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CASE REPORT

# Effects of Close Monitoring with Telemedicine on Glycemic Control in an Immunocompromised Patient with Type 1 Diabetes.

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### Abstract

**Background:** Hypoglycaemia is a condition that can have a severely negative impact on the life of a person with diabetes, making blood sugar control difficult. Closed loop hybrid insulin pump therapy has been shown to be highly effective in managing this condition, resulting in rapid improvement in glycaemic control and a reduction in the frequency and severity of hypoglycaemic attacks. This article presents a case study in which a type 1 diabetic achieved significant improvement in glycaemic control after switching to a closed-loop hybrid insulin pump system and receiving remote monitoring.

**Case presentation:** A 57-year-old female with type 1 diabetic who had all micro and macro vascular complications. Her blood glucose control was achieved rapidly after switching to insulin pump and her daily life was became more active and normalised. **Conclusion:** This study highlights rapid achievement of glycemic control, minimization of hypoglycemic episodes, and remote monitoring of the person with type 1 diabetes using a closed circuit insulin pump system. The study's evaluation is objective and based on clear evidence.

### Keywords:

- Type 1 Diabetes
- Glycemic Control
- Immunocompromised Patient
- Hyperglycemic or hypoglycemic emergencies
- Hypertension

Introduction

Telemedicine has been particularly beneficial during the Covid-19 pandemic, allowing patients to easily connect with physicians and enabling physicians to make timely decisions about their patients. This technology has greatly improved the efficiency and accessibility of healthcare services [1]. Close monitoring of diabetes through telemedicine has not only improved patient satisfaction, but also provided a sense of security in addition to effectively controlling glycemic levels, preventing hyperglycemic or hypoglycemic emergencies, and reducing the risk of long-term diabetes complications [2]. Our aim in this case study highlights the success of remote diabetes monitoring in improving the quality of life of a woman with type 1 diabetes.

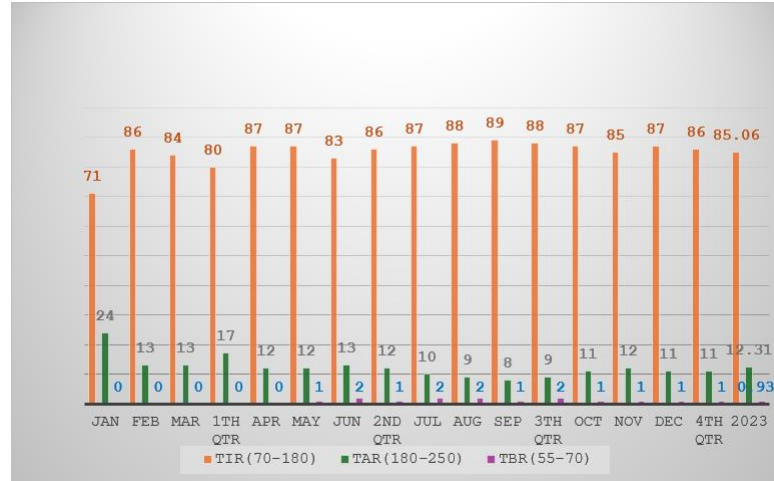
Case

A 57-year-old female patient with type 1 diabetes for 36 years. In her complex medical history; The patient had a complex medical history, including hypertension, Hashimoto thyroiditis, atrial fibrillation, acute ischaemic cerebrovascular attack, coronary artery bypass graft surgery, and two times kidney transplants. She had been experiencing frequent and severe hypoglycemic attacks, often leading to loss of consciousness, especially during sleep and mild exercise. This greatly impacted her daily life, as she had to monitor constantly her blood sugar levels and was unable to go out alone. "University of Virginia 1998 fear of hypoglycemia survey" performed on patient's application and her skor was 122 point [3]. At the time of application, the patient was receiving multiple medications, including insulin glargine, insulin lispro, mycophenolate mofetil, methylprednisolone, tacrolimus, apixaban, levothyroxine, lacidipine, doxazosin, bisoprolol, and pantoprazole. After careful consideration and with the patient's consent, it was decided that switching from multiple daily injections (MDI) to a closed loop system insulin pump therapy would be the most effective solution for her blood glucose fluctuations and hypoglycemic episodes. The patient underwent four sessions of carbohydrate counting training and insulin pen dose adjustments before initiating insulin pump therapy (Medtronic 780 G) on December 30, 2022.

The results were remarkable, with an average time in range (glucose level between 70-180 mg) of 85.06%.

The time above range (>180 mg glucose) was only 13.99 %, with a rate above 250 mg/dl of 0.93%. The time below range was 0.93%, all of which was between 55-70 mg/dl. Below 55 mg/dl blood glucose level was too low to be detected (appr. %0.02). And her hypoglycemia fear survey score dropped to 28 point.

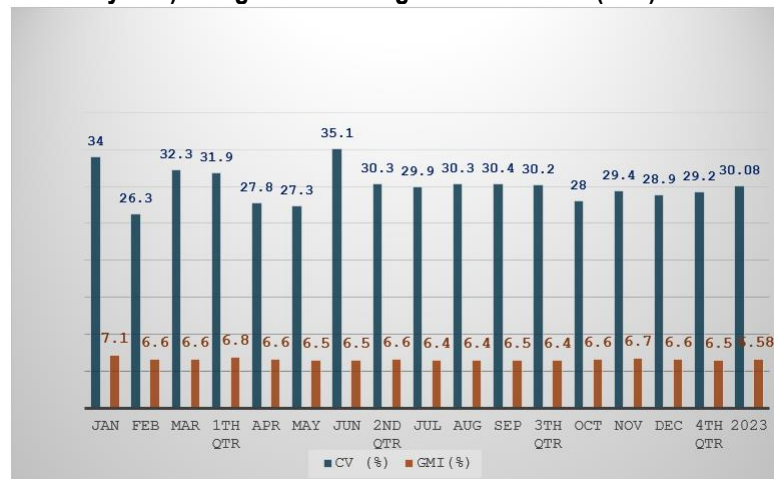
Table 1: Percentages of time in range (TIR), time above range 180-250 mg (TAR 180-250)



QTR: Quarters of year

The estimated HbA1c level (glucose management indicator) was 6.58% and glycemic variability (coefficient of variation) was 30% throughout the year.

Table 2: Percentages of coefficient of variation (Glycemic variability: GV) and glucose management indicator (GMI)



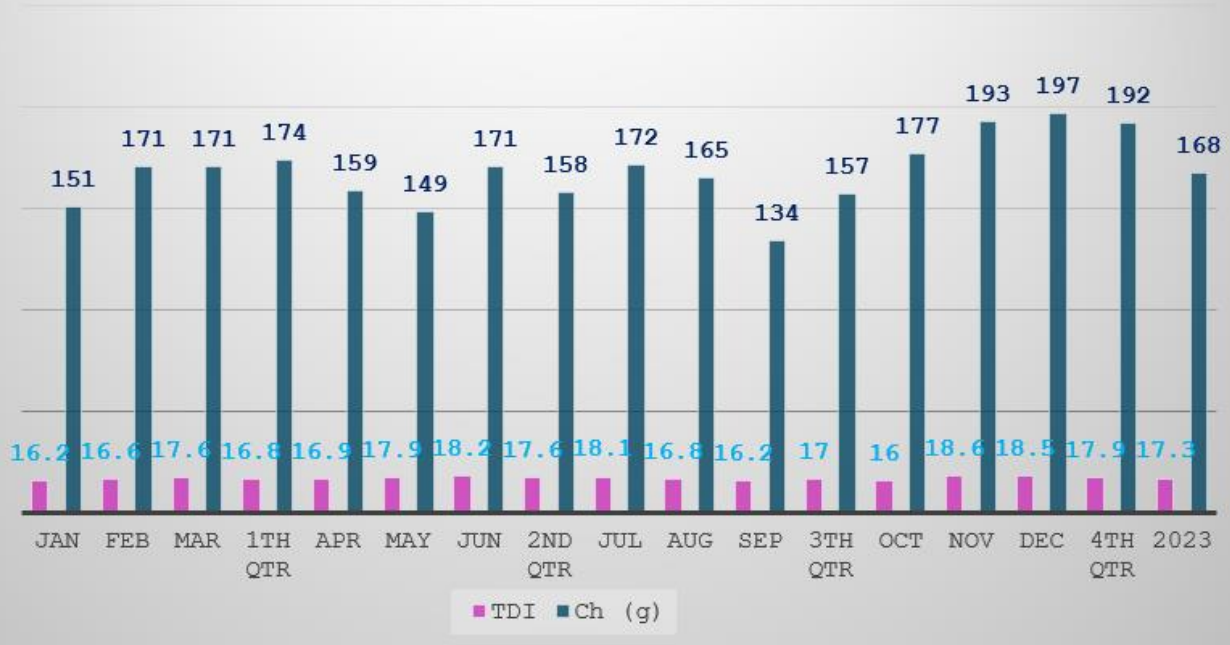
This was a significant improvement compared to the patient's previous MDI treatment, where the the patient's average daily insulin dose was 23 units, with 12 units being basal and 11 units being bolus. In 2023,



the average daily insulin dose was 17.3 units (with a range of 16-18.6 units) and the average carbohydrate intake was 168 grams (with a range of 151-197 grams).

due to the increased risk of infection. For this reason, it was decided to organize all glycemia follow-ups and insulin pump dose adjustments online. The patient's pump reports were reviewed weekly for the first month

**Table 3: Average daily consumed grams of carbohydrates (ch) and Daily total doses of insulin (TDI)**



Additionally, the patient's weight decreased from 64 kg to 59 kg after one year of insulin pump therapy. The patient's HbA1c levels also improved, with a baseline measurement of 7.5 % and follow-up measurements of 7.4 % and 6.5 %, respectively.

**Discussion**

We presented a case of a type 1 diabetic whose lifestyle was negatively affected by hypoglycaemia and fear of hypoglycaemia. Frequent episodes of hypoglycaemia not only have a negative impact on one's lifestyle but also make it challenging to maintain optimal blood glucose levels [4]. Therefore, it was considered that switching to a closed-loop insulin pump would be the most appropriate method for preventing hypoglycaemia and controlling blood sugar. Due to her cardiovascular diseases, diabetes, and immunosuppressive treatments following a kidney transplant, she was advised to avoid the hospital environment unless absolutely necessary

and then every 15 days for one year. Overcoming hypoglycaemia and its associated fear can lead to a more normalised life, better management of blood sugar levels, and prevention of long-term complications of diabetes.

**Summary**

In summary, this case study highlights the effectiveness of remote diabetes monitoring and closed loop system insulin pump therapy in improving the quality of life for patients with type 1 diabetes. With specific training and regular monitoring, remote diabetes monitoring and closed loop system insulin pump therapy can significantly decrease the risk of hypoglycemic episodes and allow patients to sleep and go out independently without fear. With closed loop insulin pump systems, it is possible to monitor individuals with diabetes without direct contact with physicians and healthcare professionals, during pandemic periods or during seasons when the number

of viral infections increases. In this way, it may be possible for healthcare professionals working in different localizations to evaluate the condition of the individuals with diabetes together, as well as saving time, labor and money.

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**Conflict of Interest:** There are no conflict of interest

**Ethical Consideration:** Not required

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