

DANA-I & CAMAPS

Smart Phone, Smart Pumps.

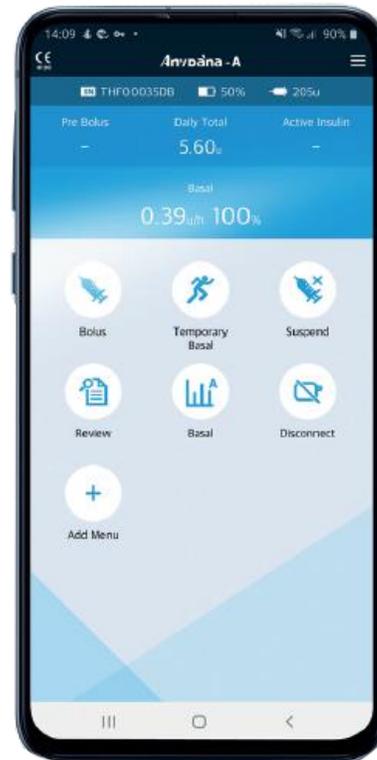
Advanced Therapeutics (UK) Ltd

SOOIL: manufacturer of Dana pumps



Pump Choice for people with diabetes

What is important?



- ▶ Discretion
- ▶ Improved Glucose Control
- ▶ Flexibility
- ▶ Quality of life Benefits
- ▶ Ease of Use

Dana-i: features

- ▶ **Designed to be used as an artificial Pancreas**
- ▶ Low Energy Bluetooth 5.2
- ▶ Full Featured - Android and iOS control via AnyDana app
- ▶ Small
- ▶ Light: 82g weight
- ▶ Insulin choice = rapid and ultra rapids
- ▶ 300 unit reservoir - can part fill from as little as 50u.
- ▶ Bolus increments: **0.05u**
- ▶ Small basal increment: (starts 0.04 u) - **0.01u/hour**
- ▶ Large Max bolus - **80u**
- ▶ Pump can be used stand-alone without a phone
- ▶ Accuracy of delivery



Dana-i: features

▶ Accuracy:

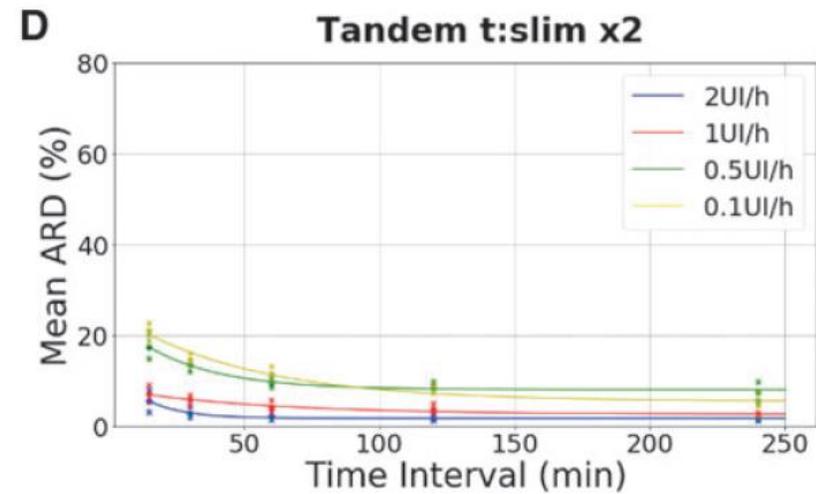
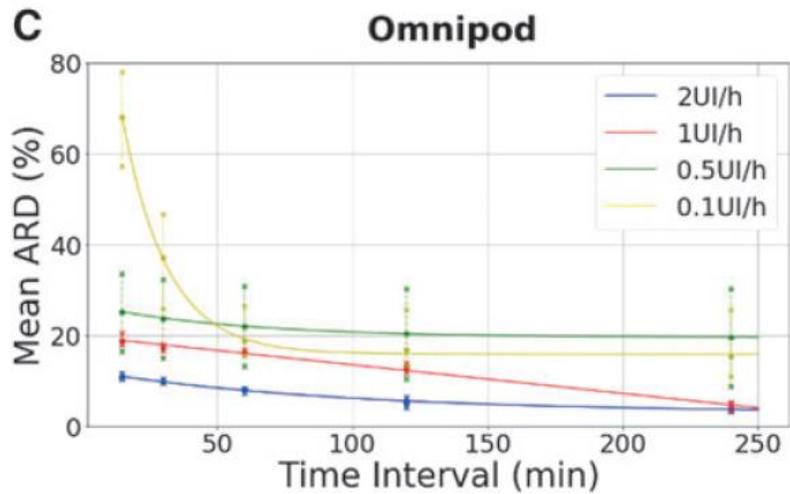
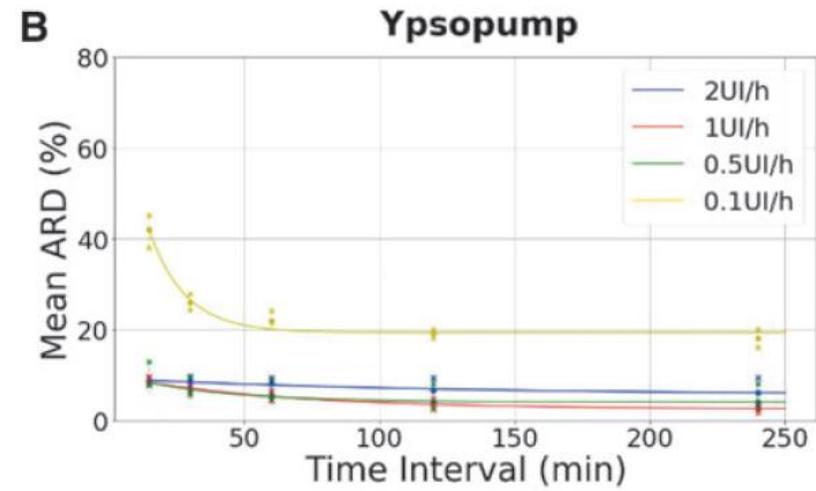
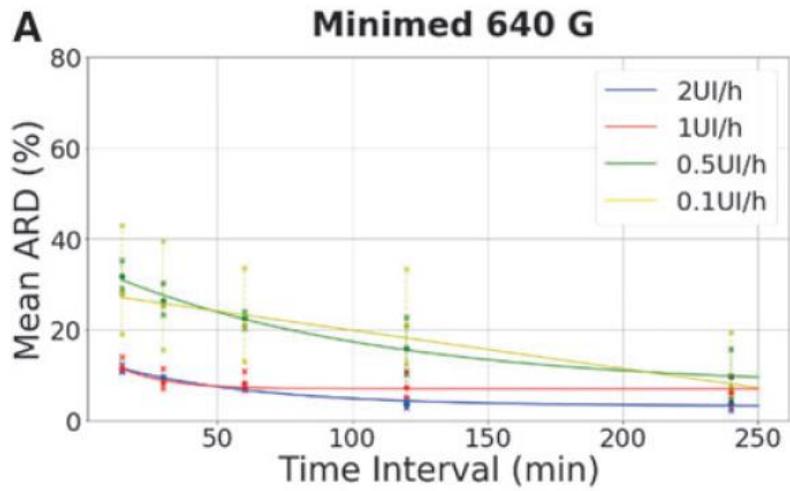
- ▶ Bolus delivery as low as 0.05 units: maximum error is $\pm 4\%$ ⁽¹⁾
- ▶ Basal delivery as low as 0.04 units/hour: maximum error is $\pm 4\%$ ⁽¹⁾
- ▶ **MARD at 0.01u/h delivery rate with 60 minute time interval = 2.52%**

“With regard to the use of pumps in artificial pancreas systems, short-term accuracy is especially important, because insulin delivery is frequently adapted to current glucose levels.” ⁽²⁾

1. Dana-i User Manual

2. Ralph Ziegler, Nick Oliver et al. Diabetes Technology & Therapeutics Volume 23. Number 5. 2021





Ref: All Pumps are not Equivalent: A bench test assessment for several basal rates, Sylvian Giardot Et al, DOI: 10.1089/dia.2019.0486

Infusion Sets

4 Cannulas

Dana Inset II (NEW)

- ▶ Teflon cannula 90 degree: 6mm & 9mm

Soft Release O

- ▶ Teflon cannula 90 deg: 6mm & 9mm

Easy Release

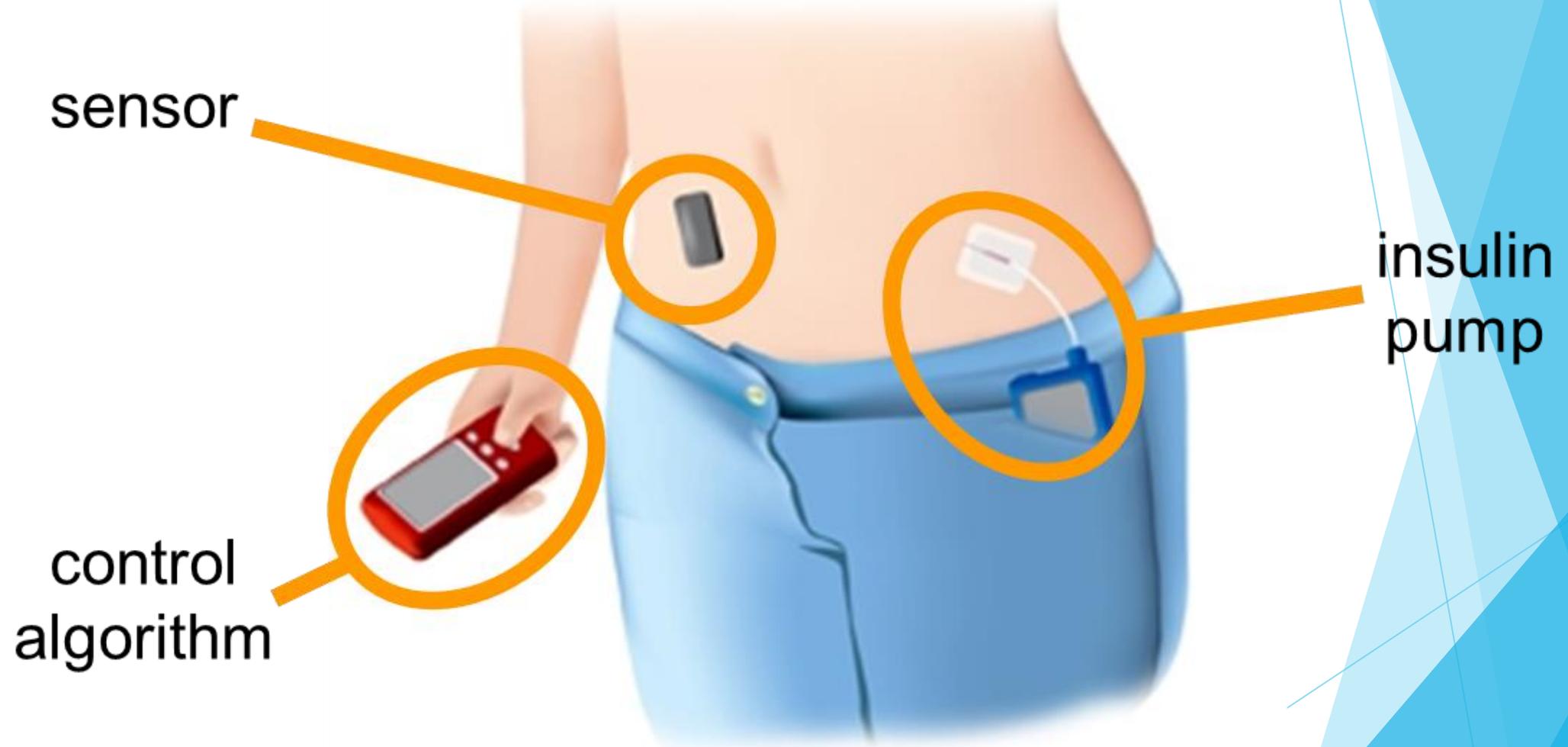
- ▶ Steel cannula 90 deg: 4.5mm & 7mm

Soft Release Micro (NEW)

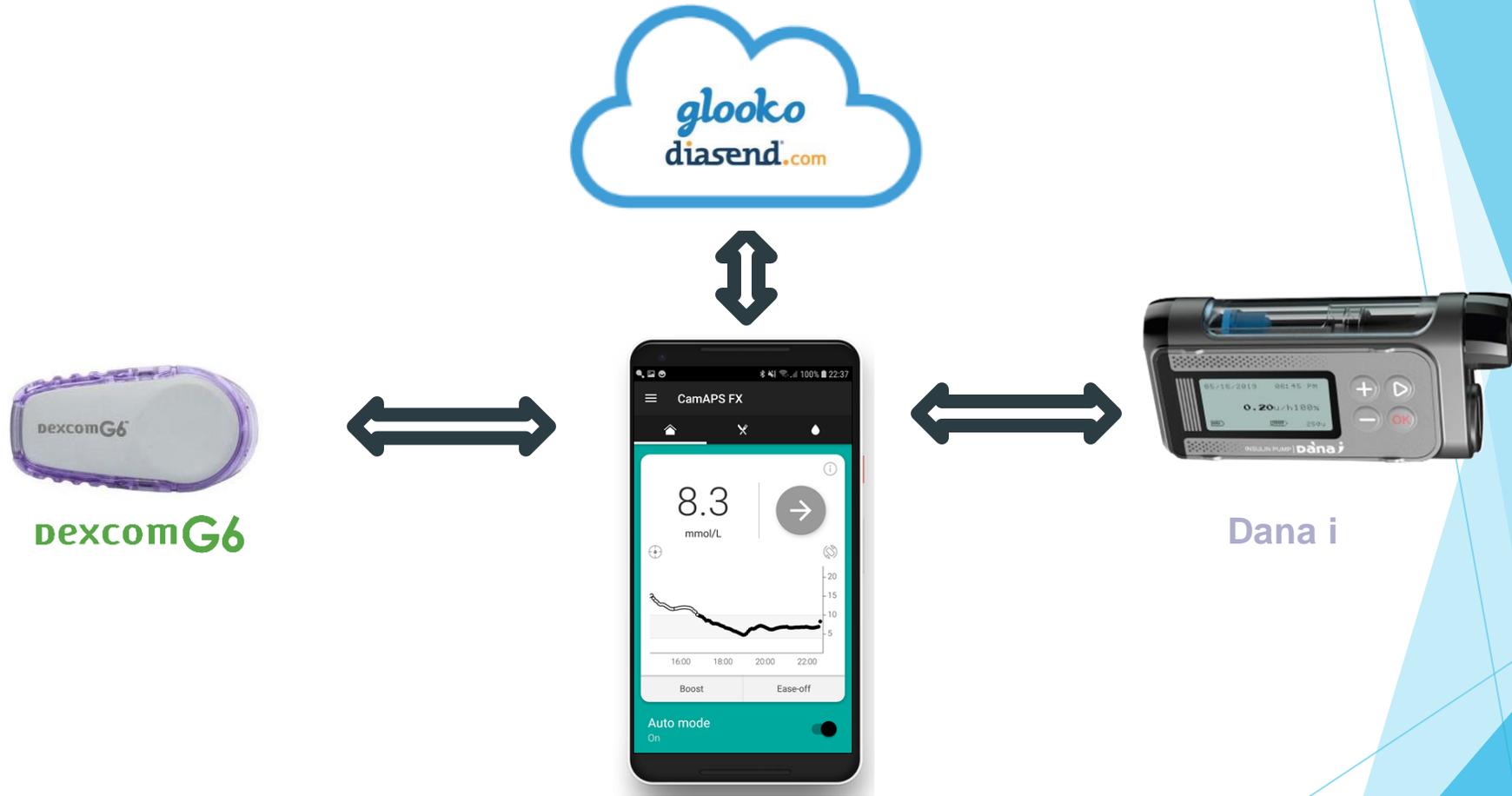
- ▶ Steel - 31g needle 5.5mm & 8.5mm



Hybrid Closed Loop- automated insulin delivery



CamAPS | FX



Android Smartphone with
CamAPS | FX

Clinical results

- Comprehensive outcome RCT data
 - ✓ Over 15 years of translational research experience
 - ✓ Young children, children, adolescents, adults, pregnancy
 - ✓ Reduced glycated haemoglobin, increased time in range, reduced hypoglycaemia, improved quality of life



Overnight Closed-Loop Insulin Delivery in Young People With Type 1 Diabetes: A Free-Living, Randomized Clinical Trial

Diabetes Care 2014;37:1204–1211 | DOI: 10.2337/dc13-2644



Roman Hovorka,^{1,2} Daniela Eleri,^{1,2} Hood Thabit,¹ Janet M. Allen,^{1,2} Lalantha Leelarathna,^{1,2} Ranna El-Khairi,^{1,2} Kavita Kumareswaran,^{1,2} Karen Caldwell,^{1,2} Peter Calhoun,⁴ Craig Kollman,⁴ Helen R. Murphy,¹ Carlo L. Acerini,^{1,2} Malgorzata E. Wilinska,^{1,2} Marianna Nodale,⁵ and David B. Dunger^{1,2}

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Home Use of an Artificial Beta Cell in Type 1 Diabetes

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Closed-Loop Insulin Delivery during Pregnancy in Women with Type 1 Diabetes

Day-and-night glycaemic control with closed-loop insulin delivery versus conventional insulin pump therapy in free-living adults with well controlled type 1 diabetes: an open-label, randomised, crossover study



Diabetes Care Volume 37, ■■■ 2014



Day and Night Home Closed-Loop Insulin Delivery in Adults With Type 1 Diabetes: Three-Center Randomized Crossover Study

Diabetes Care 2014;37:1–7 | DOI: 10.2337/dc13-2911



Lalantha Leelarathna,^{1,2} Sibylle Dellweg,³ Julia K. Mader,⁴ Janet M. Allen,¹ Carsten Benesch,⁴ Werner Doll,⁴ Martin Ellmerer,⁴ Sara Hartnell,² Lutz Heinemann,³ Harald Kojzar,⁴ Lucy Michalewski,¹ Marianna Nodale,¹ Hood Thabit,^{1,2} Malgorzata E. Wilinska,¹ Thomas R. Pieber,⁴ Sabine Arnolds,³ Mark L. Evans,^{1,2} and Roman Hovorka,¹ on behalf of the AP@home consortium

THELANCETDE-D-14-00205

S2213-8587(14)70114-7

Embargo: June 16, 2014—01:00 (BST)

ZN

Version 1

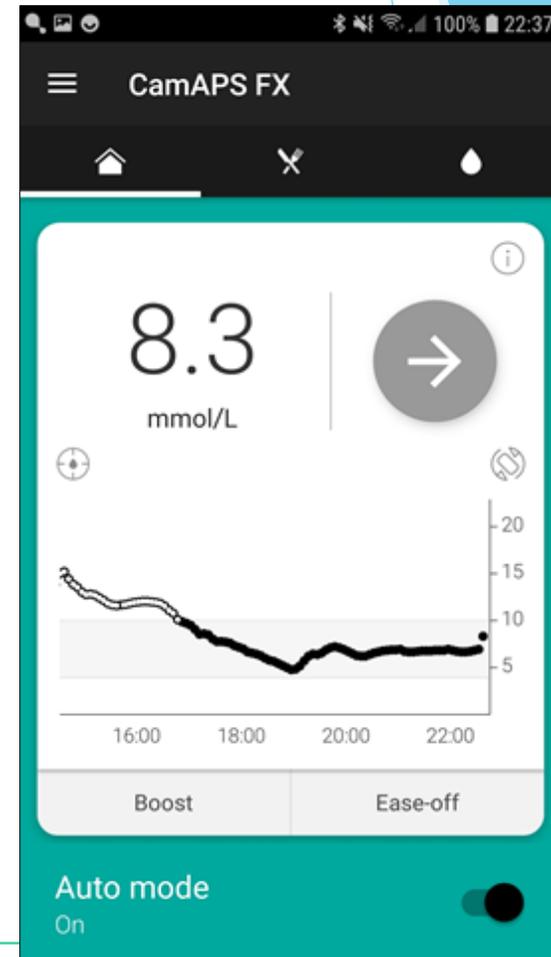
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Home use of closed-loop insulin delivery for overnight glucose control in adults with type 1 diabetes: a 4-week, multicentre, randomised crossover study



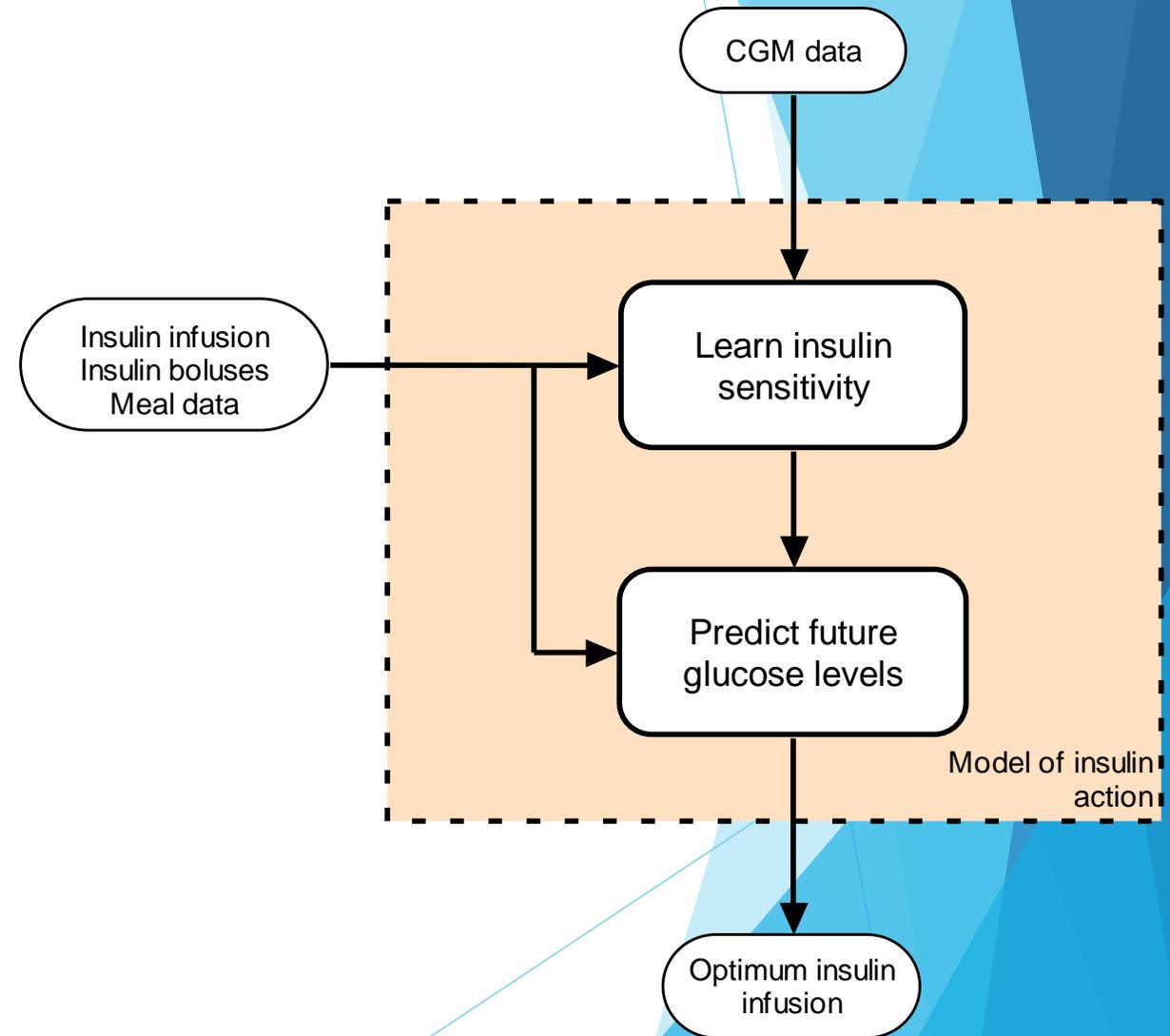
CamAPS FX app

- Incorporates hybrid Cambridge model predictive control algorithm
- Acts as “CGM receiver” alerts/alarms
- Incorporates bolus wizard
- Data automatically uploaded to Glooko
- Real-time SMS alerts (for guardians)
- Real-time followers through CamAPS Companion



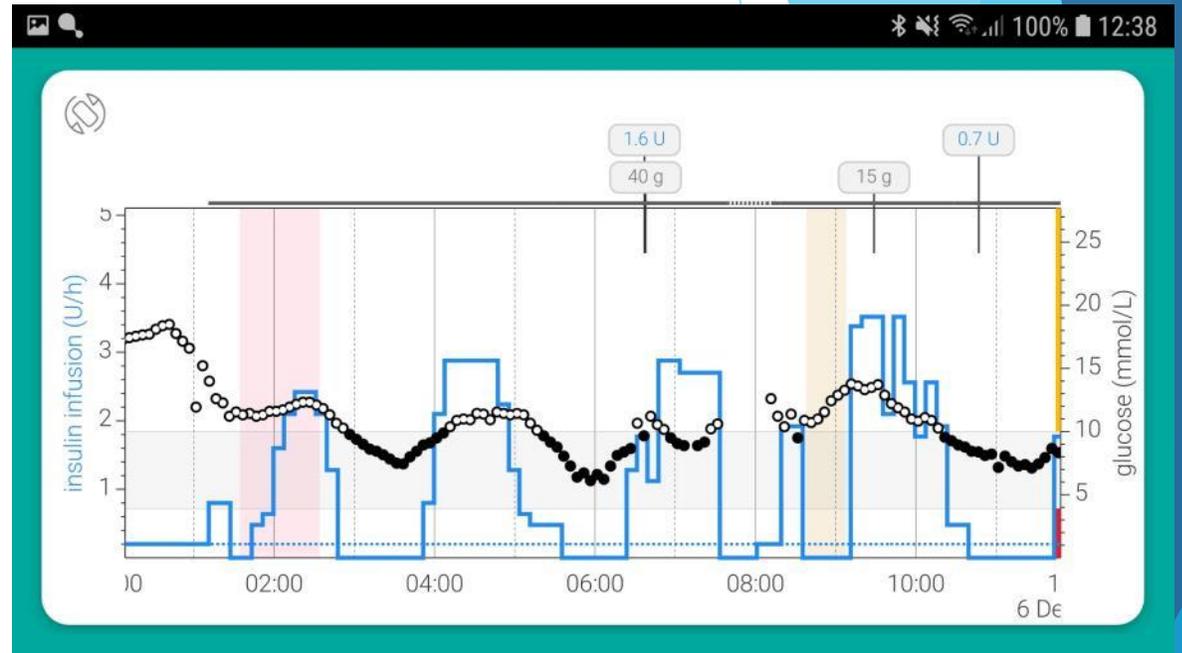
How does the algorithm learn?

- ✓ Continually adjusts based on previous learning
- ✓ Learns more without “Ease-off” & “Boost”
- ✓ Learns from bolus calculator
- ✓ Takes on average 1-3 weeks to optimize
- ✓ In first few weeks, most people need to review
 - insulin to carb ratios and
 - personal glucose target.

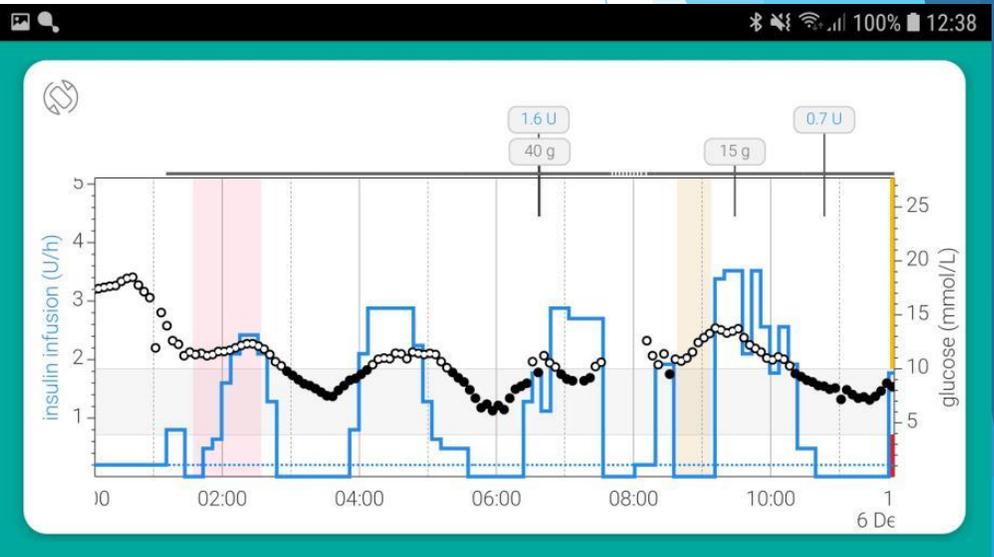
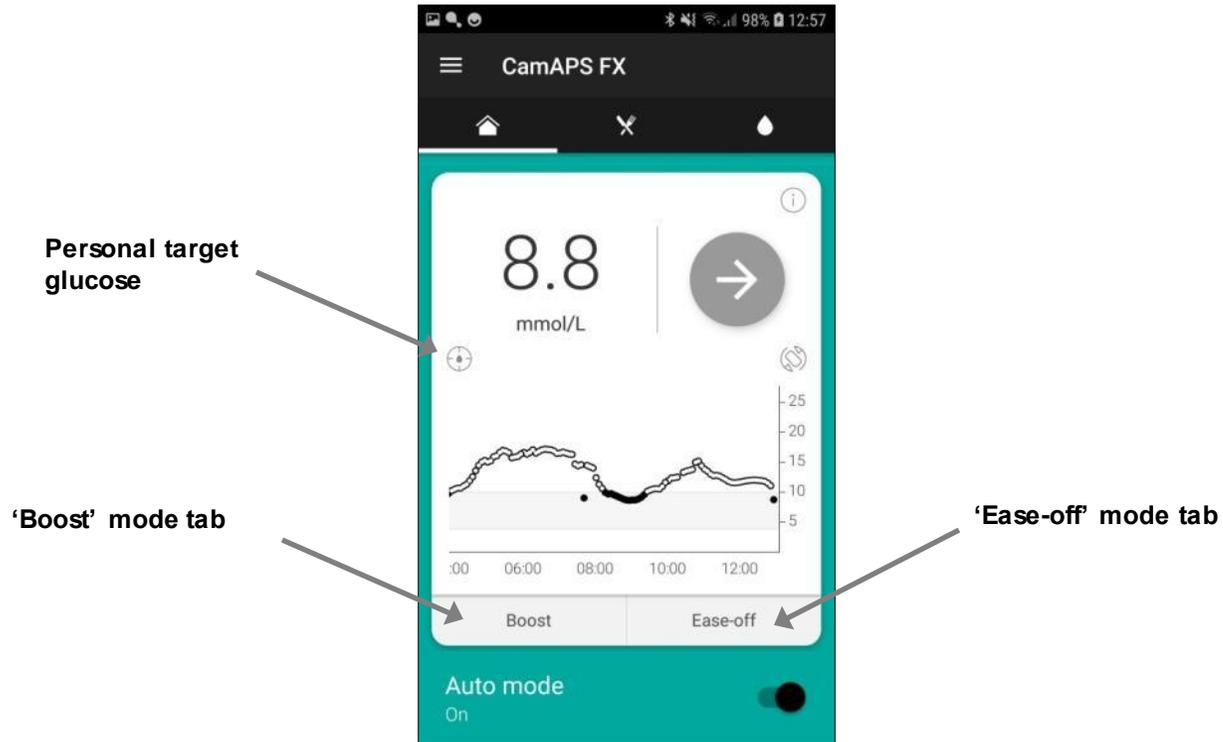


Algorithm details

- Simple setup
 - Body weight
 - Total daily dose
- Modulates “basal dose” delivery
- Highly adaptive
 - Daily insulin needs
 - Diurnal insulin needs
 - Postprandial insulin needs
 - Independent of basal dose settings
- Permits corrective boluses

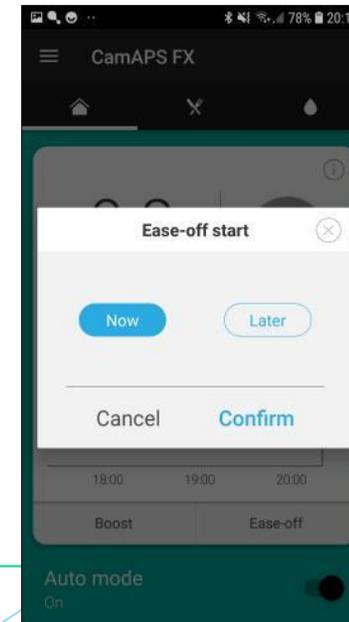
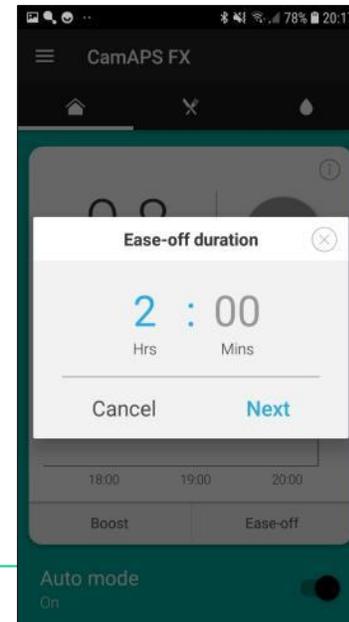


Personalization



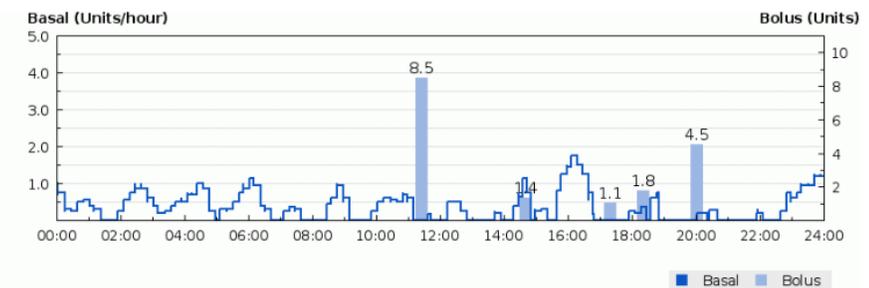
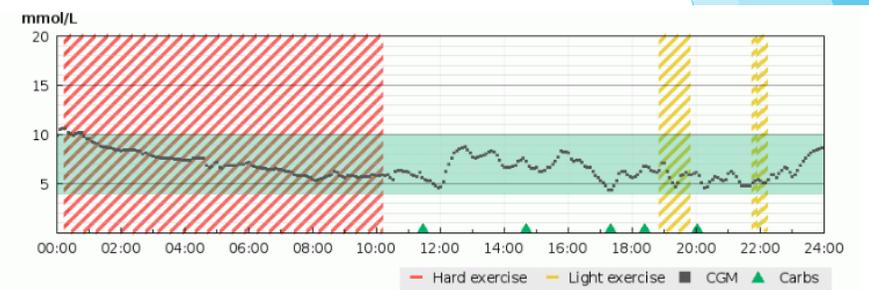
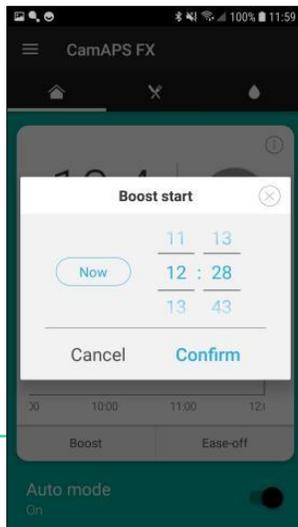
Ease-off

- Makes the algorithm less 'aggressive'
- Reduces considerably basal insulin delivery
- Raises glucose target temporarily
- When to use Ease Off?
 - Before, during and/or after exercise/activity
 - Following hypoglycaemia
 - Hot weather



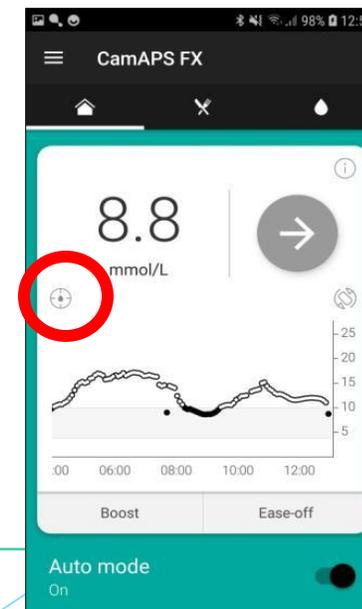
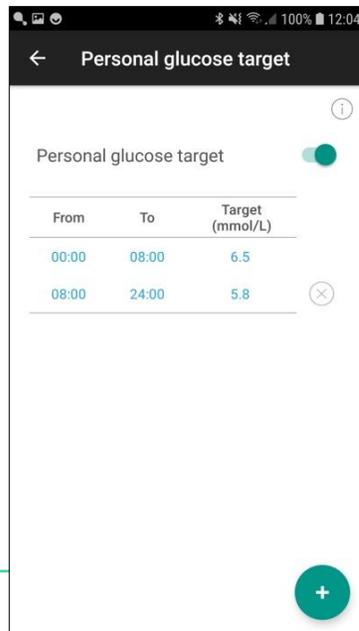
Boost

- Makes the algorithm more 'responsive'
 - Increases basal insulin delivery by ~35%
 - Once glucose reaches target, boost will not push glucose lower than target
- When to use Boost?
 - Pre-menstrual
 - Growth hormone pulses in adolescence
 - Post prandial hyperglycaemia
 - Low grade illness (not requiring sick day rules)



Personal glucose target

- Algorithm target (default 5.8 mmol/L) adjustable at different times of day and night
- Minimum 4.4 mmol/L
- Maximum 11.0 mmol/L
- When to use it
 - Lower target if glucose variability low
 - Lower target in pregnancy
 - Raise target if period of frequent hypoglycaemia





Comparison

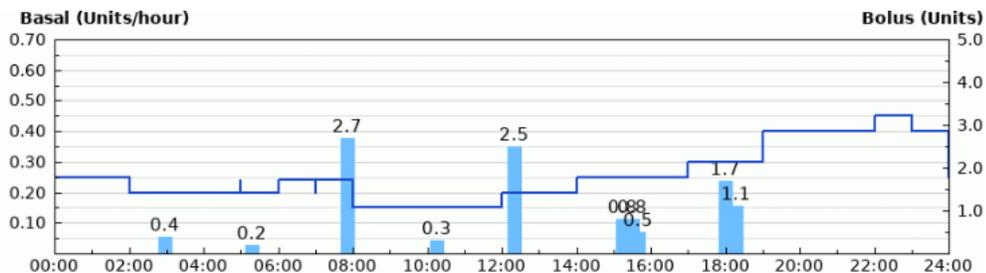
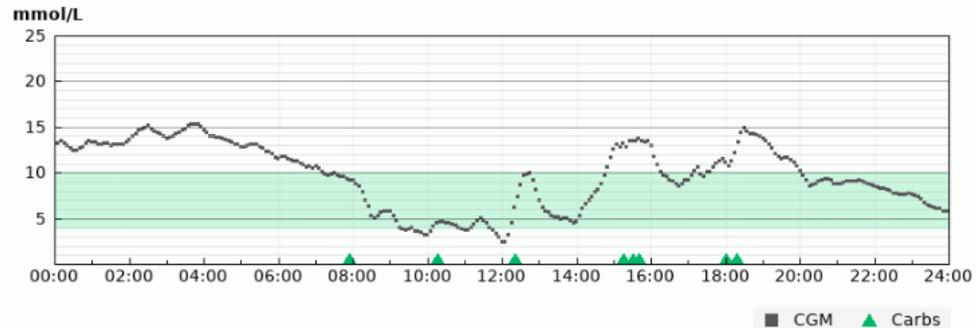
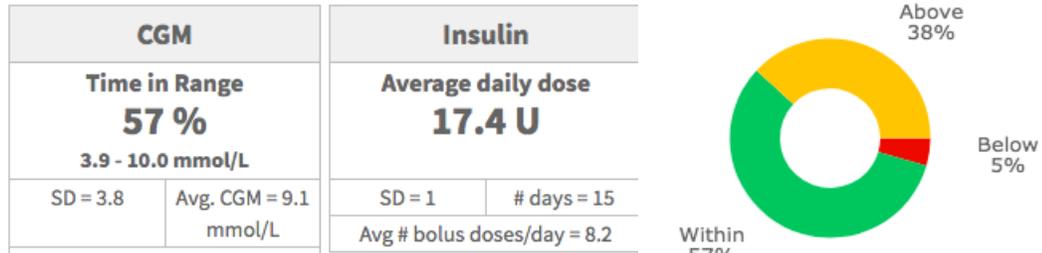
	CamAPS FX	Tandem Control IQ	Medtronic 780G
License	1 year up and Pregnancy	6 years up	7 years up
Factory calibration	✓	✓	
Always in automode	✓	✓	
System setup	TDD, weight	TDD, weight, ICR, CF, basal rate	TDD, weight, ICR, CF, basal rate
Adaptive learning	Overall, diurnal, meals		Overall
Bolusing from phone	✓		
Personal glucose target	4.4 - 11 mmol/L	Overnight 6.1 - 6.7 mmol/L	780G: 5.5, 6.1, 6.7 mmol/L
Ease-Off / Activity mode	Now and planned	Now	Now
Boost mode	Now and planned		
Remote monitoring	SMS and CamAPS Companion	Dexcom Follow	✓
Automated cloud upload	Glooko	T:connect	✓
Insulin	Rapid & ultra-rapid	Rapid	Rapid

Young child

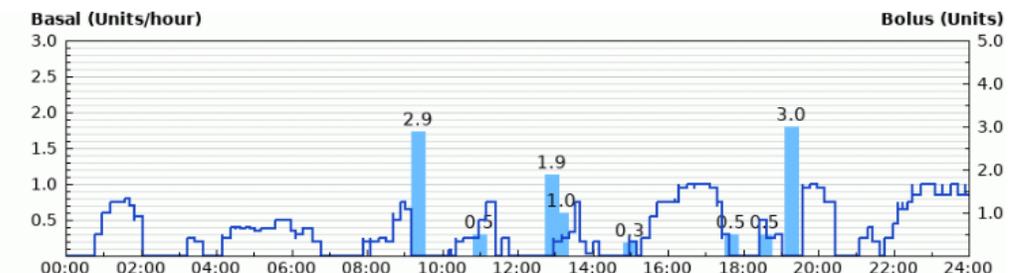
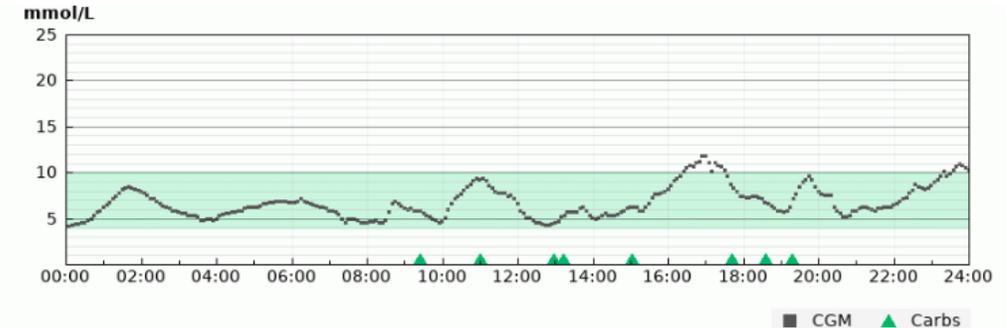
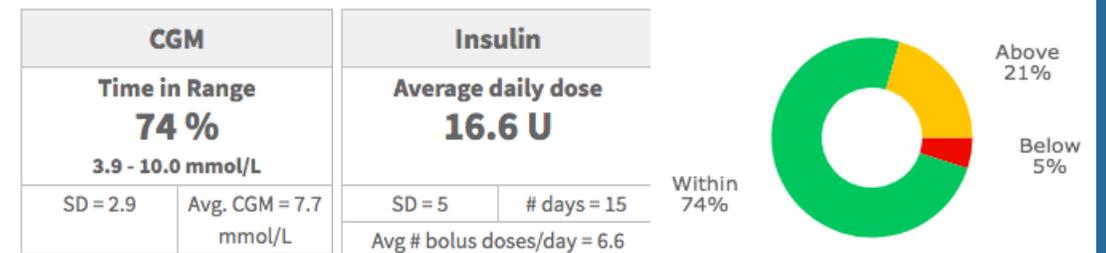
- ▶ 6 year old girl (prior to study enrolment)
 - ▶ Diagnosis aged 2 years
 - ▶ Medtronic 640G + Enlite sensor
 - ▶ HbA1c 66 mmol/mol
 - ▶ Motivated parents - working hard!
- ▶ **KidsAP02 study**
 - ▶ 4 months of closed loop with CamAPS FX → HbA1c 51
 - ▶ Followed by 4 months of sensor + pump → HbA1c 66

Young child

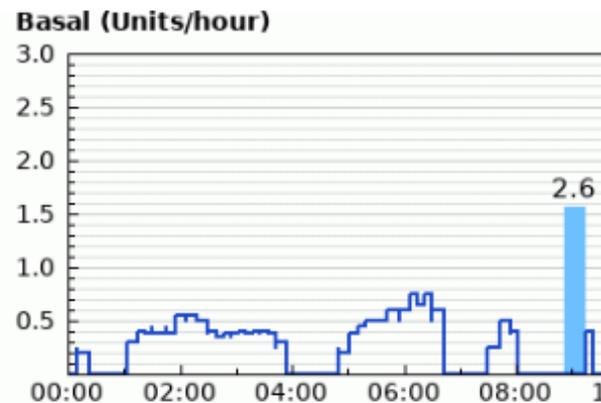
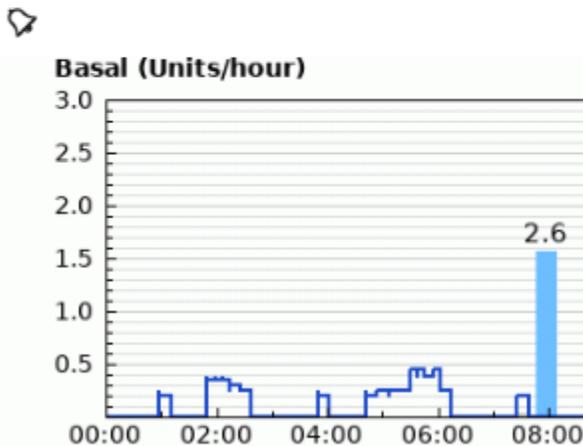
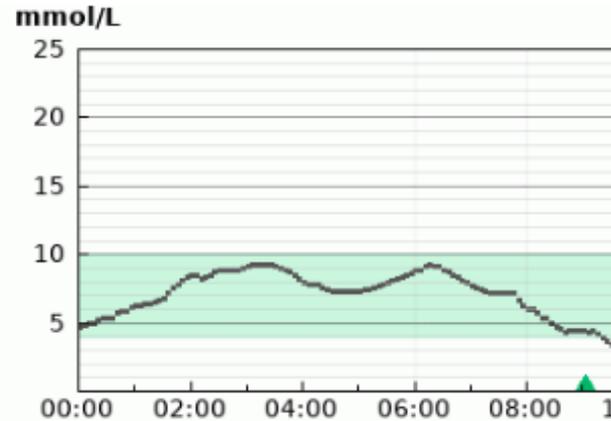
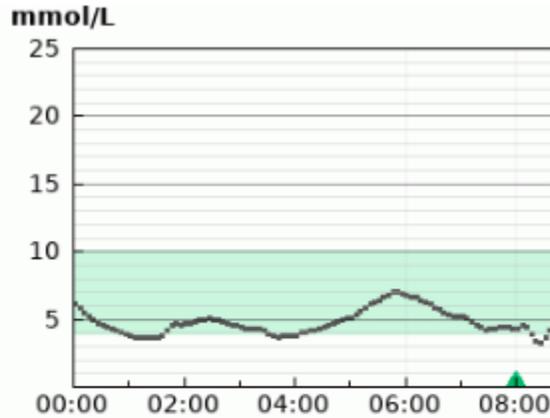
Pump & sensor



Hybrid closed-loop



Every night is different...

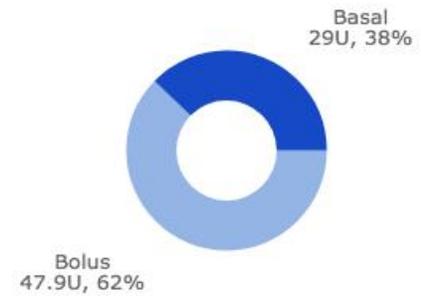
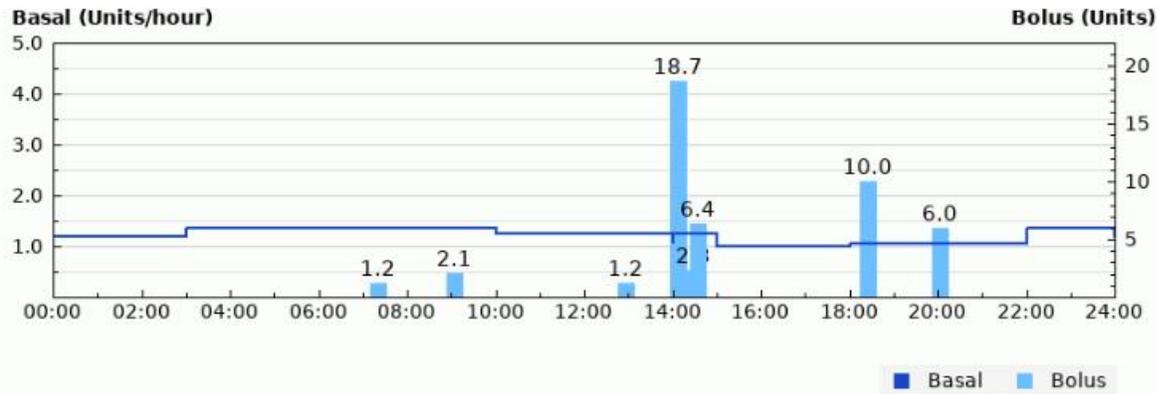
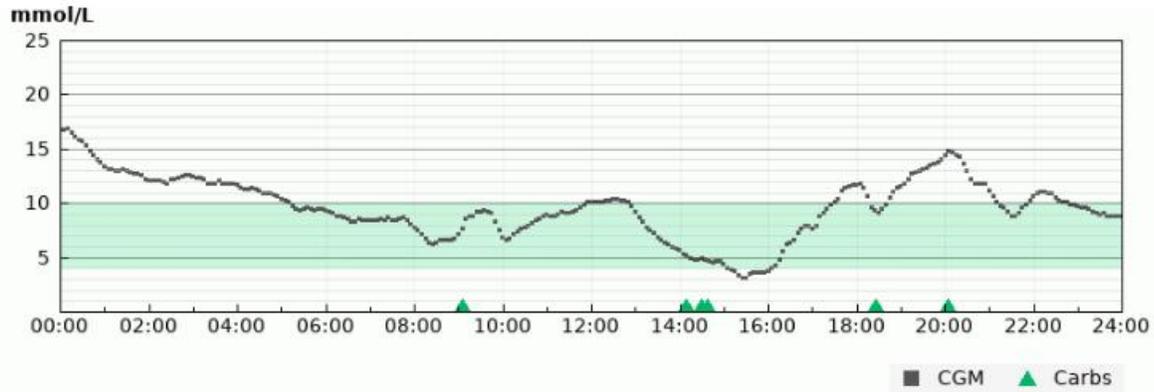


“The app is life changing for [our child] and us already. My head isn't constantly full of her diabetes data...We are sleeping a lot more at night.”

Young person

- ▶ 16 year old male (prior to study enrolment)
 - ▶ HbA1c 67
 - ▶ Medtronic 640G, no sensor
 - ▶ High achieving student, very athletic
 - ▶ Not very interested in diabetes management
- ▶ **DAN05 study**
 - ▶ 6 months of closed loop with CamAPS FX → HbA1c 47
 - ▶ No increase in time below range
 - ▶ Not an 'ideal' candidate

In run-in



Basal

Time	U/h
00:00	1.200
01:00	1.200
02:00	1.200
03:00	1.350
04:00	1.350
05:00	1.350
06:00	1.350
07:00	1.350

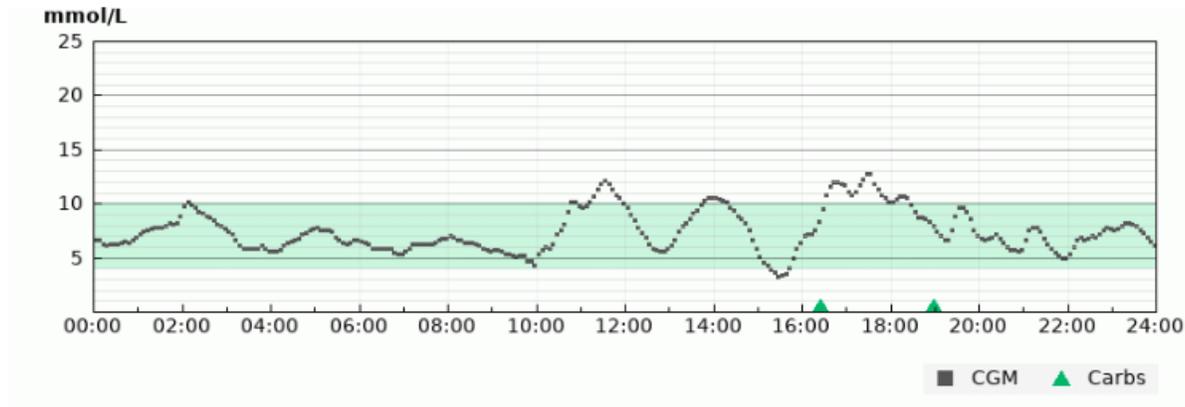
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Bolus

Time	U
07:22	1.20
(Corr: 1.20)	
09:05	2.10
(Corr: 0.10)	
(Meal: 2.00)	
12:57	1.20
(Corr: 1.20)	
14:08	18.70
(Meal: 18.70)	
14:30	2.30

Show more ▾

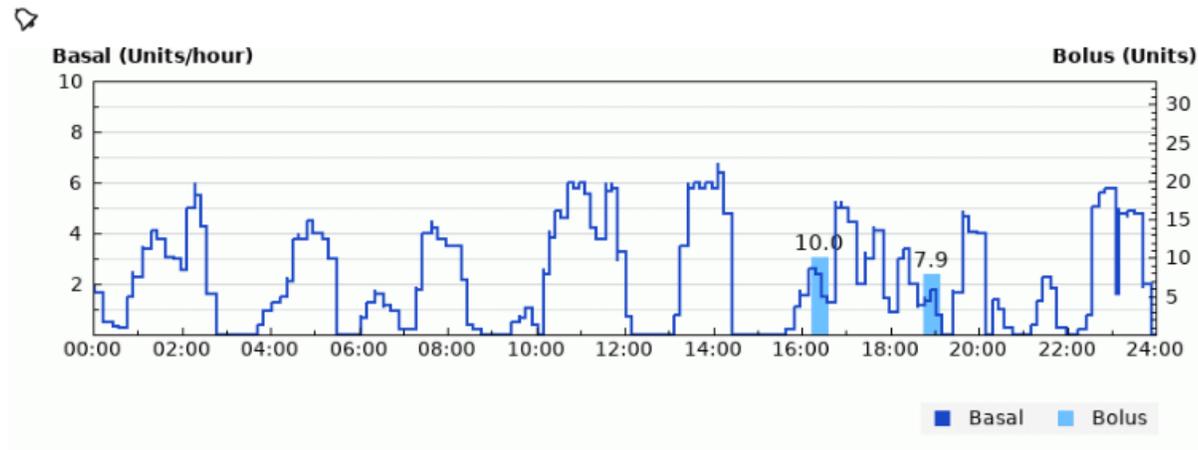
Closed loop



Basal
52.3U, 74%



Bolus
17.9U, 26%



Basal

Time	U/h
00:02	1.650
00:02	1.750
00:14	0.500
00:26	0.350
00:26	0.380
00:34	0.250
00:46	1.500
00:54	2.250
Show more ▾	

Bolus

Time	U
16:24	10.00
(Meal: 10.00)	
18:57	7.90
(Meal: 15.00)	

Carbohydrates

Time	
16:24	50g
18:57	60g

“I can just get on with my day – I don’t need to think about it”

On Line Support

CamAPS FX online training portal

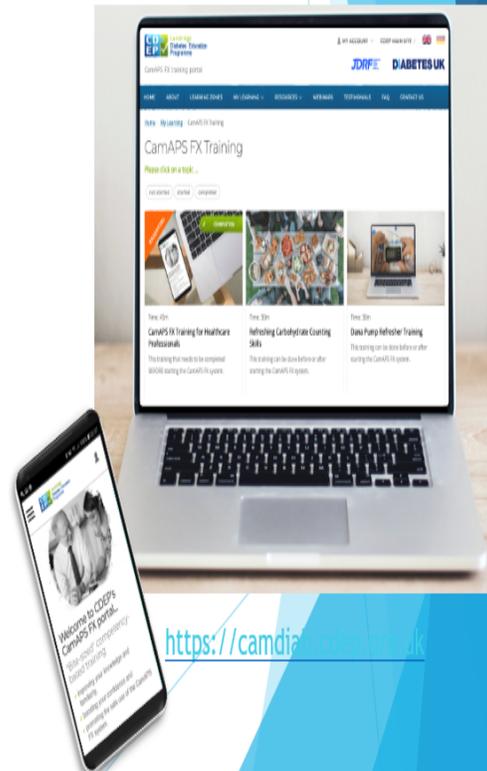


Online training for:

- ✓ Healthcare professionals
- ✓ People (and their family) living with diabetes
- ✓ Teachers and support staff

Training topics :

- ✓ Essential CamAPS FX training
- ✓ Dana Pump refresher
- ✓ Carb counting refresher
- ✓ Optimising the system
- ✓ Schools training
- ✓ Dexcom refresher (in development)



Practical CamAPS FX Webinars

<https://camdiab.cdep.org.uk>



Webinar 1: introducing the CamAPS FX closed-loop insulin delivery system.
7th October 2020 6:30 - 7:30pm (BST)



Webinar 2: getting ready to start using the CamAPS FX system
21st October 2020 6:30 - 7:30pm (BST)



Webinar 3: optimising settings after starting the CamAPS FX system
4th November 2020 6:30 - 7:30pm (GMT)



Webinar 4: training for teachers and education support staff
18th November 2020 6:30pm - 7:30pm (GMT)



Webinar 5: fine-tuning the CamAPS FX system to improve time in range (TIR)
2nd December 2020 6:30 - 7:30pm (GMT)

New in 2021



Webinar 6: using the CamAPS FX system in Pregnancy
20th January 2021 6:30 - 7:30pm (GMT)



Webinar 7: using the CamAPS FX system in Infants, Toddlers and Young Children
17th February 2021 6:30 - 7:30pm



Webinar 8: using the CamAPS FX system in Young Adults and Adults
17th March 2021 6:30 - 7:30pm (GMT)



Webinar 9: managing physical activity and high fat, high protein meals as well as other life events
21st April 2021 6:30 - 7:30pm (BST)

Training & Support

For patients:

- ▶ On-line training videos (x12)
- ▶ Face to face/virtual support
 - ▶ Pre-pump start
 - ▶ Pump start
 - ▶ Follow up
- ▶ 24/7 telephone tech support
- ▶ DPD tracked service -. Choice of drop-off point
- ▶ Accredited Dana refresher training via ccx
- ▶ Patient Education Days
- ▶ JDRF FUSION meetings

For health professionals:

- ▶ On-line training videos (x12)
- ▶ Face to face/virtual support
 - ▶ Pre-pump start
 - ▶ Pump start
- ▶ Demo pumps and samples for centres
- ▶ Accredited Dana refresher training via CCX
- ▶ Diabetes Technology Network meetings (DTN)
- ▶ Regional Network Forums

What our patients say.....

Case Study

Rachel's CAMAPS-FX Journey (Burnley)

32 Years old

T1 for 12 years

MDI Pre pregnancy HBA1c 67

- ▶ “The Dana pump and CAMAPS has completely revolutionised my life and is the closest I've ever felt to having a cure or leading a normal a life as possible.”
- ▶ “ In 12 years of living with diabetes I have never had such good control and I have embraced the technology and the freedom and independence it affords me.”
- ▶ “More than anything it relieves the mental load of managing diabetes and I would recommend it to everyone.”
- ▶ HBA1c Before Dana/CAMAPS was 67 mmol (She was working hard pre pregnancy to achieve this)
- ▶ HBA1c After DANA/CAMAPS is 42 mmol (after 6 weeks)

Questions?

