**Title:** Concentrated insulin use (Humalog U-200) within a hybrid-closed-loop (HCL) system in Type 1 diabetes: a clinical case

**Background:**

Insulin resistance in type 1 diabetes is associated with increased cardiovascular risk, suboptimal glycaemia, increased body weight, and metabolic syndrome features. Further, as insulin pump reservoirs hold 300 units of U-100 insulin, individuals with type 1 diabetes and high insulin dose requirements require frequent set changes, adding to the costs and burdens of living with type 1 diabetes. Concentrated insulins have been developed to improve the pharmacokinetic and pharmacodynamic properties of insulin injections. Reports of their use in insulin pumps have been limited. The following case illustrates the effectiveness of concentrated insulin within a HCL system.

**Case:**

A 26 year-old female living with type 1 diabetes since the age of 6 years old, presents with the issues of obesity (BMI 32.3), suboptimal glycaemia (HbA1C 8.5%) and insulin resistance (65 units per day; 0.7units/kg). Her diabetes was managed with U-100 insulin, a HCL system and metformin. Insulin intensification, induced 15kg of weight gain and further insulin resistance (HbA1c 7.5%, 100 units/day; 0.95 units/kg BMI 37.6). Over 2 years, her insulin requirements increased by 250% (165 units/day, 1.4 units/kg, peak weight 114kg, BMI 40.9). She expressed affordability concerns associated with frequent set changes. The conversion from U-100 to U-200 insulin reduced her improved glycaemia (HbA1C 7.0%) and halved her set change frequency.

**Conclusion:** This case demonstrates that combining HCL systems with concentrated insulins (U-200), can aid in improving glycaemic control, compliance, and quality of life in individuals living with type 1 diabetes and insulin resistance. Care must be taken with patient counselling and the interpretation of pump downloads, when using concentrated insulins off-label in HCL systems.