



## Treating psychological insulin resistance in type 2 diabetes



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### ABSTRACT

**Aims:** The phenomenon of psychological insulin resistance (PIR) has been well documented for two decades, but interventions to treat PIR have not been well described. The aim of this study was to describe interventions used to treat psychological insulin resistance by certified diabetes educators (CDE's).

**Methods:** A secondary data analysis study using empirical data from a trial (N = 234) that included four CDEs providing counseling for psychological insulin resistance. Participants not currently using insulin completed the 10-item Barriers to Insulin Therapy measure. The four CDE interventionists documented their approach to addressing participants' barriers to taking insulin using a standard form. Recommendations were collated and summarized.

**Results:** Strong PIR was shown by 28.4% of participants reporting that they "would not start insulin" and a moderate degree of PIR was shown by 61.2% who said they "would be upset, but would start insulin." The CDE's treated PIR with four primary interventions: 1) teaching and providing explanations, 2) demonstrations and sharing examples of success using insulin therapy, 3) return demonstrations, and 4) addressing feelings and positively managing expectations.

**Conclusion:** This is the first study to describe in some detail potentially effective patient management strategies for PIR. A randomized controlled trial testing the efficacy of PIR interventions is needed.

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### Introduction

Diabetes, which is characterized by high blood glucose levels and microvascular complications, can result in damage to the cardiovascular system, eyes, kidneys, and lower limbs, resulting in high personal and societal costs [1]. Insulin therapy is a highly effective treatment for diabetes that reduces hyperglycemia and its associated medical complications [2]. The Diabetes Control and Complications Trial [3] and the United Kingdom Prospective Diabetes Trial (UKPDS) [2] have demonstrated the benefits of tight glycemic control in individuals with type 1 (T1DM) and type 2 diabetes (T2DM). For example, the UKPDS showed that a 1% decrease in HbA1c was associated with a 37% reduction in the risk of microvascular complications and a 14% reduction in the risk of macrovascular complications [4]. Although insulin therapy is highly effective in helping patients achieve tight glycemic control, this treatment benefit is often delayed in individuals with T2DM. This delay is frequently attributed to psychological insulin resistance (PIR), a term coined in 1994 to describe both provider-

patient-level barriers to initiating and maintaining insulin therapy [5]. Since then, aspects of PIR and its management have been well described in literature reviews [6,7].

Among the principal factors contributing to PIR, the foremost is patients' lack of accurate knowledge and understanding about diabetes and insulin therapy [8,9]. For example, patients may believe that insulin is only appropriate for individuals with severe disease; thus, patients with PIR will interpret a new prescription for insulin therapy negatively as a sign that their diabetes is getting worse rather than a necessary next step in treatment to protect their health and quality of life [8,9]. Another component of PIR is a patient's negative perception that a transition to insulin therapy is a personal failure as a result of inadequate disease self-management efforts, which is associated with guilt and remorse [9–13]. Other negative self-perceptions include feeling overwhelmed and unable to manage the complexity and daily self-management demands of insulin therapy [14], as well as fears that starting insulin therapy represents a loss of normalcy [15] and the risk of being viewed differently by others [13]. Using syringes in a public place may result in feeling socially embarrassed and rejected, leading to feeling that daily insulin injection routines

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must be hidden from others [16,17]. These perceptions can lead to omissions, delays, or early injections.

Individuals may also fear injecting insulin [9–13,18], including concerns about inability to self-administer injections [19], pain associated with injections [11,20], or general uneasiness or specific phobias about being injected [20,21]. Patients may also have concerns about the lifestyle changes imposed by insulin therapy, including concerns around its inconvenience [11,17], time-consuming aspects [22], complexity [17,23,24], and loss of personal freedom [25,26]. Additionally, patients may simply be unwilling to take on the new responsibilities associated with insulin therapy [24]. PIR may also result from potential physiological side effects of insulin [16], with the two most commonly cited problems being fear of hypoglycemia [17,27] and weight gain [28].

This accumulated body of clinical reports clearly shows that PIR can negatively affect a patient's ability to successfully incorporate insulin therapy into daily life. However, few trials have described interventions used to treat PIR. To fill this gap in knowledge, this secondary analysis study explored how PIR was managed by certified diabetes educators (CDEs) in a large-scale behavioral intervention trial [29].

## Materials and methods

For this secondary analysis study, we used empirical data from a behavioral intervention trial (N = 234) that included skills training for four CDEs in diabetes self-management education (DSME) [29]. The purpose of the trial was to determine whether glycemic control (HbA1c) is improved in Type 2 diabetes when DSME is used with Motivational Interviewing versus DSME alone. Trial participants were recruited from adult patients with T2DM and in the patient population of a large hospital medical center. Patients were included if they were 30–70 years old, had poorly controlled blood glucose (HbA1c  $\geq$  7.5%), and were able to speak and write English. The full results of this trial are described elsewhere [29].

All DSME sessions were conducted by a CDE, and all patients received four DSME sessions within the 6-month intervention period. Participants were randomly assigned to four intervention conditions: DSME alone, DSME with motivational interviewing, DSME with a summary of participants' barriers to diabetes self-management from the computerized Diabetes Self-Care Profile (DSCP) questionnaire, or DSME with motivational interviewing and the DSCP one-page clinical summary. The DSCP was found to improve patient-provider communication about diabetes-related lifestyle changes [29]. Participants not currently using insulin completed the 10-item Barriers to Insulin Therapy measure, which is part of the DSCP and includes 10 common barriers to initiating insulin therapy such as erroneous beliefs, negative self-perceptions, concerns about lifestyle adjustments, and fear of injections. The four CDE interventionists documented their approach to addressing participants' barriers to taking insulin. Specifically, CDEs used a standard form we provided to record retrospectively their treatment recommendations (n = 1–3) used for each of the 10 barriers. Recommendations were collated and summarized.

## Statistical analysis

Data were analyzed using descriptive statistics. Continuous variables (age, diabetes duration, body mass index, HbA1c, CDE visits) were described by means, standard deviations (SDs), and ranges. Categorical variables (gender, race/ethnicity, education level, marital status, use non-insulin diabetes medications, insulin use, barriers questions, and CDE recommendations) were described by number and percent.

## Results

Of the 234 participants enrolled in the study, 119 were in the two intervention conditions whose CDEs received DSME skills training. Participants' mean  $\pm$  SD age was 56.6  $\pm$  10.6 years, and 58% were women. Most participants were white (83.5%), 13% self-identified as Hispanic, and 41% had graduated from high school or had some high school education. They had been diagnosed with diabetes on average for 8.4  $\pm$  7.4 years and their baseline HbA1c was 8.8  $\pm$  1.1% (Table 1).

The majority of participants were not using insulin (59%), and only 10.4% reported being "OK with starting insulin." A majority of participants also reported they "would be upset, but would start" insulin (61.2%), and 28.4% "would not start" insulin (Table 2).

Participants endorsed a mean ( $\pm$ SD) of 4.1  $\pm$  2.1 insulin therapy barriers. The top three barriers to starting insulin therapy were "I would want to try all other options first" (89.6%), "It would mean my diabetes was getting worse (83.6%)" and "Reluctance to give myself insulin shots in public" (43.4%). Moderately endorsed barriers were "I would be scared of needle pain (38.8%)", "I would be worried about gaining weight" (38.8%), and "I would be worried about getting low blood sugars" (35.8%). Less commonly endorsed barriers included "I am too busy to add another big demand to my life right now" (19.4%), "Health insurance/financial difficulties would make it hard to afford," (16.4%), and "I have seen people develop serious complications after going on insulin" (11.9%) (Table 3).

The majority of CDEs' 45 treatment recommendations to overcome/minimize insulin therapy barriers consisted of first exploring reasons why participants did not think they could take insulin, then teaching and explaining (Table 4). Education examples included teaching about progression of diabetes, causes of hypoglycemia, prevention of hypoglycemia, injection techniques in public places, the benefit of practicing, the benefits of insulin, and strategies to prevent weight gain. Other educational points are to teach that people may develop... serious complications when they start insulin because the insulin was started too late not because the insulin caused the complication and teaching about strategies to get insulin if they can't afford it. Explanation examples included distinguishing between the natural progression of diabetes and complications due to high glycemic levels, and explaining insulin action times to prevent hypoglycemia.

The other treatment recommendations included demonstrations and sharing examples of insulin therapy success, return demonstrations (e.g. participants' successful demonstration of taking an insulin injection as taught by the CDE), addressing participants' feelings about insulin therapy and positively managing their expectations. Examples of demonstrations or sharing experiences of insulin therapy success (n = 8) included showing how easy it is to give an insulin injection, talking about how many people give themselves injections at dinner tables or in bathroom stalls, discussing different ways to give injections in these places, and

**Table 1**  
Characteristics of the study sample at baseline (n = 119).

Characteristic	Mean (SD)	Range	n (%)
Age, years	56.6 (10.6)	31.0–80.0	
Female			69 (58.0)
Married			71 (59.7)
$\leq$ High school graduate			48 (40.3)
White race			96 (80.1)
Hispanic ethnicity			12 (10.1)
Duration of diabetes, years	8.4 (7.4)	0.5–38.0	
Body mass index, kg/m <sup>2</sup>	34.5 (6.6)	21.3–57.4	
Hemoglobin A1c, %	8.8 (1.1)	7.5–12.0	
Use non-insulin diabetes medication			102 (85.7)

**Table 2**  
Insulin use status and attitudes towards starting insulin.

n (%)	
Not currently using insulin	67 (56.3)
Attitudes towards starting insulin	
Would be OK starting insulin	7 (10.4)
Would be upset, but would start	41 (61.2)
Would not start	19 (28.4)

**Table 3**  
Barriers to starting insulin therapy (n = 67).

Barrier	Participants Endorsing Barrier, % <sup>a</sup>
It would mean diabetes getting worse	83.6
I would be scared of needle pain	38.8
I would be worried about getting low blood sugars	35.8
I would be worried about gaining weight	38.8
I don't think I could learn to take insulin shots	22.4
Reluctant to give myself insulin shots in public	43.4
I am too busy to add another big demand to my life right now	20.7
I would want to try all other options first	89.6
I have seen people develop serious complications after going on insulin	11.9
Health insurance/financial difficulties would make it hard to afford	16.4

<sup>a</sup> Mean number of barriers endorsed: 4.1 (SD = 2.1, range = 0–9).

showing how quickly insulin can be injected. Return demonstration examples included having participants inject themselves with insulin syringes or insulin pens provided, having participants handle the syringe and vial, and practicing injecting into an injection pillow (n = 4). Lastly, examples of addressing negative feelings and positively managing expectations included asking participants who doubted their ability to take insulin to think about accomplishments and challenges overcome in their life; ask why they think they cannot learn to inject insulin; agree that some people do gain weight on insulin, but CDEs can help them to control their weight through meal planning and exercise (n = 3).

## Discussion

This is the first study to describe effective patient management strategies for PIR from experienced certified diabetes educators who were asked to systematically provide feedback on management strategies they used in routine clinical care that could inform other clinicians working in this challenging area of patient education and behavior change in T2DM. Our finding that 28.4% of participants' not currently taking insulin had strong PIR is consistent with previous reports. In the UKPDS landmark trial, 27% of patients with T2DM randomized to insulin therapy initially refused insulin treatment [30]. Similarly, of 708 community-dwelling patients with T2DM not taking insulin, 28.2% reported that they would not take insulin even if it were prescribed by their physician [12,22].

Our findings on barriers to using insulin and CDEs' interventions for treating PIR are similar to those from a systematic review of 16 papers on PIR in adults with T2DM [7]. This study found that PIR could be explained by five themes about people with T2DM: some patients do not see the necessity for insulin and actively seek ways to control blood sugars without insulin, patients have a holistic view of the consequences of insulin, people with T2DM see insulin therapy as less feasible, some patients see insulin as a source of fear/anxiety (about injection, hypoglycemia, and addiction), and some patients perceive the necessity to start insulin therapy as strongly negative and it is associated with distressing

emotions. These individuals did not believe their illness was serious nor that it was temporary and did not therefore did not see benefit in starting insulin or did not believe they required insulin therapy. Some patients were also more likely than insulin users to have a negative attitude towards the physical and psychological benefits of insulin and to fear the social consequences of taking insulin, influencing their perception of insulin therapy as inaccessible, impractical and unacceptable [7]. Two differences between this review and our study were that 16.4% of our participants reported health insurance/financial difficulties as a barrier to starting insulin therapy, and the review comprised mostly non-US studies.

The CDEs in our study followed evidence-based procedures [31] for counseling participants with PIR. For example, they assessed participants' health literacy as part of their initial visit and tailored the education to each participant's health literacy level and preferred learning style (e.g., verbal, written, demonstration). Part of CDEs' insulin self-management education included the benefits and risks associated with insulin (Table 4). Since our participants were insulin naïve, we did not assess who had provided previous insulin education, as recommended [31].

The barriers to insulin therapy identified in our study are similar to those of another systematic review of 60 studies on PIR [6]. This review found that PIR was due to patients' emotional states (e.g., anxiety, fear), cognitive status (lack of knowledge), social stigma, and interactions with health providers [6]. In our study we did not examine the health provider's role in PIR. This review also found that PIR can be worsened by 1) a previous threat by a physician to initiate insulin as a punishment for low adherence, 2) perceiving the physician as inexperienced, 3) believing that insulin is an incorrect medical decision for oneself, 4) lack of knowledge and treatment guidelines, 5) fear of hypoglycemia in elderly patients with T2DM and serious comorbidities, 6) reduced life expectancy, and 7) lack of time and/or personnel to teach insulin initiation [6]. It is important that future studies consider the additional PIR barriers of health literacy, the health provider's role, and who is providing the insulin education.

Although treatments have been suggested for PIR, no empirically tested PIR intervention studies have been published to date. However, 45 patients' and 21 health professionals' experiences of starting insulin treatment were explored in the Treating To Target in T2DM trial [32]. The majority of participants were receptive to starting insulin despite being upset, disappointed, shocked and anxious. The health professionals were highly experienced at initiating insulin and used insulin pens with high associated patient acceptance and quality of life [33,34]. Other interventions to overcome PIR included encouraging engagement with self-monitored blood glucose results, prescribing a low starting dose of insulin, supervising initial injections, and having patients inject themselves [32]. The study authors concluded that the problem of PIR may have been previously overstated, with factors and treatment experiences possibly promoting insulin receptiveness ignored among patients with T2DM [32]. However, this study was limited by not using an objective measure of insulin barriers. Moreover, the study may have downplayed PIR among their participants, who reported emotional distress at the prospect of having to start insulin. PIR may be considered as occurring at different levels of resistance such as a moderate degree of PIR when a patient may be upset but willing to try insulin. If PIR emotions are not addressed, participants/patients may quickly change their mind and refuse to start insulin.

Our study was limited by not including real-time documentation of CDEs' interventions to treat PIR. Instead, CDEs were interviewed after the end of the trial to obtain PIR treatment information. Second, our study did not use a longitudinal randomized controlled intervention design to determine the effectiveness

**Table 4**  
Clinical diabetes educators' recommendations for participants' reported barriers to starting insulin therapy.

Treatment Recommendation	Information Source
<i>I would mean my diabetes was getting worse (n = 56, 83.6%)</i>	
We would discuss the natural progression of diabetes and give facts such as 80% of people w/type 2 diabetes will require insulin. (KZ)	Teaching/Explanation
Explain that diabetes is a naturally progressive disease where the pancreas produces less insulin over time. Insulin injections are a replacement of what the body would produce naturally. (BB)	Teaching/Explanation
If there are changeable lifestyle measures such as weight loss and exercise, explain that insulin might be a temporary treatment until these measures decrease insulin resistance. (BB)	Teaching/Explanation
Explain that controlling blood sugar levels through insulin administration can prevent diabetes complications which can worsen health. (BB)	Teaching/Explanation
Explain that diabetes is not getting "worse", it is "progressive" and requires treatment with insulin to replace what their body no longer can produce. (MC)	Teaching/Explanation
Explain diabetes is a progressive disease, current therapy (diet, exercise, medications) may not continue to keep blood glucose in goal ranges. Their body requires insulin shots because the pancreas may not be producing enough anymore (MOH)	Teaching/Explanation
<i>I would be scared of needle pain (n = 26, 38.8%)</i>	
I always have the patient do a self-stick with an insulin syringe and generally find 95% of people are amazed that it doesn't hurt. (KZ)	Return demonstration
Show how small the needles actually are now and that we can select an appropriate needle size to the patient's body. (BB)	Teaching/Explanation
Remind them that we are only trying to deliver a small amount of fluid into the tissue. We are not drawing blood, like for a lab test, blood glucose monitoring, or intravenous therapy. (BB)	Teaching/Explanation
Have them self-inject a clean needle. (BB)	Return demonstration
Validate that most people are afraid of the needle stick until they actually do it and see how relatively pain-free it actually is. (BB)	Feelings/Expectations
I show them how thin and short the needle is and help them perform a dry demo stick to get over the anxiety and see that it is not painful. (MC)	Teaching/Explanation Return demonstration
Show that the needles are smaller and thinner than the lancets they are using and smaller/thinner than the needles used to draw blood at lab (MOH).	Teaching/Explanation
<i>I would be worried about getting low blood sugars (n = 24, 35.8%)</i>	
We would talk about prevention of low sugars and especially convey that people w/ type 2 diabetes are not likely to lose consciousness but would have warning symptoms. (KZ)	Teaching/Explanation
Explain that we would start on a low dose that would reduce the risk of hypoglycemia and then adjust the dose as necessary to control the blood sugar. (BB)	Teaching/Explanation
Instruct that prevention of hypoglycemia is key, through balancing activity, food, and exercise, which we would teach them how to do. Instruct them how to prevent hypoglycemia. (BB)	Teaching/Explanation
Explain that there is always a reason for hypoglycemia—either lack of food, increased activity levels, or excess medication. (BB)	Teaching/Explanation
Teach them how to appropriately be prepared to treat hypoglycemia and to wear a medical ID. (BB)	Teaching/Explanation
I teach them low blood sugar prevention and proper treatment. Explaining insulin action and proper timing to meals is essential in minimizing risk of low BS. (MC)	Teaching/Explanation
So patients feel more in control, educate how to avoid low blood sugars by proper meal planning, exercise, and correct insulin dosing. Teach how to recognize symptoms of low blood sugar test and the correct way to treat a low blood sugar (MOH)	Teaching/Explanation
<i>I would be worried about gaining weight (n = 26, 38.8%)</i>	
We discuss the fact that a slight weight gain may happen as they are no longer voiding out their calories and then discuss how to begin to modify their diet. (KZ)	Teaching/Explanation
Agree that some people do gain weight, but that we would help them to control their weight through meal planning and exercise. (BB)	Feelings/Expectations
I explain that weight gain is not from insulin, but from consuming excess calories and then talk about healthier choices and meal planning. (MC)	Teaching/Explanation
Acknowledge weight gain can happen due to the body more efficiently using food calories with the addition of insulin injections. Explain that with healthful food choices, along with the right meal plan and exercise, weight can be controlled (MOH)	Teaching/Explanation
<i>I don't think I could learn to take insulin shots (n = 15, 22.4%)</i>	
Have patients handle syringe and vial vs. insulin pens and practice injections on injection pillows. (KZ)	Return demonstration
Have them think about all the things that they have accomplished in their lives that they were able to overcome (BB)	Feelings/Expectations
Demonstrate how easy it is	Demonstrations/Examples
If insurance covers insulin pens, teach pen use, which is easier than bottle and syringe. (BB)	Teaching/Explanation
Ask them why they think they cannot learn to take the shots. (BB)	Feelings/Expectations
I demonstrate how easy insulin injections are, and if their insurance covers insulin pen devices, I teach the pen vs. vial and syringe. (MC)	Demonstrations/Examples
Find out why they doubt their ability to learn (i.e., literacy or sight issues, lack self-confidence, depression, etc.). Describe and show insulin pen, if an option (MOH)	Teaching/Explanation Demonstrations/Examples
<i>Reluctant to give myself insulin shots in public (n = 29, 43.4%)</i>	
Talk about ways to give injections in restaurants and such. Talk about how many people give themselves injections at dinner tables and or in bathroom stalls. (KZ)	Teaching/Explanation Demonstrations/Examples
Assure them, usually can find a clean private place even in public area. (BB)	Teaching/Explanation
Insulin pens could be more discreet if [allowed? reimbursed?] by insurance (BB)	
I show the patient ways they can get around public injections, depending upon the type of insulin that is prescribed. Some insulin is once daily and can be taken at home. Meal time insulin in a pen, can be discretely taken at the table or bathroom right before the meal. (MC)	Demonstration/Example
Explain how many people with diabetes take insulin discretely, in public places such as bathrooms, offices, restaurants; with planning and experience, it can be done quickly (MOH).	Teaching/Explanation Demonstrations/Examples
<i>I am too busy to add another big demand to my life right now (n = 14, 19.4%)</i>	
Try to find out what is happening in their lives and brainstorm as to when they do have time on their side. Discuss being proactive will take less time than getting sick and possibly hospitalized. (KZ)	Teaching/Explanation
If they have symptoms of hyperglycemia such as fatigue, frequent urination, blurred vision etc., then explain that improved blood sugar would increase their energy level and improve vision so they can accomplish more. (BB)	Teaching/Explanation



Table 4 (continued)

Treatment Recommendation	Information Source
Show them that it just takes 2 min to administer insulin. (BB)	Demonstrations/Examples
I show them how quickly insulin can be injected. I also explain that if their diabetes continues to be in poor control and they develop diabetes complications, then it won't matter how busy they are, they will not be able to continue those activities anyway. (I say this with compassion and not so harshly). (MC)	Demonstrations/Examples
Assure that with practice, taking insulin (especially pens) can be done quickly and that with improved blood sugars they will feel better and have more energy to enjoy and cope with their busy lifestyle (MOH)	Teaching/Explanation
<i>I would want to try all other options first (n = 60, 89.6%)</i>	
Explore all options with the patient, and let them know how much of a reduction in their HbA1c could be expected with each option. (KZ)	Teaching/Explanation
If other options have been tried, then explain that their body is not producing enough insulin now and needs replacement. (BB)	Teaching/Explanation
If new to diabetes and hyperglycemia, then explain that insulin therapy may be temporary until other meds get adequate blood level and/or exercise and weight loss reduce insulin resistance. (BB)	Teaching/Explanation
Discuss the basic pathophysiology of diabetes and explain how all treatment options work. (BB)	Teaching/Explanation
If other options have been tried, then explain that their body is not producing enough insulin now and needs replacement. (BB)	Teaching/Explanation
Explain why those other options will not work due to the progressive nature of the disease. (MC)	Teaching/Explanation
Review the other possible options, explaining how they work to lower blood sugars and any side effects or medical reasons why they were not chosen at this time. Insulin should be considered as part of our early arsenal of ways to control diabetes (MOH)	Teaching/Explanation
<i>I have seen people develop serious complications after going on insulin (n = 8, 11.9%)</i>	
Explain the facts that complications occur from years of elevated blood sugars and not insulin. Insulin is a hormone the body produces naturally. (KZ)	Teaching/Explanation
Unfortunately, most people are started on insulin too late—when complications already have started, so the key is to start the insulin as soon as necessary to avoid these health complications. (BB)	Teaching/Explanation
I explain that often people relate diabetes complications and insulin. The problem is that people wait too long to begin insulin therapy and that is why they already have the complications. Early use of insulin can prevent complications. (MC)	Teaching/Explanation
Acknowledge that initiating insulin and complications may appear to start at the same time. However, complications are caused by years of diabetes and elevated blood glucose, not insulin, which our bodies naturally make. To prevent complications, insulin should be started early (MOH)	Teaching/Explanation
<i>Health insurance/financial difficulties would make it hard to afford (n = 11, 16.4%)</i>	
Let the patient know we can call their insurance company to determine the medications that will be at their lowest co-pay. (KZ)	Teaching/Explanation
All insurances cover insulin with a prescription—co-pays vary. (BB)	Teaching/Explanation
If in a Medicare “donut hole,” they can ask their physician for samples. (BB)	Teaching/Explanation
Let them know that many pharmaceutical companies offer medication assistance if the patient qualifies. (BB & KZ)	Teaching/Explanation
Let them know there are also other social, community resources that may be able to assist with finances. (BB)	Teaching/Explanation
Insurance covers insulin and supplies. There are also assistance programs. Cost of complications is much greater due to loss of job and quality of life. (MC)	Teaching/Explanation
Insulin and supplies are covered by insurances. Some companies offer assistance programs. Insulin can be less expensive if previous diabetes meds are discontinued by doctor (MOH)	Teaching/Explanation

KZ, BB, MC, MOH are initial letters of certified diabetes educators' names.

of specific treatment interventions we describe for PIR but were embedded within a broader DSME intervention. Future studies on effective treatment strategies specifically for PIR are needed and should use a longitudinal randomized controlled design with independent evaluations of the actual DSME content of scheduled PIR sessions rather than using CDE self-report as in this study.

The phenomenon of PIR has been well documented for two decades, but interventions to treat PIR have not been well described and randomized controlled trials testing the efficacy of PIR interventions are needed. The personal barriers to starting insulin reported by our patient sample were similar to those described elsewhere [8,9,11,14,17,28,35]. Our study describes specific interventions taken by CDEs to treat PIR. This level of specificity has been lacking in the literature on PIR. These intervention strategies to treat PIR included 1) teaching and providing explanations, 2) demonstrations and sharing success examples, 3) return demonstration, and 4) addressing negative feelings and positively managing expectations. The next logical step is for a well-designed randomized controlled trial testing the efficacy of PIR interventions.

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