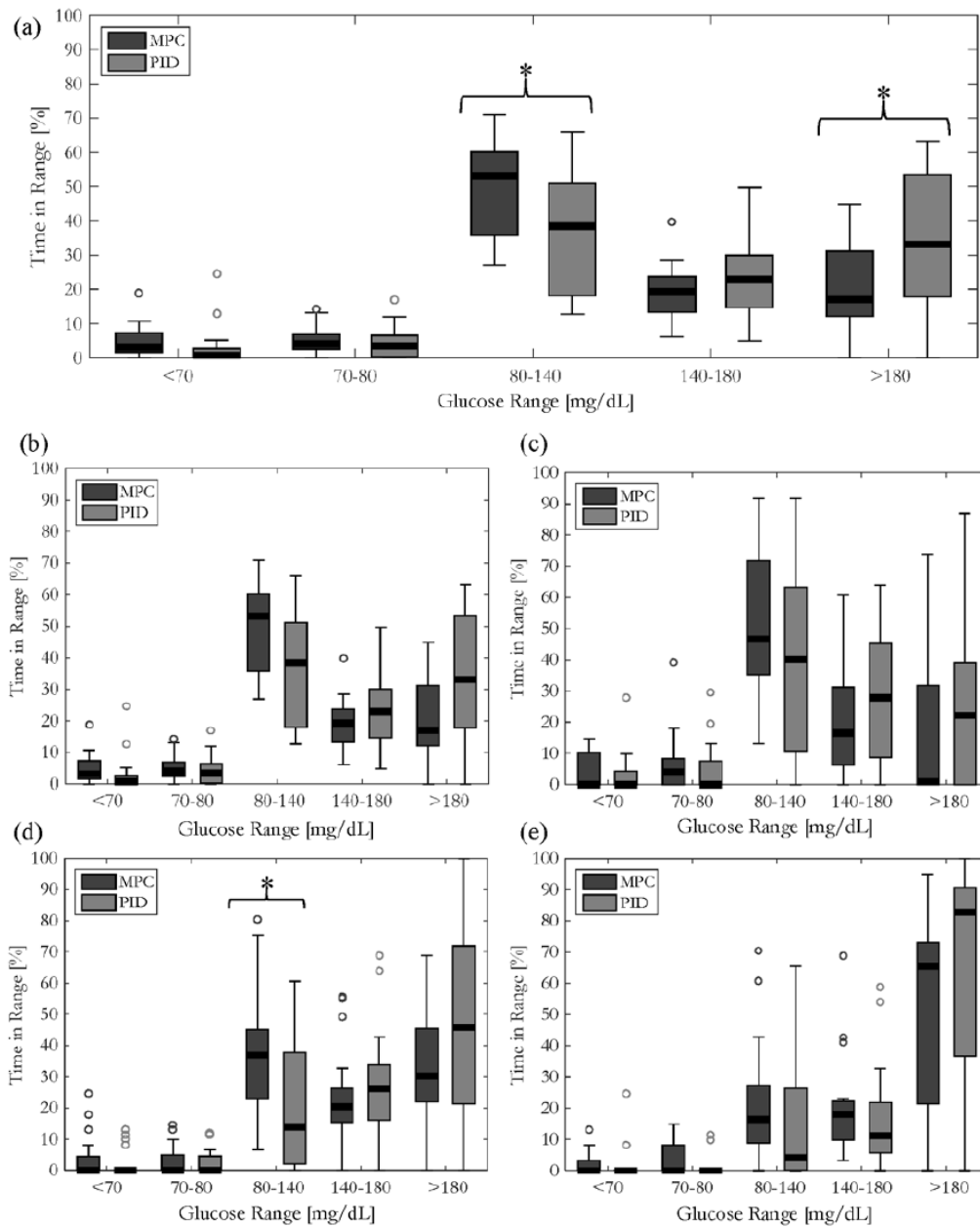


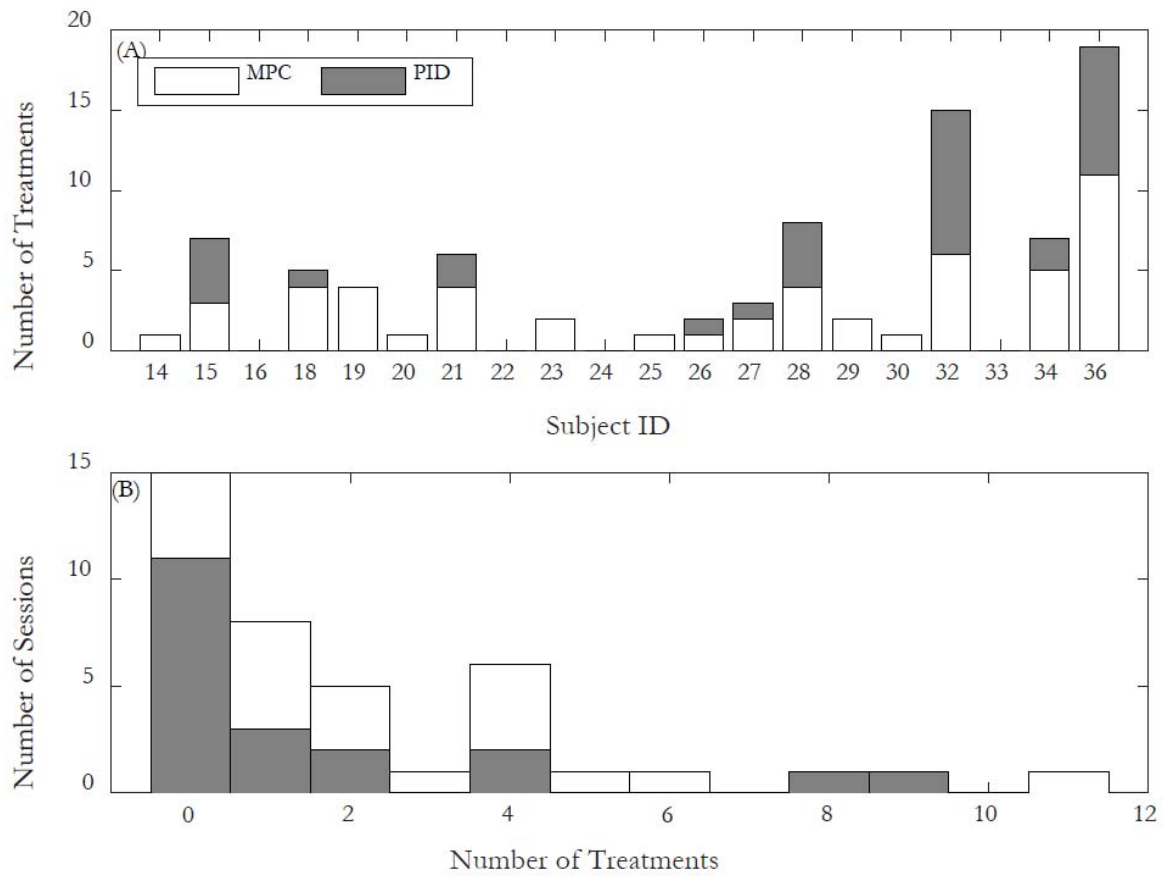
SUPPLEMENTARY DATA

**Supplementary Figure 1.** Glucose control performance (by CGM) characterized by % time in clinical range of 20 adult subjects controlled by PID and MPC for (a) the entire study period, (b) overnight, (c) dinner, (d) breakfast, (e) and unannounced lunch. Asterisks represent significant differences. Black bars represent medians.



SUPPLEMENTARY DATA

**Supplementary Figure 2.** Frequency of hypoglycemia treatments occurred for all 20 subjects in the study, under both MPC and PID control, (a) divided by each subject and trial (labeled as last two numbers of the subject IDs), and (b) divided by frequency of treatments, for a total of 40 sessions.



SUPPLEMENTARY DATA

**Supplementary Table 1.** Subject demographics for the overall study.

	Overall Study (n=20)	
	Mean [SD]	Range
Age (years)	46 [4]	21-61
BMI (kg/m)	26.2 [1.3]	19.2-36.1
HbA1c (%)	7.4 [0.1]	5.8-8.6
HbA1c (mmol/mol)	58 [1]	40-70
Duration of Diabetes (years)	29 [2]	3-49
Total Daily Dose (U/day)	42 [1.3]	25-97.2

SUPPLEMENTARY DATA

**Supplementary Table 2.** Summary of mean clinical metrics that characterize glucose control performance of 20 adult subjects controlled by PID and MPC algorithms for for 27.5 h sessions, excluding unannounced meals.

	MPC	PID	p-value MPC vs. PID
Mean glucose (mg/dL)	128 [18.5]	146 [27.6]	0.020*
% time <70 mg/dL	5.43 [5.43]	3.3 [6.09]	0.250
70<% time <80 mg/dL	5.85 [4.2]	5.14 [5.63]	0.654
% time 80-140 mg/dL	56.2 [14.8]	41.7 [18.2]	0.009*
140<% time <180 mg/dL	18.2 [10.3]	24.5 [12.2]	0.086
% time > 180 mg/dL	14.3 [10]	25.3 [17.4]	0.019*
% time 70-180 mg/dL	80.3 [9.57]	71.4 [15.1]	0.032*
#<70 mg/dL events >15 min	2.55 [2.78]	1.55 [3.38]	0.313
# treatments	2.45 [2.44]	1.4 [2.26]	0.166
LBGI	1.39 [0.94]	0.95 [1.16]	0.198
HBGI	3.02 [2.08]	5.1 [3.49]	0.027*

Brackets represent the standard deviation. Asterisks represent significance with  $\alpha = 0.05$ .

SUPPLEMENTARY DATA

**Supplementary Table 3.** Summary of mean clinical metrics that characterize glucose control performance of 20 adult subjects controlled by PID and MPC algorithms during the 5 hour post prandial period after the first and second meals (Dinner, Breakfast).

	MPC	PID	p-value MPC vs. PID
<b>5 HOUR POSTPRANDIAL PERIOD AFTER ANNOUNCED DINNER (65g CHO)</b>			
Mean glucose (mg/dL)	132 [33.6]	146 [35.7]	0.219
Maximum Δ glucose (mg/dL)	72.2 [38.8]	71.3 [50]	0.950
% time <70 mg/dL	4.69 [5.81]	3.03 [6.67]	0.407
70< % time <80 mg/dL	7.22 [9.49]	5.25 [8.08]	0.484
% time 80-140 mg/dL	50.8 [23.7]	38.3 [29.3]	0.146
140< % time <180 mg/dL	21.3 [18.5]	28.1 [20.1]	0.276
% time > 180 mg/dL	15.9 [22.6]	25.3 [25.1]	0.221
% time 70-180 mg/dL	79.4 [21]	71.6 [23.4]	0.278
Time to return to <180 mg/dL (min)	42.5 [64.6]	61.3 [72.7]	0.394
# treatments	0.6 [0.82]	0.4 [0.75]	0.427
LBG1	1.24 [1.31]	0.88 [1.29]	0.380
HBGI	3.27 [4.24]	4.66 [4.31]	0.310
<b>5 HOUR POSTPRANDIAL PERIOD AFTER ANNOUNCED BREAKFAST (50g CHO)</b>			
Mean glucose (mg/dL)	156 [34.8]	181 [48]	0.06
Maximum Δ glucose (mg/dL)	111 [45.2]	106 [46.5]	0.724
% time <70 mg/dL	3.61 [7.09]	2.15 [4.48]	0.441
70< % time <80 mg/dL	2.8 [4.74]	2.24 [4]	0.69
% time 80-140 mg/dL	38.1 [18.7]	20.9 [19.9]	0.008*
140< % time <180 mg/dL	23.9 [14.8]	26.7 [18.4]	0.6
% time > 180 mg/dL	31.6 [20.6]	48 [32.3]	0.064
% time 70-180 mg/dL	64.8 [19.3]	49.9 [30.9]	0.075
Time to return to <180 mg/dL (min)	93.8 [63.6]	139 [101]	0.099
# treatments	0.3 [0.73]	0.15 [0.37]	0.418
LBG1	0.81 [1.27]	0.47 [0.86]	0.318
HBGI	6.55 [5.25]	10.3 [8.62]	0.1

Brackets represent the standard deviation. Asterisks represent significance with  $\alpha = 0.05$ .

SUPPLEMENTARY DATA

**Supplementary Table 4.** Summary of mean clinical metrics that characterize insulin delivery of 20 adult subjects controlled by PID and MPC algorithms.

	MPC	PID	p-value MPC vs. PID
<b>OVERALL STUDY</b>			
Total delivery (U)	38.9 [11.2]	36.8 [9.29]	0.535
Total delivery in excess of basal (U)	17.4 [4.85]	17.8 [5.55]	0.792
Total Delivery in excess of TDI (U) (normalized by study duration)	-9.04 [10.9]	-11 [12.3]	0.591
# insulin suspensions by controller >15 min	10.5 [7.13]	15.9 [8.96]	0.045*
# insulin suspensions by controller >30 min	4.5 [3.09]	7.5 [5.08]	0.03*
<b>5 HOUR POSTPRANDIAL PERIOD</b>			
CL insulin delivered in excess of basal and calculated I:C ratio for dinner (U)	-0.899 [2.23]	-2.87 [2.12]	0.056
CL insulin delivered in excess of basal and calculated I:C ratio for breakfast (U)	-1.56 [3.05]	-2.29 [2.35]	0.556
CL insulin delivered in excess of basal and calculated I:C ratio for <u>unannounced</u> lunch (U)	-3.71 [2.76]	-3.84 [2.91]	0.92
<b>COMPARISON BETWEEN ANNOUNCED AND UNANNOUNCED MEALS</b>			
CL insulin delivery for <u>unannounced</u> <u>lunch</u> in excess of CL insulin delivery for dinner (U)	-2.04 [2.20]	-0.66 [2.71]	0.086

Brackets represent the standard deviation. Asterisks represent significance with  $\alpha = 0.05$ .