

Influencing Factors and Intervention Strategies for Psychological Insulin Resistance in Community-Based Patients with Diabetes Receiving Insulin Therapy

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Abstract: Psychological Insulin Resistance (PIR) is a major psychological barrier for community-dwelling patients with type 2 diabetes mellitus to initiate and maintain insulin therapy, manifesting as difficulties in treatment initiation, injection-related fear and anxiety, disease cognition and belief biases, and psychosocial distress. PIR is influenced by multiple factors: at the patient level, including sociodemographic characteristics, personality traits, and health literacy; at the disease and treatment level, involving the complexity of treatment regimens; at the social environment level, encompassing family support and sociocultural factors; and at the iatrogenic and health system level, relating to the quality of physician-patient communication and accessibility of healthcare resources. Assessment tools include the Insulin Treatment Appraisal Scale (ITAS), the Hypoglycemia Fear Survey (HFS), and the Diabetes Distress Scale (DDS). Community-based intervention strategies should integrate behavioral change techniques (motivational interviewing, cognitive behavioral therapy, empowerment education), construct social support systems (family support, peer support), and optimize service models (shared decision-making, information technology, simplified treatment regimens). Future research should explore the integration of psychological interventions into family doctor contract services to improve the quality of community diabetes management.

Keywords: Psychological Insulin Resistance; Insulin Therapy Reluctance; Type 2 Diabetes Mellitus; Influencing Factors; Community; Health Education.

1. Introduction

The global prevalence of type 2 diabetes mellitus (T2DM) continues to rise. In China, the prevalence of diabetes in community populations has reached 12.8%, while the treatment control rate remains only 49.2%, presenting a dual challenge characterized by **high prevalence and low glycemic control** [1]. As the disease progresses, the progressive decline in pancreatic β -cell function makes insulin therapy a central strategy for achieving glycemic control [2]. However, clinical data indicate that approximately 50–70% of patients experience delayed initiation or inadequate dosing of insulin therapy [3].

A major barrier underlying this phenomenon is **Psychological Insulin Resistance (PIR)**, defined as cognitive, emotional, and behavioral resistance to insulin treatment caused by psychosocial factors [4]. PIR encompasses multiple psychosocial dimensions, including misconceptions about the disease (e.g., the belief that insulin causes addiction or signals disease deterioration), fear of injections (e.g., needle phobia and fear of hypoglycemia), perceived social stigma, and reduced self-efficacy [5].

This review aims to systematically summarize the manifestations, influencing factors, assessment tools, and community-based intervention strategies related to PIR, thereby providing evidence-based guidance for community general practitioners in identifying and addressing psychological barriers to insulin therapy.

2. Core Psychological Manifestations Related to Insulin Therapy

2.1. Initiation Barriers

Many patients demonstrate resistance and delay in initiating insulin therapy. This resistance may manifest as repeatedly postponing treatment initiation, seeking non-insulin alternatives, or discontinuing prescribed medication without medical advice [3].

According to the **Stages of Change Model**, patients often remain in either the **precontemplation stage** (failing to recognize the necessity of treatment) or the **contemplation stage** (lacking motivation to act), which leads to prolonged delays in treatment decisions. A cohort study involving 500 patients with T2DM reported that PIR increased the difficulty of achieving glycemic control ($HbA_{1c} < 7.0\%$) by 2.34 times (OR = 2.34, 95% CI: 1.82–3.01) [1].

2.2. Injection-Related Fear and Anxiety

2.2.1. Needle Phobia and Anxiety About Injection Techniques

Approximately 34% of patients with diabetes experience significant needle phobia, and 12% refuse to initiate insulin therapy because of this fear [6]. Anxiety regarding injection techniques often involves concerns about incorrect dosing, operational errors, or missed injections. Such concerns may reduce patients' self-efficacy and create a **cycle of anxiety and avoidance behavior** [7].

Studies show that the error rate associated with traditional syringes can reach 22%, whereas insulin pens, which incorporate dose visualization designs, reduce the error rate to approximately 8% [8].

2.2.2. Fear of Hypoglycemia

Fear of hypoglycemia, particularly nocturnal hypoglycemia or asymptomatic hypoglycemia, is a core emotional component of PIR. Patients may adopt irrational coping strategies, such as reducing insulin dosage on their own initiative. Evidence indicates that for every 10-point increase in the **Hypoglycemia Fear Survey (HFS)** score, insulin adherence decreases by 15% (OR = 0.85, 95% CI: 0.78–0.92) [9].

2.3. Cognitive and Belief Biases About Disease

2.3.1. The “Insulin Addiction” Misconception

Among patients who have not yet initiated insulin therapy, 38.2% identify “addiction risk” as their primary concern, mistakenly believing that once insulin injections begin, they cannot be discontinued [10]. This misconception often arises from insufficient understanding of disease progression and exposure to misleading non-professional information.

2.3.2. Perception of Insulin as a Marker of Disease Severity

Some patients perceive insulin therapy as evidence that their disease is “out of control” or “incurable.” Patients with such cognitive biases demonstrate significantly lower treatment adherence compared with those without these beliefs (OR = 2.34, 95% CI: 1.67–3.28) [11].

2.3.3. Self-Attribution Failure

Patients may attribute the need for insulin therapy to personal failure in disease management, leading to feelings of guilt and shame. Attribution bias shows a significant negative correlation with self-efficacy ($r = -0.42$, $P < 0.01$) [12].

2.4. Psychosocial Distress

2.4.1. Stigma

Approximately 65.7% of patients avoid injecting insulin in public due to fear of discrimination or negative social judgment [13]. Perceived stigma may activate neural regions associated with fear responses, such as the anterior cingulate cortex and amygdala, forming conditioned fear memories. As a result, patients may still experience emotional resistance even when they cognitively recognize the necessity of treatment.

2.4.2. Social Restrictions

Concerns about the impact of insulin therapy on work, social gatherings, or travel may reduce patients’ sense of self-efficacy and perceived control over treatment, ultimately affecting glycemic outcomes. For instance, insulin regimen adjustments during cross-time-zone travel often have a high failure rate [14].

3. Analysis of Influencing Factors of Psychological Insulin Resistance

3.1. Patient-Level Factors

3.1.1. Sociodemographic Factors

Younger patients (<40 years) often resist insulin therapy due to concerns about social image, whereas older patients (>65 years) may show reduced adherence because of the complexity of injection procedures. Individuals with lower educational attainment (\leq junior high school) exhibit a 32.7% higher prevalence of PIR compared with those with higher education (\geq college level) (95% CI: 28.4%–37.0%). Additionally, low-income patients (monthly income <3000 RMB) frequently worry about treatment costs, resulting in an

insulin discontinuation rate of 41.2% [1,15].

3.1.2. Personality Traits and Psychological Status

Patients with higher levels of neuroticism tend to experience stronger fear of insulin injections ($\beta = 0.42$, $P < 0.01$). Depressive symptoms indirectly reinforce treatment resistance through negative cognitive bias (path coefficient = 0.38, $P < 0.05$). Coping strategies are also associated with PIR: negative coping strategies show a positive correlation with PIR ($r = 0.47$), whereas positive coping strategies are negatively correlated with PIR ($r = -0.31$) [16].

3.1.3. Health Literacy

Patients with insufficient knowledge about diabetes are more likely to develop cognitive misconceptions regarding insulin therapy. Individuals with health literacy scores below 12 have a significantly higher risk of PIR (OR = 2.34, 95% CI: 1.78–3.07) [2].

3.2. Disease- and Treatment-Level Factors

The complexity of treatment regimens is an important contributor to PIR. Multiple daily injections (MDI) increase patients’ cognitive burden and reduce treatment adherence by approximately 34% [8]. There are significant differences in usability between traditional syringes and insulin pens: the error rate associated with traditional syringes can reach 22%, while insulin pens reduce this rate to approximately 8% through dose-visualization design. Furthermore, patients receiving fixed-ratio combination (FRC) therapy of basal insulin and GLP-1 receptor agonists show a 41% lower incidence of PIR compared with those using MDI regimens [17].

3.3. Social Environment-Level Factors

3.3.1. Family Support

The family support index shows a significant negative correlation with PIR ($r = -0.68$, $P < 0.01$). Negative attitudes from spouses, such as the belief that “starting injections means the disease is out of control,” can reduce patients’ treatment adherence by 42% [2].

3.3.2. Sociocultural Factors

Folk beliefs and stereotypical perceptions about injections form an important cultural background contributing to PIR. Patients who receive Diabetes Self-Management Education (DSME) demonstrate a significantly lower incidence of PIR compared with those who do not receive such education (OR = 0.42, 95% CI: 0.31–0.57) [18].

3.4. Iatrogenic and Health System-Level Factors

3.4.1. Quality of Physician–patient Communication

When physicians do not adopt a shared decision-making model, patients’ acceptance of insulin therapy decreases by approximately 30% (95% CI: 22%–38%). Moreover, only about 12% of physician–patient discussions involve self-management strategies for insulin dose adjustment [19].

3.4.2. Accessibility of Community Healthcare Resources

The insulin supply rate in community health service centers is significantly negatively correlated with patient treatment interruption rates ($r = -0.72$, $P < 0.01$). Communities adopting a “mobile medical vehicle + teleconsultation” service model report a 23% lower incidence of PIR compared with traditional service models [20].

4. Assessment and Identification Tools for Psychological Insulin Resistance

4.1. Commonly Used Scales

4.1.1. Insulin Treatment Appraisal Scale (ITAS)

The ITAS evaluates multiple dimensions, including perceived necessity of insulin therapy, fear of injections, perceived social stigma, and self-efficacy. The scale demonstrates good reliability, with a Cronbach's α greater than 0.85 and a test-retest reliability of 0.78. Patients with ITAS scores ≥ 40 show treatment adherence that is 32% lower than that of the control group [21].

4.1.2. Hypoglycemia Fear Survey (HFS)

The HFS includes three dimensions: behavior, worry, and glycemic control. For every 10-point increase in the total HFS score, adherence to insulin dose adjustment decreases by approximately 23% ($P < 0.01$) [9].

4.1.3. Diabetes Distress Scale (DDS), Treatment-related Dimension

The treatment-related domain of the DDS includes three subdimensions: concern about hypoglycemia, treatment complexity, and social burden. The scale demonstrates high internal consistency (Cronbach's $\alpha > 0.85$). Patients with scores ≥ 3 are recommended to receive stepwise psychological intervention, which has been shown to reduce treatment-related distress by 42% after intervention [22].

4.2. Simplified Screening Methods in Community Settings

In routine outpatient visits, structured questions can be used for rapid screening. For example, asking patients "What concerns you most about insulin injections?" can facilitate a preliminary assessment within 3–5 minutes. This method demonstrates a sensitivity of 82.3% (95% CI: 75.6–89.0) [23].

5. Community-Based Intervention Strategies

5.1. Psychological Interventions Based on Behavioral Change

5.1.1. Motivational Interviewing

Motivational interviewing employs open-ended questions (e.g., "What impact do you think insulin therapy might have on your life?"), reflective listening, and change-oriented dialogue to stimulate patients' intrinsic motivation. Studies show that motivational interviewing can increase patients' willingness to initiate treatment by 42% [24].

5.1.2. Cognitive Behavioral Therapy (CBT)

CBT uses cognitive restructuring techniques to identify and challenge irrational beliefs such as the "insulin addiction" misconception or the perception that insulin therapy represents treatment failure. Exposure therapy can also be applied to reduce injection-related fear. Patients receiving CBT interventions demonstrate a 37% increase in treatment satisfaction (95% CI: 28.4%–45.6%), and the delay in initiating insulin therapy is reduced to an average of 4.2 weeks [25].

5.1.3. Empowerment Education

Empowerment-based education integrates practical training in insulin injection techniques and blood glucose monitoring with dynamic assessment of self-efficacy. After six weeks of empowerment education, patients' General Self-

Efficacy (GSE) scores increase by an average of 23.6% ($P < 0.01$), and insulin adherence improves by 68.3% [12].

5.2. Development of Social Support Systems

5.2.1. Family Support Interventions

Family members can be invited to participate in health education sessions, and family meetings may be used to promote cognitive restructuring among family members. Patients receiving family support interventions demonstrate a 23.7% increase in glycemic control rates and an average reduction of 1.8% in HbA1c levels [2].

5.2.2. Peer Support

Patients with well-controlled blood glucose (HbA1c $< 7.0\%$) who are experienced insulin users can share their experiences to reshape treatment perceptions through observational learning. Participants in peer support programs show an average reduction of 23.6% in PIR scores ($P < 0.01$) [5].

5.3. Optimization of Physician–Patient Communication and Service Models

5.3.1. Shared Decision-making (SDM)

The Decision Conflict Scale can be used to evaluate patients' cognitive biases and emotional concerns. Physicians may present visualized data regarding the benefits and risks of insulin therapy to involve patients in treatment planning. The SDM model increases treatment adherence by 30% and improves patient satisfaction scores on the CSQ-8 by 25% [19].

5.3.2. Use of Information Technology

Digital tools such as messaging platforms and mobile applications can deliver personalized educational content and provide continuous health education beyond time and location constraints. Communities adopting a hybrid "online + offline" model report an average reduction of 1.8 points in injection fear scores and a follow-up glycemic control rate of 78.3% [26].

5.3.3. Simplification of Treatment Regimens

The use of insulin pens with ultra-fine short needles (diameter ≤ 4 mm, length ≤ 5 mm) is recommended. Their biomechanical characteristics reduce tissue injury and improve the injection experience. According to the User Experience Questionnaire (UEQ), these devices score significantly higher than traditional syringes in perceived ease of use (mean 4.2/5) and perceived enjoyment (mean 3.9/5) ($P < 0.01$), leading to a 32% increase in patient treatment satisfaction [27].

6. Summary and Future Perspectives

Psychological Insulin Resistance (PIR) is a major barrier to insulin therapy among community-based patients with type 2 diabetes mellitus (T2DM). Its development reflects a complex biopsychosocial interaction, involving patients' cognitive and emotional responses, treatment regimens, social support systems, and healthcare system factors [1,4]. Neglecting psychological factors may lead to a reduction of more than 30% in the rate of achieving HbA1c targets [11].

Community general practitioners are therefore encouraged to incorporate psychological assessment into routine procedures prior to initiating insulin therapy. Standardized tools such as the Insulin Treatment Appraisal Scale (ITAS) and the Hypoglycemia Fear Survey (HFS) can be used to identify high-risk patients. Evidence-based psychological

interventions, including motivational interviewing and cognitive behavioral therapy (CBT), should be applied accordingly. At the same time, healthcare services should strengthen a patient-centered approach, integrating humanistic care with clinical expertise in diabetes management [21].

Future research should explore ways to integrate psychological interventions into family doctor contract service packages, thereby establishing a patient-centered psychological support system. Drawing on hierarchical medical service models, stepped psychological intervention strategies may be developed based on the severity of psychological resistance. For example, patients with mild PIR may benefit from digital educational tools, such as mobile-based cognitive behavioral training applications, whereas those with moderate to severe PIR may require group psychotherapy led by family physicians [26]. In addition, a multidimensional outcome evaluation framework should be established, and the potential impact of healthcare insurance payment reforms on the sustainability of such service packages should be investigated, promoting the transition of psychological support from an “additional service” to a “core component” of community diabetes care.

7. Conclusion

Effective community-based management of type 2 diabetes requires addressing psychological insulin resistance, which represents a key barrier to insulin therapy. The mechanisms underlying PIR involve multiple levels of influence. At the cognitive level, misconceptions such as the “insulin addiction” belief persist; at the emotional level, patients often experience needle phobia and fear of hypoglycemia; at the behavioral level, PIR manifests as treatment delay and poor adherence; and at the social level, it is influenced by insufficient family support and perceived social stigma.

Intervention strategies should integrate principles from evidence-based medicine and behavioral psychology, establishing a comprehensive management model that combines assessment, guidance, and support. Future research should focus on improving the precision and personalization of intervention measures. With the support of artificial intelligence and digital health technologies, remote intervention platforms could be developed to enhance community physicians’ ability to identify and manage PIR through multidisciplinary collaboration. Ultimately, these efforts may help improve glycemic control, delay the progression of complications, and provide scientific support for achieving the objectives of the Healthy China 2030 initiative.

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