THE ROLE OF INFORMATION TECHNOLOGY IN PHARMACY FOR THE TREATMENT OF DIABETES

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Abstract: Diabetes mellitus is one of the most common chronic diseases worldwide. Its treatment requires a comprehensive approach, including blood glucose monitoring, medication intake, and adherence to a proper diet. In recent years, information technology (IT) has played a significant role in pharmacy and healthcare, enabling automated glucose monitoring, personalized medication management, and remote patient monitoring. The use of electronic prescriptions, mobile applications, sensor systems, and analytical platforms improves therapy efficiency, reduces errors, and enhances patients' quality of life. This article examines the areas of IT application in diabetes treatment, their advantages and limitations, and future prospects in pharmaceutical technology.

1. Introduction

Diabetes mellitus is a chronic disease characterized by impaired glucose metabolism due to insufficient insulin production or action. Elevated glucose levels negatively affect the heart, blood vessels, kidneys, eyes, and nervous system.

The main types of diabetes include:

1. **Type 1 Diabetes** – often develops in childhood or adolescence. The pancreas does not produce insulin, requiring patients to administer it regularly.
2. **Type 2 Diabetes** – usually occurs in adults and is often associated with obesity, a sedentary lifestyle, and poor diet. Treatment involves oral medications and, if necessary, insulin.
3. **Gestational Diabetes** – occurs during pregnancy and usually resolves after childbirth but increases the risk of type 2 diabetes in the future.

Without glucose control, diabetes can lead to complications such as kidney damage (nephropathy), eye damage (retinopathy), nervous system damage (neuropathy), and cardiovascular diseases. Diabetes-related complications are a leading cause of disability and reduced quality of life.

Traditional diabetes treatment includes:

- Regular glucose monitoring using glucometers;
- Medication or insulin therapy;
- Following a diet and maintaining physical activity;
- Physician consultations for therapy adjustment.

However, traditional methods have limitations: patients may forget glucose measurements, incorrectly calculate medication doses, or fail to maintain a diet diary. It is also difficult for doctors to access patient data, especially from remote areas.

In this context, information technology becomes a key tool for effective diabetes management, allowing:

- Automated glucose monitoring;
- Storage and analysis of medical data;
- Personalized medication dosing;
- Remote patient monitoring;
- Improved interaction among doctors, patients, and pharmacies.

2. Main Areas of IT Application in Pharmacy

2.1 Electronic Prescriptions
Electronic prescriptions (e-prescriptions) allow physicians to send prescriptions directly to pharmacies. This reduces prescription errors, speeds up medication dispensing, and maintains a record of medications for each patient.

2.2 Mobile Applications
Mobile applications help patients to:

- Monitor blood glucose levels;
- Keep dietary and activity diaries;
- Calculate insulin doses;
- Share data with healthcare providers.

Examples include: MySugr, Glooko, BlueLoop.

2.3 Sensor Systems and Wearable Devices
Sensors continuously measure glucose levels and transmit data to mobile applications. Both patients and doctors can track readings in real-time and adjust treatment as needed.

Examples include: Freestyle Libre, Dexcom G6.

2.4 Analytical Platforms and Big Data
Collecting and analyzing medical data helps predict complications, identify patterns, and develop individualized treatment plans.

3. IT Applications in Diabetes Treatment

- **Personalized Therapeutic Plans** – IT assists in calculating insulin and medication doses based on glucose levels, age, weight, and activity.
- **Telemedicine** – provides remote consultations, particularly valuable for patients in rural areas.
- **Complication Prediction** – data analytics identifies at-risk groups and allows intervention before problems arise.

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4. Advantages of IT

Advantage	Description
Error Reduction	E-prescriptions and automated monitoring reduce the risk of incorrect medication use
Glucose Control	Sensors and mobile apps provide continuous monitoring
Self-management	Patients can track trends and adjust behavior
Time Efficiency	Doctors receive ready-made reports, reducing the need for frequent visits
Personalization	Data analysis helps optimize therapy for each patient

5. Limitations and Challenges

- High cost of sensor systems and applications;
- Need for constant internet access;
- Data security and privacy concerns;
- Not all patients have the skills to use technology effectively.

6. Future Prospects

- Integration of artificial intelligence (AI) for patient condition prediction;
- Development of more affordable sensor systems;
- Creation of integrated platforms connecting patients, doctors, and pharmacies;
- Use of technology for developing new drugs and therapies;
- Full automation of dose selection and complication prevention.

7. Conclusion

IT plays a crucial role in pharmacy for diabetes management. It enables:

- Glucose monitoring;
- Personalized treatment;
- Error reduction;
- Remote patient monitoring;
- Prediction and prevention of complications.

Despite existing limitations, the potential of IT is vast. Its implementation enhances treatment effectiveness, improves healthcare quality, and boosts patients' quality of life. In the future, AI integration and advanced analytical platforms will become even more critical in combating diabetes.

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