

## **Implementation of Mobile Applications in the Process of Monitoring Patient Compliance in the Treatment of Anemia**

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**Abstract:** This article describes the results of a study on adaptation, implementation and evaluation of the effectiveness of the mobile application "MyTherapy" in the practice of treating anemia in order to control treatment and patient compliance. Based on the more pronounced positive dynamics of ferrotherapy itself, improvement of the quality of life indicator and the indicator of adherence to treatment, it has been shown that the use of this mobile application can be a highly effective method of controlling the therapy of anemia, if used correctly.

**Key words:** anemia; compliance; control of therapy; mobile applications.

### **INTRODUCTION**

According to the UNICEF multicenter studies conducted in Uzbekistan in 2017, approximately one in seven children in the country (15.6%) suffers from anemia. At the same time, 1% of patients have a severe form of anemia. About 20.3% of women of reproductive age and 32.7% of pregnant women also had severe symptoms of anemia [1,2]. The study of patients' attitudes towards prescribed therapy and the degree of its adherence is a fairly new area of scientific research. The development of this direction is due to the large role of the paradigm of interaction between the doctor and the patient, the transition from a paternalistic model to partnership and the patient's awareness of his own active role in therapy [3,4,5,6].

Inadequate adherence to iron supplementation (RV) is a likely reason for ineffective therapy for anemia. Patient adherence, or compliance, to treatment is usually defined as the degree of patient compliance with physician prescriptions [7,8,9]. Lack of compliance is common and a problem for health systems in many countries. According to the WHO, in developed countries, only 50% of patients suffering from chronic diseases for a long time strictly follow medical recommendations, in developing countries the indicator is even lower [10,11,12].

The beginning of the third decade of the 21st century was characterized by the rapid development and spread of electronic "gadgets" in all aspects of society. In this regard, one of the most urgent areas of medicine today is the improvement of the process of diagnosis, treatment and prevention of various diseases through the introduction of special mobile applications. A huge advantage of such software is that "gadgets" (smartphones, tablets, laptops, smart watches) are in the hands of an average person, according to sociological research, for 12-16 hours a day, which determines their high potential in terms of impact on the patient.

### **PURPOSE OF THE STUDY**

Adaptation and implementation of modern mobile software applications designed to control medication intake in the treatment of patients with anemia, and assessment of their

effectiveness in improving patient compliance.

## **MATERIAL AND RESEARCH METHODS**

The study included 60 patients with moderate iron deficiency anemia (hemoglobin level 90-70 g / l). The average age of the patients was  $24.23 \pm 3.42$  years. Sex distribution: 48 women (80%) and 12 men (20%).

All patients received outpatient pancreatic treatment. The study included only patients taking RV Fe (III) (iron hydroxide polymaltosate) in order to exclude the influence of side effects from taking drugs (in the case of RV Fe (II)), which may affect the patients' compliance. During treatment, the patients included in the sample under consideration took various trade names of the pancreas Fe (III), among which Maltofer and Ferrum Lek were most often used. In addition to the pancreatic intake, the administration of ascorbic acid preparations or multivitamin complexes was prescribed.

To assess the effectiveness of the mobile application for monitoring compliance, patients were divided into 2 groups of the same age and gender ratio:

- the main group included 30 patients who were monitored for therapy compliance using the MyTherapy mobile application;
- the control group included 30 patients in whom the treatment of anemia was carried out without compliance control.

There are more than 10 medication control apps available on the Internet, the interface and functionality of which can be used to improve patient compliance in the treatment of anemia. We have chosen the application "MyTherapy". This application is distributed on the Internet and is available for free download on devices running both Android and IOS. The application has a fairly wide range of functions.

First of all, the application can be used to enter information about the drug intake, its form, frequency of administration, time of administration and duration of the course of treatment. After the introduction of the appropriate information about the time of taking the drug, a special signal will be triggered in the form of music or other sound, which will announce the time of taking the drug. When a signal appears, the application requires confirmation of the drug intake, which is important to record the fulfillment or non-fulfillment of the doctor's prescription. The daily intake of the drug is recorded and stored in the form of a report (in pdf format), which can then be printed or sent by e-mail to the attending physician.

In addition to reminders about taking medications, you can enter notifications about visiting a doctor, taking an analysis and taking any preventive measures (gymnastics, walking, etc.), registration and implementation of which will also be recorded in a special report.

In a separate section, you can enter the results of various measurements and analyzes. A separate section is devoted to checking the symptoms of the disease, which is important in monitoring the dynamics of therapy and its effectiveness.

During the study, this application was installed on smartphones or tablets of all patients with

anemia who were included in the study. After installing the mobile application, the doctor entered the names of the drugs, their dose, dosage form, time of admission and duration of therapy (3 months for all patients). Separately, the dates of repeated visits to the doctor (once a month), the dates of blood donation to determine the hemoglobin level (once a month) and the date of blood donation to determine the level of ferritin (before and after the end of the ferrotherapy course) were noted.

As a reminder, the applications included precisely those activities that are often neglected by most patients. Nevertheless, these measures are of great importance in monitoring the course of pancreatic therapy and correspond to generally accepted standards.

During therapy, all patients included in the main group weekly notified the doctor about the course of therapy by sending a report on the pancreas intake and the fulfillment of other prescriptions via the Telegram messenger. To assess the effectiveness of ferrotherapy, patients were surveyed to assess adherence to therapy using the Morisky-Green questionnaire. The FACT-An (For patients with anemia / fatigue) questionnaire was used to assess the quality of life (QOL) in patients with anemia. Also, during 3 months of observation, patients' visits to the doctor and the delivery of appropriate tests were recorded. Statistical processing of the data obtained was carried out using the statistical software package "Microsoft Excel". Data are presented as means and mean errors.

## RESULTS

Analysis of the average number of missed pancreatic appointments showed that during the first month of therapy, patients of the main group missed pancreatic intake  $6.8 \pm 2.1$  times, while at 3 months the indicator significantly improved and was  $2.4 \pm 1.8$  average. The analysis of the average number of untimely pancreatic intake during the first month was  $14.2 \pm 4.3$  times, and in the third month it was  $6.3 \pm 3.2$  times. Analysis of the average number of missed doses of vitamin preparations showed that during the first month of therapy, patients of the main group missed pancreatic intake  $12.5 \pm 3.5$  times, while at 3 months the indicator significantly improved and was  $4.4 \pm 2.6$  gaps average. Analysis of the average number of untimely intake of vitamin preparations during the first month was  $17.7 \pm 4.4$  times, and in the third month it was  $8.3 \pm 3.7$  times (tab. 1).

Table 1.

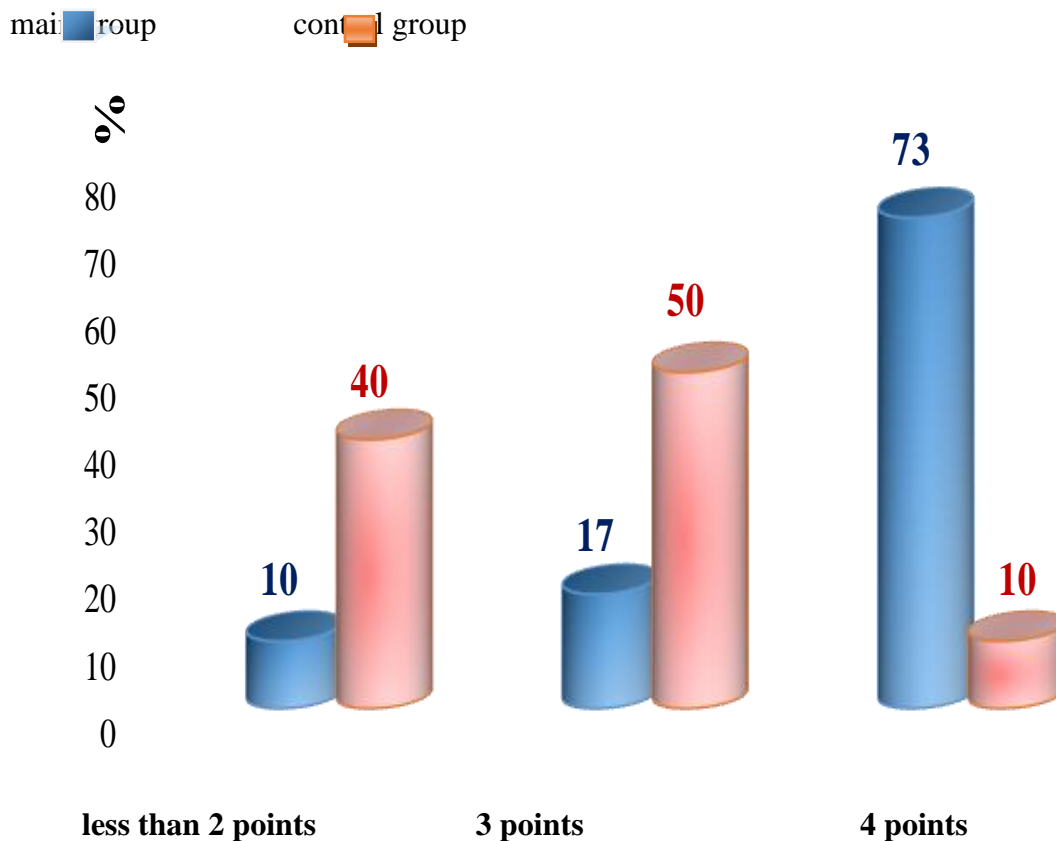
The average number of missed medications in patients of the main group according to the monthly reports "MyTherapy».

Medicines taken	Average number of missed doses of the drug		Average number of untimely drug intake	
	1 месяц	3 месяц	1 месяц	3 месяц
Iron preparations	6,8±2,1	2,4±1,8	14,2±4,3	6,3±3,2
Vitamins	12,5±3,5	4,4±2,6	17,7±4,4	8,3±3,7

Analysis of the results of assessing adherence according to the Morisky-Green scale after 3

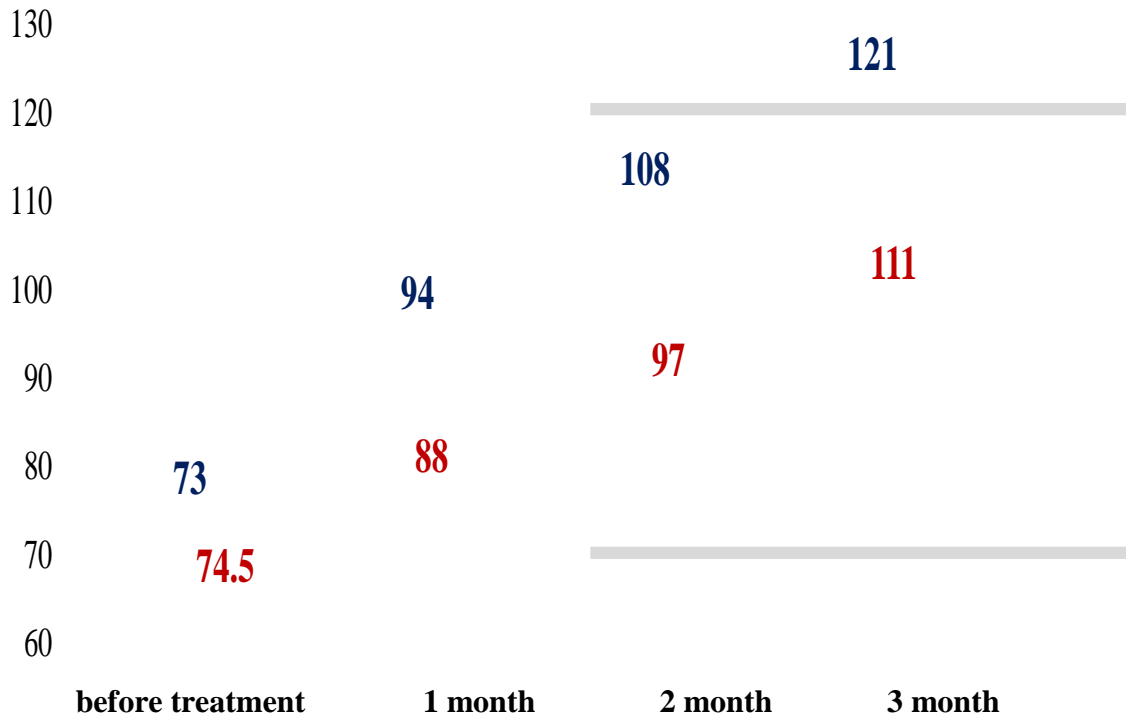
months of therapy showed that the proportion of non-adherent patients in the main group was 10%, while in the control group it was 4 times higher (Fig. 1).

The number of adherents to therapy was 73% in the main group, while in the control group - only 10%. Observations of the dynamics of the increase in hemoglobin in the studied groups showed that in the main group there was a higher level of its monthly increase in the blood (Fig. 2). By the end of 3 months in the main group, the hemoglobin level averaged 121 g / l, while in the control - 111 g / l.

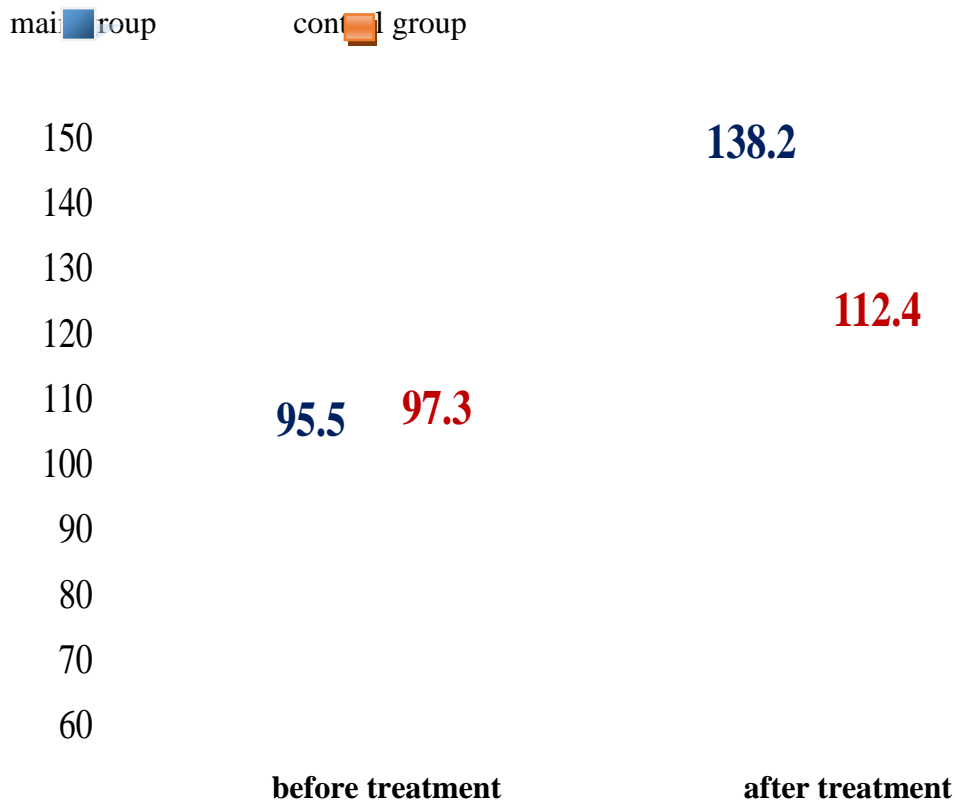


**Figure 1. The results of assessing adherence according to the Morisky-Green scale in patients after 3 months of therapy.**

main group → control group →



**Figure 2. Results of determining the level of hemoglobin in patients in dynamics.**



**Figure 3. The results of assessing the quality of life of patients in dynamics.**

Along with an increase in the level of hemoglobin in patients in the study groups, there was

also an improvement in the QOL indicator, the value of which according to the FACT-An test was equal to 95.5 and 97.3 points in the main and control groups, respectively. After treatment, the average index of patients in the main group increased to 138.2 points, while in the control group - up to 112.4 points (Fig. 3).

In this regard, anemia has a significant impact on the quality of life of patients. An assessment of the quality of life of patients using the FACT-An questionnaire showed that significantly higher rates were observed in patients undergoing anemia therapy under the control of the MyTherapy mobile application. It should also be noted that the patients of the main group significantly more often visited the attending physician during therapy, which was prescribed in the treatment. In the main group of patients, there was also a higher average number of planned and prescribed doctor visits (3.4 visits), as well as a higher average number of doctor-prescribed hemoglobin blood tests (3.1 tests).

## CONCLUSION

Observations of patients receiving treatment for 3 months showed that the patients of the main group had significantly higher compliance scores according to the Morisky-Green scale, a more pronounced increase in the level of hemoglobin in the blood and higher quality of life indicators in comparison with patients in the control group. Based on the shown efficiency, availability and simplicity, the proposed method can be recommended for implementation in wide medical practice.

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