AID-IRL

(Automated Insulin Delivery In Real Life)

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Study aim:

- A qualitative deep dive into the real-world impact of commercial automated insulin delivery systems.

Methods:

- Semi-structured phone interviews with 7 users of commercial AID systems
  - 4 Control-IQ users; 2 670G users; 1 CamAPS FX user
  - Mix of longer time users and newer users
  - Participants received $50 via Paypal or Amazon gift card

Note: This study was funded by DiabetesMine

DIABETES MINE

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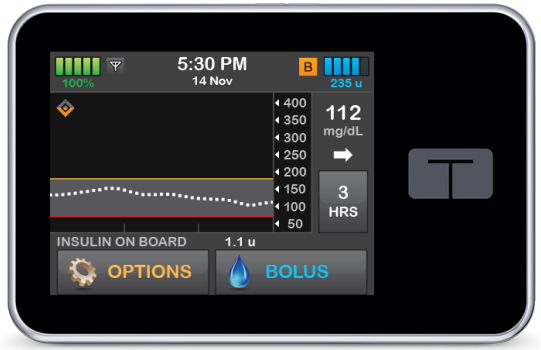
Control-IQ



Tandem

Available since January 2020 in US

670G

Medtronic

Available since 2018 in US

CamAPS FX

CamDiab

Not available in US
(app used with DANA*RS pump by SOOIL, recently available in UK)

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improved, or no issues

no change, satisfactory or neutral

negative impact or experience

training/learning curve
TIR
hypo
QOL
sleep impact
troubleshooting
expectations met

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1 – Control-IQ

- **Parent of child with T1D** (4+ years on pump/CGM), previous experience in ‘littles’ study on Control-IQ, currently using off-label
- TIR – 30% increase, no change to hypos (3% <70)
- Less aggressive corrections needed – usually meal-related
- minimal troubleshooting, but referenced having ’solid’ settings

	1
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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1 – Control-IQ (continued)

- **QOL general:** “It’s been huge. I feel like in 90 days, I thought about diabetes less than any other time in 3.5 years.”
- **Sleep:** “It’s huge. We get solid sleep, uninterrupted sleep for the first time since diagnosis.”
- **Frustrated by:**
  - lack of remote bolusing, remote monitoring on phone
  - 2 hour warmup on CGM
  - doesn’t deal well with underestimated meals (but ok with growth spurt hormones)

	1
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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2 – Control-IQ

- **Adult male T1D**, previous experience for several years with a DIYAPS (including unannounced meals), longtime pump & CGM user

- TIR – 5-10% decrease from DIYAPS usage
  - *(on par with other commercial users' TIR averages)*
- Pleased with ease of use/convenience factor of non-DIY solution

- "Just me and my pump, and I love that. It's awesome. I feel like that's what I wanted for so long. It's supremely good - except for the stats (*decreased TIR)*."

	2
training/learning curve	✓
TIR	X
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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2 – Control-IQ (continued)

- **Frustrated by:**
  - post-meal highs - **stopped eating breakfast**
  - lack of 'learning' – e.g. high for a week when sick
  - requires more manual interventions
  - 2 hour warmup on CGM

- "With DIY, I could tweak and make things better and achieve 5% better. With Control-IQ, I can't."

	2
training/learning curve	✓
TIR	X
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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5 – Control-IQ

- **Adult female with LADA**, previously on Basal-IQ
- **Did not like at first and turned it off after 2 weeks;** restarted after a month pause with more aggressive settings
- Same TIR as Basal-IQ.
  - Does not bolus or enter carbs(due to making own insulin)
  - It took 'artificially inflating settings to 2x carb ratio, 2x stronger ISF, and 3x basal rates' to achieve the similar TIR.

	5
training/learning curve	✗
TIR	✓
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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5 – Control-IQ (continued)

- Peace of mind with system: sleeps better knowing it is preventing hypo's
- **Frustrated by:**
  - Hard coded target ('too high') and lack of flexibility around achieving goal BG levels
  - Not having low glucose suspend active to ward off lows if Control-IQ turned off
  - How aggressive settings need to be
  - Lack of information on how much basal insulin is being/has been dosed each hour – retrospectively hard to find if not looking at the screen

	5
training/learning curve	✗
TIR	✓
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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7 – Control-IQ

- **Adult female** with T1D, 2 years with pump and CGM.
  - Frequently takes steroids, which increase BGs
- More TIR at night (70% increase in TIR overall), no additional lows
- “It does a decent job keeping up” with steroid-induced highs
- Does not manually set high temps/correct as often

	7
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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7 – Control-IQ (continued)

- **Frustrated by:**
  - Set target – wants to run ‘tighter’
  - Unable to get boluses in sleep mode, so never runs sleep mode to get more corrections

- “I don’t use sleep mode because it doesn’t use boluses, and it doesn’t work for dawn phenomenon."

	7
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	✓
troubleshooting	✓
expectations met	✓

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3 – 670G

- **Adult male T1D**, 1 year of CGM before switching to CGM+pump (3mo) then 670G (last 3 years)
- No observed change to A1c/not aware of TIR changes
- Pleased with ability to handle activity/exercise with automode and activity target
- Learning curve was ‘easy’ – if you already understood CGM calibration

	3
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	X
troubleshooting	X
expectations met	✓

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3 – 670G (continued)

- **Frustrated by:**
  - post-meal highs, especially if missed/delayed bolus or underestimated carbs
  - CGM calibration – fingersticks, woken up overnight 1-2x a week to calibrate, **issues 3x/week**
  - not having low glucose suspend active to ward off lows if kicked out of automode
  - requires more manual interventions
  - CGM transmitter charging

	3
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	X
troubleshooting	X
expectations met	✓

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6 – 670G

- **Adult male**, originally diagnosed T2 but treated aggressively with insulin; now considered T1. 5 years on pump; first CGM was used alongside 670G (last few months).
- Increased TIR with less hypo, and **decreased TDD**
  - Did not have to adjust settings despite TDD decreased
- Learning curve was ‘easy’, previous pump experience (despite lack of CGM) gave confidence

	6
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	X
troubleshooting	✓
expectations met	✓

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6 – 670G (continued)

- **Frustrated by:**
  - Virtual training (due to COVID-19; would have preferred in person with trainer)
  - **Alarms/alert frequency** – has to clear 4-5 off the screen per day
  - **Woken up every other night** – BG alarm or calibration required
  - Warm up time and charging transmitter (takes another – 1.5h to charge on top of 2h warmup)
  - Keeping pump near transmitter on the same side of the body

	6
training/learning curve	✓
TIR	✓
hypo	✓
QOL	✓
sleep impact	X
troubleshooting	✓
expectations met	✓

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4 – CamAPS FX

- **Adult male T1D**, 5 years on pump/CGM, previous DIYAPS user with no-carb-announce meals
- No observed change to TIR compared to DIYAPS
- Learning curve was ‘easy’ – but “it has to learn you and you have to learn it”.
- Has features that achieve similar outcomes to DIYAPS-based temporary targets, but misses ability to schedule in advance.

	4
training/learning curve	✓
TIR	✓
hypo	X
QOL	✓
sleep impact	X
troubleshooting	✓
expectations met	✓

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4 – CamAPS FX (continued)

- **Frustrated by:**
  - ”**Too much**” hypoglycemia – 7% (<70 mg/dL), which is almost 2x DIYAPS hypos.
  - Lack of visibility to IOB; IOB not visible outside of mealtimes. makes exercise challenging without IOB knowledge.
  - Learning model of system works better for people with a regular routine
  - Alarms would impact sleep if wasn’t using a second phone for better alarms

	4
training/learning curve	✓
TIR	✓
hypo	X
QOL	✓
sleep impact	X
troubleshooting	✓
expectations met	✓

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Universal themes

- Increased (or same) TIR
- Some reduced hypos; some systems increase hypos
- Post-meal highs were commonly mentioned by 670G & Control-IQ users

	Control-IQ				670G		CamAPS
	1	2	5	7	3	6	4
training/learning curve	✓	✓	✗	✓	✓	✓	✓
TIR	✓	✗	✓	✓	✓	✓	✓
hypo	✓	✓	✓	✓	✓	✓	✗
QOL	✓	✓	✓	✓	✓	✓	✓
sleep impact	✓	✓	✓	✓	✗	✗	✗
troubleshooting	✓	✓	✓	✓	✗	✓	✓
expectations met	✓	✓	✓	✓	✓	✓	✓

✓ improved, or no issues

✓ no change, satisfactory or neutral

✗ negative impact or experience

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Universal themes

- New CGM users have a more noticeable learning curve; more likely to comment on alarms/alerts

- 670G users more likely to mention connection issues and CGM calibration issues, both of which impacted sleep.

	Control-IQ				670G		CamAPS
	1	2	5	7	3	6	4
training/learning curve	✓	✓	X	✓	✓	✓	✓
TIR	✓	X	✓	✓	✓	✓	✓
hypo	✓	✓	✓	✓	✓	✓	X
QOL	✓	✓	✓	✓	✓	✓	✓
sleep impact	✓	✓	✓	✓	X	X	X
troubleshooting	✓	✓	✓	✓	X	✓	✓
expectations met	✓	✓	✓	✓	✓	✓	✓

✓ improved, or no issues

✓ no change, satisfactory or neutral

X negative impact or experience

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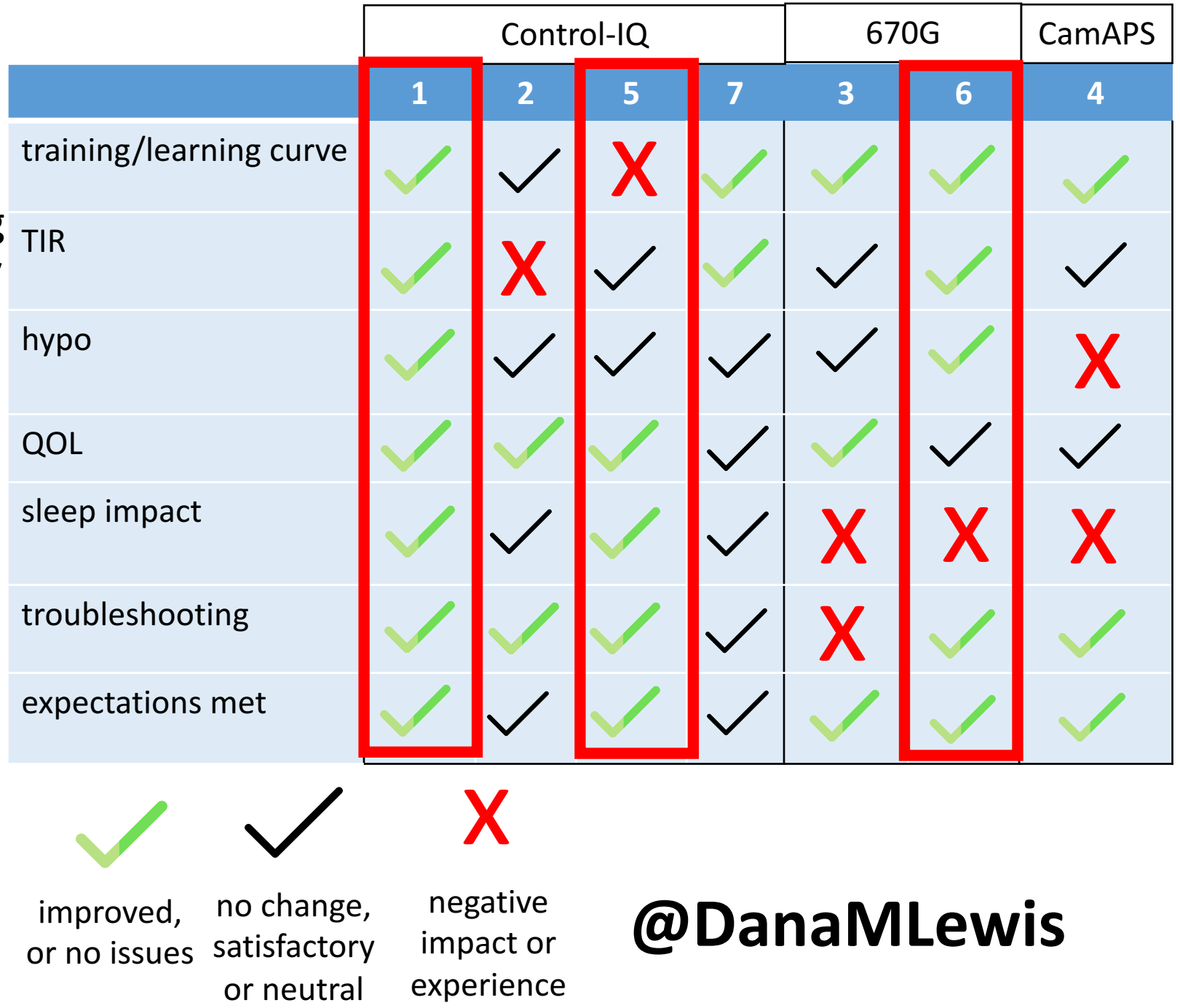
Newer AID users:

- **1** - Eased by ”lurking” in DIY community (despite not using DIY) and previous 5-day study experience
- **5** - Felt learning curve was ‘high’.
- **6** - Previous pump experience helped, but struggled with CGM



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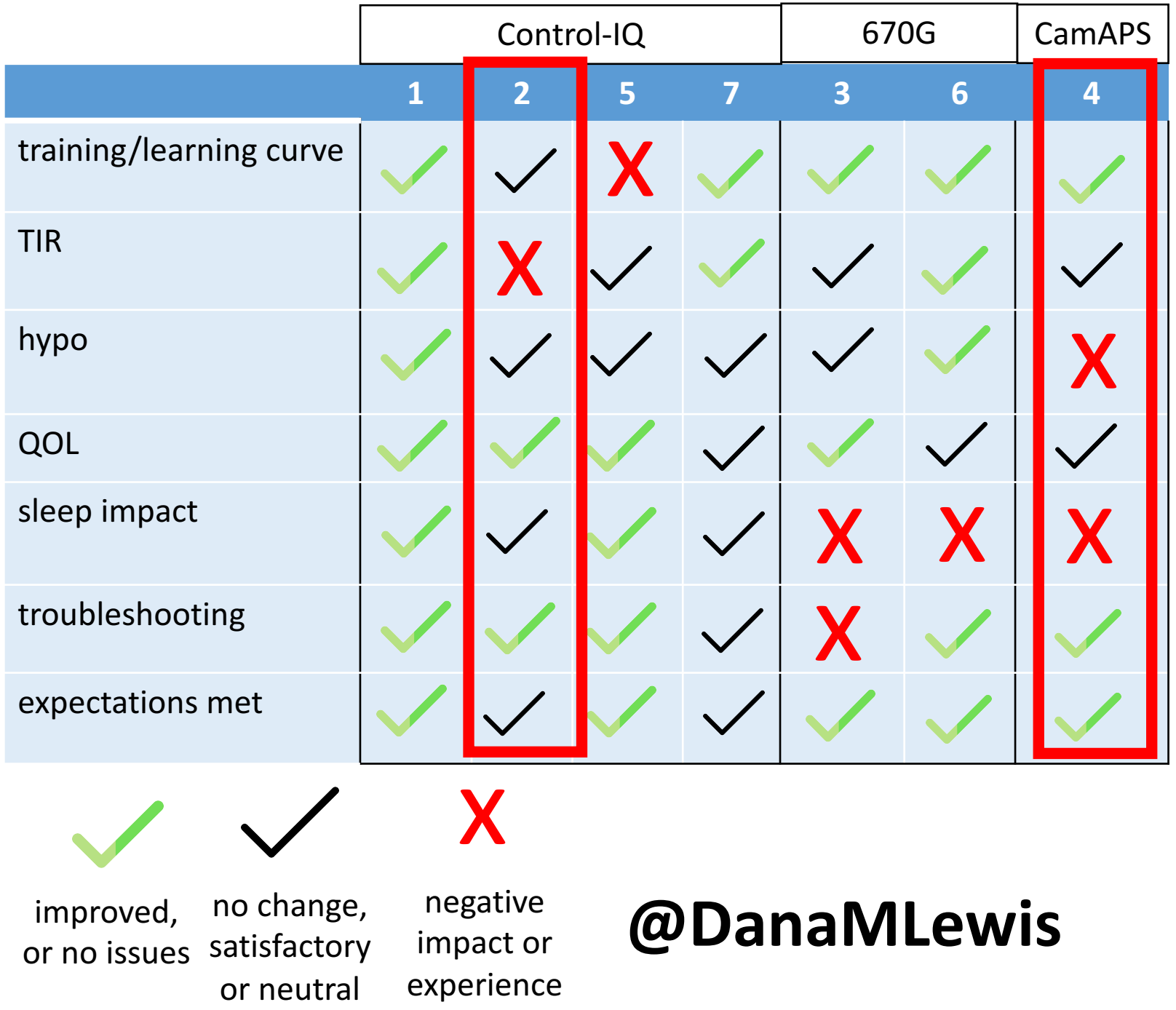
Previous DIY users:

Both referenced convenience factor of commercial system.

- **2 -** “With DIY [OpenAPS] I felt like I could eat breakfast.”
- **4 -** “I was quite surprised at how well it performed.”



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Take note, companies:

- Different onboarding based on prior diabetes tech may be useful.
- Most users wanted better displays of IOB, temporary/adjustable targets
- Enabling hypo protection even if high correction is disabled
- Post-prandial needs further improvements
- Remote bolusing is highly desired – as is remote monitoring

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Discussion items

- Many users with ‘ideal’ TIR are still doing **frequent** (2-3x/day) manual corrections outside of mealtimes with commercial hybrid closed loop technology

- Newer CGM users (1 year or less) seem to have their own learning curve adapting to CGM calibration, data availability, alerts/alarms

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Limitations of AID-IRL study

- Recruited participants via social media (primarily Twitter and Instagram) who had publicly shared about commercial AID use
- Attempted to get a mix of new/longer users, but this is also biased by availability timeline of commercial systems
- Participant bias: recall and recency
- Status quo bias
  - insurance and HC makes it hard to switch to try something else
  - only DIY users have had access to try multiple systems

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Questions about AID-IRL?

Ask the panelists

(use Q&A feature)

or ask me on Twitter @DanaMLewis!

Thanks to DiabetesMine for AID-IRL study funding.