Appendix 1: Semi-structured Interview Questions

- Tell me briefly about you/your family member's diabetes - what type, when were you diagnosed?
- How old are you/they now?
- What commercial closed loop system are you using?
- When did you start using it?
- What were you using before?
    - *If pump/CGM used before, how long had you used those?*
    - *Tell me about your meal behaviors - did you enter/announce carbs and/or bolus at mealtimes?*
- Has your time in range (TIR, 70-180mg/dL) changed from using a closed loop?
- Do you know how much hypoglycemia (<70 mg/dL) you've experienced, and any differences from before/after closed loop?
- Have you changed any of your correction behaviors for hyper or hypoglycemia now that you're on a closed loop? If so, what behaviors have you changed?
- Has using this new system impacted your QOL?
- How would you describe that overall impact on your QOL?
  Has the closed loop impacted your sleep? How so?
- What level of troubleshooting do you think your closed loop system requires to keep it running?
- What does troubleshooting entail on a daily or weekly basis?
- Has the level of troubleshooting changed over time?
- What was the learning curve like when switching to your closed loop system?
- What do you wish you knew when you started using a closed loop?
- What outcomes have surprised you after being on a closed loop?
- What are the best aspects of using a closed loop?
- What do you find are the biggest challenges or downsides of using a closed loop?
- What have you not experienced that you hoped to get on closed loop?
- What would you like to see offered in future iterations or versions of commercial closed loop technology?
- Is there anything else you think someone should know about commercial closed loop technology?

Appendix 2 – Participant Summaries

Participant 1

Participant 1 is the mother of a child living with type 1 diabetes. The child is now 6 and using Control-IQ off-label due to age since January 2020. This family previously participated in a "littles" study for Control-IQ in the fall, and felt comfortable using Control-IQ off-label due to their previous trial experience and also their experience "lurking" and learning from the do-it-yourself community. They saw immediate benefits from Control-IQ, and have increased their time in range by 30 percentage points compared to SAP, without increasing hypoglycemia (at 3% < 70 mg/dL). They find themselves correcting less often and less aggressively for both hypoglycemia and hyperglycemia, treating lows with fewer carbohydrates and usually only need to correct for highs after mealtimes due to misestimated carbs. They report getting "solid, uninterrupted sleep for the first time since diagnosis" and said that "not having to think" and not worrying as much when the child is with another caregiver are other benefits they appreciate.

They did not find themselves spending much time troubleshooting the system, and felt like they had "solid" settings (such as basal rates, ISF, and carb ratio) when they began using Control-IQ. They recommended other users be prepared to adjust their settings. They perceive the system to do well with growth spurts, but less so with underestimated or misestimated mealtime carbohydrates. They miss the remote bolusing capabilities they had on a previous insulin pump and wish for phone-based bolusing and remote monitoring with more AID information available on the phone so they don't need to dig out the pump to access it.

Participant 2

Participant 2 is an adult male who has lived with type 1 diabetes for multiple decades and is a previous long-time (3-4 years) user of a do-it-yourself AID system (OpenAPS), now using

Control-IQ since February 2020. His previous DIYAPS use included unannounced meals, meaning he did not need to bolus manually for his meals. With Control-IQ, he is pleased with the ease of use and convenience of an all-in-one system where he does not need to carry or charge extra parts to have AID capabilities. He perceived the learning curve was “pretty quick” and only took days to learn the system, due to his familiarity with AID from DIYAPS. He did not have any changes to hypoglycemia or changes to his sleep (his previous experience with these was positive from DIYAPS) when switching to the commercial AID.

However, overall his outcomes were slightly less good than his DIYAPS experience, and his time in range (70-180 mg/dL) was reduced by 5-10% overall (although these levels were on par with other commercial AID users). In addition, while he was previously doing no-announced and no-bolus meals on DIYAPS, with Control-IQ he needs to enter carbs and bolus, and still found himself frustrated with post-meal hyperglycemia. He was unhappy with post-meal highs on a “fairly regular” basis, meaning several times per week. He stopped eating breakfast while using Control-IQ (but did eat breakfast before, using OpenAPS). He misses the autosensitivity feature when he is sick, and felt like he was high for over a week when sick, despite numerous manual interventions and corrections. Overall, he finds himself having to do mealtime carb entry and boluses in addition to several manual interventions per day, 2-3 months into his Control-IQ experience. He also emphasized his recommendation to other commercial AID users to be prepared to adjust settings when starting AID.

Participant 3

Participant 3 was an adult male with nearly a decade of type 1 diabetes, diagnosed as an adult. He spent 6 years on insulin pens and had one year of CGM (Dexcom G4) experience before switching to a 630G pump with an Enlite sensor, and 3 months later switching to 670G. He commented on the difference of training between receiving his first standalone CGM in the mail

and feeling like he was left to figure it out on his own, versus when he started the systems with integrated CGM where he felt like he received much more training regarding calibration. He has now been on the commercial AID for several years. He likes the AID for managing highs and lows and feels 'more in control' of blood glucose levels around activity levels. He uses the higher activity target (150 mg/dL) with some buffer time before and after exercise to manage activity and finds the higher target and automode do well with managing glycemic variations for him. He felt like the learning curve of AID was easy if you already understood the calibration of CGM. He does not find himself needing to troubleshoot much and does not experience many connection issues in keeping the system running. However, he did not see impact or improvement to his quality of life and did not remember a change to his A1c or time in range when switching to AID.

He finds he experiences hyperglycemia the most if he has missed or delayed a mealtime bolus, or underestimates mealtime carbohydrate entry. He expressed the most frustration at the CGM as part of the AID system since his CGM requires 2-3 fingersticks a day to calibrate. He commented on waking up once or twice a week to calibrate overnight if he missed a calibration before going to bed, and says he has calibration issues about 3 times a week. Additionally, he does not like the design of the CGM and the CGM transmitter charger. He also expressed frustration about being "kicked out of automode" and that when it happens (if he sleeps through a calibration alarm), it not only turns off the ability to treat hyperglycemia but it also does not do low glucose suspend to treat or prevent hypoglycemia. He feels that this is when he needs protection against hypoglycemia the most.

Participant 4

Participant 4 is an adult male who also has had type 1 diabetes for several decades, and is a longtime DIYAPS user who was able to try the CamAPS Fx system. He found that he achieved the same overall time in range with the commercial AID that he did on DIYAPS. However, the commercial system requires mealtime carb entry and boluses, which he did not do before on DIYAPS. He also experiences what he describes as "too much" hypoglycemia (7% < 70 mg/dL), nearly doubling from his previous system. As a longtime user of DIYAPS, he did not see any QOL changes and did not have any complaints about system upkeep of the commercial system. He thinks other DIYAPS users - particularly those using Loop - may benefit from this or similar commercial AID that does not require precise basal rate settings or basal rate testing to achieve similar outcomes because the system does not require basal rate input to get started. He likes the "ease off" and "boost" buttons in the commercial system that act similar to "temporary targets" used by the DIYAPS.

In addition to increased hypoglycemia, he is dissatisfied with not having visibility to the amount of insulin on board (IOB) outside of mealtimes, which impacts his ability to decide what to do for exercise. He also misses having CGM data sharing capabilities and does not like the CGM alarms within the AID system app. He does not think the system handles mealtime glycemia well and thinks the learning model of this commercial AID likely works better for people with a regular routine. He shared an anecdote of the system 'learning' that he showers in the morning and increasing insulin prior to that time to compensate for the time off the pump during the shower, but that backfired on a morning when he did not shower, causing hypoglycemia.

Participant 5

Participant 5 is an adult female with LADA who still produces some of her own insulin, a few years after being diagnosed. She was on a pump with low-glucose suspend capabilities for

more than a year before switching to Control-IQ. She achieves the same time in range that she did before Control-IQ, even though she does not have to bolus for meals due to her insulin production. However, she stopped using the system a few weeks after acquiring it, due to frustration that her blood glucose levels were running high. After a month off, she spoke with someone online who encouraged her to try again with "more aggressive" settings, which she did. She "artificially inflated" her carb ratio to 2x; ISF to 2x; and basal rates by 3x and started again, and has been using the system since then (for a few months). She likes the low glucose suspend capabilities, and finds it frustrating that if she turns off Control-IQ features on the pump (to turn off hyperglycemia correction, due to her increased insulin production), that she cannot fall back to only using the hypoglycemia prevention aspects of the system. Hypoglycemia prevention and peace of mind are benefits she appreciates from the system and doesn't experience many issues with troubleshooting or upkeep since she re-initiated use.

She wishes she had the ability to adjust the target below the currently hard-coded (120 mg/dL) system target, because "it's hardcoded like it's one size fits all and it's clearly not". She felt like the learning curve was "pretty high" due to the restrictions around the target and trying to make the system work for her to achieve her goal levels. She doesn't like how aggressive she has to be with the artificial settings, because she doesn't feel she knows what her settings really are. Similarly, she finds it challenging to see how much insulin the system has recently given her in a given hour to determine what her basal needs really are, given her varied insulin production.

Participant 6

Participant 6 is an adult male using 670G for two months. He was originally diagnosed as type 2 but aggressively treated with insulin. He has pumped for 5 years, and when switching to his first pump was able to reduce his total insulin intake from 8 injections a day totaling 250 units of

insulin per day, down to 120 units with the standard pump. He has been able to further reduce his total daily insulin dose below 100 units per day with the 670G. His first CGM was used as part of the 670G, and he's increased his time in range by about 15% with the commercial AID. He has less hypoglycemia than before, feels it requires minimal troubleshooting, and thought the learning curve for AID was 'easy' due to his prior pump experience. Despite the reduction in total daily insulin dosage, he has not had to change his settings in the first 2 months of using the AID. He finds himself correcting manually about twice a day for hyperglycemia.

His commercial AID training took place online due to COVID-19. He expressed the desire - if it was safe - to instead have had the training in person, like his previous pump training. He found it not as easy to learn to navigate the new pump menus without someone sitting directly beside him.

He finds himself clearing 4-5 alerts and alarms off the pump every day, and is woken up every other night due to a BG alarm or calibration alert. He expressed frustration with the CGM and the transmitter charging setup, because it takes an hour or more to charge the transmitter in addition to the 2-hour CGM warm-up, which means several hours without AID. He was one of the only participants that proactively described the need to troubleshoot or work to keep his AID running, and his troubleshooting typically involved having to keep the transmitter near the pump.

Participant 7

Participant 7 is an adult female with type 1 diabetes, for almost a decade, who has used Control-IQ since early 2020. She frequently takes steroids for another health condition. This participant really emphasized that your diabetes may vary (YDMV) with regards to expectations of commercial AID and finding a system that works for you. She is satisfied with her use of

Control-IQ because she has not had additional lows and has had a 70% increase in time in range. It does a “decent job keeping up” even with steroid-induced hyperglycemia, and she does not have to manually set high temporary basal rates because the system “just does its thing” and adjusts automatically. She was the only participant who mentioned experiencing improvements related to mealtime glucose levels.

She also expressed frustration about the target/set point of the system and would like to be able to adjust it to run “tighter”. She knows that this system does not allow correction boluses for hyperglycemia in ‘sleep mode’, so she never enables sleep mode so that she can get the maximum correction possible from the system. This is for both the steroid-induced highs as well as from dawn phenomenon-related highs.