SUPPLEMENTARY DATA

Supplementary Table 1. Content of the INPUT education and treatment program

INPUT lessons	Content
1: Understanding CSII-therapy	• Individual goal setting • Differences between MDI- and CSII-therapy • Advantages of CSII-therapy • Understanding basal insulin demand and basal rate
2: Motivation for CSII-therapy	• Personal value of CSII-therapy • What is going well – what isn't • Continuous glucose monitoring • Testing the basal rate
3: Adjusting basal rates	• How to adjust the basal rate • Advantages of temporary basal rates • Examples for using temporary basal rates • Using different basal rates (basal rate profiles) • Dealing with catheter problems
4: Eating and drinking with the insulin pump	• Carbohydrate content of food and meals • Training of carbohydrate estimation • Understanding insulin-to-carb ratio • Understanding correction factors
5: Determining and adjusting bolus insulin	• Training of carbohydrate estimation • Advantages of different bolus options • Examples for using bolus options • Determining the correct insulin dose – bolus calculators
6: Management of hyperglycemia	• Recognizing patterns within glucose profiles • Reasons for hyperglycemia • Handling of hyperglycemic glucose values • Management of ketoacidosis • Evaluation of individual goals
7: Management of hypoglycemia	• Reasons for hypoglycemia • Handling of hypoglycemia • Sensor-augmented pump therapy
8: Physical activity	• Gaining flexibility with temporary basal rates • How to adjust CSII-therapy before/during/after physical activity
9: CSII-therapy in special situations	• CSII-therapy in social situations • When it's hot, cold, dirty • Travelling with the insulin pump • Short-term discontinuation of CSII-therapy • Pregnancy
10: CSII-therapy and family/partnership	• Finding ways of supporting each other • Dealing with hypoglycemia
11: Learning from mistakes	• Positive error management • What motivates for optimal glycemic control? • Attitudes towards CSII-therapy
12: Closing the loop	• Evaluation of personal goals • What has changed since the beginning of INPUT? • Future developments and artificial pancreas

SUPPLEMENTARY DATA

Supplementary Table 2. Changes in therapy parameters

Per-protocol population (N = 254)	**INPUT (n =128)**		**Control group (n = 126)**		p*
	Baseline	Follow-up	Baseline	Follow-up	
Self-monitored blood glucose measurements (number per day)	5.3 (1.8)	4.8 (2.3)	5.2 (1.9)	5.3 (4.3)	0.405
Percentage of participants using rtCGM#	13.1%	5.3%	10.2%	5.1%	0.829
Percentage of participants using iscCGM#	17.6%	57.1%	16.9%	31.7%	0.001
Combined use of rtCGM or iscCGM#	29.4%	61.1%	25.6%	36.3%	0.001
Basal insulin dose (Insulin units per day)	24.8 (12.7)	24.9 (13.7)	24.6 (10.7)	25.0 (10.6)	0.658
Basal insulin need (insulin units/kg)	0.29 (0.11)	0.30 (0.16)	0.29 (0.09)	0.29 (0.09)	0.842
BMI (kg/m²)	28.3 (5.8)	28.1 (5.9)	27.9 (5.6)	28.0 (5.6)	0.116
Data are mean (SD) or %; * p-values for between-group difference of change; # rtCGM = real time continuous glucose monitoring; iscCGM = intermittent scan continuous glucose monitoring (Flash Glucose Monitoring)					

Supplementary Table 3. Effect of the interaction between group and relevant baseline variables on the primary outcome (Moderator analysis).

	Standardized beta coefficient of the interaction	**$p_{interaction}$**
Age	-0.237	0.108
Gender+	0.064	0.452
HbA1c	-0.016	0.802
Use of continuous glucose monitoring technology+#	-0.02	0.783
Duration of CSII-therapy	0.103	0.260
Age of onset of CSII-therapy	-0.240	0.042
Number of previous education courses	-0.041	0.661
Years since last diabetes education	0.111	0.200
Therapy regimen at last structured education+	-0.019	0.846
Diabetes distress	0.098	0.328
Depressive symptoms	0.081	0.439
Empowerment	-0.319	0.170
Treatment satisfaction	-0.062	0.751
Recruited pool size	-0.503	0.001
Study center*	1.434*	0.088
Separate linear regression analyses were performed for each baseline variable with HbA1c at follow-up as dependent variable, group, baseline variable and baseline HbA1c as main effects and the respective interaction term between group and baseline variable; + categorical variables (dummy coding): 0 = male, 1 = female; 0 = no use, 1 = use; 0 = MDI at last education, 1 = CSII at last education; # rtCGM or iscCGM (rtCGM = real time continuous glucose monitoring; iscCGM = intermittent scan continuous glucose monitoring [Flash Glucose Monitoring]); * Analysis of covariance with baseline HbA1c as covariate was performed and the respective F value of the interaction between study center and group is reported.		

SUPPLEMENTARY DATA

Supplementary Table 4. Mediation effect of relevant variables on the change in HbA1c

	Standardized beta coefficient	**$p_{beta\text{-}coefficient}$**	**Sobel-Test statistic for mediation effect**	**p_{soebel}**
Group	0.185	0.004	0.697	0.46
Reduction in diabetes distress	0.045	0.480		
Group	0.150	0.017	1.848	0.063
Reduction in depressive symptoms	0.162	0.010		
Group	0.123	0.050	2.609	0.009
Improvement in diabetes self-management	0.234	< 0.001		
Group	0.168	0.008	0.923	0.356
Increased use of temporary basal rates	0.063	0.320		
Group	0.188	0.004	-1.146	0.252
Increased use of bolus options	-0.081	0.209		
Group	0.141	0.031	2.063	0.039
New use of continuous glucose monitoring technology at follow-up[#+]	0.183	0.005		

Separate linear regression analyses with difference in HbA1c as dependent variable and group and the respective change value as independent variables were performed. Mediation effect of the variables were tested according to Sobel. Positive values of change in HbA1c indicate improvement; # rtCGM or iscCGM (rtCGM = real time continuous glucose monitoring; iscCGM = intermittent scan continuous glucose monitoring [Flash Glucose Monitoring]); + categorical variable (dummy coding): 0 = no new use, 1 = new use

SUPPLEMENTARY DATA

Supplementary Table 5. Measures of fidelity and intervention implementation

Fidelity questionnaire completed by the INPUT group participants after the last course			
Percentage of participants "partly" or "totally agreeing"	INPUT	Control group	p
The content was important for my everyday life with the insulin pump	90.4%	-	-
There was enough time to discuss problems with insulin pump therapy	89.5%	-	-
There were enough opportunities for practicing the use of insulin pump features	72.0%	-	-
There was enough time to discuss and exchange experiences with other participants	93.9%	-	-
There was enough time to review and intensify specific content	75.2%	-	-
I achieved my individual goals	87.1%	-	-
Testing of basic parameters of CSII-therapy at the end of the intervention phase			
Basal rate test	95.3%	19.2%	< .001
Insulin-to-carb ratio test	73.2%	16%	< .001
Correction factor test	62.6%	9.9%	< .001
Testing of basic parameters of CSII-therapy during the 6-months after the intervention phase			
Basal rate test	45.3%	28.6%	0.006
Insulin-to-carb ratio test	35.4%	22.4%	0.026
Correction factor test	26.8%	12.7%	0.007

SUPPLEMENTARY DATA

Appendix: Study centers

Diabeteszentrum am Sophia-Charlotte-Platz: Dr. Kristina Pralle (Berlin, Germany)
Diabetes- und Stoffwechselpraxis Bochum: Stephan Bonnermann (Bochum, Germany)
Die Zuckerpraxis: Dr. Ewald Jammers (Bramsche, Germany)
Diabetologische Schwerpunktpraxis Dr. Gölz: Dr. Stefan Gölz (Esslingen, Germany)
Praxis Dres. Sammler/Denger: Dr. Armin Sammler (Friedrichsthal, Germany)
Zentrum für Diabetologie Bergedorf: Dr. Jens Kröger (Hamburg, Germany)
Diabetologische Schwerpunktpraxis Dr. Milek: Dr. Karsten Milek (Hohenmölsen, Germany)
Gemeinschaftspraxis Dres. Puth/König/Brockmann: Dr. Kerstin König (Kamen, Germany)
Hormonzentrum Karlsruhe: Sebastian Zink (Karlsruhe, Germany)
Diabetologische Schwerpunktpraxis Dres. Cloß/Brahimi: Dr. Beqir Brahimi (Kempen, Germany)
Gemeinschaftspraxis Dres. Schlotmann/Hochlehnert/Zavaleta/Birgel: Dr. Michael Birgel (Köln, Germany)
Praxis Dres. Reichert/Hinck: Dr. Dorothea Reichert (Landau, Germany)
Diabetologische Schwerpunktpraxis Dr. Lang: Dr. Vera Lang (Lauf, Germany)
Praxis Dr. Gläß: Dr. Florian Gläß (Magdeburg, Germany)
Diabeteszentrum Neckar-Odenwald: Dr. Carsten Iannello (Mosbach, Germany)
Schwerpunktpraxis für Diabetes und Ernährungsmedizin Dr. Keuthage: Dr. Winfried Keuthage (Münster, Germany)
Zentrum für Diabetes und Gefäßerkrankungen Münster: Dr. Ludger Rose (Münster, Germany)
Praxis Marck-Linn-Pickel: Dr. Cornelia Marck (Pohlheim, Germany)
Praxis Dr. Lange: Dr. Martina Lange (Rheinbach, Germany)
Diabetologische Schwerpunktpraxis Dr. Dietlein: Dr. Michael Dietlein (Stadtbergen, Germany)
Diabetologische Schwerpunktpraxis Dr. Schreiber: Dr. Anne Schreiber (Stuttgart, Germany)
Praxis Dres. Etzrodt/Alexopoulos: Dr. Gwendolin Etzrodt-Walter (Ulm, Germany)
Gemeinschaftspraxis Dr. Schreiber/Werkmeister: Petra Werkmeister (Volkertshausen, Germany)
Praxis Dr. Stürmer: Dr. Annette Klüpfel (Würzburg, Germany)
diabendo Praxisgemeinschaft: Dr. Stephan Arndt (Rostock, Germany)
Diabetologische Schwerpunktpraxis Galatea-Anlage: Dr. Dorothea Herber (Wiesbaden, Germany)