table 4, in the group that subscribed to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease progression awareness shows a significant increase of 21.8% at the 3-month follow-up compared to before knowledge acquisition (p-value 0.0174). Other variables showed increases but were not statistically significant.

In the group that did not subscribe to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by disease progression awareness shows a significant increase of 28.3% after knowledge acquisition compared to before knowledge acquisition (p-value 0.0076). Other variables showed increases and decreases but were not statistically significant.

Table 4: Comparative Study of Pre- and Post-Knowledge Acquisition and 3-Month Follow-Up Data of Respondents Who Subscribed and Did Not Subscribe to the Retina Track Application, Categorized by Disease Progression Awareness

Variable	Disease Progression Awareness			Difference Before-After (P-value)	Difference Before-3 m (P-value)	Difference After-3 m (P-value)
	Before Knowledge Acquisition (percentage)	After Knowledge Acquisition (percentage)	3-Month Follow-Up (percentage)			
Subscribed to Retina Track Application	25.5	41.8	47.3	16.3 (0.0693)	21.8 (0.0174*)	5.5 (0.5649)
Did Not Subscribe to Retina Track Application	53.8	82.1	74.4	28.3 (0.0076*)	20.6 (0.0590)	-7.7 (0.4106)

*Statistical significance set at p-value ≤ 0.05

Table 5: Comparative Study of Pre- and Post-Knowledge Acquisition and 3-Month Follow-Up Data of Respondents Who Subscribed and Did Not Subscribe to the Retina Track Application, Categorized by Treatment Awareness

Variable	Treatment Awareness			Difference Before-After (P-value)	Difference Before-3 m (P-value)	Difference After-3 m (P-value)
	Before Knowledge Acquisition (percentage)	After Knowledge Acquisition (percentage)	3-Month Follow-Up (percentage)			
Subscribed to Retina Track Application	18.2	27.3	27.3	9.1 (0.2553)	9.1 (0.2553)	0.0 (1.0000)
Did Not Subscribe to Retina Track Application	46.2	87.4	61.5	40.9 (< 0.0001*)	15.3 (0.1730)	-25.9 (0.0095*)

*Statistical significance set at p-value ≤ 0.05

From Table 5, in the group that did not subscribe to the Retina Track application, a comparison of pre- and post-knowledge acquisition and 3-month follow-up data of respondents categorized by treatment awareness shows a significant increase of 40.9% after knowledge acquisition compared to before knowledge acquisition (p-value < 0.0001). Other variables showed increases and decreases but were not statistically significant.

Adverse Events/adverse reactions

No adverse event was reported in this study.

Discussions

In an era where internet access is widespread, technology can be utilized to enhance the healthcare system by improving the delivery of care, reduction of errors and cost, in addition to making healthcare more efficient and accessible.[17,18] Many eHealth tools are becoming increasingly prevalent in public health. In Thailand, only few applications are currently available in eye health care. Patients with diseases such as nAMD and DME face challenges with treatment, as they require 3 monthly loading doses of anti-VEGF to maximize the benefits on both functional and anatomical outcomes.[2-4,8] The continuous need for injection treatments creates a burden not only for patients but also physicians in real-world settings.[9,10,16] To address these challenges, the Retina Track is a web-based application that both healthcare provider and patient can access to provide consolidated treatment outcomes and next follow-up information to improve the communication and quality of patient care.

This study aimed to assess the effects of this web-based application among patients receiving anti-VEGF therapy for nAMD or DME on their awareness of disease and treatment. Participants completed a patient awareness questionnaire adapted from previous studies, consisting of 5 aspects which are disease name, cause of disease, risk factors, disease progression and treatment.

The results demonstrated that awareness of disease name increased significantly by 12.8% after receiving education sessions in both groups that subscribed and did not subscribe to the Retina Track application. At the 3-month follow-up, both groups had 100% awareness of disease names. The Retina Track subscribing group showed a significant 16.4% increase, and 12.8% in the non-subscribing group compared to prior to the educational session. This might be due to the fact that the disease name is straightforward and easy to understand.

Correspondingly, disease-cause awareness shows a significant increase after knowledge acquisition and at 3-month follow-up compared to pre-knowledge acquisition in both groups. In contrast, the non-subscribers group

experienced a slight decline in awareness of disease-cause at the 3-month follow-up after the educational session. However, this was not statistically significant, further suggesting that the sustained use of the application may maintain disease-cause awareness.

Regarding risk-factor awareness, the findings indicate an increase after receiving the educational session and a significant 20.0% increment in the Retina Track subscriber group at the 3-month follow-up compared to before the educational session. Similarly, non-subscribers showed a 25.7% increase in risk-factor awareness after knowledge acquisition. Interestingly, the non-subscribers group exhibited a significant 23.1% decrease in awareness at the 3-month follow-up compared to their post-knowledge acquisition. This demonstrates that the Retina Track app may provide continuous engagement and reminders, which were essential in preventing the loss of awareness seen in the non-subscriber group.

In the same way, the Retina Track application subscribers demonstrated a significant 21.8% increase in disease progression awareness at the 3-month follow-up compared to before knowledge acquisition. Non-subscribers also experienced a significant 28.3% increase in disease progression awareness after knowledge acquisition, however, this awareness diminished by the 3-month follow-up, with no significant changes. This finding suggests that the knowledge gained may not have been as durable without the continuous support provided by the Retina Track app. The app may aid in the long-term retention of information regarding disease progression, which is crucial for patients to understand their disease outcomes.

Lastly, those who subscribed to the Retina Track showed increasing treatment awareness, although it was not statistically significant. In the non-subscriber group, a significant 40.9% improvement in treatment awareness was observed after knowledge acquisition, followed by a significant decrease at the 3-month follow-up. While the non-subscriber group showed stronger gains in treatment awareness compared to the subscribing group, the subsequent decline in long term indicates that without continued engagement through an application like Retina Track, the maintenance of awareness may be more challenging.

Overall, the data demonstrate that while both groups benefited from the educational intervention, the Retina Track application played a critical role in both enhancing and maintaining disease awareness over time. It is possible that continuous exposure to the Retina Track app helped reinforce the retention among subscribers.

In terms of limitations, the study did not include a statistical comparison between two groups, making it difficult to definitively confirm whether the differences in outcomes between the group that subscribed to the Retina Track application and the group that did not are statistically significant. Without this comparative analysis, the results cannot provide conclusive evidence on the relative effectiveness of the Retina Track application compared to conventional education. Furthermore, the study does not account for potential external factors that could affect patient awareness, such as additional education or information received from healthcare providers outside of the intervention, or access to other resources like the internet or other social media sites.

Previous studies suggest that patient compliance and success rates from anti-VEGF therapy could be enhanced by raising awareness and knowledge relating to disease and management for patients and their caregivers.[11-13] Future studies could explore the long-term effects of web-based applications on patient awareness and investigate whether the improved awareness achieved through this app leads to better disease management and potentially improved long-term visual and anatomical outcomes for patients with nAMD or DME. Additionally, assessing visual acuity (VA), central subfield thickness (CST), and retinal fluids as markers of disease progression, alongside awareness retention, could provide valuable insights into the app's impact on clinical outcomes.

Conclusion

This study aimed to assess the impact of the Retina Track web-based application on patient awareness of disease and treatment in nAMD and DME patients undergoing anti-VEGF therapy. While the study presented valuable insights into the role of technology-assisted education, the absence of a direct comparison between the two arms within the results limits the ability to draw conclusive evidence regarding the relative effectiveness of the Retina Track application compared to conventional education methods. Without this comparative analysis, potential biases may be introduced, thereby affecting the reliability of the findings.

Despite these limitations, the results demonstrate that the Retina Track application significantly enhanced and maintained patient awareness, particularly in areas where conventional education methods showed a decline over time. Improvements were observed in disease name, cause, risk factors, and disease progression awareness, with statistical significance achieved in several key areas. However, the results for treatment awareness were less conclusive. The conclusion should more clearly state that while treatment awareness improved initially, this improvement was not sustained to a statistically significant level.

Additionally, minor typographical errors noted in the document, such as "accepted" instead of "excepted," should be corrected to enhance the clarity and professionalism of the final report. Addressing these issues will strengthen the overall presentation and credibility of the study's findings.

Future research should consider a more robust comparative analysis of the two arms to provide stronger evidence of the application's effectiveness. Further exploration of the long-term effects of sustained awareness on patient compliance, disease management, and visual outcomes could offer valuable insights into the broader impact of web-based educational tools in chronic disease management.

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