

Please note that with autoISF you are in an early-dev. environment, where the user interface is **not optimized for safety** of users who stray away from intended ways to use. Good safety features exist, but these are only as good as the development-oriented user understands and implements them. This is not a medical product, refer to disclaimer in [section 0](#)



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[Available related case studies:](#)

[Case study 7.1: MA_Adv.HCL_5 year old](#)

See also [Case study 13.3](#) from a user of Boost

Originally it was planned to provide an extra section on FCL **for kids** here.

To establish and maintain *any loop* for kids brings about some extra challenges if:

- Going through marked changes of insulin sensitivity or of circadian pattern makes it difficult to keep the FCL appropriately tuned.

This problem is about the same in all loops. However, Autotune, dynamicISF, and some commercial systems with elementary “self-learning” might provide rough (and time.delayed) solutions to this that could prove good-enough.

When facing such challenges, you should try to set appropriate (temp.?) changed profiles, that serve also as a basis for your autoISF loop.

- Between kid and supervising parent it must be guaranteed, especially in the initial weeks, that an eye is kept on whether the “Meal Announcement” (MA) advanced hybrid closed loop” is working about as to be expected.
- Extra caution is needed re. the SMB delivery ratio. The fixed 0.5 value in AAPS was installed also with a consideration on user/follower (parent) set up and limiting potential problems from a bolus being initiated from both phones in parallel. Recommendation is to stay with 0.5.

36 However, we came to realize that the approach is no different for kids than already laid out. It just seems
 37 some implementation hurdles are significantly higher for implementing a safe FCL for minors.
 38 Also adults may face special challenges, or just lack the time to do a sophisticated FCL set-up project.
 39 For that reason, we like to focus this section 7. on how a **hybrid closed loop without carb inputs, using**
 40 **autoISF**, might get you to a **solution that removes most of the everyday burden** associated with having to
 41 co-manage meals.
 42 This "Meal Announcement" could - not only for kids - also be an **intermediary step, from which to**
 43 **progress into FCL as soon as a currently missing pre-requisite resolves** for you in the future.

45 7.1 Hurdles for FCL

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Deficit making FCL difficult or unsafe	Bridging solution with Meal Announcement (MA) via pre-bolussing for meals
Lyumjev or Fiasp (also in 50% mix w.slower insulin) not tolerated/too many occlusions; poor discipline re. scheduled infusion site changes	Different insertion (site, depth, angle, cannula material), injection speed, site exchange frequency might help, but difficult w/ pod pumps. Low carb diet would help, but not consistently used by many. => Pre-bolussing
Poor discipline regarding keeping 100% BlueTooth connectivity (keeping phone 24/7 at body, and well charged)	Giving meal boli (+ pump providing profile basal in case of problems) will reduce potential problems significantly. Install alarm on (parent) phone. Libre3 (1 minute) might aggravate problems
Leaking pods	(still a "no go")
Jumpy CGM	Use strong smoothing, and weak bgAccel_ISF (MA, HCL do not rely on early aggressive action, upon first signs of rising bg)
CGM does not allow SMBs always (also at cob=0, which we always have in FCL)	Use Dexcom or Libre3. For others you probably will find work-arounds described
Very low hourly basal	No problem as MA (HCL) does not require super boosted SMBs
Erratic patterns of sweet drinks and snacks	Much less of a problem when a bolus is given with it, and bgAccel_ISF is dialed-in much softer, SMBs come smaller and delayed (compared to FCL)

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51 7.2 Getting ready to advance from your Hybrid Closed Loop

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53 7.2.1 Optimize your Hybrid Closed Loop

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55 Switch off dynamicISF, forget what Autotune tries to tell you, and make sure your profile parameters are set
56 right. Refer to guidance given in the HCL repo ([https://github.com/bernie4375/HCL-Meal-Mgt.-ISF-and-IC-](https://github.com/bernie4375/HCL-Meal-Mgt.-ISF-and-IC-settings)
57 [settings](https://github.com/bernie4375/HCL-Meal-Mgt.-ISF-and-IC-settings)).

58

59 Optimize meal management, notably watch that your ISFs are set right to deal with rising bg once your given
60 meal bolus loses power.

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62 With properly set ISFs, you should be able to expand allowed SMB sizes to 120 minutes worth of basal.

63

64 Next, introduce a method that allows your loop take care of temp. insulin resistance from fats. (In the past,
65 dynamicISF might have helped you for that.)

66 For this, you have two options:

- 67 • Temporary increase of %profile via an Automation at signs of post-meal fatty acid resistance. See:
68 <https://androidaps.readthedocs.io/en/latest/Usage/FullClosedLoop.html#stagnation-at-high-bg-values>
- 69 • Or: Step into using the AAPS dev variant with autoISF, but make exclusively use of the dura_ISF
70 component there.

71

72 Make sure your HCL now works at satisfying performance.

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74 7.2.2 Develop your Advanced HCL: Meal Announcement (MA) w/o carb counting

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76 In the next steps, you try to get same performance, but with only a very rough idea, what you will eat (and
77 **no** carb inputs)

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79 Go through [section 2 – 4](#) for setting up your autoISF,

80 Caution: If you do not fully establish a FCL, make sure to use significantly less aggressive (**lower** than
81 suggested there for FCL) **settings** for SMB_range_extention ([section 2.1](#)), for autoISF_max ([section 2.2](#)) and
82 for bgAccel_ISF_weight ([section 4.2](#)).

83 If you and your child operate with remote bolusses via a NSClient caregiver set-up, it is important to **not**
84 extend the SMB delivery ratio above 0.5 in the MA mode (This is for safety, in case issuing a bolus by the
85 remote parent overlaps with autoISF driven SMB)([section 2.3](#))

86 Do not forget to install your iob threshold above which your autoISF loop will no longer issue any SMBs
87 ([section 2.4](#)).

88 7.3 Pre-bolussing

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90 Operating in the SMB+UAM mode, you do no longer need to count any carbs. (If you wonder why, [section](#)
91 [4.5.3](#) attempts to explain why this can work just fine) .

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93 However, going for a Full Closed Loop comes with difficult issues, how to automatically get iob up to
94 control carb absorption and bg level after meal start.

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96 “Meal Announcement” via giving a bolus

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98 A “Meal Announcement” mode based on autoISF must deal with the fact that giving a **user bolus** severely
99 distorts the glucose curve.

100 You need a different look (than we did in section 4.1-4.7 for FCL) on the contributions we expect from
101 bgAccel_, pp_, bgBrake, bg_ and dura_ISF.

102 The proper settings will vary between

- 103 • no-bolus (FCL),
- 104 • substantial bolus
- 105 • or very small pre-bolus..

106 This topic is currently not well investigated. Inconsistent daily patterns of bolus size, time, and ratio
107 of %coverage for the carbs consumed could complicate the matter further.

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109 Maybe we are too cautious here, and in fact the autoISF adaptation to glucose behavior is
110 tolerant enough of disturbances by **user boli**. Please report your findings in case you collect
111 data of “mixed use” (FCL / Meal Announcement / HCL use with meal bolus).

112 A n=1 finding, and guide how to evaluate, is reported here: [https://github.com/ga-](https://github.com/ga-zelle/autolSF/blob/A3.2.0.2_ai3.0/To%20prebolus%20or%20not%20to%20prebolus.pdf)
113 [zelle/autolSF/blob/A3.2.0.2_ai3.0/To%20prebolus%20or%20not%20to%20prebolus.pdf](https://github.com/ga-zelle/autolSF/blob/A3.2.0.2_ai3.0/To%20prebolus%20or%20not%20to%20prebolus.pdf)).

114 Once we have a body of data, including from those who moved from *HCL with autoISF* to FCL,
115 we may need to re-define what the bi-directional transitions FCL < - > HCL in detail shall mean,
116 and whether or not this has implications for needing different autoISF settings in /preferences for
117 FCL and for HCL. .

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119 To “help” your advanced hybrid closed loop not bear the full burden of quickly getting iob up (like in FCL)
120 you have two options: Giving a substantial meal bolus, or just giving a little pre-bolus:

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7.3.1 Meal bolus in Meal Announcement (advanced HCL)

Based on a very rough idea on how *in HCL* a bolus *in the past* looked for the meal you are about to start, issue nearly that bolus size.

Note that timing is very critical: You should **bolus** (and AAPS must have the related iob info to work with) **before any** meal-related **acceleration** and first pos. delta bg **happen**.

This is important, because - even with Lyumjev given at meal start -, carb absorption and bg rise happen earlier than the insulin activity kicks in “against it”. So, autoISF would issue SMBs if it had no info about the big bolus you already gave, or you are about to give. (The latter case can get really dangerous, especially if you operate with FCL-suitable autoISF_weights and SMB sizes!, You must look at your screen and **deduct** the **iob** **that the FCL already issued** from your intended bolus in that case!)

Most eaters will have **over 60 g carbs** in each of their meals. This means that the amount that gets digested while their fast insulin is active in a major way (without many extra SMBs already complementing), is always the same, and hence just define your personal meal bolus for your advanced HCL (~ 60 g / IC. At an IC = 8 g/U this would for instance mean to **always** bolus $60/8 = 7.5$ U, or maybe 1 unit less to play it safer) . This should immediately put you above iobTH, and from there, your loop will not differ from FCL, and should work with the same settings.

- In Meal Announcement mode, you need not pay so much attention to setting an aggressive bgAccel_weight ([section 4.2](#)). Also, you generally operate with higher safety because you require no super big SMB sizes as you would in FCL ([section 2](#)). This also helps keeping your autoISF loop from over-reacting to small snacks, or any “bumps” in your maybe sub-optimal CGM.
- FCL users should be able to occasionally just give a meal bolus, too, without worrying how that works out with their FCL settings. (The author does not know of much experience with this, but used it a few times as a quick fix when, in a critical time period around meal start, the FCL was without BT connectivity).

Low carb eaters should of course bolus for an estimated lower amount of carbs (as they estimate gets digested in the first 2 hours). In this case iob remains under iobTH. autoISF tuning should focus on bgBrake_ISF ([section 4.4](#)) and dura_ISF ([section 4.5](#)). Consistent low carb eaters in MA mode might set their bgAccel_ISF_weight ([section 4.2](#)) to zero, or very low.

Users coming from (positive experience with) dynamicISF might look deeper into tuning bg_ISF, as well.

157 158 7.3.2 Small pre bolus in Meal Announcement (advanced HCL) 159

160 Giving a **small bolus before or at meal start** can be helpful in several respects:

- 161 • It provides some iob to cover for the first grams of carbs that will be absorbed faster than a subcutaneous
162 insulin could become active
- 163 • It relieves the FCL algorithm from the job (difficulty depends on your CGM performance) to recognize
164 a meal start
- 165 • Allows to keep max. possible SMB size within safer limits, and probably does not require quite the
166 strong amplification of ISF via high bgAccel_ or pp_ISF_weights (as for FCL, see [sections 4.2](#) and [4.3](#)):

167 The challenge then is, how the loop can take over, notably, as your bolus severely distorts the bg curve upon
168 which you must “train” your autoISF loop to reasonably respond (via tuning your ..._ISF_weights):
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- 170 • Fortunately, the loop always has the iob and insulin activity data (stemming also from your bolus),
171 and can factor this in when determining the insulinRequired. Also, your set iobTH ([section 2.4](#))
172 remains valid.
- 173 • But, **problem** is, that size of the pre-bolus, relative timing (minutes) vs. meal start, and kind of
174 meal, all strongly would impact the bg curve, and tuning the four ..._ISF_weights might become a
175 mission impossible on such shaky grounds. The key author of this e-book did not even experiment
176 with this, and just looks forward to eventual case studies that can give insights into the workings of
177 autoISF in Meal Announcement mode, with **small** pre-boli.

178 179 7.3.3 Conclusions

- 180 • Setting Meal Announcement with small or large pre-boli might be easier or better than going all the
181 way for a FCL, in case:
 - 182 ○ key pre-requisites for a FCL are missing (extremely reliable bg data, and leak-/occlusion-
183 free insulin supply)
 - 184 ○ time is missing for a sophisticated FCL set-up project
 - 185 ○ user appreciates to gradually move from HCL towards FCL.
- 186 • The Meal Announcement mode (**MA**) **can be the best solution** for many kids. Especially for small
187 kids (but probably also for teenagers in a negligent phase), the much **more reactive FCL** mode
188 **could too often backfire** (and in effect ruin the principally possible high %TIR) because it:
 - 189 ○ strongly elevates the need to have a technically super working system, to carry phone 24/7
190 on the body etc

- 191 ○ may be less forgiving of spontaneous bursts of activity, a small sweet snack etc (anything
192 that distorts the bg curve, and could be misinterpreted by the FCL, which is (always?<- that
193 can be restricted) looking out for meal starts...).
- 194 ○ comes with extra challenges if the real user of the FCL is not aware of, and “mindful” about,
195 what limitations of the system to watch out for, to avoid, or to actually very easy deal with
196 (See next [section 7.4](#). Available methods are the same in FCL and in MA).

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198 See also “To pre-bolus or not to pre-bolus” here: [https://github.com/ga-](https://github.com/ga-zelle/autoISF/blob/A3.2.0.2_ai3.0/To%20prebolus%20or%20not%20to%20prebolus.pdf)
199 [zelle/autoISF/blob/A3.2.0.2_ai3.0/To%20prebolus%20or%20not%20to%20prebolus.pdf](https://github.com/ga-zelle/autoISF/blob/A3.2.0.2_ai3.0/To%20prebolus%20or%20not%20to%20prebolus.pdf)

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201 7.4 Dealing with special situations / insulin sensitivity / disturbances in MA 202 mode

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204 7.4.1 Manual nudging of loop aggressiveness

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206 Whenever you see a need, you can temporarily “micromanage” your loops aggressiveness by:

- 207 • temp, switching between **even / odd bg target**, to allow / block SMBs
- 208 • setting a **temp. profile%**
- 209 • significantly elevating or lowering the (even) **bg target** temporarily

210 More see in [sections 5.1.3](#) and [5.2.2.1](#)

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212 7.4.2 Automations to adjust loop aggressiveness

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214 To set up suitable Automations, you first must **analyze patterns** you find **in your data**, at times (or
215 geo-locationa, or bg and iob patterns that point to a problem ...) **where you want your loop act**
216 **differently**, to carve out Conditions that describe the respective situations (and either for how long
217 it typically lasts, or at which *other* Conditions you want your loop get back to default FCL
218 operation).

219 Under Actions, make use of any (combination of) measures that adapt aggressiveness (see above,
220 under [7.4.1](#)). Also, setting a different iobTH%, or temporarily shutting off ISF modulation by
221 autoISF are selectable Actions.

222 More see in [section 5.1.4](#)

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7.4.3 Automations triggered via custom buttons

Via defining “User action” Automations, you can install customized buttons for your “DIY cockpit” on your AAPS main screen ([section 5.2.2.3](#)).

Recurring special situations can be addressed via a DIY cockpit button, and **receive automatically** (whenever the conditions that describe the special situation are indeed given) **treatment with adjusted aggressiveness** (up to a suitable iobTH level).

This should be very helpful to custom program buttons, e.g. for kids in kindergarten, and you can even custom-define the hours of day when they show up, and disappear again from, the AAPS main screen!!

Over time you can have a big number of User action Automations, and keep them “shelved” rather invisibly (clicked inactive via top left box in the Automation description) in your long list of potential Automations. Even when active, they only show in your cockpit (bottom grey field of your AAPS home screen) in the time slot you assigned as potentially relevant

7.5 Exercise management and Activity Monitor

With meal bolus ([7.3.1](#)), that bolus is reduced, and exercise settings can be maintained, or (if exercise starts after the meal) can be set, then.

With small pre-bolus ([7.3.2](#)), focus should be on setting a TT and exercise mode, right after giving that bolus, that would limit iob from rising more than desirable during exercise.

More see [section 6](#).

7.6 Remote control: Implications of looping in MA or FCL mode for small children

(The main author is unfamiliar with that area, and happy to include contribution from a co-author)

7.7 Other methods w/ Meal Announcement (MA)

See [section 13.3](#)

Off-topic remark, to complete the picture about looping options:

There are also advocates of doing “the opposite”, precise carb inputs, but no (or reduced) boli.

See [section 13.4](#).

261 7.8 Closing remarks

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263 The author is sceptical about effort / benefit of setting up your MA loop vs just working with very
264 sloppy carb inputs in a well-tuned “vanilla AAPS” SMB+UAM HCL.

265 The author is also not sure about effort / benefit of setting up your MA loop vs going for FCL.

266 I guess there is a higher safety level in MA, especially when the pre-requisites ([section 1](#), and [7.1](#))
267 are **not** permanently given. Not having to watch out for this so much, may also relief of some extra
268 vigilance (and frustration?). See [Case study 7.1](#)

269

270 Regarding a journey towards FCL for/with your kid, there are a couple of parents and kids pioneer-
271 ing this area,

272 Unfortunately, many need to work on eliminating any deficits (as listed in [section 7.1](#)) that stand in
273 the way of establishing a FCL.

274 This may not be possible within their next year or so. Advancing your HCL into one or another form
275 of Meal Announcement (MA) mode involving pre-boli then might be an intermediary step that is
276 worth developing.

277 [Section 13.3](#) points to a couple of other options, besides autoISF, that do well with Meal An-
278 nouncement. See also [Case study 13.3](#).

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280 We highlighted areas that would require some minimum compliance.

281 In the end it comes down to compare the achieved ease in daily use and achieved %TIR to how it
282 was in prior hybrid closed looping.

283 Generalizations of conclusions will always be difficult in this area.

284 Note that while you may be able to conclude an improvement in *your* looping, this does not necessarily say
285 anything about superiority or inferiority of the involved methods...

286 ○ ...not even for you, as you probably did not put the same effort, at same knowledge level, into
287 “getting the best out of” both methods...

288 ○ ...plus there is always that “YDMV” (your diabetes may vary) ...