1. INTRODUCTION

In the open-loop insulin therapy for Type 1 Diabetes (T1D), semi-empirical rules to determine a suitable size of the insulin bolus are commonly employed. The state-of-art rules in particular, are based on two individual parameters [1]:
- the carbohydrate-to-insulin ratio (CR)
- the correction factor (CF)

That are normally tuned by trial-and-error procedures and, in many cases, could result suboptimal. In this context, automatic algorithms for the optimization of the insulin bolus parameters are particularly useful.

2. AIM

The aim of this work is to create a simulation framework to test the different algorithms for CR optimization in a credible real-life scenario.

3. SIMULATION FRAMEWORK

The proposed simulation framework (Fig. 1) integrates state-of-art models of variability of patient’s physiology and behavior, and technology.

**Fig. 1:** Simulation Framework for T1D open-loop management (Simulink notation)

4. TESTED CR OPTIMIZATION ALGORITHMS

The two tested CR optimization algorithms are the run-to-run (R2R) and a new method where the R2R is integrated with case-based reasoning (R2R+CBR) [5]. We simulated four 30-day sessions on 100 virtual patients.

5. RESULTS

The results show how both the algorithms improved the therapy performance obtained without optimization session-by-session. On average, in the fourth session, time in target and risk index result, respectively, 82.68% and 3.84 with R2R, 75.87% and 4.90 with R2R+CBR, 67.37% and 7.02 with no optimization.

6. CONCLUSIONS

We developed a simulation framework that allows generating credible scenarios to test existing, and develop new, algorithms for CR optimization in real life conditions. Both tested algorithms were able to improve the therapy performance. Future work will involve the expansion of the simulation framework in order to take into account for other factors, e.g. circadian rhythms, physical activity levels and stress.