Reviewing hybrid closed loop (HCL) systems

General Considerations

- Review time in automode, time in range, time below range and AGP.
- Dive into daily reports to look for patterns.
- Is automode > 80%? If not, assess why.
- If TIR is less than expected:
- Behaviour vs structure- are the settings correct? Have the automode settings been optimised?
- Review timing of bolus, advise importance of pre-bolus timing.
- Assess for missed bolus or snacks, If given late could cause initial hyperglycaemia then post prandial hypos. Educate if late bolus < 1 hr from meal only enter half of carbs eaten as system would have already started correcting, >1hr correct through bolus calculator.
- Review is user is accurately carbohydrate counting
- Check if user is over-riding the bolus calculator or entering fake carbs
- Review if pump is correcting or stopping basal after meals, if so the ICR may need adjusting.
- Check if hyperglycaemia is secondary to hypo treatments and revisit education. Overtreatment of hypos could cause the pump to correct
- Does the user know what to do with unexplained highs, If above 15.0mmol/l for >2hrs change cannula.
- Check set changes are appropriate e.g. steel cannulas usually need changing every 2 days & silicone every 3 days or 7 days depending on cannula.
- Assess the user knows when/how to use the special features 'exercise mode' to avoid hypoglycaemia
- Update user weight every 6 months if using Ypsomed or Tandem T-slim x2 pumps

Illness Management

- Check user has a ketone meter and blood ketone strips on prescription
- Check user had a management plan for illness management/sick days
- Check user has back up insulin pens

ICR = Insulin to carbohydrate ratio, ISF = Insulin sensitivity factor/correction factor, AIT = active insulin time,
HCL = hybrid closed loop, CGM = continuous glucose monitor, AGP= Ambulatory Glucose Profile

Quick reference guide - adjustments that can be made in automated HCL mode

Pump	Basal rates	ICR	ISF	Active insulin time	Target level	Exercise/activity mode
Medtronic 780G	❌	✅	❌	✅	✅	✅
Omnipod 5	❌	✅	✅	✅	✅	✅
Tandem T-slim x2	✅	✅	✅	❌	❌	✅
CamAPS Ypsopump & Dana I	❌	✅	❌	❌	✅	✅

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Hybrid Closed Loop Systems - adjustments that can be made in automated HCL mode

Pump	CGM	Editable functions in HCL	What to edit if hyperglycaemia	What to edit if hypoglycaemia
Medtronic 780G	Guardian 3 Guardian 4	• Active insulin time • SmartGuard target • ICR • Temp target	• Optimise SmartGuard settings (SmartGuard target 5.5mmol/l, & active insulin time 2hrs) • Strengthen ICR if hyperglycaemia after meals • Check if hyperglycaemia is secondary to over treatment of hypos and revisit education • Reduce active insulin time	• Increase glucose target if applicable or use a temporary target • Weaken insulin ICR if hypos after meals (check meal reports) • Assess if hypos are caused by 'fake carb' boluses • Use temp target feature 1-2 hours before exercise • Reduce meal bolus(-30%) if within 90mins of exercise & increase active insulin time
Omnipod 5	Dexcom G6	• Active insulin time • Target glucose • ICR • ISF • Activity Feature	• Reduce glucose target if applicable. • Review if over-riding bolus calculation • ISF related to manual corrections • Consider strengthening ISF	• Increase glucose target if applicable • Consider using the activity feature • ISF related to manual corrections • Assess if the user over-riding the bolus calculator /fake carbs • Use the activity feature 1-2 hours before exercise
Tandem T-Slim x2	Dexcom G6	• Basal rates • ICR • ISF • Exercise activity • Sleep activity	• Turn sleep activity on overnight if hyperglycaemia overnight/fasting • Recalculation of all settings: • Consider strengthening ISF • Increase basal rate 1-2 hours prior to the hyperglycaemia	• Reduce basal rates by 10-20% 1-2 hours prior to hypoglycaemia pattern • Check if overriding bolus calculator/'fake carbs' • Consider weakening ISF • Use exercise activity 1-2 hours before exercise
CamAPS - Ypsomed & Dana I	Dexcom G6 Libre 3	• Target Glucose • ICR • Boost • Ease off	• Review target level, reduce if applicable • Strengthen the ICR if hyperglycaemia after meals • Allow the algorithm to to learn and adjust the insulin before using 'boost' function • Boost should only be used for known reasons for hyperglycaemia e.g. reduced activity, illness, stress, menstrual cycle • Boost – increases basal by 35% to be used if BG rise too high	• Review target level, increase if applicable • Review ICR if hypos after meals • Allow the algorithm to learn and adjust the insulin before using 'ease off' function • Ease off should be used for events known to cause hypoglycaemia e.g. unexpected exercise, alcohol, menstrual cycle • Use ease off prior to hypo patterns (this won't work if pump has already suspended insulin) • Encourage user to add hypo treatments into the add meal section to avoid over correction after hypo. • Ease off increases BG target by 2.5mmol/l

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