CONVEGNO MACROREGIONALE

AME DAY

20/21 MAGGIO 2016

IL TRATTAMENTO DEL DIABETE MELLITO CON IL MICROINFUSORE

Alessandro Scorsone

[1]ASP 6 Palermo PO Civico Partinico, Centro di Riferimento Regionale per il Diabete e l'impianto dei microinfusori Partinico. Direttore Vincenzo Provenzano

Different scientific societies have produced clinical recommendations containing the **indications to pump** treatment.

These indications are mainly **based on poor glycemic control,** even **many years after diabetes onset** :

- HbA1c persistently > 8.5% in individuals > 12 yrs old (NICE 2008)
- HbA1c > 7.5% for adults and children (Societe´Francophone du Diabete 2010)
- failure to achieve the glycemic goals (ESPE, Lawson Wilkins Pediatric ES, ISPAD, ADA, EASD 2007)
- failure to achieve the glycemic goals (AACE/ACE 2014)

The evidence that supports these recommendations is centered on the **CSII-lowering effect on HbA1c** levels in comparison with MDI **on the short-term**

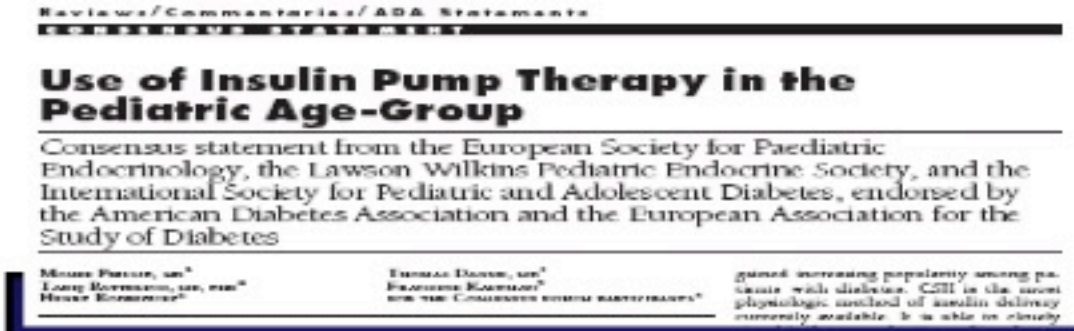
Dobbiamo aspettare che i bambini e gli adolescenti con diabete tipo 1 siano scompensati per utilizzare il microinfusore ?

O dobbiamo tentare, utilizzando il microinfusore, di mantenerli **in buon compenso già subito dopo l'esordio** e per un lungo periodo di tempo ?

AZIENDA U.S.L. N. 6 PALERMO

OBIETTIVI DELLA TERAPIA DEL DIABETE

Gli obiettivi del trattamento dei bambini e degli adolescenti con DM1 comprendono il raggiungimento di *livelli glicemici vicini alla norma,riducendo il piu' possibile il rischio di ipoglicemia,ottimizzando* ***la qualita' di vita*** *e prevenendo o ritardando la comparsa delle complicanze* **SIEDP- Raccomandazioni italiane all'utilizzo del microinfusore 2008**



Reviews/Commentaries/ADA Statements

Use of Insulin Pump Therapy in the Pediatric Age-Group

Consensus statement from the European Society for Paediatric Endocrinology, the Lawson Wilkins Pediatric Endocrine Society, and the International Society for Pediatric and Adolescent Diabetes, endorsed by the American Diabetes Association and the European Association for the Study of Diabetes

Attività Diabetologica e Metabolica in Italia

Raccomandazioni italiane all'utilizzo del microinfusore sottocutaneo di insulina in età pediatrica

Position statement Lawson-Wilkins

- " la terapia con CSII dovrebbe essere resa il piu' disponibile possibile per bambini, adolescenti e giovani adulti; cio' perche' si e' osservato un miglioramento del controllo metabolico e della qualita' di vita ,senza un aumento del rischio di ipoglicemie o DKA rispetto alla terapia con MDI "

The NEW ENGLAND JOURNAL of MEDICINE

CLINICAL THERAPEUTICS

Insulin-Pump Therapy for Type 1 Diabetes Mellitus

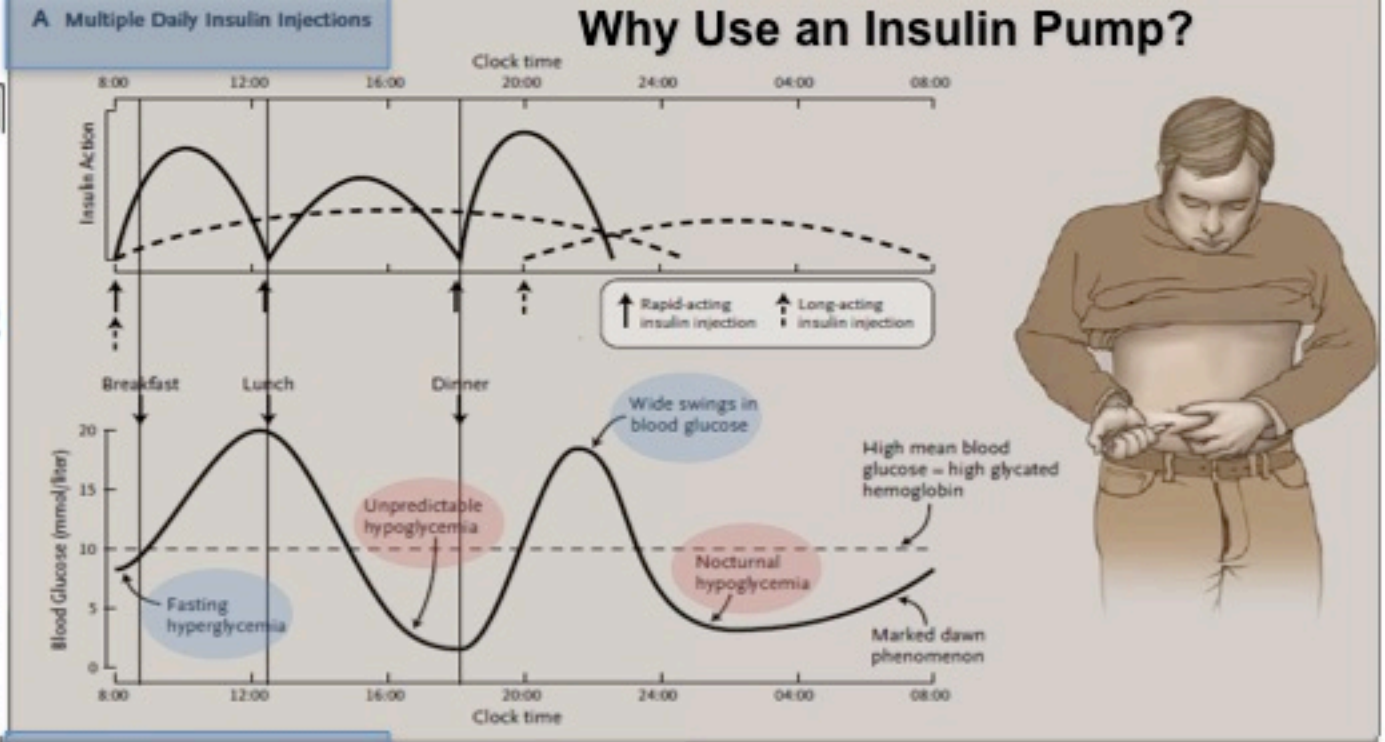
John C. Pickup, B.M., D.Phil.

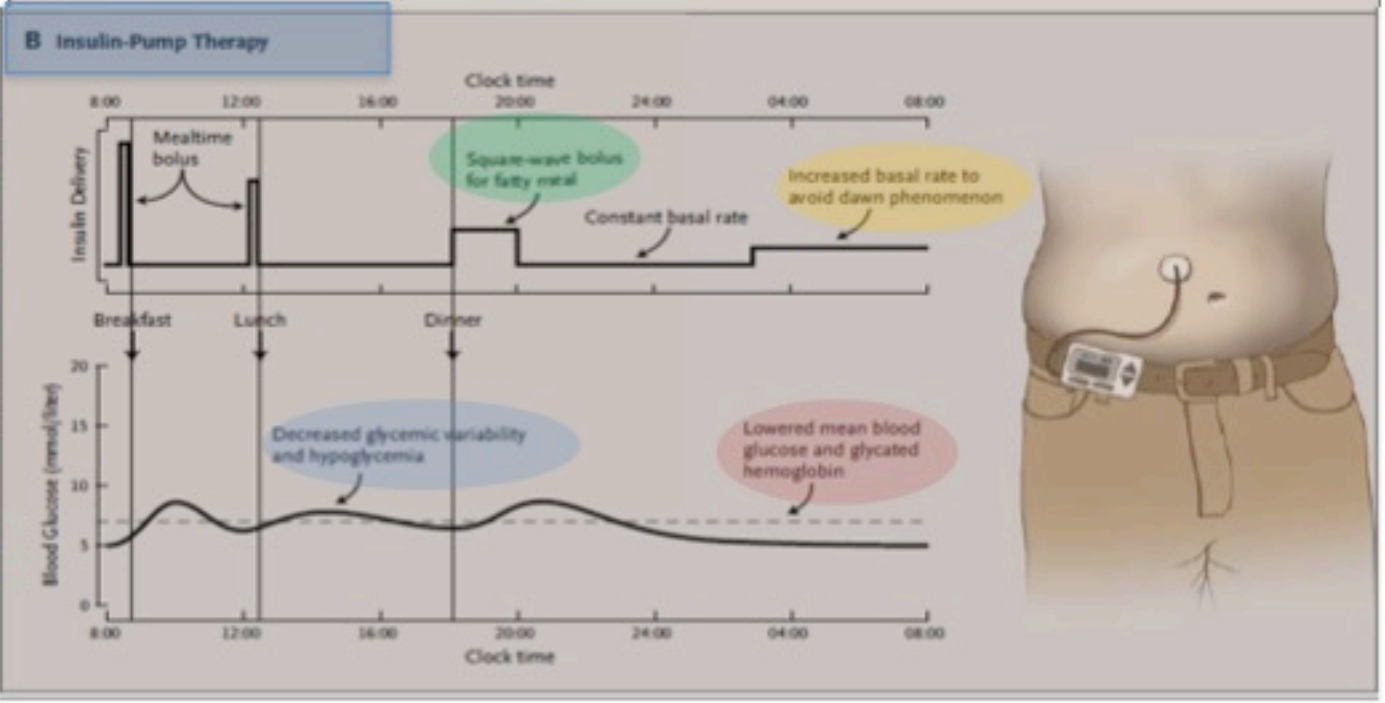
N ENGL J MED 366;17 NEJM.ORG APRIL 26, 2012

Riduzione HbA1c

Several meta-analyses of randomized, controlled trials of glycemic control with multiple daily insulin injections as compared with insulin-pump therapy have shown that **mean glycated hemoglobin levels are significantly lower with insulin-pump therapy — with a mean difference of about 0.3 to 0.6%between treatments** — and this reduction in gly cated hemoglobin levels is accompanied by a **10 to 20% reduction in the dose of insulin**.(26-29)

Why Use an Insulin Pump?





SOCIETA' ITALIANA DI FARMACIA OSPEDALIERA E DEI SERVIZI FARMACEUTICI DELLE AZIENDE SANITARIE

Presidenza

Milano, 29 maggio 2012

DIABETE : FATTI E CIFRE IN ITALIA

COMPENSO METABOLICO

Due terzi delle persone con diabete di tipo 1 e oltre la metà di quelle con diabete di tipo 2 non presentano un adeguato controllo metabolico:

Dati del rapporto Osmed 2012 evidenziano :

DM 1 con glicata inf. a 7 mg%ml= 23,2%

DM1 con glicata magg. di 8 mg = 44,2 %

DM 2 con glicata a target = 43,8%

DM2 con glicata magg di 8 mg%ml = 27,2 %

Figura 19. Percentuali di soggetti con diabete di tipo 1 e di tipo 2 in cura presso le strutture specialistiche che raggiungono i target terapeutici raccomandati (Annali AMD 2010).

	Diabete di tipo 1	Diabete di tipo 2
HbA1c ≤7.0%	24,0%	43.8%
Colesterolo LDL <100 mg/dl	37,2%	41,8%
Pressione arteriosa ≤130/80 mmHg	36,1%	15,2%

Figura 4 - E' possibile prevenire le complicanze del diabete anche con la sola riduzione di un punto HbA_{1c}

International Forum on Quality and Safety in Healthcare

Parigi 9-11 APRILE -2014

Improving the care model for people with diabetes mellitus type 1 and insulin pumps

Vincenzo Provenzano, Davide Brancato, Mattia Fleres, Vito Aiello, Alessandro Scorsone, Gabriella Saura, Lidia Ferrara, Anna Di Noto, Lucia Spano
Regional Reference Center for Diabetology and Insulin Pumps,
Department of Internal Medicine, Hospital of Partinico, ASP Palermo

Context. The present project was performed in the Regional Reference Center for Diabetology and Insulin Pumps of Sicily (RRCDIP), from October 2011 until November 2013. RRCDIP has the role to address the changes of diabetes care in Sicily, and to coordinate the "Diabetologic Territorial Network" (DTN), including all the people (diabetologists, general practitioners, nurses, dietitians, psychologists, representatives of patient association and halthcare companies) involved in diabetes care in the Province of Palermo. The client group was formed by people with diabetes mellitus treated with continuous subcutaneous insulin pumps (CSII) at RRCDIP.

ASP PA prot. N 7020 del 14.11.2011 :istituzione Amb integrato

TEAM : Un medico diabetologo Due psicologi Due assistenti sociali 1 dietista 1 infermiere

DIABETES TECHNOLOGY & THERAPEUTICS
Volume 18, Number 5, 2016

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COMMENTARY

Is Pump Therapy for All with Type 1 Diabetes?

Darrell M. Wilson, MD

ORIGINAL ARTICLE

Prevalence of Insulin Pump Therapy and Its Association with Measures of Glycemic Control: Results from the Canadian Study of Longevity in Type 1 Diabetes

Geneviève Boulet, MD,[1] Elise M. Halpern, MSc,[1] Leif E. Lovblom, MSc,[1] Alanna Weisman, MD,[1] Johnny-Wei Bai, BHSc,[1] Devrim Eldelekli, BM,[1] Hillary A. Keenan, PhD,[2] Michael H. Brent, MD,[3] Narinder Paul, MD,[4] Vera Bril, MD,[5] David Z.I. Cherney, MD, PhD,[6,*] and Bruce A. Perkins, MD, MPH[1,*]

TABLE 1. GENERAL CHARACTERISTICS OF THE GROUPS ACCORDING TO INSULIN DELIVERY METHOD

	Total	*Non-pump subgroup*	*Pump subgroup*	P *value*[a]
Participants, *n* (%)	305	172 (56%)	133 (44%)	
Age (years)	65 [59,71]	66 [60,73]	64 [59,69]	0.04
Male, *n* (%)	137 (45%)	82 (48%)	55 (42%)	0.30
Age (years) at diagnosis	11.3±7.3	11.9±8.0	10.5±6.2	0.10
Duration (years) of diabetes	54 [51, 59]	54 [51, 60]	53 [51, 57]	0.12
Body mass index (kg/m^2)	26.0±4.7	26.2±5.1	25.7±4.2	0.41
Level of education higher than high school, *n* (%)	239 (78%)	126 (73%)	113 (85%)	0.01
Mean systolic blood pressure (mm Hg)	128.9±15.0	129.7±15.2	127.7±14.9	0.41
HDL cholesterol (mmol/L)	1.72±0.52	1.66±0.50	1.79±0.54	0.05
LDL cholesterol (mmol/L)	2.02±0.69	2.00±0.71	2.06±0.68	0.49
Triglycerides (mmol/L)	0.92±0.53	0.99±0.63	0.83±0.37	0.02
HbA1c (%)	7.5±1.1	7.6±1.2	7.4±0.9	0.22[b]
Diabetes complications, *n* (%)				
Diabetic retinopathy[c]	192 (72%)	104 (70%)	88 (73%)	0.58
Neuropathy (MNSI questionnaire ≥3)	128 (42%)	74 (43%)	54 (41%)	0.68
Nephropathy (ACR ≥2 mg/mmol)	89 (38%)	60 (45%)	29 (29%)	0.01
Nephropathy (GFR <60 mL/min/1.73 m^2)	95 (33%)	56 (34%)	39 (31%)	0.57
Macrovascular complications[d]	105 (34%)	66 (38%)	39 (29%)	0.10
Quality of life				
QOL self-assessment, *n* (%)				
Excellent	118 (39%)	60 (35%)	58 (44%)	0.07
Good–normal	178 (59%)	107 (62%)	71 (54%)	
Poor	8 (3%)	5 (3%)	3 (2%)	
Problem Areas in Diabetes score (/100)	10.0 [5.0, 18.0]	10.0 [5.0, 19.0]	9.0 [4.0, 17.5]	0.27
Geriatric Depression Scale score (/15)	1.0 [0.0, 3.0]	2.0 [0.0, 4.0]	1.0 [1.0, 3.0]	0.65

Data are mean ± SD values, median [interquartile range], or *n* (%). Percentages are calculated from available data.

[a]*P* values for comparison between non-pump and pump subgroups were calculated using Student's *t* test, the Wilcoxon rank-sum test, or the χ^2 test.

[b]Glycosylated hemoglobin (HbA1c) between the subgroups after exclusion of the non-pump users with insulin injections twice daily or less was also not significantly different (HbA1c, 7.4±0.9% vs. 7.5±1.2%; $P=0.50$).

[c]Presence of any degree of diabetic retinopathy as determined by most recent funduscopic examination results.

[d]Macrovascular complications as determined by history of myocardial infarction, angina, cardiac or leg artery bypass surgery, or angioplasty.

ACR, albumin-to-creatinine ratio; GFR, glomerular filtration rate; HDL, high-density lipoprotein cholesterol; LDL, low-density lipoprotein; MNSI, Michigan Neuropathy Screening Instrument; QOL, quality of life.

TABLE 2. TECHNICAL FACTORS RELATED TO DIABETES CARE ACCORDING TO INSULIN DELIVERY METHOD

	Total (n = 305)	*Non-pump subgroup (n = 172)*	*Pump subgroup (n = 133)*	P *value*[a]
Habits				
Healthy diet	164 (54%)	93 (54%)	71 (53%)	0.91
Currently physically active	214 (70%)	111 (65%)	102 (77%)	0.02[b]
Self-assessment				
Daily frequency of capillary glucose tests	5.0 [4.0. 6.5]	4.0 [4.0. 6.0]	6.0 [4.0, 7.0]	<0.0001[b]
Upload blood glucose data	68 (24%)	18 (11%)	50 (38%)	<0.0001[b]
Use of CGM[c]				
Nonhabitual	16 (5%)	2 (1%)	14 (11%)	0.0003
Habitual	23 (8%)	8 (5%)	15 (11%)	
Medical care				
Follow-up by endocrinologist	225 (80%)	114 (75%)	111 (86%)	0.02[b]
Medical visits ≥2/year	255 (84%)	139 (81%)	116 (87%)	0.10
Insulin therapy				
Daily insulin dose (units/kg)	0.52 ± 0.24	0.56 ± 0.27	0.47 ± 0.16	0.01[b]
Number of insulin injections per day	—	4.0 [4.0, 5.0]	—	—
Basal insulin				
Number of units per day (units)	16.0 [12.0, 23.0]	18.0 [13.0, 28.0]	14.9 [10.8, 20.0]	0.001[b]
Percentage of total daily dose	50 [43, 61]	53 [44, 65]	48 [40, 55]	0.004[b]
Dawn phenomenon coverage (%)	—	—	36.2	—
Use of analog insulin	275 (92%)	146 (86%)	129 (99%)	<0.0001[b]
Bolus insulin				
Number of units per day (units)	15.9 [11.1, 22.7]	16.0 [11.0, 24.0]	15.8 [11.4, 22.3]	0.72
Percentage of total daily dose	50 [39, 58]	47 [35, 56]	52 [45, 60]	0.01[b]
Use of analog insulin	281 (94%)	152 (90%)	129 (99%)	0.001[b]
Food bolus				<0.0001[b]
Fixed Dose	38 (12%)	30 (17%)	7 (5%)	
Estimation Range	166 (54%)	122 (71%)	44 (33%)	
Carb Counting	102 (33%)	20 (12%)	82 (62%)	
Correction bolus use	265 (89%)	144 (85%)	121 (95%)	0.004[b]

Data are mean ± SD values, median [interquartile range], or *n* (%). Percentages are calculated from available data.

[a]*P* values for comparison between non-pump and pump subgroups were calculated using Student's *t* test, the Wilcoxon rank-sum test, or the χ^2 test.

[b]Statistically significant difference, $P < 0.05$.

[c]Nonhabitual continuous glucose monitoring (CGM) use was defined as <1 week per month, and habitual CGM use was defined as ≥1 weeks per month. The remaining 266 (87%) participants never adopted CGM use.

Carb, carbohydrate.

TABLE 3. SELF-REPORTED MINOR AND SEVERE HYPOGLYCEMIA EVENTS ACCORDING TO INSULIN DELIVERY METHOD

	Total (n = *305*)	*Non-pump subgroup* (n = *172*)	*Pump subgroup* (n = *133*)	P *value*
Minor hypoglycemia[a]				
Events in past calendar year (*n* per patient-month)	5.7 ± 9.0	5.1 ± 9.9	6.5 ± 7.6	0.004
Severe hypoglycemia[b]				
Lifetime (% of patients)	234 (77%)	132 (78%)	102 (77%)	0.84
Past calendar year (% of patients)	76 (27%)	51 (32%)	25 (20%)	0.02
Events in past calendar year (*n* per patient-year)	1.0 ± 2.9	1.3 ± 3.7	0.5 ± 1.4	0.02
Hypoglycemia unawareness (% of patients)[c]	122 (41%)	71 (43%)	51 (39%)	0.54
Hypoglycemia Fear Questionnaire[d]				
Total Score	28 [16, 43]	31 [17, 44]	26 [15, 41]	0.14
Behavior Subscale	13 [9, 21]	15 [9, 21]	13 [8, 19]	0.20
Worry Subscale	13 [6, 24]	14 [7, 25]	11 [6, 23]	0.24

Data are mean ± SD values, median [interquartile range], or *n* (%). Percentages are calculated from available data.

[a]Minor hypoglycemia defined by self-reported capillary blood sugar reading of less than 4 mmol/L that did not require help from others.

[b]Severe hypoglycemia defined as events that required help from a friend or family member or required emergency medical services or a visit to a hospital.

[c]Hypoglycemia unawareness was defined by the qualitative presence of lost ability to feel the symptoms of hypoglycemia.

[d]Hypoglycemia Fear Questionnaire scores could range from 0 to 132, with higher scores indicating greater magnitude of fear, as a composite of behaviors and worries related to hypoglycemia.[28]

Table 4. Univariable and Multivariable Linear Regression Analysis of Variables Associated with Glycosylated Hemoglobin in the 305 Participants

	Univariable analysis[a]		*Multivariable analysis*[b]	
Characteristic	*β-Coefficient*	P *value*	*β-Coefficient*	P *value*
General				
Age	−0.01	0.30	−0.01	0.24
Gender (reference female)	−0.56	<0.0001[c]	−0.44	0.0046[c]
LDL cholesterol	0.25	0.01[c]	0.08	0.43
Triglycerides	0.30	0.02[c]	0.19	0.26
PAID score	0.01	0.003[c]	0.01	0.33
Geriatric Depression Scale score	0.06	0.02[c]	0.03	0.55
Macrovascular complications	0.28	0.03[c]	0.25	0.12
Habits				
Currently physically active	−0.28	0.04[c]	0.05	0.78
Self-assessment				
Daily frequency of capillary glucose tests	−0.12	<0.0001[c]	−0.09	0.01[c]
CGM use[d]				
Nonhabitual	0.18	0.81	0.32	0.52
Habitual	−0.04		0.16	
Hypoglycemia (number of events in past calendar year)				
Minor (per month)	−0.03	<0.0001[c]	−0.02	0.0052[c]
Severe	0.01	0.58	0.0001	0.97
Insulin therapy				
Percentage of daily bolus insulin	−0.01	0.03[c]	0.001	0.83
Use of an insulin pump	−0.15	0.24	−0.04	0.81

[a]All variables from Tables 1–3 were analyzed in univariable linear regression, but only the significant results are showed here, with exceptions for continuous glucose monitoring (CGM) use, the number of severe hypoglycemia events, and the use of an insulin pump.

[b]All significant variables from univariable linear regression ($P < 0.25$) as well as use of CGM and the number of severe hypoglycemia events in the past year were included in the multivariable analysis, and age was forced into the model (data not shown). R^2 value = 0.26. In a second analysis strategy for multivariable analysis (data not shown), using a backward elimination variable selection model, male gender, higher frequency of daily capillary glucose test, and number of minor hypoglycemia events in remained significantly associated with lower glycosylated hemoglobin level, along with a lower Problem Areas in Diabetes (PAID) score.

[c]Statistically significant difference, $P < 0.05$.

[d]Nonhabitual CGM use was defined as <1 week per month, and habitual CGM use was defined as ≥1 weeks per month. The reference group consisted of participants who never adopted CGM use.

LDL, low-density lipoprotein.

TABLE 5. UNIVARIABLE AND MULTIVARIABLE REGRESSION ANALYSIS OF VARIABLES ASSOCIATED WITH SEVERE HYPOGLYCEMIA EVENTS IN THE PAST CALENDAR YEAR IN THE 305 PARTICIPANTS

	Univariable analysis[a]		*Multivariable analysis*[b]	
Characteristic	*RR*	P *value*	*RR*	P *value*
General				
Age	1.03	<0.0001[c]	1.02	0.04[c]
Triglycerides	1.22	0.041[c]	1.33	0.09
Problem Areas In Diabetes score	1.03	<0.0001[c]	1.01	0.47
Geriatric Depression Scale score	1.20	<0.0001[c]	1.07	0.05
Macrovascular complications (compared with none)	2.37	<0.0001[c]	1.80	0.0004[c]
Habits				
Currently physically active (compared with no)	0.64	0.0004[c]	1.10	0.60
Self-assessment				
Daily frequency of capillary glucose tests	0.91	0.002[c]	0.95	0.22
CGM use[d]		0.001[c]		0.001[c]
Nonhabitual	0.69		1.82	
Habitual	0.29		0.30	
Hypoglycemia				
Number of minor events in past calendar year (per month)	1.01	0.06	1.03	0.0001[c]
HFS total	1.03	<0.0001[c]	1.03	<0.0001[c]
Insulin therapy				
Use of an insulin pump	0.41	0.0001[c]	0.50	<0.0001[c]

The self-reported number of severe hypoglycemia events in the past year was analyzed by Poisson regression modeling. The risk ratio (RR) and P value are given for each variable.

[a]All variables from Tables 1–3 were analyzed in univariable Poisson regression, but only the significant results are showed in Table 5, including the number of minor hypoglycemia events in the past year.

[b]All variables from univariable linear regression with $P < 0.10$ were included in the multivariable analysis.

[c]Statistically significant difference, $P < 0.05$.

[d]Nonhabitual continuous glucose monitoring (CGM) use was defined as <1 week per month, and habitual CGM use was defined as ≥1 weeks per month. The reference group consisted of participants who never adopted CGM use.

HFS, Hypoglycemia Fear Questionnaire score.

Conclusions

Insulin pump and continuous glucose monitoring technologies were associated with lower risk of severe hypoglycemia, while frequent daily glucose testing was associated with lower HbA1c level. These findings imply that basic self-management skill and technology play complementary roles in glycemic control among older adults with long-standing T1DM.

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DTT
Diabetes Technology & Therapeutics

ORIGINAL ARTICLE

Predicting the Effectiveness of Insulin Pump Therapy on Glycemic Control in Clinical Practice: A Retrospective Study of Patients with Type 1 Diabetes from 10 Outpatient Diabetes Clinics in Sweden over 5 Years

Mark Clements, MD, PhD,[1,2] Viktorija Matuleviciene, MD,[3,4] Stig Attvall, MD, PhD,[4,5] Magnus Ekelund, MD, PhD,[6] Aldina Pivodic, MSc,[7] Sofia Dahlqvist,[3] Martin Fahlén, MD, PhD,[8] Börje Haraldsson, MD,[9] and Marcus Lind, MD, PhD[3,4]

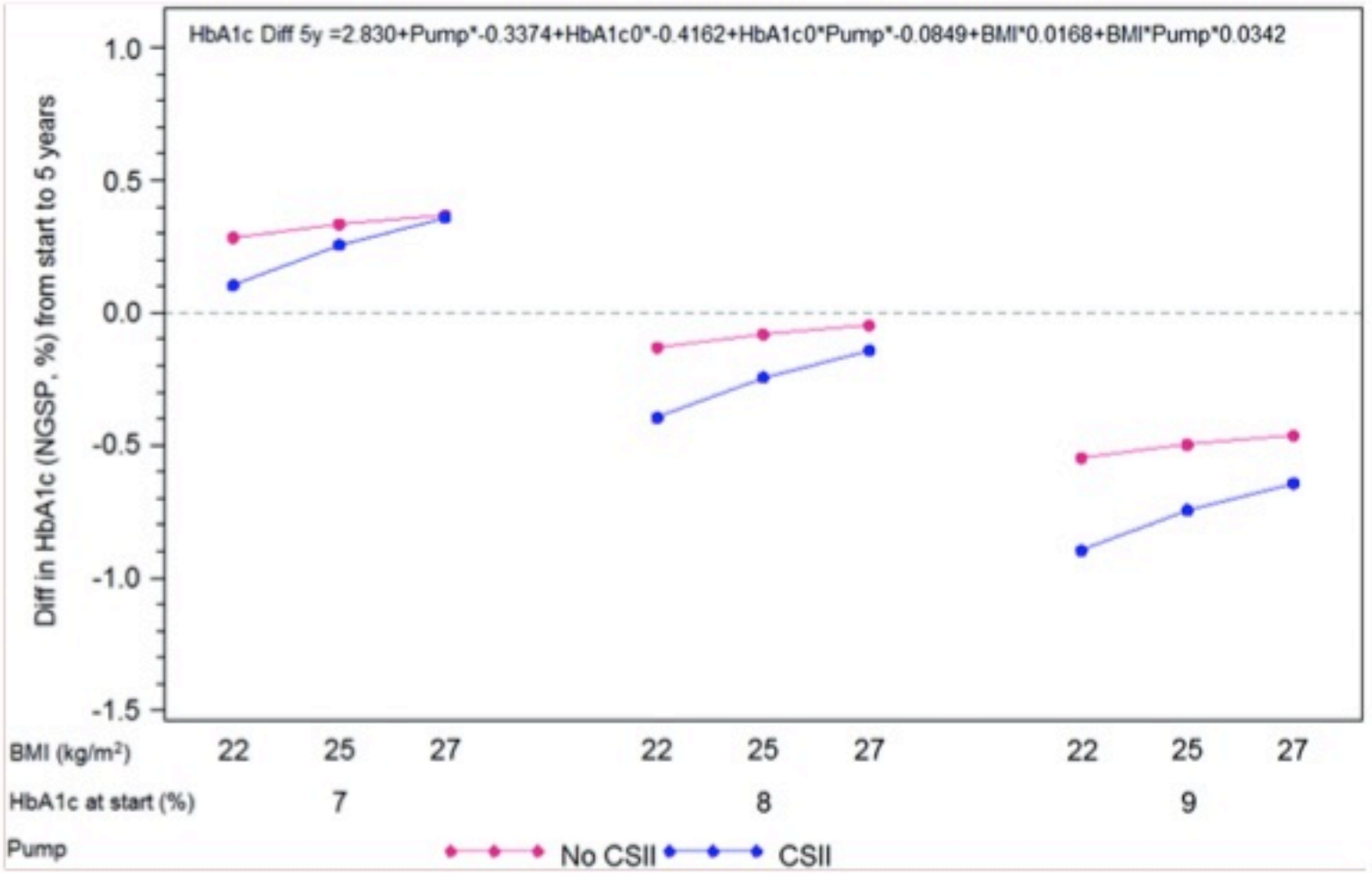
Background: Multicenter long-term studies of predictors for the effectiveness of continuous subcutaneous insulin infusion (CSII) in clinical practice are lacking. We hypothesized that there are substantially greater reductions in hemoglobin A1c (HbA1c) in patients with poor glycemic control and that other predictors may also exist.

Subjects and Methods: We used data from 10 outpatient diabetic clinics in Sweden and studied CSII treatment over 5 years. Patients with HbA1c values available £ 6 months before starting CSII and at 5 years were included (n = 272, 82% of CSII patients) along with 2,437 contemporaneous controls on multiple daily insulin injections (MDI). Baseline variables evaluated were age, sex, diabetes duration, insulin dose, body mass index (BMI), HbA1c at baseline, and outpatient clinical care unit.

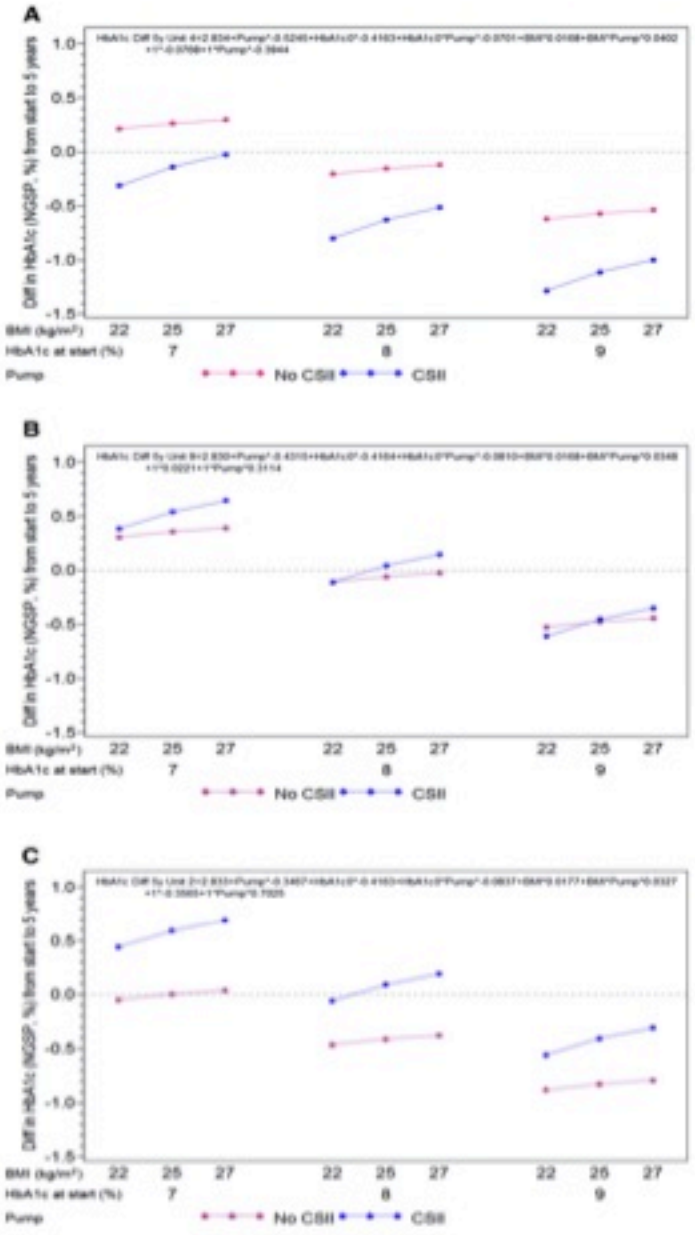
Table 1. Baseline Characteristics

Variable	*CSII* (n=*272*)	*MDI* (n=*2,437*)	P *value*
Sex			
Male	119 (43.8%)	1391 (57.1%)	
Female	153 (56.3%)	1046 (42.9%)	<0.001
Age (years)	38.6 (11.3) (*n*=267)	45.6 (14.4) (*n*=2,437)	<0.001
HbA1c	*n*=272	*n*=2,437	<0.001
NGSP (%)	8.39 (1.30)	8.07 (1.27)	
IFCC (mmol/mol)	68.1 (14.2)	64.7 (13.9)	
BMI (kg/m^2)	24.8 (3.4) (*n*=266)	25.0 (3.8) (*n*=2,392)	0.38
Insulin dose (U/kg/day)	0.632 (0.372) (*n*=271)	0.671 (0.226) (*n*=2,427)	0.09
Diabetes duration (months)	15.1 (11.2) (*n*=272)	20.1 (13.2) (*n*=2,437)	<0.001
Care Unit 1	5.9%	6.1%	1.0
Care Unit 2	2.6%	7.1%	0.003
Care Unit 3	15.8%	27.6%	<0.001
Care Unit 4	21.3%	7.6%	<0.001
Care Unit 5	4.4%	6.1%	0.32
Care Unit 6	10.3%	17.5%	0.002
Care Unit 7	19.1%	15.0%	0.09
Care Unit 8	5.9%	6.6%	0.78
Care Unit 9	13.2%	3.5%	<0.001
Care Unit 10	1.5%	2.9%	0.24

BMI, body mass index; CSII, continuous subcutaneous insulin infusion; HbA1c, hemoglobin A1c; IFCC, International Federation for Clinical Chemistry; MDI, multiple daily insulin injections; NGSP, National Glycohemoglobin Standardization Program.



Least square means for change in hemoglobin A1c (HbA1c) (National Glycohemoglobin Standardization Program [NGSP], in %) from baseline to 5 years in patients on continuous subcutaneous insulin infusion (CSII) versus multiple daily insulin injections (No CSII), presented for selected baseline HbA1c and body mass index (BMI) values. Diff, difference.



Least square means for change in hemoglobin A1c (HbA1c) (National Glycohemoglobin Standardization Program [NGSP], in %) from baseline to 5 years in patients on continuous subcutaneous insulin infusion (CSII) versus multiple daily insulin injections (No CSII), presented for selected baseline HbA1c and body mass index (BMI), in individual care units in which **(A)** CSII was superior to no CSII (site 4), **(B)** CSII was similar to no CSII (site 9), or **(C)** CSII was inferior to no CSII (site 2). Diff, difference.

Results: At 5 years, significantly greater reductions in HbA1c by CSII compared with MDI were found for patients with higher baseline

Conclusions: Patients with high HbA1c levels have a greater probability of improved HbA1c after initiating pump therapy, but effects remain relatively modest even for patients with poor control. Factors predicting successful insulin pump use need further study.

1 and 2 years revealed a significant interaction of insulin pump therapy only with baseline HbA1c levels ($P < 0.001$ and $P = 0.030$, respectively). The interaction term between outpatient clinical care unit and CSII treatment was statistically significant for some care units, with some care units demonstrating a benefit from CSII and others demonstrating a detriment.

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DTT
Diabetes Technology & Therapeutics

ORIGINAL ARTICLE

Long-Term Efficacy of Insulin Pump Therapy on Glycemic Control in Adults with Type 1 Diabetes Mellitus

Christine J. Orr, MD, Wilma Hopman, PhD, Joy L. Yen, and Robyn L. Houlden, MD

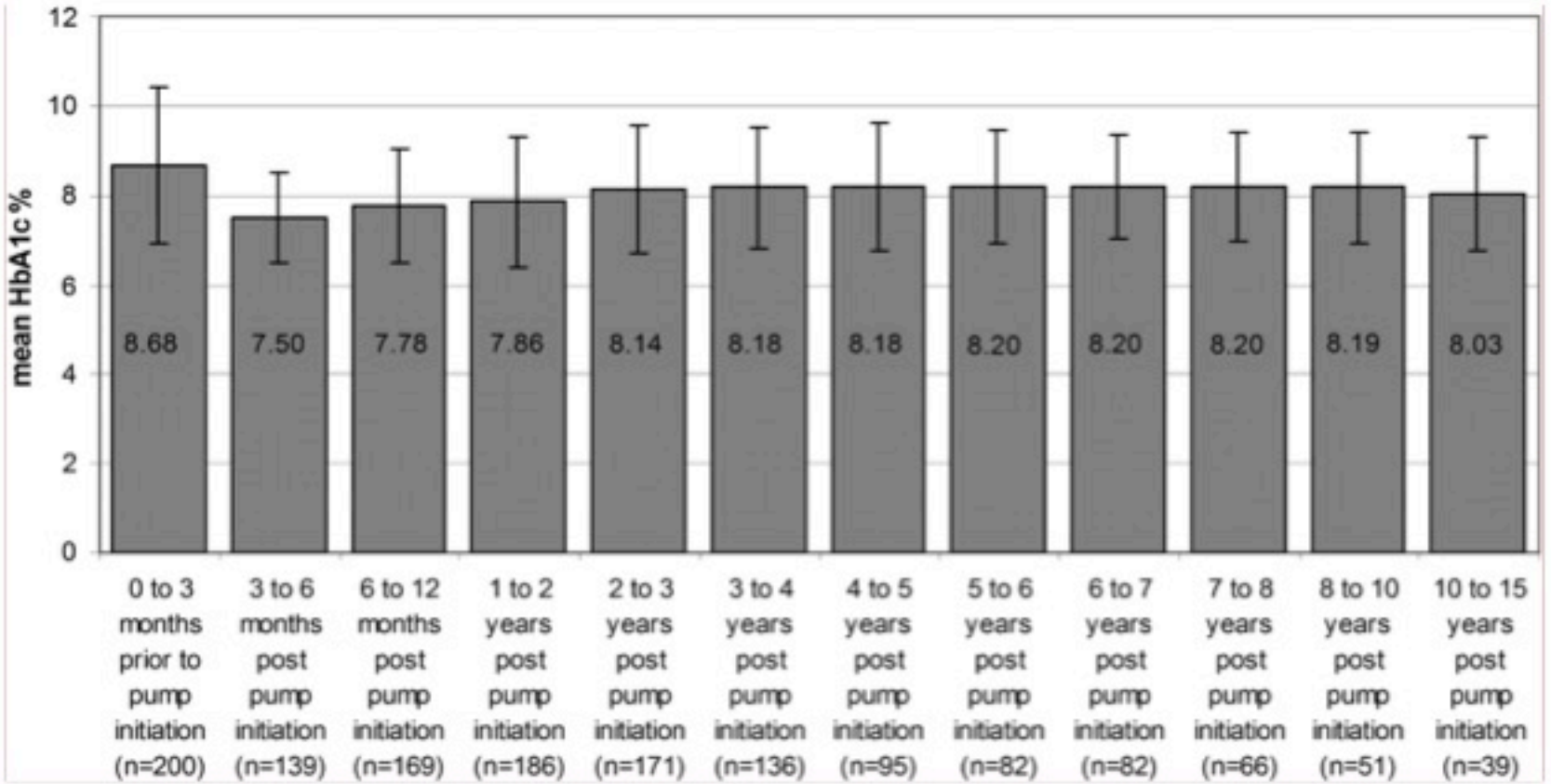
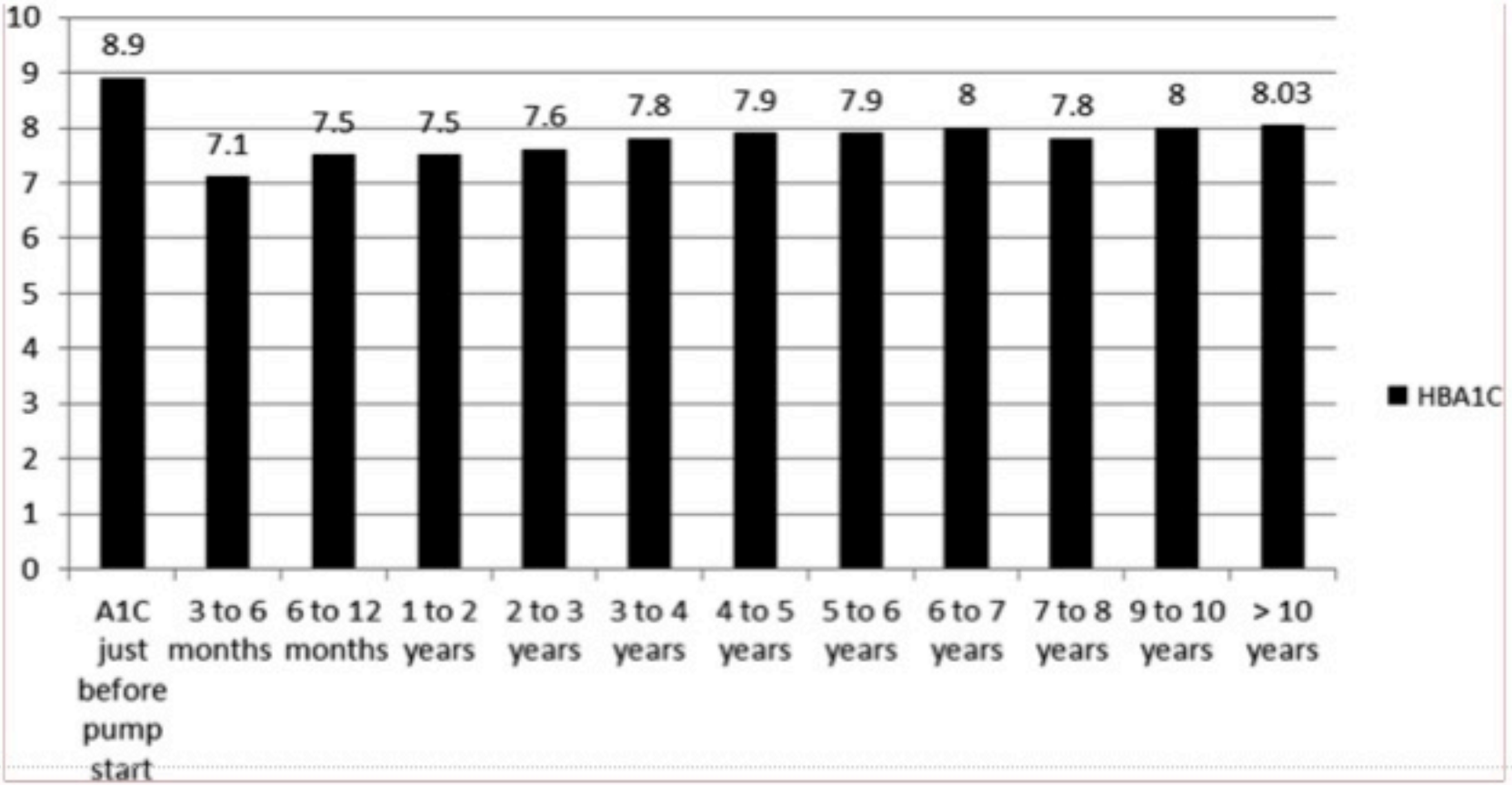
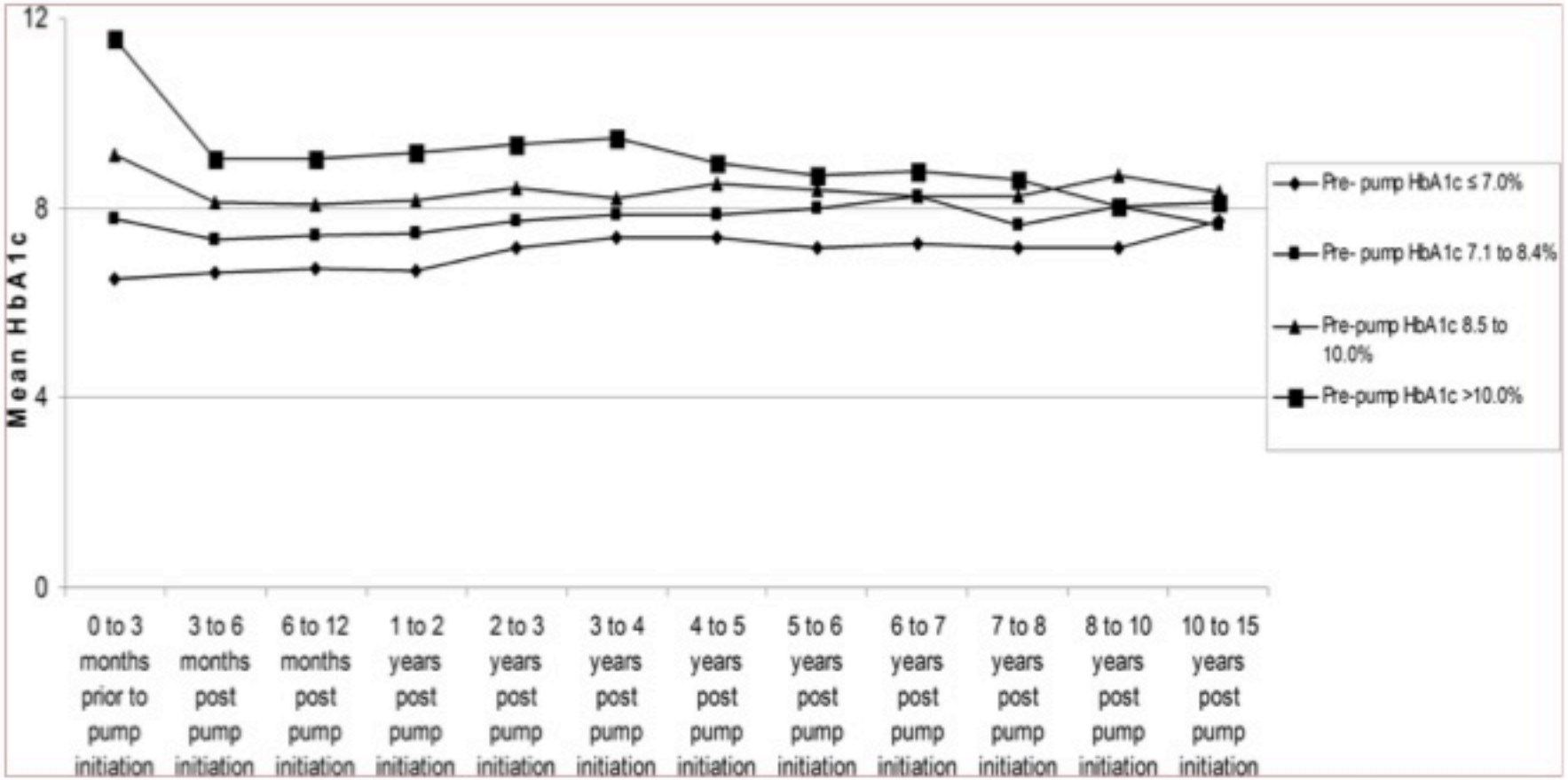


FIG. 1. Mean glycated hemoglobin (HbA1c) and duration of insulin pump therapy. The mean HbA1c for the study population within 3 months prior to continuous subcutaneous insulin infusion initiation was 8.68%. At 3–6 months after continuous subcutaneous insulin infusion initiation, the mean for the entire population dropped to a nadir of 7.50% (SD=1.0%) ($P<0.001$). Over the 10–15-year study duration this mean HbA1c increased to 8.03% (range, 7.78–8.20%) but remained lower than prepump HbA1c ($P<0.001$).



Glycated hemoglobin (HBA1C or A1C) trend over time in the 39 patients who completed >10 years of follow-up. The trend of initial improvement in A1C following continuous subcutaneous insulin infusion initiation followed by a gradual increase over time is preserved. The final A1C is lower than the pre-continuous subcutaneous insulin infusion A1C in the patients completing >10 years of therapy.



Mean glycated hemoglobin (HbA1c) on insulin pump therapy based on stratification of patients according to prepump HbA1c. Patients were separated into three cohorts based on average control attained while on continuous subcutaneous insulin infusion using thresholds of ≤7.0%, ≤8.0%, and ≤9.0%. Those with pre-continuous subcutaneous insulin infusion values of >9% showed the greatest decline in HbA1c level (mean reduction of 2.5% at 1 and 2 years). Although fewer data points were available for those with an HbA1c level of >10% on average, a trend of lowered HbA1c with time was apparent.

Table 1. Number of Patients at Each Duration of Insulin Pump Therapy Based on Stratification of Patients According to Baseline Glycated Hemoglobin

	Number of patients at											
Prepump HbA1c	*0–3 months prior to pump initiation*	*3–6 months post-pump initiation*	*6–12 months post-pump initiation*	*1–2 years post-pump initiation*	*2–3 years post-pump initiation*	*3–4 years post-pump initiation*	*4–5 years post-pump initiation*	*5–6 years post-pump initiation*	*6–7 years post-pump initiation*	*7–8 years post-pump initiation*	*8–10 years post-pump initiation*	*10–15 years post-pump initiation*
<7.0%	29	20	25	24	23	19	15	10	10	9	5	4
7.1–8.4%	71	54	62	68	60	47	33	28	30	21	16	10
8.5–10.0%	66	47	56	60	54	47	33	31	28	25	20	16
>10.0%	15	23	29	31	33	24	13	13	13	10	9	7

HbA1c, glycated hemoglobin.

Table 2. Predictors of Mean Glycated Hemoglobin on Insulin Pump Therapy

Variable	*HbA1c* ≤7.0%	≤8.0%	≤9.0%	>9.0%	P *value*
Number of patients	38	108	168	32	
Gender					≤7% = 0.053
Male	20 (52.6%)	46 (59.7%)	69 (88.3%)	9 (11.7%)	≤8% = 0.219
Female	18 (47.4%)	62 (50.8%)	99 (81.1%)	23 (18.9%)	≤9% = 0.183
Mean HbA1c before pump start	7.48%	7.93%	8.37%	10.36%	≤7% < 0.001 ≤8% < 0.001 ≤9% < 0.001
Duration (years) of diabetes prior to pump initiation	23.2	23.5	23.4	17.7	≤7% = 0.722 ≤8% = 0.227 ≤9% = 0.002
Age (years) at pump start	39.47	36.86	36.78	28.69	≤7% = 0.063 ≤8% = 0.15 ≤9% = 0.004
Age <18 years at pump initiation	3 (13%)	10 (43.5%)	18 (78.3%)	5 (21.7%)	≤7% = 0.578 ≤8% = 0.277 ≤9% = 0.383
Total duration (years) of insulin pump therapy	6.25	6.22	6.12	5.72	≤7% = 0.708 ≤8% = 0.471 ≤9% = 0.559
History of missed appointments	8	41 (42.5%)	55 (75.3%)	18 (24.7%)	≤7% = 0.026 ≤8% = 0.011 ≤9% = 0.012
Number of missed appointments	0.42	0.80	1.25	3.22	<7% = 0.002 ≤8% = 0.001 ≤9% < 0.001
Active smoking	0	4 (25%)	11 (68.8%)	5 (31.2%)	≤7% = 0.045 ≤8% = 0.018 ≤9% = 0.085
Mental illness	0 (0%)	8 (29.6%)	20 (74.1%)	7 (25.9%)	≤7% = 0.003 ≤8% = 0.006 ≤9% = 0.134

Our study shows in a real world clinic setting, patients on pump therapy maintain lower HbA1c values over a 1–10-year period compared with their prepump values. Although HbA1c values tend to rise over time, they remain statistically lower. Poor pre-pump HbA1c, missed appointments, mental illness, and active smoking are predictors of patients who are less likely to achieve an HbA1c target of ≤7.0% on pump therapy.

ATTD The 6th International Conference on Advanced Technologies & Treatments for Diabetes Paris, France, February 27 - March 2, 2013

- CSII therapy must be initiated only by a trained specialist team, which should normally comprise a physician with a specialist interest in insulin pump therapy, a diabetes specialist nurse and a dietician. (specialist teams should provide structured education programmes and advice on diet, lifestyle and exercise appropriate for people using CSII).

" *LONG TERM EFFICACY OF INSULIN PUMP THERAPY IN TYPE 1 DIABETES (T1 DM) SUBJECTS OF DIFFERENT AGE GROUPS* "

A. Scorsone, M. Fleres M, D. Brancato, V. Aiello, G. Saura, V. Provenzano.

ATTD The 6th International Conference on Advanced Technologies & Treatments for Diabetes Paris, France, February 27 - March 2, 2013

We studied 460 Type 1 diabetes subjects (221/239 men/ women age14,4 ± 1V0.61 yrs, mean diabetes duration 11 ± 10 yrs, onset age 13.6 ± 10.1), on insulin pump therapy from 2003 to 2010), of different age (Group A < 5 yrs, Group B 5-12 yrs, Group C 12-18 yrs, Group D 19-35 yrs, Group E > 35 yrs). All subjects were routinely visited every three months during the follow-up years by a multidisciplinary team.

GROUP	HbA1c		BMI	
	2003	2010	2003	2010
1	8.44 ± 1.42	7.6 ± 1.03	16.4 ± 1.41	16.6 ± 1.64
2	8.79 ± 1.66	7.99 ± 1.01	16.9 ± 3.3	17.2 ± 2.6
3	9.42 ± 1.93	8.10 ± 1.44	19.4 ± 2.5	20.5 ± 2.7
4	8.88 ± 1.48	8.15 ± 1.35	16.9 ± 3.3	17.1 ± 2.6
5	8.44 ± 1.22	7.60 ± 1.03	17.2 ± 3.54	18.6 ± 3.04

- CSII therapy should only be continued if it results in a sustained improvement in glycaemic control, evidenced by a fall in HbA1c levels, or a sustained decrease in the rate of hypoglycaemic episodes.

- In our study the absence of predictive variables, related to people selection, influencing from the beginning glucose control in type 1 diabetic subjects underwenting insulin pumps therapy and the absence, during a seven years follow-up, of an age-related effect influencing its success rate, underscore the pivotal role of the specialist TEAM as the way to obtain and maintain the optimal glucose control and quality of life.

" *LONG TERM EFFICACY OF INSULIN PUMP THERAPY IN TYPE 1 DIABETES (T1 DM) SUBJECTS OF DIFFERENT AGE GROUPS* "

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Variable	Coef	St Dev	T	P
Costant	6,9512	0,8853	8,22	0,000
AGE	0,02708	0,08813	0,31	0,875
IMPLANT AGE	- 0,05130	0,08959	-0,49	0,691
ONSET AGE	- 0,00111	0,01388	-0,08	0,831
BMI	0,04674	0,03928	1,36	0,114

S = 1,248 R-Sq = 5,6% R-Sq(adj) = 2,2%

" LONG TERM EFFICACY OF INSULIN PUMP THERAPY
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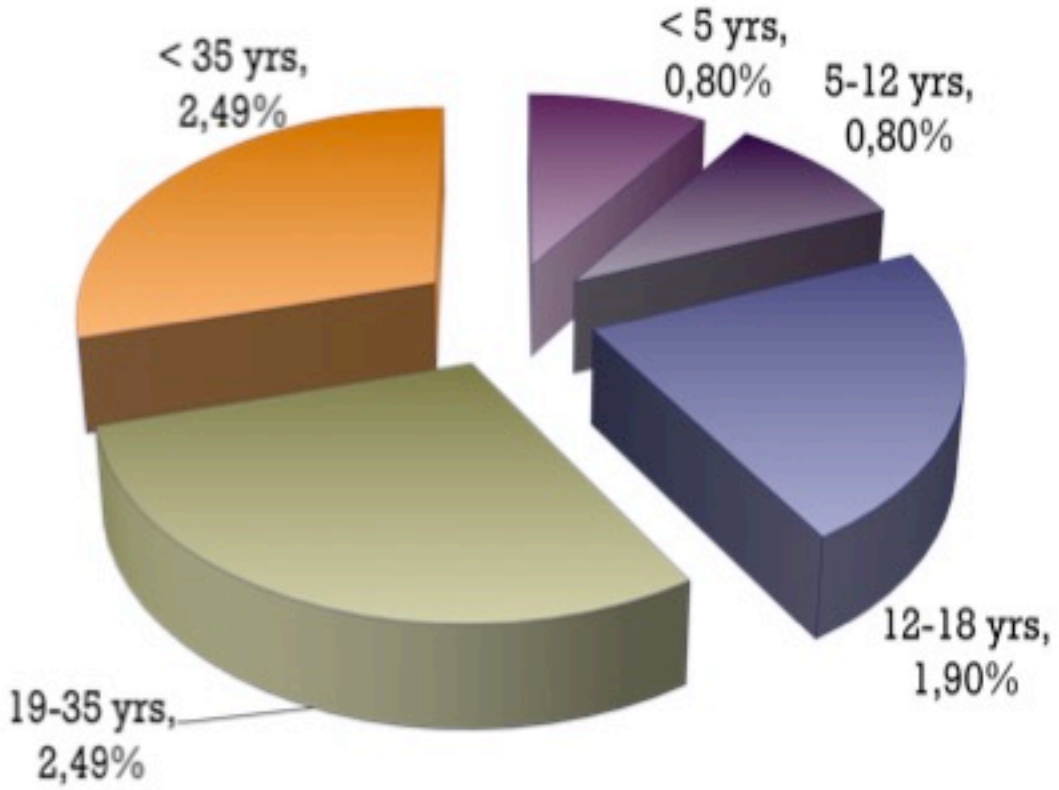

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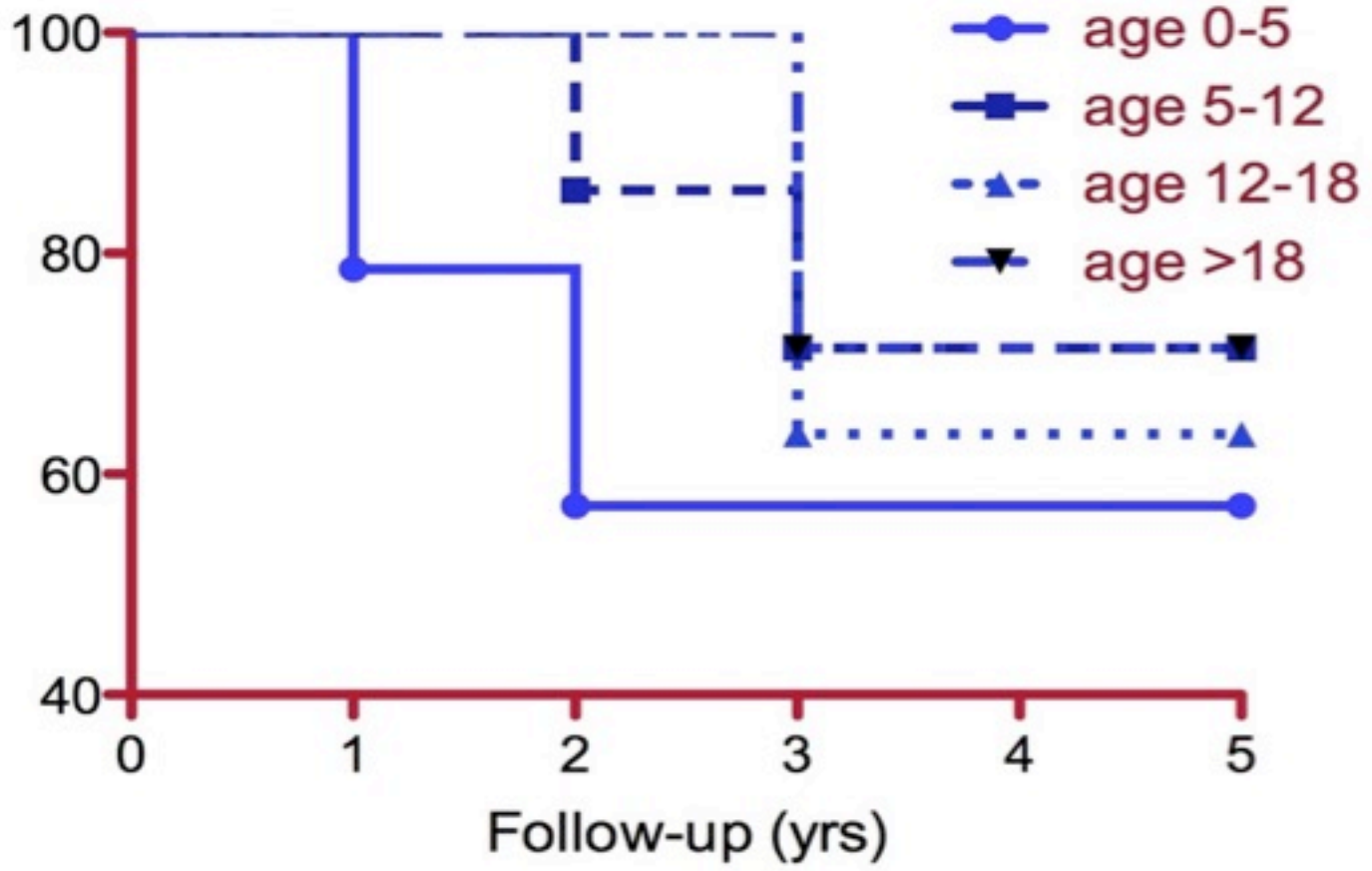
Loss of glucose control (HbA1c reduction < 0.5%/yr



Long-term efficacy and performance of diabetes management in insulin pump treated Type 1 Diabetic patients.

A. Scorsone[1], M. Fleres[1], V. Aiello[1], D. Brancato[1], G. Saura[1], A. Di Noto[1], L. Spano[1], F. Provenzano[2], V. Provenzano[1].

[1]ASP 6 Palermo PO Civico Partinico, Reference Centre for Diabetes and Insulin Pumps, Partinico, Italy.

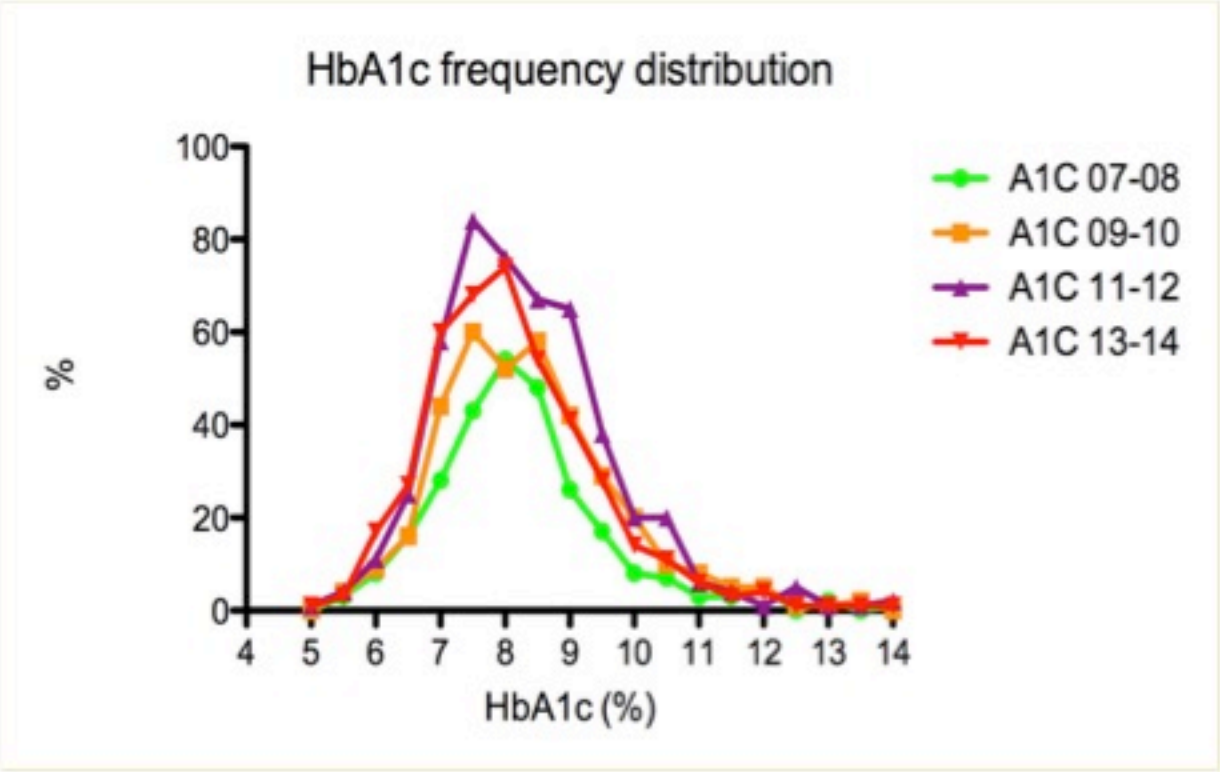
[2]University of Palermo, Department of Internal Medicine, Palermo, Italy.

Materials and Methods

We studied 690 T1 DM on insulin pump therapy. We analyzed our database from 2007 to 2014. We analyzed the effects of different variables on performance rate (number of subjects not at A1C ideal target). Age at onset, at implantation, diabetes duration, BMI, dropouts rate, A1C level (repeated measures) were studied in order to characterize insulin pump treated subjects.

Long-term efficacy and performance of diabetes management in insulin pump treated Type 1 Diabetic patients.

Total dropouts rate was 2,8%. 30,2 % T1DM in our database remained outside our optimal performance curve distribution, with persistent AIC levels above 8% for more than 24 months.



Long-term efficacy and performance of diabetes management in insulin pump treated Type 1 Diabetic patients.

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Age at onset, sex were not correlated to unstable A1c levels. Multivariate analysis demonstrated a significant role of age at onset of Diabetes and lesser time to insulin pump implantation from diabetes onset (respectively $p < 0.01$ and $p < 0.001$) on A1C level stability (intended as beetween years difference not above 1%) as previuosly demonstrated by our group. Loss of stability for more than 24 months was associated to AIC not a target on follow-up (AIC persistently > 8% $p > 0.01$).

Long-term efficacy and performance of diabetes management in insulin pump treated Type 1 Diabetic patients.

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[1]ASP 6 Palermo PO Civico Partinico, Reference Centre for Diabetes and Insulin Pumps, Partinico, Italy.
[2]University of Palermo, Department of Internal Medicine, Palermo, Italy.

Insulin pump therapy is efficacious in reaching and mantaining A1c level at target for the majority of T1 DM subjects across several years. Nevertheless mantainance of AIC ideal levels can be lost for reasons, not related to our management strategies, but related to factor linked to T1 DM subject as a person. In our practice we should change our approach to "insulin pumpers" in order to support an alternative empowerment strategy apart from singles evaluation at reference centre visit.

La percezione del proprio benessere e del ruolo fisico ed emotivo nei soggetti con DM1 in terapia con microinfusore.

M. Fleres, A.Scorsone, V. Aiello, G. Saura, A. Di Noto, L. Spano, D. Brancato, V. Provenzano

ASP 6 Palermo UO DIABETOLOGIA PO CIVICO PARTINICO CENTRO DI RIFERIMENTO DIABETOLOGIA E IMPIANTO MICROINFUSORI

Quando decidiamo di intensificare a terapia insulinica mediante microinfusore, cercando di raggiungere target di HbA1c "ideali", la percezione del benessere, la soddisfazione per il trattamento, le percezione di limitazione del proprio ruolo fisico-emotivo non sempre migliorano, nonostante il raggiungimento dei target suddetti, nei soggetti con DM1. All'interno dei team multidisciplinari dovrebbe essere dedicato un tempo maggiore al supporto psicologico (limitazione del ruolo fisico e rischio di isolamento sociale).

La percezione del proprio benessere e del ruolo fisico ed emotivo nei soggetti con DM1 in terapia con microinfusore.

M. Fleres, A.Scorsone, V. Aiello, G. Saura, A. Di Noto, L. Spano, D. Brancato, V. Provenzano

ASP 6 Palermo UO DIABETOLOGIA PO CIVICO PARTINICO CENTRO DI RIFERIMENTO DIABETOLOGIA E IMPIANTO MICROINFUSORI

Materiali e metodi

Abbiamo studiato 50 soggetti con DM 1 per 12 mesi. La frequenza delle loro visite è stata intensificata a 4 incontri/anno (ogni tre mesi con dosaggio della HbA1c) da parte del team multidisciplinare. Sia all'inizio dei dodici mesi che alla fine sono stati somministrati i questionari SF-36 e DTSQ (Diabetes Treatment Satisfaction Questionnaire). L'età media era (M ± SD) 33,3 ± 18,9 con gruppi di età cosi distribuiti A (10-20) B (20-50 n= 30) C (>50). La durata media del DM 1 era 8,33 ± 7,2 anni.

Premessa e scopo dello studio

I soggetti con diabete mellito di tipo 1 in terapia insulinica mediante microinfusore devono essere seguiti in modo intensivo da un team multidisciplinare che contenga all'interno, oltre allo specialista diabetologo, figure professionali quali lo psicologo, il dietista e l'infermiere ad esso dedicato. Tale approccio implica, alla pari di incontri più frequenti, anche un carico psicologico maggiore. Lo scopo del nostro studio è stato quello di valutare se la terapia insulinica mediante microinfusore sia fonte di stress emozionale e/o disagio anche in presenza di un buon controllo glicemico.

La percezione del proprio benessere e del ruolo fisico ed emotivo nei soggetti con DM1 in terapia con microinfusore.

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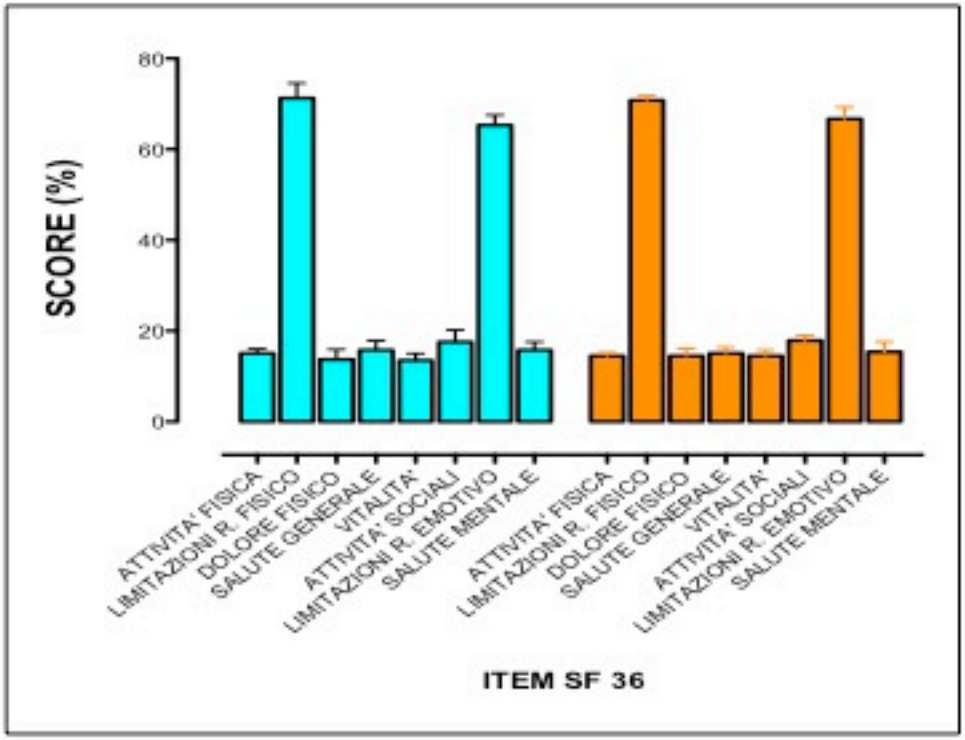
Risultati

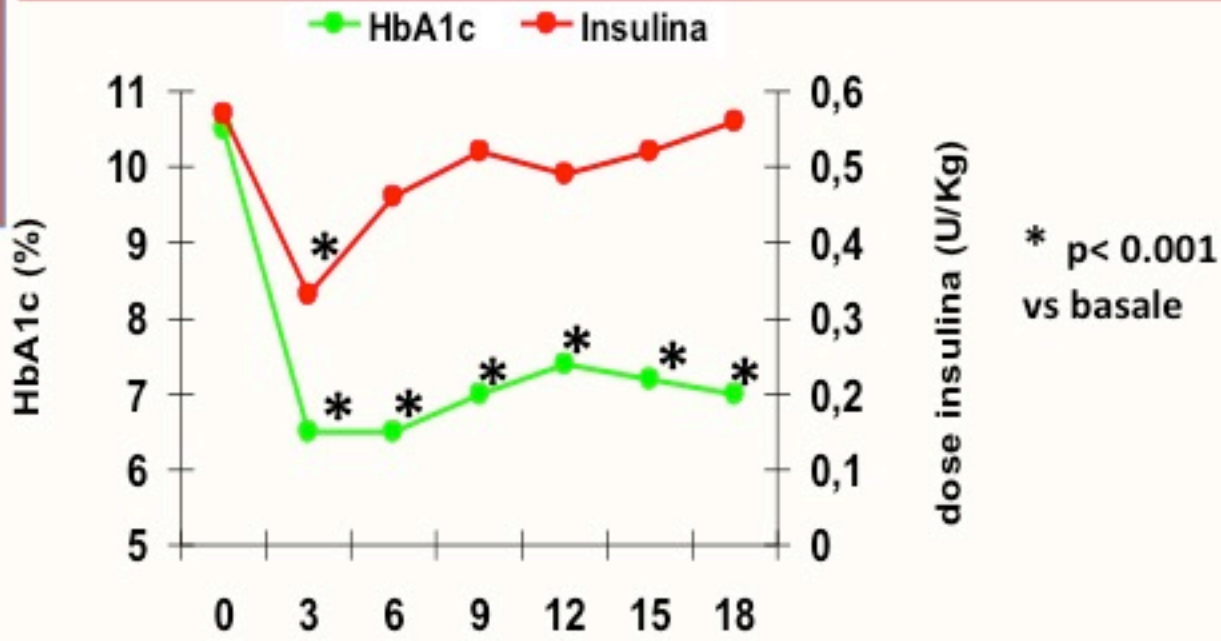
Nei gruppi in studio abbiamo osservato la riduzione significativa dei livelli di HbA1c (%) rispetto a quelli basali (8,2 ± 0,65 vs 7.91 ± 0,45 p=0.01) ma lo score dei questionari DTSQ ed SF-36 non si era modificato in maniera significativa. Alcune aree dell' SF-36 rivelarono persino un peggioramento. La limitazione del proprio ruolo (fisico ed emotivo) e la percezione della propria salute generale costituivano delle aree di conflitto e sono rimaste immodificate indipendentemente dalla riduzione della HbA1c.



Ramchandanl N et al *Diabetes Technol Ther. 2006 Dec;8(6):663-670*

La CSII all'esordio del diabete tipo 1 migliora il controllo metabolico e preserva la funzione β-cellulare

Quando applicare l microinfu sore ?



CONCLUSIONS: The study provided a positive experience with CSII as the initial insulin replacement therapy in newly diagnosed patients with T1DM with excellent clinical outcomes and apparent prolongations of the honeymoon period. It remains to be proven by random patient assignment whether endogenous insulin secretion is better preserved with CSII as an initial ongoing treatment modality and whether long-term complications are reduced by this approach.

DIABETES TECHNOLOGY & THERAPEUTICS
Volume 16, Number 11, 2014

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DTT
Diabetes Technology & Therapeutics

ORIGINAL ARTICLE

The Effectiveness and Durability of an Early Insulin Pump Therapy in Children and Adolescents with Type 1 Diabetes Mellitus

Davide Brancato, MD, Mattia Fleres, MD, Vito Aiello, MD, Gabriella Saura, MD, Alessandro Scorsone, MD, Lidia Ferrara, MD, Francesca Provenzano, MD, Anna Di Noto, MD, Lucia Spano, MD, and Vincenzo Provenzano, MD

TABLE 1. BASELINE CLINICAL AND METABOLIC PARAMETERS OF ALL THE PATIENTS INCLUDED IN THE STUDY (SECOND COLUMN FROM THE LEFT), OF THE PATIENTS SUBDIVIDED INTO FOUR QUARTILES ON THE BASIS OF THE DURATION OF DIABETES AT PUMP COMMENCEMENT (THIRD–SIXTH COLUMNS FROM THE LEFT), AND INTERQUARTILE DIFFERENCES (FIRST COLUMN FROM THE RIGHT)

	All (n=113)	*First quartile (n=29)*	*Second quartile (n=28)*	*Third quartile (n=28)*	*Fourth quartile (n=28)*	*Interquartile differences*
Female/male ratio	60/53	16/13	12/16	19/9	12/16	NS
Age (years) at onset	8.9±5.6 (0.2–21.8)	8.1±5.5 (0.7–19.5)	8.6±5.6 (1.0–20.9)	8.7±6.0 (0.2–20.7)	10.2±5.4 (0.9–21.8)	NS
Age (years) at pump implant	9.6±5. (0.8–23.3)	8.2±5.5 (0.8–19.7)	8.9±5.6 (1.4–21.4)	9.5±6.0 (1.1–21.5)	11.8±5.4 (2.2–23.2)	$P=0.017$[a]
Duration of diabetes at pump commencement (days)	252.7±217.5 (1–726)	34.1±19.4 (1–61)	118.9±40.0 (62–181)	287.6±64.4 (182–400)	578.0±96.5 (425–726)	ND
BMI (kg/m^2)	18.5±3.1 (13.0–28.1)	18.1±2.9 (14.6–26.0)	18.1±2.8 (14.0–24.7)	17.3±4.1 (14.6–26.0)	18.6±2.6 (13.0–22.9)	NS
Baseline HbA1c (%)	9.3±1.8 (6.4–14.8)	9.8±1.7 (7.5–14.3)	9.0±1.8 (6.4–12.6)	9.0±1.6 (6.8–12.4)	9.4±2.1 (6.4–14.8)	NS
Follow-up (years)	4.0±1.8 (1.0–8.0)	4.5±1.8 (1.0–7.0)	3.6±1.5 (1.0–7.0)	4.1±2.0 (1.0–8.0)	4.1±1.8 (1.0–8.0)	NS

Data are mean±SD values (range).

[a]First quartile versus fourth quartile, by *t* test for unpaired data.

BMI, body mass index; HbA1c, glycosylated hemoglobin; ND, not determined; NS, not significant.

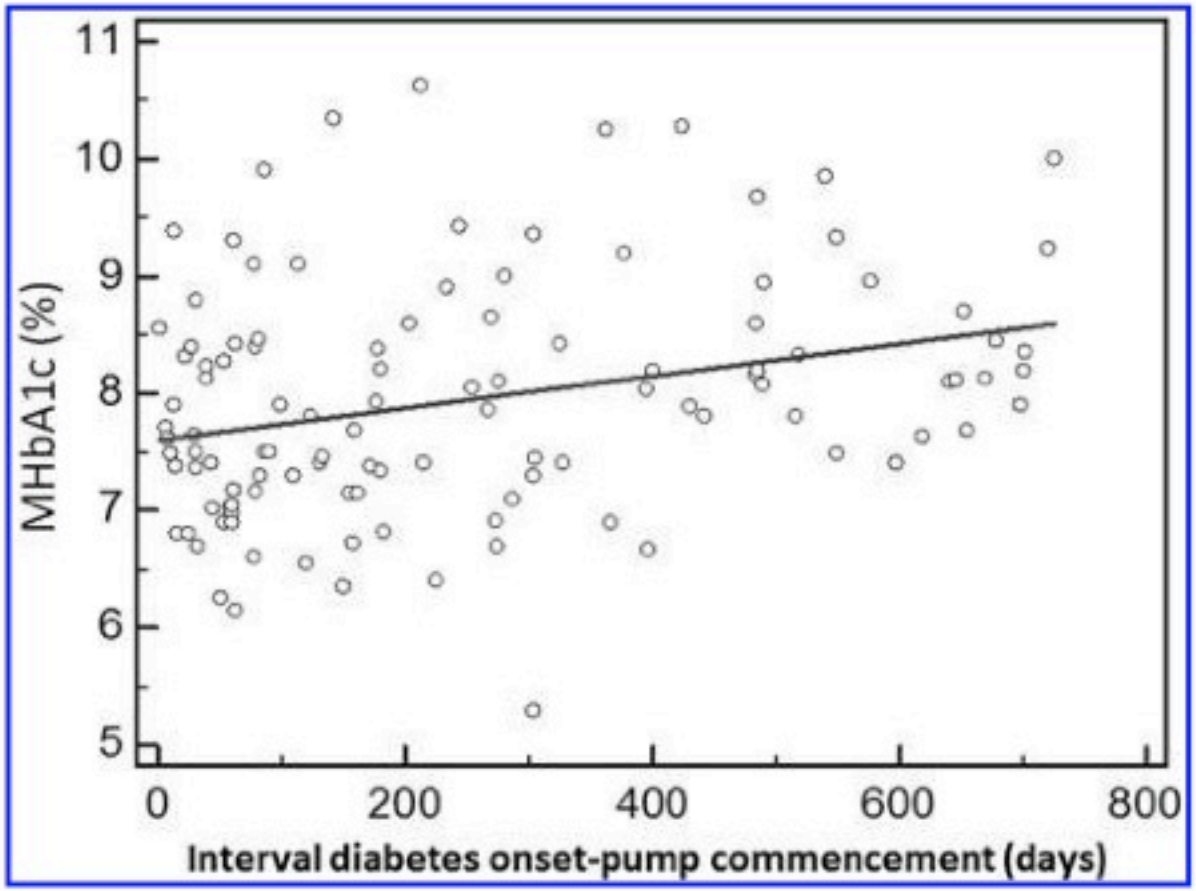
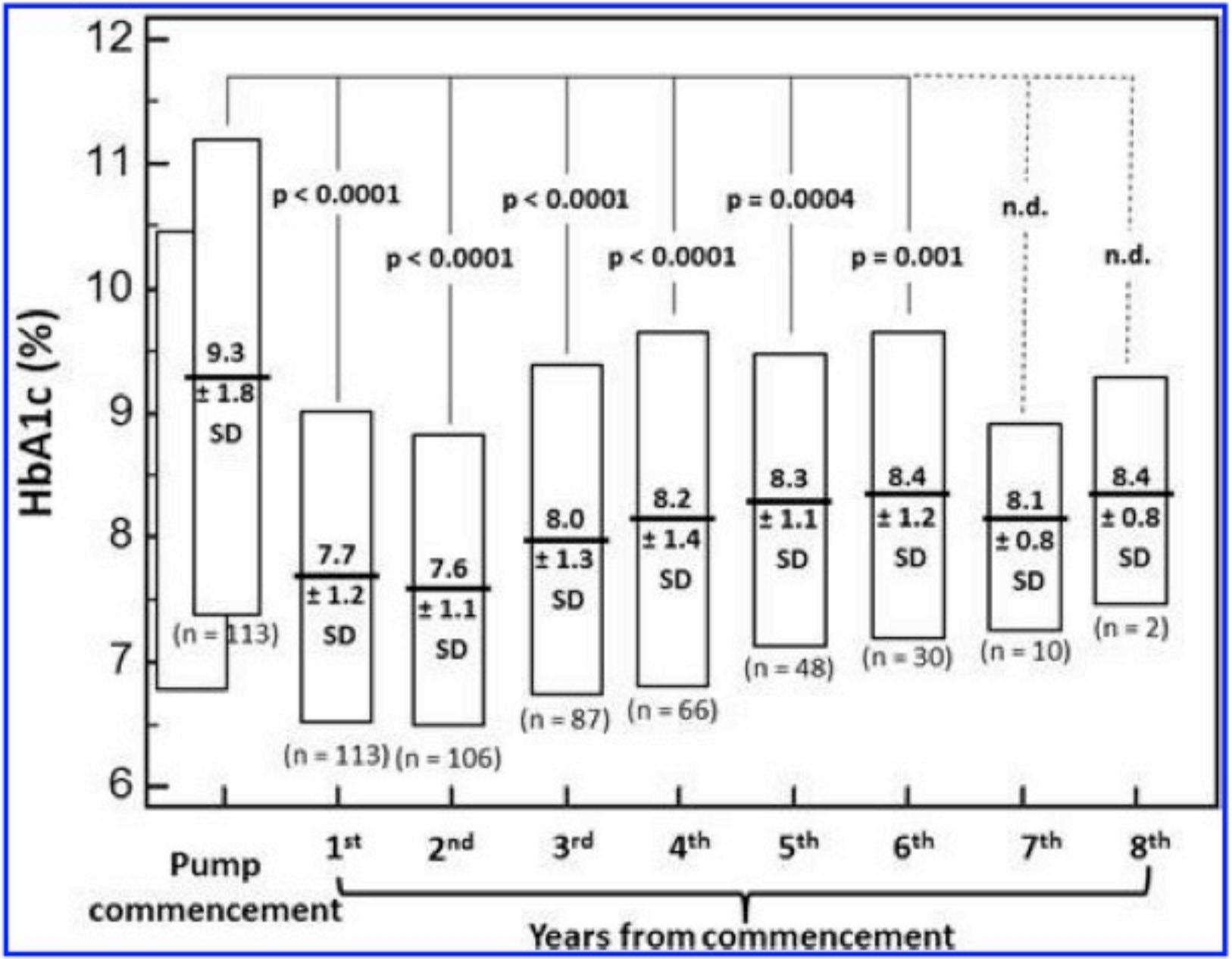
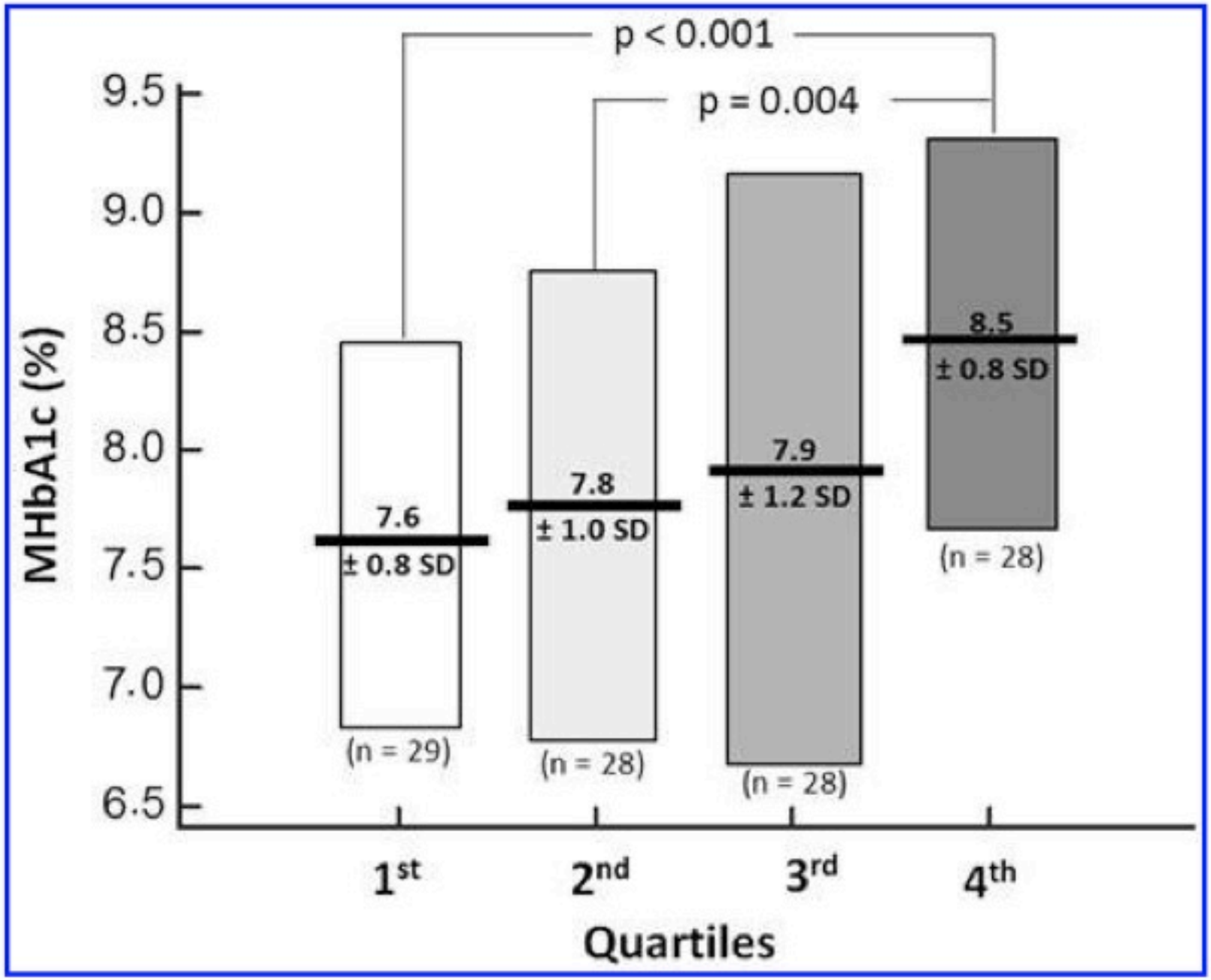
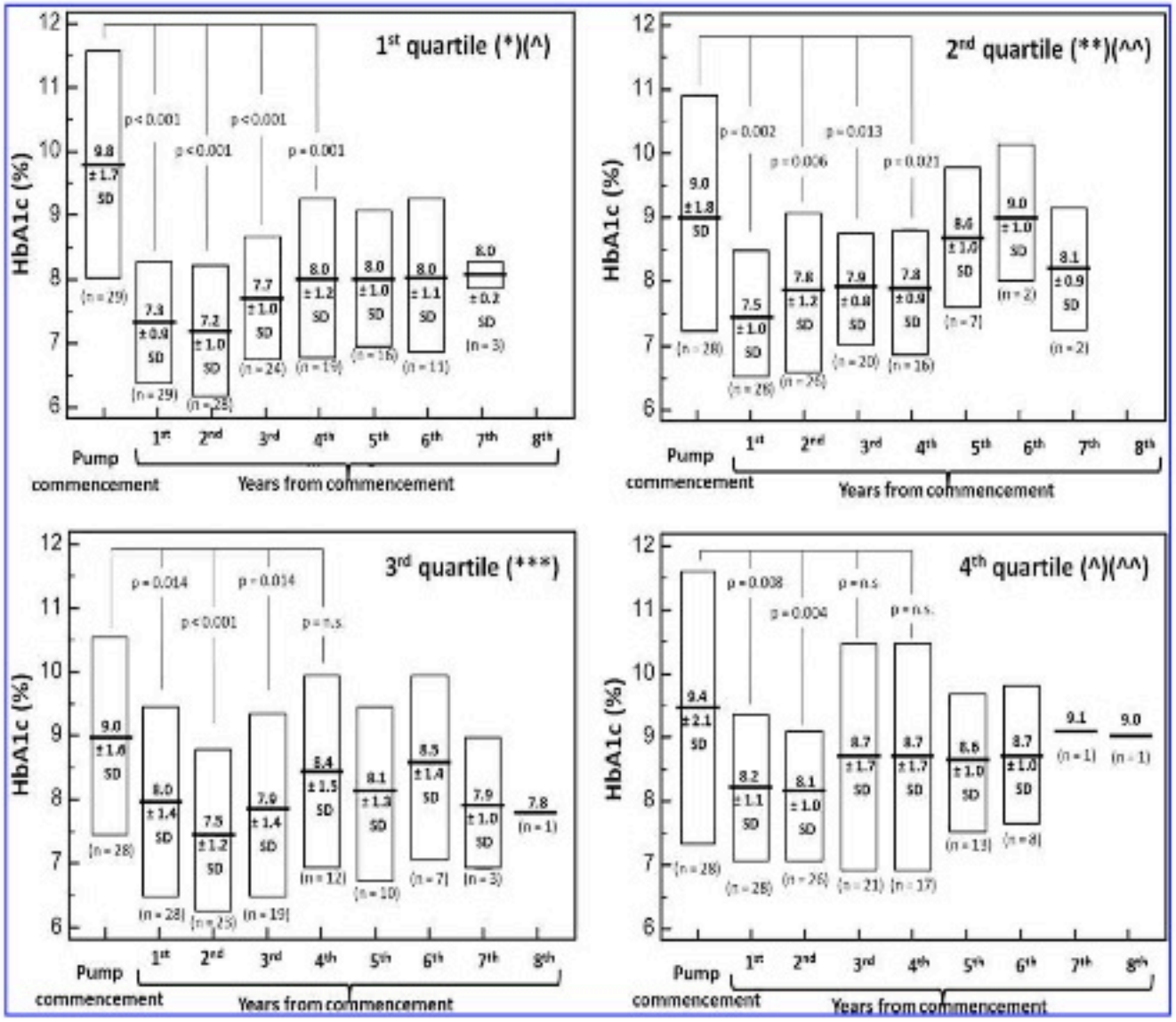


FIG. 1. Linear relationship between the mean glycosylated hemoglobin (MHbA1c) throughout all the follow-up and the interval diabetes onset–pump commencement (expressed as days).


HbA1c (%)
12
11
10
9
8
7
6
p < 0.0001
p < 0.0001
p < 0.0001
p = 0.0004
p = 0.001
n.d.
n.d.
9.3
± 1.8
SD
(n = 113)
7.7
± 1.2
SD
(n = 113)
7.6
± 1.1
SD
(n = 106)
8.0
± 1.3
SD
(n = 87)
8.2
± 1.4
SD
(n = 66)
8.3
± 1.1
SD
(n = 48)
8.4
± 1.2
SD
(n = 30)
8.1
± 0.8
SD
(n = 10)
8.4
± 0.8
SD
(n = 2)
Pump commencement
1st
2nd
3rd
4th
5th
6th
7th
8th
Years from commencement


p < 0.001
p = 0.004
9.5
9.0
8.5
8.0
7.5
7.0
6.5
MHbA1c (%)
7.6
± 0.8 SD
(n = 29)
7.8
± 1.0 SD
(n = 28)
7.9
± 1.2 SD
(n = 28)
8.5
± 0.8 SD
(n = 28)
1st
2nd
3rd
4th
Quartiles



Glycosylated hemoglobin (HbA1c) at pump commencement baseline and mean yearly HbA1c of four quartiles obtained dividing the sample on the basis of the interval diabetes onset–pump commencement. The bars express the SD; the horizontal lines on the bars express the mean values. All the HbA1c values are expressed as percentages. Also shown are the comparisons between HbA1c at baseline and the mean yearly HbA1c, from the first until the fourth year (by t test for independent samples); the fifth through eighth years were not considered for statistical analysis because the number of patients was small.

By analysis of variance for repeated measures, **within-subjects effects**: *P < 0.001, **P = 0.009,***P < 0.001. ^For first versus fourth quartile, by analysis of variance for repeated measures: **between-subjects effects**, P = 0.023, F = 5.63; within-subjects effects, P < 0.001, F = 13.36. ^^For second versus fourth quartile, by analysis of variance for repeated measures: **between-subjects effects**, P = 0.045, F = 4.37; within-subjects effects, P = 0.001, F = 5.15.

Discussion

- The present study shows, in children and adolescents with T1DM treated with insulin pumps, a significant and **durable reduction of HbA1c** level from the pump commencement until the sixth year of follow-up.

- The **magnitude of HbA1c reduction (0.9%)** was higher than previous RCTs and observational studies, despite the negligible use of sensors in our study.

- The interval onset–commencement is a linear predictor of mean HbA1c throughout the follow-up: **the earlier** the pump commencement (within six months from diabetes onset), **the better** the pump effectiveness and durability

Brancato D et al. Diabetes Technol Ther 2014

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ORIGINAL ARTICLE

The Effectiveness and Durability of an Early Insulin Pump Therapy in Children and Adolescents with Type 1 Diabetes Mellitus

Discussion

•The present observational study suggests that **an early pump commencement in children and adolescents with T1DM provides lower and more durable HbA1c values than a late commencement, independent of other factors, such as baseline HbA1c, age at diagnosis, or age at commencement.**

• **It is possible that the better glycemic control observed in our study in the first and second quartiles is related to a better preservation of residual b-cell function; in other words, an early pump commencement could prolong the honeymoon phase. However,we cannot confirm or exclude this hypothesis because of the lack of data about C-peptide levels during the follow-up.**

The present observational study suggests that an early pump commencement in children and adolescents with T1DM provides lower and more durable HbA1c values than a late commencement, independent of other factors, such as baseline HbA1c, age at diagnosis, or age at commencement.

The applications of new technologies to diabetes management could produce interesting results,34 but further studies are needed to confirm the relevance of an early commencement of insulin pumps on long-term outcomes in individuals with T1DM.

DIABETES TECHNOLOGY & THERAPEUTICS
Volume 13, Number 10, 2011

DOI: 10.1089/dia.2011.0085

Insulin Pump Therapy Started at the Time of Diagnosis: Effects on Glycemic Control and Pancreatic β-Cell Function in Type 1 Diabetes

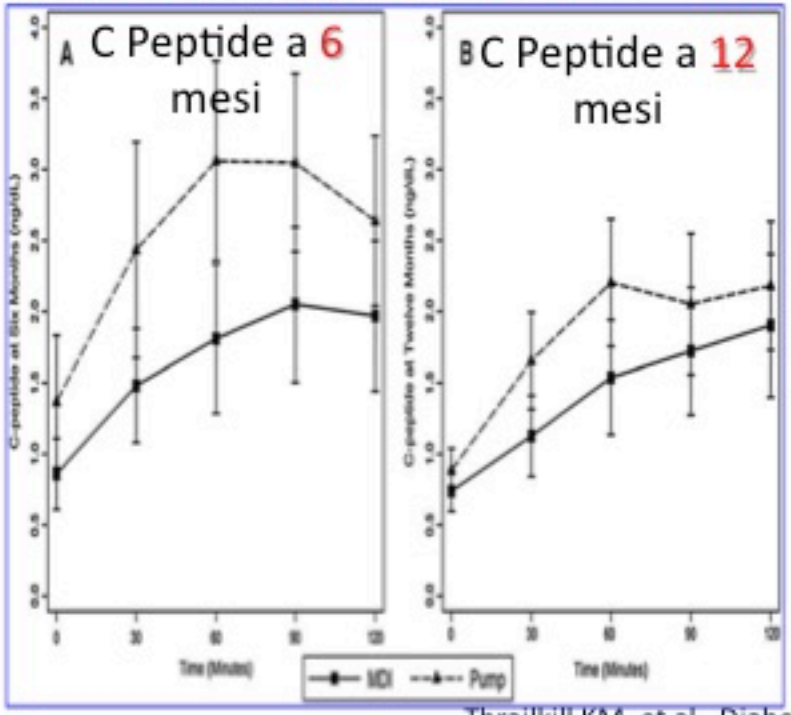
Kathryn M. Thrailkill, M.D., Cynthia S. Moreau, R.N., Christopher Swearingen, Ph.D., Mallik Rettiganti, Ph.D., Kathy Edwards, R.N., Alba E. Morales, M.D., Stephen F. Kemp, M.D., J. Paul Frindik, M.D., and John L. Fowlkes, M.D.

Results: Initiation of pump therapy within 1 month of diagnosis resulted in consistently higher mixed-meal tolerance test–stimulated C-peptide values at all time points, although these differences were not statistically significant. Nonetheless, improved glycemic control was observed in insulin pump-treated subjects (more time spent with normoglycemia, better mean HbA1c), and pump-treated subjects reported comparatively greater satisfaction with route of treatment administration.

Conclusions: Initiation of insulin pump therapy at diagnosis improved glycemic control, was well tolerated, and contributed to improved patient satisfaction with treatment. This study also suggests that earlier use of pump therapy might help to preserve residual β-cell function, although a larger clinical trial would be required to confirm this.

Discussion

Other intervention studies, but with a short follow-up duration (<24 months), showed that an **early** pump commencement has a favorable effect on **residual beta-cell function** and **glycemic control**



Thrailkill KM, et al., Diabetes Technol Ther 2011;13:1023-30

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Table 3. Comparison of Secondary Outcome Measures by Group Assignment

Measure, month	*Mean (SD)* MDI	*Mean (SD)* Pump	P *value*
HbA1c (%)			
Baseline	11.7 (2.6)	11.2 (2.1)	0.33
6	7.0 (1.1)	6.34 (0.7)	**0.06**
12	6.9 (0.90)	6.9 (0.7)	0.54
Insulin dose (units/kg/day)			
Baseline	0.84 (0.27)	0.62 (0.34)	0.07
1	0.66 (0.17)	0.48 (0.18)	**0.03**
6	0.61 (0.16)	0.45 (0.22)	**0.04**
12	0.70 (0.30)	0.59 (0.20)	0.17
ICA512 antibodies (U/mL)			
Baseline	17.4 (17.9)	14.86 (16.9)	0.37
12	8.6 (8.7)	18.3 (26.3)	0.85
GAD65 antibodies (U/mL)			
Baseline	209.2 (455.3)	38.9 (49.6)	0.11
12	27.7 (40.4)	12.3 (13.8)	0.14
Average CGMS glucose (mg/dL)			
6	167.3 (53.9)	144.3 (32.2)	0.12
12	166.1 (49.8)	157.7 (41.4)	0.35
CGMS duration (%) of Euglycemia			
6	52.9 (34)	73.1 (18.4)	**0.03**
12	53.9 (29.7)	60.5 (19.4)	0.28
Hypoglycemia			
6	11.1 (16.1)	5.9 (7.2)	0.51
12	9.6 (17.7)	9.0 (12.1)	0.47
Hyperglycemia			
6	36.0 (28)	21.1 (16.9)	**0.04**
12	36.5 (25.9)	30.5 (20)	0.53
MAGE			
6	136.0 (34.7)	140.5 (61)	0.57
12	149.4 (54.4)	159.3 (33.5)	0.68
IDAA1C			
6	9.4 (1.6)	8.1 (1.3)	**0.03**
12	9.9 (1.1)	9.3 (1.3)	0.21

Discussion

Other intervention studies, but with a short follow-up duration (<24 months), showed that **an early sensor augmented pump (SAP)** commencement has a **more favorable effect** on residual beta-cell function than pump alone, among subjects 12-16 yrs old

Sensor-augmented pump therapy from the diagnosis of childhood type 1 diabetes: results of the Paediatric Onset Study (ONSET) after 12 months of treatment

O. Kordonouri · E. Pankowska · B. Rami · T. Kapellen · R. Coutant · R. Hartmann · K. Lange · M. Knip · T. Danne

Diabetologia
DOI 10.1007/s00125-010-1878-6

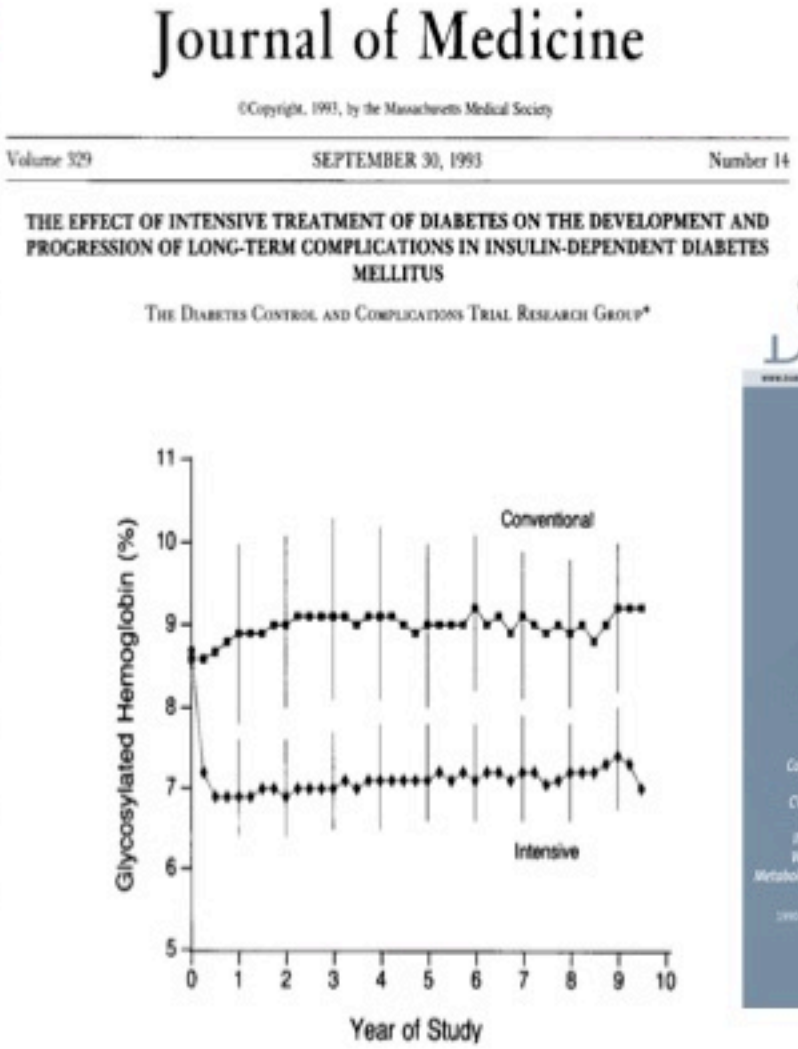
Pediatric Diabetes
ISPAD
Pediatric Diabetes 2012: 13: 515–518
doi: 10.1111/j.1399-5448.2012.00863.x

Original Article

Sensor augmented pump therapy from onset of type 1 diabetes: late follow-up results of the Pediatric Onset Study

Discussion

However, the **DCCT/EDIC** demonstrated that the most relevant factor that predicts the reduction of the complications of diabetes mellitus is the ability of the therapy to achieve and maintain lower HbA1c values **soon after diabetes onset** and **on the long term**, and not the effect of therapy on the absolute reduction of HbA1c values on the short term.



Discussion

Impact of C-Peptide Preservation on Metabolic and Clinical Outcomes in the Diabetes Control and Complications Trial

John M. Lachin[1⇑], Paula McGee[1], Jerry P. Palmer[2,3], for the DCCT/EDIC Research Group

Diabetes **February 2014** vol. 63 no. 2 **739-748**

DIABETICMedicine

DOI: 10.1111/dme.12504

Short Report: Pathophysiology

Insulin secretion measured by stimulated C-peptide in long-established Type 1 diabetes in the Diabetes Control and Complications Trial (DCCT)/ Epidemiology of Diabetes Interventions and Complications (EDIC) cohort: a pilot study

P. McGee[1], M. Steffes[2], M. Nowicki[2], M. Bayless[3], R. Gubitosi-Klug[4], P. Cleary[1], J. Lachin[1], J. Palmer[5] and the DCCT/EDIC Research Group

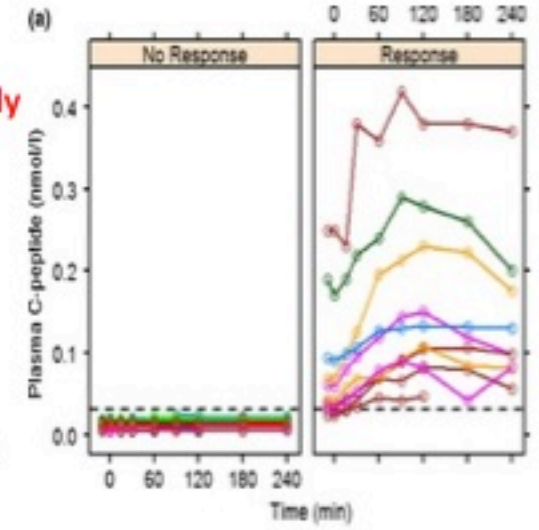
[1]The George Washington University Biostatistics Center, Rockville, MD, [2]Department of Laboratory Medicine and Pathology, University of Minnesota, Minneapolis, MN, [3]University of Iowa Hospitals and Clinics DCRP, Iowa City, IA, [4]University Hospitals Case Medical Center, Cleveland, OH, and [5]University of Washington Medical Center Diabetes Care Center and VA Puget Sound Health Care System, Seattle, WA, USA

Accepted 13 May 2014

The **Diabetes Control and Complications Trial** (DCCT) showed that an **early intensive** insulin therapy resulted in:

- a **longer retention** of residual endogenous insulin secretion
- lower HbA1c levels
- reduced risk of diabetes complications than conventional therapy

(DCCT Research Group, Ann Intern Med 1998; Steffes et al., Diabetes Care 2003)



Diabetologia (2014) 57:187–191
DOI 10.1007/s00125-013-3067-x

ARTICLE

The majority of patients with long-duration type 1 diabetes are insulin microsecretors and have functioning beta cells

Richard A. Oram · Angus G. Jones · Rachel E. J. Besser · Bridget A. Knight · Beverley M. Shields · Richard J. Brown · Andrew T. Hattersley · Timothy J. McDonald

Conclusions/interpretation Most patients with long-duration type 1 diabetes continue to secrete very low levels of endogenous insulin, which increase after meals. This is consistent with the presence of a small number of still functional beta cells and implies that beta cells are either escaping immune attack or undergoing regeneration.

Diabetologia (2014) 57:1–3
DOI 10.1007/s00125-013-3104-9

COMMENTARY

Why were we wrong for so long? The pancreas of type 1 diabetic patients commonly functions for decades

Denise L. Faustman

he take-home message of the paper by Oram and colleagues is that a large fraction of patients with long-standing diabetes have low-level, but persistent functioning of pancreatic islet cells. This implies that most individuals with long-term type 1 diabetes should perhaps now be given the same opportunity as individuals with new-onset disease to participate in clinical trials on immune intervention therapy seeking to preserve insulin secretion if innovative ideas to halt long-standing autoimmunity, not just acute autoimmunity, can be thoughtfully devised.

DIABETES TECHNOLOGY & THERAPEUTICS
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DTT
Diabetes Technology & Therapeutics

ORIGINAL ARTICLE

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However, we cannot confirm or exclude this hypothesis because of the lack of data about C-peptide levels during the follow-up.

Brancato D et al. Diabetes Technol Ther 2014

Insulin pump therapy, multiple daily injections, and cardiovascular mortality in 18 168 people with type 1 diabetes: observational study

Isabelle Steineck,[1] Jan Cederholm,[2] Björn Eliasson,[3] Araz Rawshani,[4] Katarina Eeg-Olofsson,[3] Ann-Marie Svensson,[4] Björn Zethelius,[5,6] Tarik Avdic,[4] Mona Landin-Olsson,[7] Johan Jendle,[8] Soffia Gudbjörnsdóttir[3,4] the Swedish National Diabetes Register

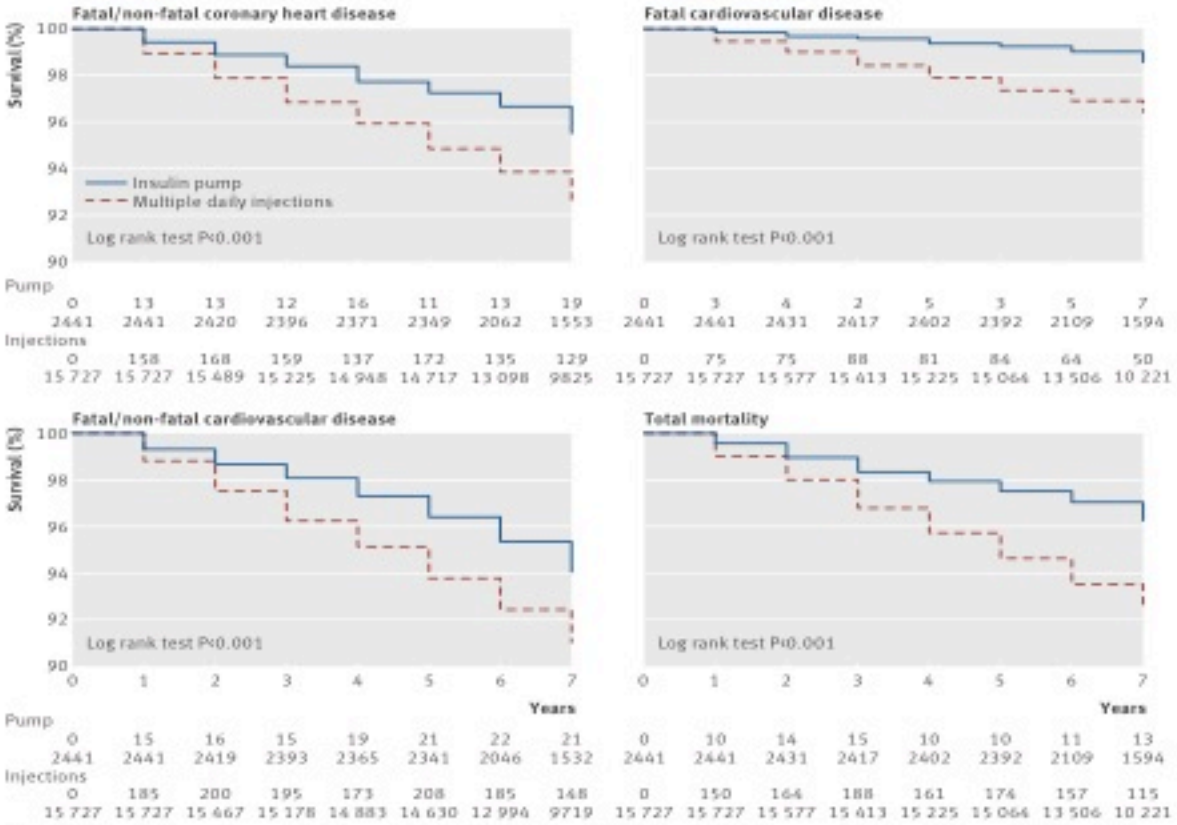
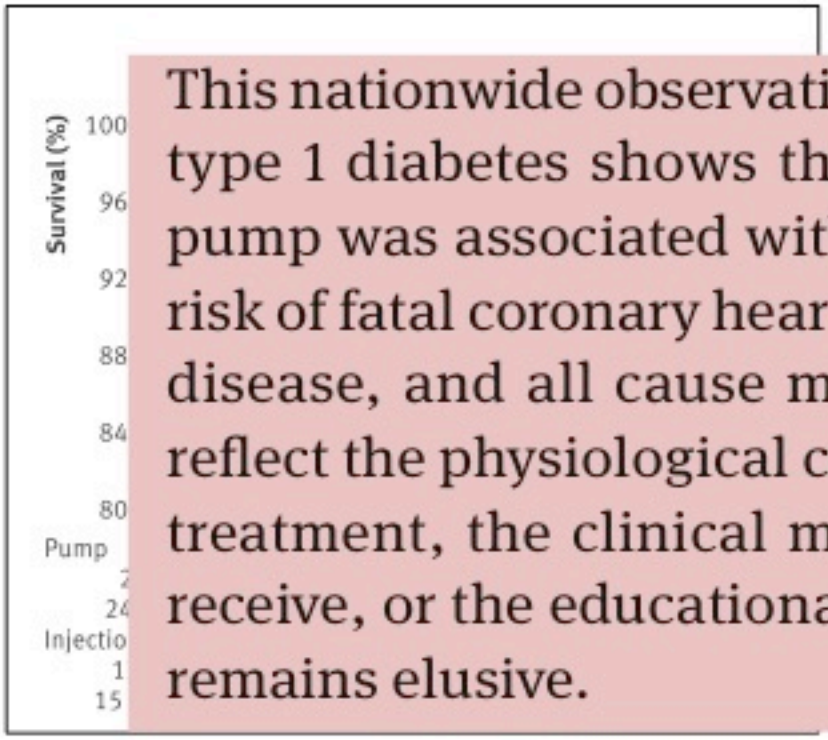
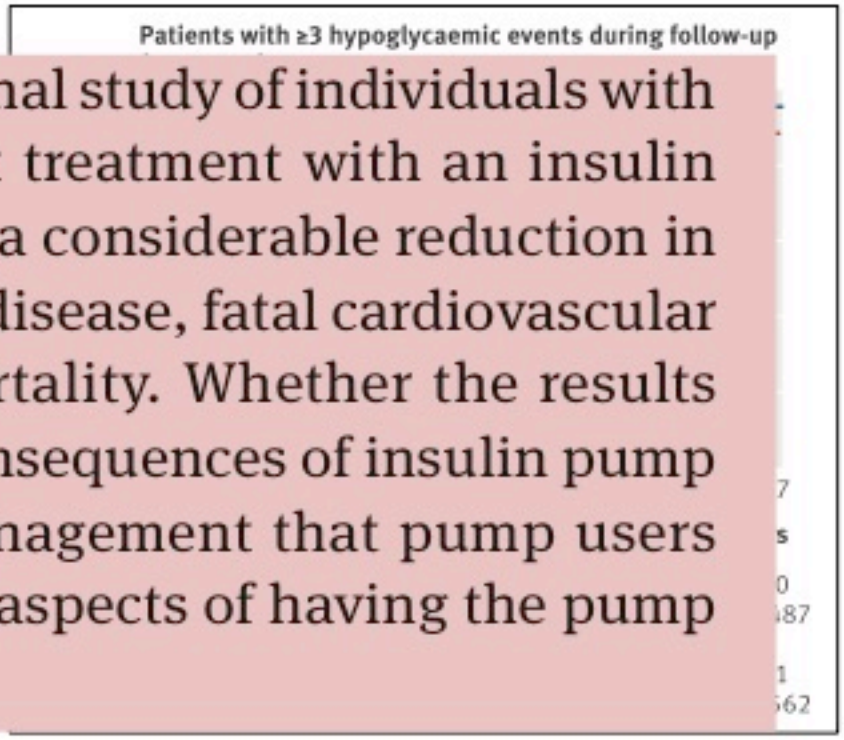


Fig 1 | Kaplan-Meier crude survival curves in 18 168 individuals with type 1 diabetes according to treatment with insulin pump therapy or multiple daily injections. No of cases and individuals at risk are given in each group

Insulin pump therapy, multiple daily injections, and cardiovascular mortality in 18 168 people with type 1 diabetes: observational study

Isabelle Steineck,[1] Jan Cederholm,[2] Björn Eliasson,[3] Araz Rawshani,[4] Katarina Eeg-Olofsson,[3] Ann-Marie Svensson,[4] Björn Zethelius,[5,6] Tarik Avdic,[4] Mona Landin-Olsson,[7] Johan Jendle,[8] Soffia Gudbjörnsdóttir[3,4] the Swedish National Diabetes Register





This nationwide observational study of individuals with type 1 diabetes shows that treatment with an insulin pump was associated with a considerable reduction in risk of fatal coronary heart disease, fatal cardiovascular disease, and all cause mortality. Whether the results reflect the physiological consequences of insulin pump treatment, the clinical management that pump users receive, or the educational aspects of having the pump remains elusive.