

Supplementary Appendix

Supplement to:

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Sustained impact of real-time continuous glucose monitoring in adults with type 1 diabetes on insulin pump therapy: Results after 24 months RESCUE study

This appendix has been provided by the authors to give readers additional information about their work.

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Table S1. Overview of insulin pumps and glucose sensors

	baseline	12 months	24 months
n total	441	387	360
Insulin pumps			
Medtronic MiniMed Veo Paradigm 522	1 (0.2%)	1 (0.3%)	0 (0.0%)
Medtronic MiniMed Veo Paradigm 722	4 (0.9%)	1 (0.3%)	0 (0.0%)
Medtronic MiniMed Veo Paradigm 554	3 (0.7%)	2 (0.5%)	1 (0.3%)
Medtronic MiniMed Veo Paradigm 754*	293 (66.4%)	209 (54.0%)	133 (36.9%)
Medtronic MiniMed 640G	60 (13.6%)	98 (25.3%)	157 (43.6%)
Roche Accu-Chek Combo	80 (18.1%)	76 (19.6%)	65 (18.1%)
Roche Accu-Chek Insight	0 (0.0%)	0 (0.0%)	4 (1.1%)
Glucose sensors			
Medtronic Enlite	348 (78.9%)	298 (77.0%)	278 (77.2%)
Dexcom G4 Platinum	93 (21.1%)	88 (22.7%)	81 (22.5%)
Dexcom G5	0 (0.0%)	1 (0.3%)	1 (0.3%)
Combination of insulin pump and glucose sensor			
rtCGM + insulin pump	95 (21.5%)	89 (23.0%)	82 (22.8%)
Low-glucose threshold suspend	287 (65.1%)	202 (52.2%)	123 (34.2%)
Low-glucose predictive suspend	59 (13.4%)	96 (24.8%)	155 (43.0%)

Data are n (%). *Also known as Medtronic MiniMed 530G or 630G.

Table S2. Overview of completeness of data per variable and time point

	baseline	4 months	8 months	12 months	24 months
n total	441	417	399	387	360
HbA _{1c}	439 (99.5%)	412 (98.8%)	370 (92.7%)	374 (96.6%)	351 (97.5%)
Hospitalizations	432 (98.0%)	NA	NA	370 (95.6%)	342 (95.0%)
Third party help for hypoglycemia	421 (95.5%)	NA	NA	353 (91.2%)	317 (88.1%)
Hypoglycemic coma	425 (96.4%)	NA	NA	355 (91.7%)	319 (88.6%)
Hypoglycemia with seizure	424 (96.1%)	NA	NA	355 (91.7%)	318 (88.3%)
Needing glucagon for hypoglycemia	425 (96.4%)	NA	NA	355 (91.7%)	319 (88.6%)
Help from ambulance for hypoglycemia	426 (96.6%)	NA	NA	354 (91.5%)	319 (88.6%)
Work absenteeism	404 (91.6%)	NA	NA	350 (90.4%)	319 (88.6%)
SF-36 subscales	399 (90.5%)	NA	NA	336 (86.8%)	313 (86.9%)
PAID-SF	392 (88.9%)	NA	NA	327 (84.5%)	310 (86.1%)
HFS-worry	358 (81.2%)	NA	NA	324 (83.7%)	310 (86.1%)
Sensor data*	307 (69.6%)	373 (89.4%)	299 (74.9%)	350 (90.4%)	300 (83.3%)

Data are n (%). *Baseline for this variable is the first 2 weeks after start. PAID-SF = Problem Areas in Diabetes-short form, HFS = Hypoglycemia Fear Survey, NA = not applicable

Table S3. Number of people in each subgroup

	baseline	4 months	8 months	12 months	24 months
n total	441	417	399	387	360
Impaired awareness of hypoglycemia at baseline					
Yes	193 (46.8%)	184 (44.1%)	179 (44.9%)	177 (45.7%)	167 (46.4%)
No	244 (55.3%)	230 (55.2%)	217 (54.4%)	208 (53.7%)	191 (53.1%)
Baseline HbA_{1c}					
<7.0% (<53 mmol/mol)	93 (21.1%)	93 (22.3%)	85 (21.3%)	80 (20.7%)	74 (20.6%)
7.0–8.0% (53–64 mmol/mol)	225 (51.0%)	218 (52.3%)	214 (53.6%)	209 (54.0%)	197 (54.7%)
>8.0% (>64 mmol/mol)	118 (26.8%)	105 (25.2%)	99 (24.8%)	97 (25.1%)	88 (24.4%)

Data are n (%). Note: Numbers and percentages at the different time points denote how many people from the initial grouping are still in follow-up.

Table S4. Baseline characteristics

General characteristics	
Total number of participants	441 (100%)
Female	257 (58.3%)
Caucasian	429 (97.3%)
Age (years)	41.9 (12.5)
BMI (kg/m ²)	25.3 (3.7)
Education	
Higher*	272 (61.7%)
No higher	150 (34.0%)
Unknown	19 (4.3%)
Living alone	47 (10.7%)
Diabetes-related characteristics	
Diabetes duration (years)	22.3 (11.6)
Age at diagnosis (years)	19.1 (11.4)
Insulin pump therapy	441 (100%)
Duration (years)	5.6 (4.5)
Microvascular complications	146 (33.1%)
Retinopathy	123 (27.9%)
Neuropathy†	63 (14.3%)
Nephropathy	47 (10.7%)
Macrovascular complications	18 (4.1%)
Acute myocardial infarction	9 (2.0%)
Peripheral arterial disease	5 (1.1%)
Cerebrovascular accident	4 (0.9%)
Heart failure	2 (0.5%)
Impaired awareness of hypoglycemia‡	193 (43.8%)
Symptoms <50 mg/dL (2.8 mmol/L)	131 (29.7%)
No symptoms <50 mg/dL (2.8 mmol/L)	53 (12.0%)
Unknown	9 (2.0%)
HbA _{1c} (%)	7.6 (0.9)
HbA _{1c} (mmol/mol)	60 (9.8)
Self-reported daily home glucose-meter readings (number per day)‡	5.6 (2.1)
rtCGM-related characteristics	
Indication for rtCGM therapy	
Hypoglycemia	247 (56.0%)
Insufficient and variable glycemic control	118 (26.8%)
Pregnancy	58 (13.2%)
Other	11 (2.5%)
Unknown	7 (1.5%)
rtCGM-use before reimbursement	
No	234 (53.1%)
Sporadically	84 (19.0%)
Continuously ≤4 months	56 (12.7%)
Continuously >4 months	67 (15.2%)

Data are mean (SD) or n (%). *Defined as graduated from university or college. †Peripheral and/or autonomic neuropathy. ‡Based on questionnaire filled out by patients or the clinical team.

Table S5. Quality of life scores

	baseline		12 months		p-value*	24 months		p-value*
Total population								
SF-36								
Physical functioning	80.5	(78.6-82.5)	83.5	(81.5-85.6)	<0.0001	83.2	(81.2-85.3)	0.004
Role-physical	63.7	(59.6-67.8)	68.7	(64.5-72.9)	<0.0001	68.7	(64.5-72.9)	<0.0001
Bodily pain	72.5	(67.9-77.1)	75.6	(70.9-80.3)	0.009	73.7	(68.9-78.4)	0.366
General health	50.1	(46.7-53.6)	54.6	(51.1-58.1)	<0.0001	53.6	(50.0-57.1)	<0.0001
Vitality	56.1	(53.5-58.7)	58.5	(55.8-61.2)	0.009	57.3	(54.6-60.0)	0.212
Social functioning	72.3	(69.3-75.3)	78.1	(75.1-81.1)	<0.0001	78.2	(75.0-81.3)	<0.0001
Role-emotional	72.9	(69.4-76.3)	77.0	(73.5-80.5)	0.006	75.5	(72.1-79.0)	0.087
Mental health	67.0	(64.9-69.2)	69.7	(67.5-72.0)	0.003	68.6	(66.3-70.9)	0.117
PAID-SF	7.4	(6.8-8.1)	6.4	(5.7-7.0)	<0.0001	6.2	(5.5-6.8)	<0.0001
HFS-worry	18.3	(16.7-19.9)	14.7	(13.2-16.3)	<0.0001	14.1	(12.5-15.7)	<0.0001
Impaired awareness of hypoglycemia								
SF-36								
Physical functioning	77.2	(72.9-81.6)	81.7	(77.3-86.1)	<0.0001	81.1	(76.7-85.6)	<0.0001
Role-physical	59.3	(53.5-65.1)	66.4	(60.5-72.3)	0.002	66.7	(60.8-72.6)	0.002
Bodily pain	68.5	(63.0-73.9)	73.4	(67.9-78.9)	0.007	71.0	(65.5-76.5)	0.191
General health	47.6	(42.4-52.7)	53.3	(48.1-58.5)	<0.0001	51.5	(46.3-56.6)	0.012
Vitality	53.8	(48.9-58.7)	58.5	(53.6-63.5)	0.001	58.2	(53.2-63.1)	0.006
Social functioning	67.9	(62.7-73.0)	76.0	(70.8-81.2)	<0.0001	77.3	(72.0-82.5)	<0.0001
Role-emotional	68.6	(62.5-74.7)	74.2	(68.0-80.4)	0.024	72.9	(66.9-78.9)	0.098
Mental health	65.8	(61.2-70.4)	68.9	(64.2-73.6)	0.030	67.6	(62.9-72.4)	0.239
PAID-SF	7.9	(7.0-8.8)	6.3	(5.4-7.2)	<0.0001	6.2	(5.3-7.1)	<0.0001
HFS-worry	20.8	(19.1-22.5)	16.6	(15.0-18.1)	<0.0001	15.4	(13.8-16.9)	<0.0001
Normal awareness of hypoglycemia								
SF-36								
Physical functioning	83.4	(80.9-85.8)	85.3	(82.5-88.0)	0.087	85.2	(82.5-88.0)	0.110
Role-physical	68.1	(62.4-73.8)	71.4	(66.0-76.7)	0.034	71.4	(66.1-76.7)	0.051
Bodily pain	77.1	(74.0-80.2)	78.8	(75.4-82.3)	0.262	77.5	(73.8-81.2)	0.824
General health	52.9	(48.8-57.1)	56.5	(52.3-60.7)	0.003	56.2	(51.9-60.4)	0.009
Vitality	58.6	(56.1-61.1)	59.1	(56.3-62.0)	0.663	57.4	(54.6-60.2)	0.357
Social functioning	76.4	(73.2-79.5)	80.3	(77.1-83.5)	0.015	79.3	(75.6-82.9)	0.110
Role-emotional	76.1	(72.7-79.5)	79.0	(75.5-82.5)	0.128	77.4	(73.6-81.2)	0.507
Mental health	68.5	(66.3-70.7)	70.7	(68.3-73.2)	0.054	69.5	(67.0-72.1)	0.401
PAID-SF	6.9	(6.4-7.5)	6.4	(5.7-7.0)	0.020	6.0	(5.4-6.6)	<0.0001
HFS-worry	16.1	(14.1-18.2)	13.1	(11.1-15.2)	<0.0001	12.9	(10.9-15.0)	<0.0001

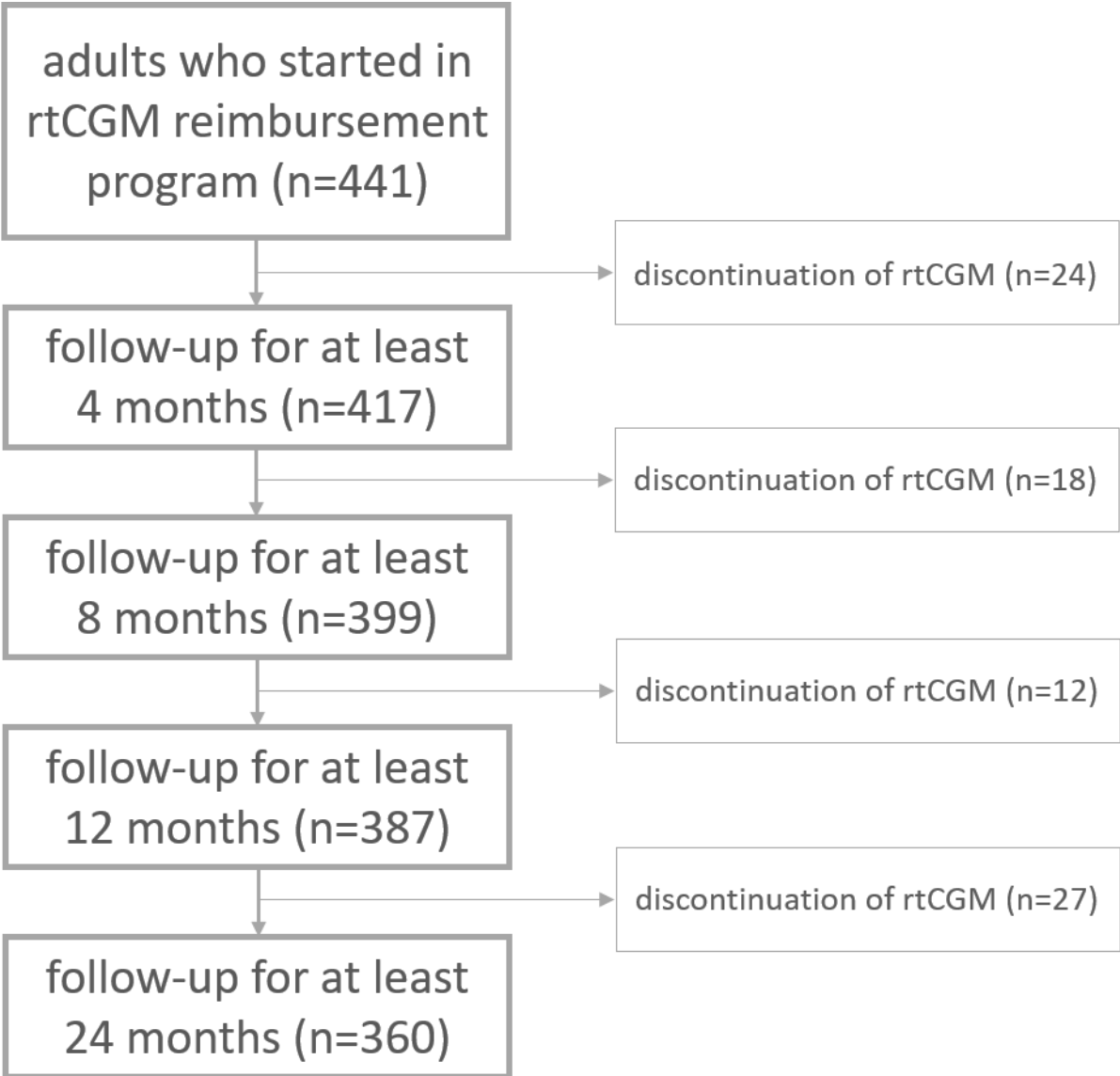
Data are least-squares mean (95% confidence interval). SF-36 = Short Form 36, scores range from 0-100 with higher scores indicating a better perception of quality of life; PAID-SF = Problem Areas in Diabetes–Short Form, scores range from 0-20 with higher scores suggesting greater diabetes-related emotional distress; HFS-worry = Hypoglycemia Fear Survey – worry subscale, scores range from 0-52 with higher scores representing more hypoglycemia-related concerns and fears. *P-value for the change versus baseline.

Table S6. People meeting glycemic targets with and without impaired awareness of hypoglycemia

	baseline	4 months	8 months	12 months	24 months	p-value‡
Impaired awareness of hypoglycemia						
Clinical consensus targets						
HbA _{1c} <7% (<53 mmol/mol)	43 (22.3%)	69 (38.1%)	58 (34.9%)	59 (34.5%)	52 (32.1%)	<0.0001
<1% of time spent <54 mg/dL (<3.0 mmol/L)*	74 (56.5%)	95 (58.3%)†	85 (65.9%)	88 (55.3%)†	89 (64.0%)†	0.053
<4% of time spent <70 mg/dL (<3.9 mmol/L)*	62 (47.3%)†	82 (50.3%)†	78 (60.5%)	81 (51.3%)†	81 (57.9%)†	0.043
>70% of TIR*	38 (29.0%)	38 (23.3%)	29 (22.5%)	35 (22.2%)	35 (25.0%)	0.603
<25% of time spent >180 mg/dL (>10.0 mmol/L)*	44 (33.6%)	40 (24.5%)	28 (21.7%)	39 (24.7%)	35 (25.0%)	0.139
<5% of time spent >250 mg/dL (>13.9 mmol/L)*	45 (34.4%)	44 (27.0%)	30 (23.3%)	41 (25.9%)	39 (28.3%)	0.349
Composite endpoints						
HbA _{1c} <7% (<53 mmol/mol) and <1% of time spent <54 mg/dL (<3.0 mmol/L)*	18 (10.1%)	28 (16.5%)	20 (13.6%)	27 (16.4%)	27 (17.4%)	0.010
HbA _{1c} <7% (<53 mmol/mol) and no severe hypoglycemia	17 (8.8%)	NA	NA	44 (26.0%)	32 (20.5%)†	<0.0001
>70% TIR and <1% of time spent <54 mg/dL (<3.0 mmol/L)*	25 (19.1%)	22 (13.5%)	20 (15.5%)	21 (13.2%)	25 (17.9%)	0.227
>70% TIR and no severe hypoglycemia*	12 (7.1%)†	NA	NA	25 (15.6%)	23 (15.8%)	0.014
Normal awareness of hypoglycemia						
Clinical consensus targets						
HbA _{1c} <7% (<53 mmol/mol)	53 (21.9%)	84 (36.8%)	74 (36.8%)	60 (29.9%)	63 (33.7%)	<0.0001
<1% of time spent <54 mg/dL (<3.0 mmol/L)*	111 (64.2%)	143 (68.8%)	127 (75.6%)	133 (70.4%)	124 (79.5%)	0.020
<4% of time spent <70 mg/dL (<3.9 mmol/L)*	105 (60.7%)	137 (65.9%)	114 (68.3%)	131 (69.3%)	115 (73.2%)	0.023
>70% of TIR*	56 (32.4%)	65 (31.3%)	52 (31.1%)	49 (25.9%)	41 (26.1%)	0.113
<25% of time spent >180 mg/dL (>10.0 mmol/L)*	58 (33.5%)	64 (30.8%)	52 (31.1%)	52 (27.5%)	39 (24.8%)	0.114
<5% of time spent >250 mg/dL (>13.9 mmol/L)*	63 (36.4%)	68 (32.7%)	53 (31.7%)	64 (33.9%)	44 (28.2%)	0.285
Composite endpoints						
HbA _{1c} <7% (<53 mmol/mol) and <1% of time spent <54 mg/dL (<3.0 mmol/L)*	20 (8.9%)	45 (20.5%)	37 (19.9%)	32 (16.0%)	38 (21.5%)	<0.0001
HbA _{1c} <7% (<53 mmol/mol) and no severe hypoglycemia	31 (13.0%)	NA	NA	61 (31.0%)	55 (29.9%)	<0.0001
>70% TIR and <1% of time spent <54 mg/dL (<3.0 mmol/L)*	36 (20.8%)	42 (20.2%)	37 (22.2%)	34 (18.0%)	29 (18.5%)	0.448
>70% TIR and no severe hypoglycemia*	42 (22.0%)	NA	NA	39 (21.1%)	37 (23.4%)	0.875

Data are n (% of total number of people in that subgroup with data). TIR = time in range (70-180 mg/dL; 3.9-10.0 mmol/mol), NA = not applicable *Baseline for this variable is the first 2 weeks after start. †Indicates a significant between-group difference compared to people with normal awareness of hypoglycemia. ‡P-value for the evolution over the follow-up period.

Figure S1. Overview of people with type 1 diabetes in the 24-month RESCUE study.



List of RESCUE 24-month investigators

Charleer Sara, MSc	University Hospitals Leuven – KU Leuven, Leuven
De Block Christophe, MD, PhD	University Hospital Antwerp, Edegem
Gillard Pieter, MD, PhD	University Hospitals Leuven – KU Leuven, Leuven
Keymeulen Bart, MD, PhD	University Hospital Brussels, Brussels
Lowyck Ine, MD	Ziekenhuis Oost-Limburg, Genk
Mathieu Chantal, MD, PhD	University Hospitals Leuven – KU Leuven, Leuven
Mullens Annelies, MD	Jessa Ziekenhuis, Hasselt
Nobels Frank, MD, PhD	OLV Hospital, Aalst
Radermecker Regis P, MD, PhD	CHU Liège, Liege
Scarnière Denis, MD	Grand Hôpital de Charleroi, Charleroi
Spincemaille Katrien, MD	AZ Delta, Roeselare
Strivay Marie, MD	CHR la Citadelle Liège, Liege
Taes Youri, MD, PhD	AZ Sint-Jan, Bruges
Vercammen Chris, MD	Imelda Hospital, Bonheiden
Weber Eric, MD	Cliniques du Sud Luxembourg – Vivalia, Arlon