



## Clinical trial results:

**An open, single-centre, non-controlled study of efficacy, safety and usability of the GlucoTab system for glycaemic management in non-critically ill patients with type 2 diabetes at general wards**

### Summary

EudraCT number	2013-001295-38
Trial protocol	AT
Global end of trial date	23 December 2013

### Results information

Result version number	v1 (current)
This version publication date	29 October 2021
First version publication date	29 October 2021

### Trial information

#### Trial identification

Sponsor protocol code	ClinDiab-04
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#### Additional study identifiers

ISRCTN number	-
ClinicalTrials.gov id (NCT number)	NCT01932775
WHO universal trial number (UTN)	-

Notes:

### Sponsors

Sponsor organisation name	Medical University of Graz, Univ. Prof. Dr. Thomas Pieber, Department of Internal Medicine, Division of Endocrinology and Diabetology
Sponsor organisation address	Auenbruggerplatz 15, Graz, Austria, 8036
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Notes:

### Paediatric regulatory details

Is trial part of an agreed paediatric investigation plan (PIP)	No
Does article 45 of REGULATION (EC) No 1901/2006 apply to this trial?	No
Does article 46 of REGULATION (EC) No 1901/2006 apply to this trial?	No

Notes:

## Results analysis stage

Analysis stage	Final
Date of interim/final analysis	26 March 2014
Is this the analysis of the primary completion data?	Yes
Primary completion date	23 December 2013
Global end of trial reached?	Yes
Global end of trial date	23 December 2013
Was the trial ended prematurely?	No

Notes:

## General information about the trial

Main objective of the trial:

To investigate the efficacy of the GlucoTab system for glycaemic management in non-critically ill patients with type 2 diabetes at different general wards

Protection of trial subjects:

The trial was conducted in accordance with the Declaration of Helsinki and ICH Good Clinical Practice. All study participants were required to read and sign an Informed Consent Form.

Background therapy: -

Evidence for comparator: -

Actual start date of recruitment	16 May 2013
Long term follow-up planned	No
Independent data monitoring committee (IDMC) involvement?	No

Notes:

## Population of trial subjects

### Subjects enrolled per country

Country: Number of subjects enrolled	Austria: 99
Worldwide total number of subjects	99
EEA total number of subjects	99

Notes:

### Subjects enrolled per age group

In utero	0
Preterm newborn - gestational age < 37 wk	0
Newborns (0-27 days)	0
Infants and toddlers (28 days-23 months)	0
Children (2-11 years)	0
Adolescents (12-17 years)	0
Adults (18-64 years)	38
From 65 to 84 years	57
85 years and over	4

## Subject disposition

### Recruitment

Recruitment details:

Single-centre study - 1 site in Austria - 99 subjects

Recruitment started on 16-May-2013. Patients with type 2 diabetes mellitus or newly diagnosed hyperglycaemia treated initially with oral agents, non-insulin injected antidiabetic medicine, insulin, diet or any combination of the four, and who were hospitalised at the Medical University of Graz.

### Pre-assignment

Screening details:

100 patients have been screened and in total 99 patients were included. 97 patients completed the study according to study protocol and two patients were withdrawn. A physician explained the nature, purpose and risks of the study and provided the patient with a copy of the patient information sheet.

### Period 1

Period 1 title	Overall trial (overall period)
Is this the baseline period?	Yes
Allocation method	Non-randomised - controlled
Blinding used	Not blinded

### Arms

Arm title	ClinDiab04
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Arm description:

Glinide, Sulfonylureas and Glitazones were stopped. Metformin, GLP-1 Analoga and DPP-4 inhibitors were continued according local standard procedures. Insulin therapy was adjusted according to the GlucoTab® system with incorporated software algorithm. As judged by the investigator, a glucose sensor (iPro2) was inserted subcutaneously to monitor glucose continuously to gain more detailed information about the algorithm for further improvement. Insulin regimen and insulin dosage prescription for the next 24 hours was performed once daily according to the GlucoTab® system under supervision of the treating physician. Capillary glucose was measured before meals and at bedtime. If a patient was not eating, insulin glargine was given but insulin Novorapid was held. Correctional insulin was given according to glucose levels.

Arm type	Experimental
Investigational medicinal product name	Lantus Solostar 100 Einheiten/ml Injektionslösung in einem Fertigpen
Investigational medicinal product code	ATC-Code: A10A E04
Other name	Insulin glargin
Pharmaceutical forms	Solution for injection in pre-filled pen
Routes of administration	Subcutaneous use

Dosage and administration details:

Insulin regimen and insulin dosage prescription for the next 24 hours was performed once daily according to the GlucoTab® system under supervision of the treating physician. The goal of the insulin protocol was to maintain fasting and pre-meal glucose concentrations between 70 and 140 mg/dl. Insulin was started at a total daily dose of 0.5 units/kg divided half as insulin glargine once daily and the other half as insulin Novorapid given before meals.

Investigational medicinal product name	Novorapid Flexpen
Investigational medicinal product code	ATC-Code: A10A B05
Other name	insulin aspart
Pharmaceutical forms	Solution for injection in pre-filled pen
Routes of administration	Subcutaneous use

Dosage and administration details:

Insulin regimen and insulin dosage prescription for the next 24 hours was performed once daily according to the GlucoTab® system under supervision of the treating physician. The goal of the insulin protocol was to maintain fasting and pre-meal glucose concentrations between 70 and 140 mg/dl. Insulin was started at a total daily dose of 0.5 units/kg divided half as insulin glargine once daily and the other half as insulin Novorapid given before meals.

<b>Number of subjects in period 1</b>	ClinDiab04
Started	99
Completed	99

## Baseline characteristics

### Reporting groups

Reporting group title	ClinDiab04
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Reporting group description:

Glinide, Sulfonylureas and Glitazones were stopped. Metformin, GLP-1 Analoga and DPP-4 inhibitors were continued according local standard procedures. Insulin therapy was adjusted according to the GlucoTab® system with incorporated software algorithm. As judged by the investigator, a glucose sensor (iPro2) was inserted subcutaneously to monitor glucose continuously to gain more detailed information about the algorithm for further improvement. Insulin regimen and insulin dosage prescription for the next 24 hours was performed once daily according to the GlucoTab® system under supervision of the treating physician. Capillary glucose was measured before meals and at bedtime. If a patient was not eating, insulin glargine was given but insulin Novorapid was held. Correctional insulin was given according to glucose levels.

Reporting group values	ClinDiab04	Total	
Number of subjects	99	99	
Age categorical			
Units: Subjects			
In utero	0	0	
Preterm newborn infants (gestational age < 37 wks)	0	0	
Newborns (0-27 days)	0	0	
Infants and toddlers (28 days-23 months)	0	0	
Children (2-11 years)	0	0	
Adolescents (12-17 years)	0	0	
Adults (18-64 years)	38	38	
From 65-84 years	57	57	
85 years and over	4	4	
Age continuous			
Units: years			
arithmetic mean	67.2		
standard deviation	± 10.6	-	
Gender categorical			
Units: Subjects			
Female	41	41	
Male	58	58	
HbA1c			
Units: mmol/mol			
arithmetic mean	65.1		
standard deviation	± 21.3	-	
Serum creatinine			
Units: mg/dl			
arithmetic mean	1.8		
standard deviation	± 1.5	-	

## End points

### End points reporting groups

Reporting group title	ClinDiab04
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Reporting group description:

Glinide, Sulfonylureas and Glitazones were stopped. Metformin, GLP-1 Analoga and DPP-4 inhibitors were continued according local standard procedures. Insulin therapy was adjusted according to the GlucoTab® system with incorporated software algorithm. As judged by the investigator, a glucose sensor (iPro2) was inserted subcutaneously to monitor glucose continuously to gain more detailed information about the algorithm for further improvement. Insulin regimen and insulin dosage prescription for the next 24 hours was performed once daily according to the GlucoTab® system under supervision of the treating physician. Capillary glucose was measured before meals and at bedtime. If a patient was not eating, insulin glargine was given but insulin Novorapid was held. Correctional insulin was given according to glucose levels.

### Primary: Mean percentage of blood glucose values in the target range 70-140 mg/dl

End point title	Mean percentage of blood glucose values in the target range 70-140 mg/dl <sup>[1]</sup>
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End point description:

In a recent clinical trial the percentage of BG measurements within the target range between 70 and 140 mg/dl was 42%, using a basal-bolus algorithm (Umpierrez, Smiley, et al., 2013). The primary endpoint of this study was the verification of efficacy of the GlucoTab® system for blood glucose management by demonstrating at least the same performance regarding BG measurements in the target range.

End point type	Primary
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End point timeframe:

whole study duration

Notes:

[1] - No statistical analyses have been specified for this primary end point. It is expected there is at least one statistical analysis for each primary end point.

Justification: All parameters were analysed by descriptive and explorative statistical methods. No hypotheses were tested. The primary endpoint was "the percentage of actions the GlucoTab system supports either to capture BG values or provide insulin dose suggestions according to the REACTION algorithm"

<b>End point values</b>	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: Percentage				
arithmetic mean (standard deviation)	50.2 (± 22.2)			

### Statistical analyses

No statistical analyses for this end point

### Secondary: Blood glucose measurements in different ranges

End point title	Blood glucose measurements in different ranges
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End point description:

End point type	Secondary
End point timeframe: whole study duration	

<b>End point values</b>	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: Percentage				
number (not applicable)				
0-<40 mg/dl	0			
40-<60 mg/dl	0.5			
40-<70 mg/dl	1.8			
70-<100 mg/dl	14.3			
100-140 mg/dl	33			
>140-<180 mg/dl	25.2			
180-<300 mg/dl	23			
>=300 mg/dl	2.7			

### Statistical analyses

No statistical analyses for this end point

### Secondary: Mean daily blood glucose

End point title	Mean daily blood glucose
End point description:	
End point type	Secondary
End point timeframe: whole study duration	

<b>End point values</b>	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: mg/dl				
arithmetic mean (standard deviation)	154 (± 34.5)			

### Statistical analyses

No statistical analyses for this end point

**Secondary: Missed BG measurements and insulin injections**

End point title	Missed BG measurements and insulin injections
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End point description:

End point type	Secondary
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End point timeframe:

whole study duration except first and last study day

End point values	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: Percentage				
number (not applicable)				
missed blood glucose measurements	4.2			
missed bolus insulin injections	5.3			
missed basal insulin injections	1.4			

**Statistical analyses**

No statistical analyses for this end point

**Secondary: Number of BG measurements per day, standard bolus insulin injections, standard basal insulin injections**

End point title	Number of BG measurements per day, standard bolus insulin injections, standard basal insulin injections
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End point description:

End point type	Secondary
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End point timeframe:

whole study duration

End point values	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: number				
number (not applicable)				
number of BG measurements per day	3.8			
standard bolus insulin injections	3.1			
standard basal insulin injections	1.0			



## Statistical analyses

No statistical analyses for this end point

### Secondary: Insulin dose corrections

End point title Insulin dose corrections

End point description:

End point type Secondary

End point timeframe:

whole study duration

End point values	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: IU				
arithmetic mean (standard deviation)				
bolus insulin correction	-0.5 (± 1.6)			
basal insulin correction	-0.6 (± 2.9)			

## Statistical analyses

No statistical analyses for this end point

### Secondary: Insulin corrections by the user (%)

End point title Insulin corrections by the user (%)

End point description:

End point type Secondary

End point timeframe:

whole study duration excluding day 1

End point values	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: Percentage				
number (not applicable)				
basal insulin corrections	3.3			
bolus insulin corrections	3.5			

## Statistical analyses

No statistical analyses for this end point

### Secondary: Health care professionals' adherence to suggested insulin doses

End point title	Health care professionals' adherence to suggested insulin doses
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End point description:

End point type	Secondary
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End point timeframe:

whole study duration except day 1 of study

End point values	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: Percentage				
number (not applicable)				
physician adherence to basal insulin doses	96.7			
nurse adherence to bolus insulin doses	96.5			

## Statistical analyses

No statistical analyses for this end point

### Secondary: Overall mean BG values

End point title	Overall mean BG values
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End point description:

End point type	Secondary
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End point timeframe:

whole study duration

End point values	ClinDiab04			
Subject group type	Reporting group			
Number of subjects analysed	99			
Units: mg/dl				
arithmetic mean (standard deviation)				
overall pre-breakfast BG	147 (± 43.2)			
overall pre-lunch BG	170 (± 54.3)			
overall pre-dinner BG	153 (± 40.8)			
overall bedtime BG	153 (± 38.5)			
pre-enrolment BG	188 (± 72.9)			

## **Statistical analyses**

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No statistical analyses for this end point

## Adverse events

### Adverse events information

Timeframe for reporting adverse events:

Adverse events were assessed during the whole study duration

Assessment type	Systematic
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### Dictionary used

Dictionary name	MedDRA
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Dictionary version	23
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### Reporting groups

Reporting group title	ClinDiab04
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Reporting group description:

Glinide, Sulfonylureas and Glitazones were stopped. Metformin, GLP-1 Analoga and DPP-4 inhibitors were continued according local standard procedures. Insulin therapy was adjusted according to the GlucoTab® system with incorporated software algorithm. As judged by the investigator, a glucose sensor (iPro2) was inserted subcutaneously to monitor glucose continuously to gain more detailed information about the algorithm for further improvement. Insulin regimen and insulin dosage prescription for the next 24 hours was performed once daily according to the GlucoTab® system under supervision of the treating physician. Capillary glucose was measured before meals and at bedtime. If a patient was not eating, insulin glargine was given but insulin Novorapid was held. Correctional insulin was given according to glucose levels.

Serious adverse events	ClinDiab04		
Total subjects affected by serious adverse events			
subjects affected / exposed	1 / 99 (1.01%)		
number of deaths (all causes)	0		
number of deaths resulting from adverse events	0		
Vascular disorders			
In-stent thrombosis Stent Thrombosis (RCX)			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences causally related to treatment / all	0 / 1		
deaths causally related to treatment / all	0 / 0		

Frequency threshold for reporting non-serious adverse events: 0 %

Non-serious adverse events	ClinDiab04		
Total subjects affected by non-serious adverse events			
subjects affected / exposed	29 / 99 (29.29%)		
Vascular disorders			
AV-fistula right inguinal			

subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Myalgic headache			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Haematoma and false aneurysm of the right femoral artery after coronary angiography			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Multiple stenoses of arteries of the lower leg on both sides			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Cardiac disorders			
Stent thrombosis RCX			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Progression of coronary artery disease			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Coronary artery disease (3 vessels)			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Coronary artery disease (1 vessel)			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Blood and lymphatic system disorders			
Epistaxis			
subjects affected / exposed	2 / 99 (2.02%)		
occurrences (all)	2		
Hypoferremia anemia			
subjects affected / exposed	1 / 99 (1.01%)		
occurrences (all)	1		
Gastrointestinal disorders			
Atrophic gastritis			

<p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Gastric polyps</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Reflux esophagitis</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p>	<p>1 / 99 (1.01%)</p> <p>1</p> <p>1 / 99 (1.01%)</p> <p>1</p> <p>1 / 99 (1.01%)</p> <p>1</p>		
<p>Respiratory, thoracic and mediastinal disorders</p> <p>Mild respiratory abnormality with restrictive pattern</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Cough</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Respiratory abnormality with restrictive and obstructive pattern</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p>	<p>1 / 99 (1.01%)</p> <p>1</p> <p>1 / 99 (1.01%)</p> <p>1</p> <p>1 / 99 (1.01%)</p> <p>1</p>		
<p>Hepatobiliary disorders</p> <p>Non-alcoholic steatohepatitis</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Cirrhosis of the liver</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p>	<p>1 / 99 (1.01%)</p> <p>1</p> <p>1 / 99 (1.01%)</p> <p>1</p>		
<p>Skin and subcutaneous tissue disorders</p> <p>Haematoma and swelling of the right leg</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Haematoma on the right back of the hand</p> <p>subjects affected / exposed</p> <p>occurrences (all)</p> <p>Intertrigo</p>	<p>1 / 99 (1.01%)</p> <p>1</p> <p>1 / 99 (1.01%)</p> <p>1</p>		

subjects affected / exposed occurrences (all)	1 / 99 (1.01%) 1		
Renal and urinary disorders Urethritis subjects affected / exposed occurrences (all)  Glomerulonephritis subjects affected / exposed occurrences (all)  Urinary tract infection subjects affected / exposed occurrences (all)	1 / 99 (1.01%) 1  1 / 99 (1.01%) 1  1 / 99 (1.01%) 1		
Musculoskeletal and connective tissue disorders Shoulder osteoarthritis on both sides subjects affected / exposed occurrences (all)  Osteopenia subjects affected / exposed occurrences (all)	1 / 99 (1.01%) 1  2 / 99 (2.02%) 2		
Infections and infestations Infection with fever subjects affected / exposed occurrences (all)	1 / 99 (1.01%) 1		

## More information

### Substantial protocol amendments (globally)

Were there any global substantial amendments to the protocol? No

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### Interruptions (globally)

Were there any global interruptions to the trial? No

### Limitations and caveats

Limitations of the trial such as small numbers of subjects analysed or technical problems leading to unreliable data.

the number of included patients per ward was not equal (less patients from surgical wards); the study team supported and reminded clinical staff to perform necessary tasks of the GlucoTab
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Notes: