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Case Study 1

You are a practice nurse working in a local GP surgery. An increasing number of your patients have been diagnosed with diabetes, and it is clear from the clinics that they attend with you that many of them would benefit from having an increased understanding of their condition and lifestyle activities which impact on their health as this would enable them to engage more effectively with their care plans to manage their blood sugar levels safely and effectively. You decide to gather information that could be used to help patients understand their situation. Include information about why it is important for patients to record and track their blood sugar levels over time and also how addressing lifestyle factors, such as smoking, diet and exercise can help them to manage their condition.

Introduction

Diabetes Mellitus is a group of chronic metabolic diseases characterized by elevated blood glucose levels due to either insufficient insulin production or the body's ineffective use of insulin, known as insulin resistance. This condition disrupts the normal metabolism of carbohydrates, fats, and proteins. Common features include persistent hyperglycemia (high blood sugar), which can lead to serious damage to organs such as the heart, blood vessels, eyes, kidneys, and nerves over time. The two primary types are Type 1 diabetes, where the pancreas produces little or no insulin, and Type 2 diabetes, where the body becomes resistant to insulin or does not produce enough of it.(BRUTSAERT, 2023)

Diabetes Mellitus is distinct from diabetes insipidus, a rare disorder unrelated to blood sugar levels but also causing increased urination. The term "mellitus" indicates the presence of sweet-tasting urine due to excess glucose. The disease's metabolic nature means it affects the body's ability to process glucose properly, leading to chronic high blood sugar.(Diabetes UK, 2022)

Key characteristics of diabetes include chronic hyperglycemia and insulin resistance. These metabolic disturbances are responsible for the clinical symptoms and long-term complications associated with the disease. Managing diabetes involves maintaining blood glucose levels as close to normal as possible through medication, lifestyle changes, and monitoring.(World Health Organization, 2025)

Every 5 seconds 1 person in the world dies due to complications from diabetes mellitus, it can cause heart diseases, strokes and many other secondary diseases(Carrondo and Moita, 2022)

Explain how blood sugar levels are maintained at a safe and effective level for the body's needs.

Blood sugar is maintained at a safe level for diabetic patients so they and their caregivers can understand how different factors such as food, exercise and stress affect blood sugar. Different self monitoring techniques can be used such as a blood sugar metre, of which a blood sample is taken from a finger prick and tested manually with a device, or with a wearable continuous blood sugar monitor which is worn as a sensor under the skin.

When it comes to medications all people with type 1 diabetes will take insulin and sometimes other medications as well. The insulin is usually taken by injection or an insulin pump.

Blood sugar levels in part are affected by what people eat, maintaining a healthy diet is important for people living with diabetes and pre-diabetes. In general people with diabetes are encouraged to eat regular well balanced meals, limit high sugar, high fat foods and opt for water as their beverage of choice. Incorporating vegetables and fruit, whole grains and lean proteins into meals and snacks is a great foundation for a healthy diet. Engaging in regular and physical activity is one of the most valuable things people can do for their health. People should aim for about 150 minutes of moderate to vigorous exercise per week plus 2–3 resistance-training sessions, starting low and building up gradually if needed.
(Diabetes Canada, 2024)

Insulin is a hormone produced in the pancreas

Insulin is a hormone that is necessary to convert glycogen (storage form of energy) to glucose from blood into cells for energy
People with type 1 diabetes do not produce insulin

Without enough insulin, high blood glucose results:

- Energy levels are low
- Dehydration
- Complications

(University of Wales Trinity St. David Endocrine System, 2025)

Glucagon, produced by alpha cells in the pancreas, has the opposite effect. When blood sugar levels fall, glucagon signals the liver to convert stored glycogen back into glucose and release it into the bloodstream to raise blood sugar levels. The balance between insulin and glucagon is essential for maintaining stable blood glucose and overall energy homeostasis.

This balance ensures that after meals, insulin helps cells absorb glucose, and during fasting or between meals, glucagon raises blood glucose to meet the body's energy needs.

(Vargas and Alicia, 2022)

Show how oxygen and glucose are used to produce energy through cell metabolism.

Oxygen and glucose help cells make energy through a process called aerobic respiration. First, glucose is broken down into smaller molecules, producing a little energy. Then, these smaller molecules enter a cycle that creates carbon dioxide, more energy, and carriers that hold electrons. The electrons move through a chain that uses oxygen to create water and a lot of energy in the form of ATP, which powers the cell.

The equation for this is:

Glucose + Oxygen → Carbon dioxide + Water + Energy (ATP)

This process turns the energy in food into usable energy for the cell to do its work.

(Wakim and Grewal, 2018)

Briefly examine how recording and tracking blood sugar levels helps individuals with Type 2 diabetes to safely manage their condition.

Recording and tracking blood sugar levels helps individuals with Type 2 diabetes safely manage their condition by revealing patterns in glucose fluctuations influenced by diet, exercise, medications, and stress, enabling timely adjustments to prevent hyperglycemia or hypoglycemia. Tools like finger-prick meters or continuous glucose monitors (CGMs) provide real-time data—CGMs every 5 minutes—alerting users to highs/lows, supporting structured self-management that lowers HbA1c by ~0.3-0.4% short-term, especially during insulin/sulfonylurea titration or when levels exceed targets. (Diabetes UK, 2017)

For non-insulin users, benefits are modest and debated but include education on personal responses (e.g., post-meal spikes) and reassurance, reducing complication risks like cardiovascular events when paired with lifestyle changes; NICE/ADA recommend it selectively for those at hypo risk or starting therapy. Overall, tracking fosters empowerment, with CGMs improving time-in-range and quality of life in insulin-treated Type 2 cases. (Mendoza and Hickner, 2008)

Include evidence-based recommendations on how lifestyle changes could help improve their condition

Plant-based diets, such as low-fat vegan or whole-food patterns emphasizing vegetables, fruits, whole grains, legumes, and fiber, reduce HbA1c by 0.4-0.9% more than conventional diets and support weight loss without calorie limits. Focusing on high-fiber, low-glycemic options such as lentils, chickpeas, and non-starchy veggies while limiting refined carbs and sugars and aiming for 3-7% body weight reduction; studies like DiRECT show 13% remission at five years with sustained loss. (Diabetes, 2024)

Engage in 150+ minutes weekly of moderate aerobic exercise plus resistance training 2-3 times weekly to boost insulin sensitivity, stop post-meal glucose spikes, and preserve muscle during weight loss. (Chacko and Signore, 2020)

Prioritize 7-9 hours of quality sleep nightly, now a core ADA pillar equal to diet/exercise, as poor sleep worsens insulin resistance. Sequence meals with protein/veggies first, carbs later; stay hydrated with water over sweetened drinks; manage stress and track progress with a clinician, as these yield 58% diabetes risk reduction in trials. (Chacko and Signore, 2020)

Conclusion

In conclusion, empowering patients with diabetes through comprehensive education on their condition, self-monitoring practices, and evidence-based lifestyle interventions is essential for optimizing health outcomes in a primary care setting. As demonstrated, diabetes mellitus fundamentally disrupts glucose homeostasis via impaired insulin production or action, leading to hyperglycemia and heightened risks of macrovascular (e.g., cardiovascular disease, stroke) and microvascular (e.g., retinopathy, nephropathy, neuropathy) complications, with global mortality underscoring urgency—claiming one life every five seconds. Regular blood glucose tracking via finger-prick meters or continuous glucose monitors (CGMs) enables patients to discern personalized responses to meals, exercise, stress, and medications, facilitating timely adjustments to insulin, oral agents, or pumps, thereby preventing hypo/hyperglycemic episodes and supporting HbA1c targets below 7% for most. (Chacko and Signore, 2020)

Addressing modifiable lifestyle factors yields profound benefits: plant-based, high-fiber diets emphasizing low-glycemic foods like legumes and vegetables outperform standard diets in lowering HbA1c by 0.4-0.9% and promoting 3-7% weight loss, with trials like DiRECT achieving 13% type 2 remission at five years through sustained caloric restriction and whole-food patterns. Concurrently, 150+ minutes weekly of moderate aerobic activity (e.g., brisk walking) paired with resistance training enhances insulin sensitivity, mitigates postprandial spikes, and preserves lean mass, while 7-9 hours of quality sleep—now an ADA cornerstone—curbs resistance exacerbated by deprivation. Smoking cessation further halves cardiovascular risk, hydration with water supplants sugary beverages, and stress management via mindfulness or routines bolsters adherence, collectively slashing diabetes progression by 58% in landmark studies. (Diabetes, 2024)

Reference List

- BRUTSAERT, ERIKA. "Diabetes Mellitus (DM)." *MSD Manual Consumer Version*, MSD Manuals, 2023,
www.msdmanuals.com/home/hormonal-and-metabolic-disorders/diabetes-mellitus-dm-and-disorders-of-blood-sugar-metabolism/diabetes-mellitus-dm.
Accessed 26 Nov. 2025.
- Carrondo, Maria Cristina, and Joaquim Jorge Moita. "Inpatient Mortality in People with Type 2 Diabetes: A Cross-Sectional Study." *Clinical Diabetology*, vol. 11, no. 5, 31 Oct. 2022, pp. 340–345,
<https://doi.org/10.5603/dk.a2022.0049>. Accessed 26 Nov. 2025.
- Elsamma Chacko, and Christine Signore. "Five Evidence-Based Lifestyle Habits People with Diabetes Can Use." *Clinical Diabetes*, vol. 38, no. 3, 2020, pp. 273–284, <https://doi.org/10.2337/cd19-0078>. Accessed 5 Dec. 2025.
- Diabetes Canada. "Diabetes Management." *Youtu.be*, 15 Apr. 2024, youtu.be/Qs1iGublt-M?si=rldhluV8OopQT_Id. Accessed 26 Nov. 2025.
- Diabetes UK. "Diabetes Mellitus." *Diabetes UK*, 2022,
www.diabetes.org.uk/about-diabetes/types-of-diabetes/diabetes-mellitus.
Accessed 26 Nov. 2025.
- Diabetes UK. "Self-Monitoring of Blood Glucose Levels for Adults with Type 2 Diabetes (March 2017)." *Diabetes UK*, 2017,
www.diabetes.org.uk/about-us/about-the-charity/our-strategy/position-statements/self-monitoring-of-blood-glucose-levels-for-adults-with-type-2-diabetes?utm_source=perplexity. Accessed 5 Dec. 2025.
- Mendoza, Michael D, and John Hickner. "Glucose Self-Monitoring: Think Twice for Type 2 Patients." *The Journal of Family Practice*, vol. 57, no. 11,

Nov. 2008, p. 731,

[pmc.ncbi.nlm.nih.gov/articles/PMC3183841/?utm_source=perplexity](https://pubmed.ncbi.nlm.nih.gov/articles/PMC3183841/?utm_source=perplexity).

Accessed 5 Dec. 2025.

- Diabetes UK. "Weight loss can put type 2 diabetes into remission for at least 5 years, direct study reveals." Diabetes UK, 2024, https://www.diabetes.org.uk/about-us/news-and-views/weight-loss-can-put-type-2-diabetes-remission-least-five-years-reveal-latest-findings?utm_source=perplexity. Accessed 5 Dec. 2025
- Vargas, Elizabeth, and Maria Alicia. "Biochemistry, Insulin Metabolic Effects." *Nih.gov*, StatPearls Publishing, 26 Sept. 2022, www.ncbi.nlm.nih.gov/books/NBK525983/. Accessed 26 Nov. 2025.
- Wakim, Suzanne, and Mandeep Grewal. "5.9: Cellular Respiration." *Biology LibreTexts*, 24 Dec. 2018, [bio.libretexts.org/Bookshelves/Human_Biology/Human_Biology_\(Wakim_and_Grewal\)/05:_Cells/5.09:_Cellular_Respiration](https://bio.libretexts.org/Bookshelves/Human_Biology/Human_Biology_(Wakim_and_Grewal)/05:_Cells/5.09:_Cellular_Respiration). Accessed 26 Nov. 2025.
- World Health Organization. "Diabetes." *World Health Organization*, World Health Organization, 2025, www.who.int/health-topics/diabetes#tab=tab_1. Accessed 26 Nov. 2025.