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Using Information Technologies in Screening and Dynamic Monitoring of Patients with Chronic Non-Communicable Diseases

Khodjieva Gulirano Sayfullaevna[1,*], Axmedov Nodir Ilxomovich[2]

[1]PhD., Bukhara State Medical University, Uzbekistan
[2]Bukhara State Medical University, Uzbekistan

Abstract This study evaluates the effectiveness of digital health technologies in early detection and ongoing monitoring of patients with chronic non-communicable diseases (NCDs) such as diabetes, cardiovascular pathologies, and bronchial asthma. The aim is to assess how digital tools improve self-control, clinical outcomes, and patient satisfaction. A prospective observational study of 300 patients, divided into intervention and control groups, was conducted using mobile apps, smart devices, video consultations, and cloud storage. Data were analyzed using SPSS, applying Chi-square, ANOVA, and logistic regression. Significant improvement was observed in clinical indicators like HbA1c and BP levels, hospitalization rates, therapy adherence, and patient satisfaction in the intervention group compared to the control group over 12 months. This approach can be integrated into national health systems to scale chronic disease management, especially in remote and resource-limited regions of Uzbekistan.

Keywords Digital health, Information technologies, Screening, NCDs, Telemedicine, Patient monitoring, Chronic disease

1. Introduction

Chronic non-communicable diseases (NCDs) such as diabetes, hypertension, and chronic respiratory diseases are the leading cause of morbidity and mortality worldwide. Early detection and dynamic monitoring of these conditions are crucial for improving outcomes and reducing healthcare costs [1,3,7].

Information technologies (IT) have opened new avenues for efficient and scalable patient management [6,8,9,10].

The hypothesis of this study posits that the integration of IT solutions can enhance screening and follow-up efficiency in patients with NCDs through improved self-monitoring, timely data transmission, and provider feedback loops.

Previous studies (Topol, 2012; Greenhalgh et al., 2017; Hamine et al., 2015) emphasized the transformative potential of mobile and cloud-based technologies in improving outcomes of patients with chronic diseases. WHO (2023) notes that digital interventions could reduce up to 20% of preventable complications from NCDs globally.

2. Materials and Methods

* Corresponding author:
khodjieva_gulirano@bsmi.uz (Khodjieva Gulirano Sayfullaevna)
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A prospective observational study was conducted involving 300 patients aged 18 to 75 years with established NCDs: type 2 diabetes mellitus, ischemic heart disease, and bronchial asthma. Participants were recruited from three outpatient clinics in urban and semi-urban settings.

Inclusion Criteria:

- Confirmed diagnosis for over 1 year;
- Willingness to use digital health tools;
- Access to smartphone and internet.

Exclusion Criteria:

- Cognitive impairment;
- Uncontrolled psychiatric disorders.

Study Duration: 12 months

Groups:

- Intervention group (n = 150): received devices (smartwatch, glucometer, BP monitor) and app access;
- Control group (n = 150): received traditional care with in-person visits.

Digital Tools Used:

- Symptom diary (mobile);
- Medication alerts;
- Video consultations via secure portal;
- Daily upload of metrics (e.g., PEF, HR, BP, glucose).

Data Collection Tools:

- Electronic Health Record (EHR) portal;

- Cloud data server (AWS Health);
- SPSS v27 for data analysis.

Statistical Analysis:

Chi-square test, ANOVA, and multivariate logistic regression were used. A p-value < 0.05 was considered significant.

3. Results

Table 1 presents demographic and baseline clinical characteristics.

Table 1. Baseline Characteristics of Study Participants

Parameter	IT Group (n=150)	Control Group (n=150)
Mean age (years)	54.8 ± 10.2	56.1 ± 9.7
Male, %	44%	47%
Mean HbA1c (%)	8.2 ± 1.1	8.3 ± 1.2
Mean BP (mmHg)	135/85	138/87
Asthma cases, n	42	40

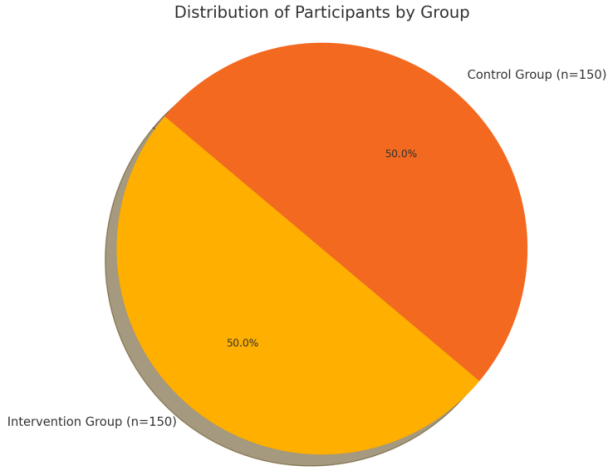

Figure 1. Participants were equally divided into two groups: Control Group and Intervention Group, with 150 participants (50%) in each

Figure 1 demonstrates reduction in HbA1c and BP levels over 12 months.

Table 2. Clinical Outcomes After 12 Months

Indicator	IT Group	Control Group	p-value
HbA1c (%)	7.0 ± 0.9	7.9 ± 1.1	<0.01
BP (mmHg)	127/78	134/84	<0.01
Hospitalizations (per pt)	0.4 ± 0.2	0.7 ± 0.3	<0.05
Adherence to therapy (%)	90	68	<0.01
Patient satisfaction (1–5)	4.6 ± 0.3	3.2 ± 0.5	<0.01

Figure 2 shows improved adherence and patient satisfaction scores.

Digital Engagement:

- Daily logins: median 5.2/week
- Data uploads: 92% patients ≥4x/week
- Video consults completed: 680

4. Discussion

The implementation of IT-based tools led to notable improvements in glycemic and blood pressure control. Enhanced adherence and satisfaction correlate with the intuitive app interface, real-time feedback, and provider-patient engagement. Patients felt empowered, especially those in remote areas.

Challenges:

- Digital literacy gaps in >60 age group;
- Need for family/caregiver training;
- Initial tech resistance in rural areas.

Opportunities:

- AI-assisted prediction of exacerbations;
- Integration with insurance/EMR systems;
- Scalable model for rural public health networks.

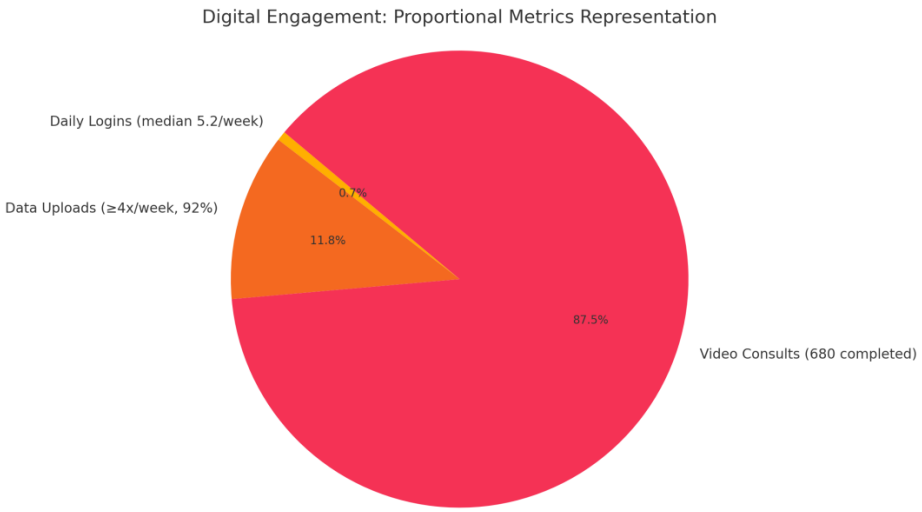

Figure 2. Video consults dominated digital engagement, with lower contributions from data uploads and daily logins

5. Conclusions

Digital health platforms represent a cost-effective, scalable approach for managing chronic NCDs. Their integration can improve outcomes, reduce hospitalizations, and enhance patient-centered care.

6. Future Directions

- Randomized controlled trials;
- Cultural adaptation of mobile interfaces;
- Expansion to oncology and nephrology populations.

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