

SUPPLEMENTARY DATA

Supplementary Table 1. Inclusion and exclusion criteria.

Inclusion criteria
• aged 18 years or above
• diagnosed with Type 1 DM at least 6 months according to the WHO definition
• Body Mass Index (BMI) <35 kg/m ²
• treated by basal-bolus insulin therapy using an external insulin pump for at least 3 months
• willing to use insulin aspart and wear a CGM device for the duration of the three study days and undergo all study procedures
• trained in carbohydrate counting
• HbA1c <10%
• if patient is on antihypertensive, thyroid, anti-depressant or lipid lowering medication, patient must have stability on the medication for at least 1 month prior to enrolment in the study and for the study duration
• signed informed consent form prior to study entry
Exclusion criteria
• Patient is pregnant, or breast feeding during the period of the study.
• hematocrit is below 36% (females) and below 38% (males)
• symptomatic coronary artery disease (e.g. history of myocardial infarction, history of acute coronary syndrome, history of therapeutic coronary intervention, history of coronary bypass or stenting procedure, stable or unstable angina, positive stress test or catheterization with coronary blockages >50%) or congestive

heart failure or a history of a cerebrovascular event.
• patient is using a medication that significantly impacts glucose metabolism (oral steroids) except if stable for at least the last three months and expected to remain stable for the study duration
• uncontrolled hypertension with resting blood pressure over 140/90 mmHg
• Patient is actively enrolled in another clinical trial or took part in a study within 30 days
• Allergy or adverse reaction to aspart insulin
• Known adrenal gland problem, pancreatic tumor, or insulinoma
• Current alcohol abuse, substance abuse, or severe mental illness, as judged by the investigator
• Retinopathy except background retinopathy according to eye fundus examination during the last year
• Known bleeding diathesis or dyscrasia
• Renal insufficiency with serum creatinine >150 µmol/L
• Patient donated blood in the last 3 months

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Supplementary Table 2. CAT trial – Per Protocol (Comparison of algorithms) data exclusion plan.

Nature of the problem	Data exclusion window
Technical failures	
POD occlusion	From 2 hour prior to occlusion to 4 hours after occlusion
POD replacement (software restarted immediately/ new battery)	No action
Sensor failure / replacement - Using finger-stick to drive algorithm	From first finger-stick until last finger-stick
Software failures (Automated and Manual)	No action < 1 hour. More than 1 hour of software failure - Remove data from time of software failure till 4 hours after re-starting.
Large sensor error (applies to closed-loop arms only)	Sensor error has to be present for at least 45 minutes for this rule to apply. YSI values act as reference glucose. From time when sensor error > 50% , until 4 hours, from the time sensor error became less than 50%.
Communication failure (this has only happened for very short periods)	No action
Protocol violations	
Wrong amount of delivered insulin	Error must be at least 0.5 units for this rule to apply. This can be an error in a single injection or a cumulative error in 1 hour. From time of error until 4 hours later
Using bolus calculator instead of iAP calculations to calculate meal bolus	From meal time to 4 hours later
Delayed meal bolus - more than 20 minutes later than planned	From meal time to 4 hours later. This is not applicable if both meal and insulin bolus are consistently delayed.
Wrong hypo treatment (under or over treatment)	No action
Not delivering meal bolus	From missed bolus to 4 hours later

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Extra calibration points	No action
Missing calibration	No action
Entering YSI for calibration time points instead of finger-stick	No action
Isolated operator error entering 0mmol/l instead of missing sensor value	From error to 4 hours later. (CAM Only)
Hypo Treatment announced as a meal	From the time of announcement till 4 hours later
Unannounced exercise	No action
Hypo treatment not announced to algorithm	From the time of hypo till 4 hours later.

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Supplementary Figure 1. Mean insulin profiles per algorithm and administration of rescue carbohydrates.

