Elucidating the lived experiences of hypoglycemia in patients diagnosed with diabetes mellitus
A general literature review
**Titel**  
Belysning av de levda erfarenheter av hypoglykemi i patienter diagnoserad med diabetes mellitus. En allmän litteraturstudie

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## Sammanfattning

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Diabetes mellitus, hypoglycemia, patient experience, self-care

Abstract

Background: Hypoglycemia is a common adverse effect to anti-hyperglycemic treatment for diabetes mellitus, it is characterized by a plasma glucose level of 79 mg/dl (3.9 mmol/l) or lower. Hypoglycemia has an abundance of symptoms, both neurogenic and neuroglycopenic which can result in loss of consciousness, seizure, and death if left untreated. General nurses have shown they are lacking in information regarding symptoms of hypoglycemia and as such experiences Aim: The aim of this study was to elucidate the lived experiences of hypoglycemia in patients diagnosed with diabetes mellitus. Method: A general literature review with an inductive approach. Results: The results of this study found that patients diagnosed with diabetes experienced challenges associated with hypoglycemia such as fear, particularly associated with nocturnal hypoglycemia. Patients diagnosed with diabetes also experienced helplessness, a lack of control, avoidance, restrictions and stress factors associated with hypoglycemia. Patients diagnosed with diabetes experienced hypoglycemic confidence primarily based on preventing recurrence and successful treatment, and for some through hope. Conclusion: The findings of this study indicate a need for nurses to understand the experiences patients diagnosed with diabetes have of hypoglycemia, to properly assist patients in health promotion and achieving a self-care balance.
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Introduction

Hypoglycemia is one of the most common adverse effects of anti-hyperglycemic treatments for diabetes. According to the World Health Organization (WHO, 2023) the number of people diagnosed with diabetes increased from 108 million people in 1980 to 422 million people in 2014. Between the year 2000 and 2019 diabetes mortality rates by age increased by 3%. Morales and Schenider (2014) say that hypoglycemia rates are higher amongst people diagnosed with diabetes mellitus type 1 than people diagnosed with diabetes mellitus type 2. In a review however, it was estimated that 7% to 25% of people with type 2 diabetes who use insulin therapy experience at least 1 severe episode annnually (Morales & Schneider, 2014). According to the Centers for Disease Control and Prevention (CDC, 2022) people diagnosed with diabetes may experience hypoglycemia as frequently as once or twice a week. McCrimmon (2021) states that recurrent hypoglycemia induces cellular adaptations in key glucose sensing neurons, which leads to reduced responsiveness to hypoglycemia. The impact on brain function is also seen on the emotional states and other cognitive functions of those who have experienced recurrent hypoglycemia. While many people with type 1 diabetes and people with type 2 diabetes can restore their hypoglycemia awareness, there remains a cohort of individuals who have complete and irreversible loss of function in detecting hypoglycemia. The vast majority of hypoglycemic cases are not severe, though many cases of severe hypoglycemia do not result in hospitalization nor contact with ambulatory services (McCrimmon, 2021). A study showed that nurses had a lack of knowledge in identifying symptoms of and treating hypoglycemia, of 100 nurses in one part of this study, only 28 knew the common symptoms of hypoglycemia (Nikitara et al., 2019). Due to this, it is imperative that nurses who come in contact with patients diagnosed with diabetes mellitus are knowledgeable of the experiences of hypoglycemia that patients diagnosed with diabetes may suffer from, and are capable of caring for these individuals based on their needs pertaining to hypoglycemia, in preventative and curative fashions.

Background

Amier (2021) states that hypoglycemia has been recognized as a complication of insulin treatment since the discovery of insulin, and remains a major concern for patients, families, and healthcare professionals even today. According to the Mayo clinic (2023) hypoglycemia or low blood sugar is characterized by a plasma glucose level of 70 mg/dl, 3.9 mmol/l or lower. Symptoms of hypoglycemia include looking pale, shakiness, sweating, headache, hunger or nausea, an irregular or fast heartbeat, fatigue, irritability or anxiety, difficulty concentrating, dizziness or lightheadedness.
As hypoglycemia worsens symptoms progress to confusion, unusual behavior or both. Loss of coordination, slurred speech, blurry or tunnel vision, as well as nightmares if asleep. When severe hypoglycemia occurs it can cause loss of consciousness and seizures. Amier (2021) states that there are three levels of hypoglycemia that have clinical implications for people diagnosed with diabetes. Level 1 is referred to as hypoglycaemia alert and is a plasma glucose level of less than 3.9 mmol/l, it is usually asymptomatic and considered the lower limit of glucose in range. Level 2 is referred to as clinically important with a plasma glucose level of less than 3 mmol/l, and is associated with impaired cognitive function, cardiac arrhythmias and is a predictor of severe hypoglycaemia and mortality. Repeated episodes can cause reduced hypoglycaemic awareness. Level 3 is considered severe hypoglycaemia, the plasma glucose level is not specified, but is characterized by requiring the treatment of another person to rectify. The Mayo Clinic (2023) say that untreated hypoglycemia can lead to seizure, coma, and death.

Causes of hypoglycemia

According to the CDC (2022) the causes of hypoglycemia are taking too much insulin, not eating enough carbohydrates in relation to the insulin dose, the timing of when you take insulin, the amount and timing of physical activity, drinking alcohol, the amount of fat, protein, and fiber that are in your meals. Other causes are hot and humid weather, unexpected changes in the diabetic person’s schedule, spending time at a high altitude, going through puberty, and menstruation. Silbert et al. (2018) say that the use of insulin secretagogues such as sulfonylureas and meglitinides as anti-hyperglycemia treatment also increases the risk of hypoglycemia, these medications in combination with insulin heavily increase the risk of severe hypoglycemia. The risk of severe hypoglycemia increases 2- to 3-fold with sulfonylureas and 3- to 4-fold increased risk with insulin (Silbert et al., 2018).

Treatment of hypoglycemia

Treatment of hypoglycemia is relatively simple depending on the severity. Morales and Schneider (2014) say that major diabetes guidelines worldwide recommend dosing patients diagnosed with diabetes 10-30 grams of carbohydrates with a wait time of 10-15 minutes, and a follow up dose if the hypoglycemia persists, however optimal treatment may be 20 grams of carbohydrates with a 10-minute wait. The Mayo Clinic (2023) say that once the person diagnosed with diabetes blood sugar stabilizes, a nutritious snack or meal may help reduce the risk of another hypoglycemic episode. Severe hypoglycemia requires treatment with a glucagon injection, or intravenous
If the person diagnosed with diabetes is unconscious, do not attempt to give them food or drink as they may choke on it.

**Impact and consequences to health**

Morales and Schnedider (2014) state that 4% to 10% of deaths of patients with type 1 diabetes is due to hypoglycemia. Patients with type 2 diabetes who have had a severe hypoglycemic event was 19.5% compared with those who have not had such an event 9%, an all cause risk of mortality remained increased for 4 years after such an event. In a sample of 1013 adults with type 1 and 2 diabetes, self-reports of severe hypoglycemia were associated with a 3.4 fold higher mortality after 5 years than those who had only experienced mild or no events. Physiological effects related to hypoglycemia include higher circulating levels of inflammatory markers, vascular adhesion molecules, platelet activation and marks of thrombosis. Severe hypoglycemia may permanently impair cognitive function, people with type 2 diabetes and severe hypoglycemia run a greater risk of developing dementia, a 1.5-2.5-fold risk compared with the general population. Severe hypoglycemia was associated with significant increases to risk for micro and macrovascular events. Amier (2021) writes that impaired awareness of hypoglycemic episodes is believed to arise from recurrent hypoglycemic events, however the awareness can be restored through avoidance of exposure to hypoglycemia in some patients.

**Nurses knowledge deficit of hypoglycemia**

According to Nikatara et al. (2019) studies have found that nurses are heavily involved in educating patients diagnosed with diabetes to manage their disease, and that when nurses are involved, a positive outcome of improved glycemic control has resulted. In other studies, however, it is expressed that general nurses have deficient knowledge pertaining diabetes management, this was theorized to be a result of outdated textbooks with contradictory information while they were students preparing for licensure, or that the level of education in diabetes was insufficient or was not retained long term (Nikatara et al., 2019). In a study with seventy-seven nurses, only sixty two percent answered correctly in a questionnaire which asked what the cutoff was for hypoglycemia from a capillary blood glucose test, along with about fifty-seven percent of nurses would have omitted insulin after a patient had a hypoglycemic episode (Hegarty & O’Donovan, 2022). Nurses were found to be deficient in recognizing and managing hypoglycemia symptoms. In a study with one hundred nurse respondents, only twenty-eight percent of them could identify the common symptoms of hypoglycemia. It was found that nurses had a tendency to conduct the activities assigned to them by physicians rather than spending time with patients to educate and support them (Nikatara et al., 2019). The results of
one study indicated that nurses were not familiar with the local hospital guidelines for treatment of patients with diabetes who suffer from hypoglycemia (Hegarty & O’Donovan, 2022).

Nursing responsibilities

The goal of nursing patients diagnosed with diabetes is to maintain euglycemia. Depending on patient resources, the nurses’ function can vary. With newly diagnosed diabetes mellitus, the nurse educates and guides the patients in order to promote the patients’ capabilities in managing the condition. During acute and critical situations, the nurse takes on a treatment and prevention function which is comprised of partially or completely replacing the patient with diabetes self-care of blood sugar monitoring. Patients often feel safe when they can measure their blood sugar levels when feeling strange (Dammen Mosand & Stubberud, 2021). In order to maintain euglycemia, a proper diet, physical activity and insulin or anti-diabetics are necessary for stable levels. Control of eventual secondary conditions including psychological conditions is a crucial factor in maintaining proper control and euglycemia (Dammen Mosand & Stubberud, 2021). In Sweden the social welfare board national guidelines for diabetes care state that treatment is heavily directed towards maintaining euglycemia, however they also give recommendations for preventative measures for health issues caused by diabetes, such as problems with the feet or the eyes, along with receiving a proper diabetes education to facilitate proper self-care for the condition (Socialstyrelsen, 2020).

Nursing theory framework

In the nursing theory of self-care deficit, Dorothea Orem describes self-care requirements as the requirements placed on an individual’s actions that self-care needs generate. These self-care needs are different in character and are related to the individuals health processes. Orem identifies eight universal self-care requirements, which are needs that healthy adults have the capability to perform in their own unique manner. There is no norm for how these needs are met, and there are a variety of ways that people fulfill these requirements based on their prior experiences and actual possibilities (Wiklund Gustin & Lindwall, 2012). The eight universal self-care requirements are as follows: To maintain adequate oxygen intake, fluid intake, and food intake. Nursing regarding eliminations processes and excrement’s, maintaining balance between rest and activity, loneliness and social interaction. Prevention of risks for human life, human function and human prosperity and promotion of human function and development within a social community, based on the individuals potential, known human limitations and the desire to be normal (Wiklund Gustin & Lindwall, 2012). Dorothea Orem’s theory on Self-care deficit is built on 3 parts, self-care
deficit, self-care, and nursing systems. In this theory, health is coupled to one’s self-care balance, which is to say that people have a will and a need for self-care that life’s different phases take with them. Dorothea Orem’s nursing theory on the self-care deficit states that people require professional nursing when hers’, or their close relatives, capability for self-care is not in sufficient balance with the self-care needs and requirements they place on the individual (Wiklund Gustin & Lindwall, 2012). Dorothea Orem means that every now and again, limitations from both internal and external factors place limitations on the individual, such as diabetes or an accident, which place the person in need of nursing (Hartweg, 1991). When a person’s self-care capacity is insufficient for the requirements that the self-care situation dictates, a self-care deficit occurs, which in turn calls for a nursing professional to assist or compensate for the flaws in self-care that the person requires to uphold the self-care balance (Wiklund Gustin & Lindwall, 2012).

Health psychology model

The stress and vulnerability model developed by Zubin and Spring, has two central concepts, stress and vulnerability. Stress has many definitions, such as meaningful stressors, greater negative life events like going bankrupt, getting divorced or losing one’s employment, as well as typical daily hassles that accumulate. Vulnerability has to do with factors that increase the risk of becoming unhealthy, these are factors that predispose people to the emergence of certain problems. These vulnerabilities can be either biological such as a predisposition to certain ailments, diabetes for example, but can also include psychological factors such as feelings like anxiousness, feeling depressed, and unhealthy behaviors such as sinking into the couch and watching television for prolonged periods. The greater the prevalence of vulnerability, the greater the risk of becoming impacted by health concerns (Linton & Flink, 2016). The stress and vulnerability model is a simplistic but elegant model which can help explain the origin of many different health concerns. The model illuminates the interaction between stress and vulnerability, the more vulnerable a person is dictates how tolerant they are to stress and how easily they become ill. If the stress levels exceed a certain limit, anyone can become unhealthy, however those with higher vulnerability require less stress to become unhealthy. Every person has a limit within the model which dictates at what level they will become affected, which is based upon the individuals vulnerability and management of stress. Resilience plays a large role within this model, as vulnerability is seen as a continuum from the negative of being vulnerable to the positive of being resilient. Resilience is defined in this model as a person’s ability to
withstand stress, such as a person who is standardly level-headed who is more capable in effectively withstanding various stressors. According to this model even the severity of ill health increases with increased stress levels above the individuals tolerance level, which means that the same levels of stress can cause ill health for one person while not another, all depending upon their vulnerability versus their resilience (Linton & Flink, 2016).

Dorothea Orems theory of the self-care deficit couples very well with the stress-vulnerability model. When a person has self-care balance, they also show that they have the necessary level of resilience to the various stressors that life has imposed upon them thus far. If a person becomes especially vulnerable and lack the resilience to deal with the stressors that life imposes upon them, they can develop a self-care deficit, in which nurses would be of particular importance in health promotion, which can assist patients in bolstering their resilience along with their self-care balance, along with implementing nursing interventions together with the patient to assist the patient with regaining autonomy and an appropriate level of self-care balance to satisfy the burdens that their lives and health conditions may demand of them.

**Problem statement**

Hypoglycemia is a detrimental consequence of hyperglycemic treatment for diabetes mellitus. People diagnosed with diabetes struggle with hypoglycemia and its consequences in numerous ways. Nurses require information regarding these varied experiences with hypoglycemia in order to facilitate health promotion interventions which can improve people diagnosed with diabetes self-care capabilities, and subsequent quality of life.

**Aim**

The aim of this study was to elucidate the lived experiences of hypoglycemia in patients diagnosed with diabetes.

**Method**

The method of this study was a general literature review done with an inductive approach. According to Popenoe et al. (2021) a general literature review is a synthesis and analysis of already published research on a relevant clinical issue, and is commonly used for bachelors and masters theses. The central task of the author of a general literature review is to analyse the results of multiple scientific studies in order to describe the state of knowledge about a particular topic, in order to draw conclusions with clinical applications. According to Priebe and Landström (2017) an
inductive approach constitutes that the study is done by first collecting and examining the empirical data before drawing any theories or conclusions

Data collection

The literature search for this study was separated into two parts. First the scoping search which was used to attain information within the general field of the designated topic, Östlundh (2023) says that at this stage, one searches from various information sources to attain a basic understanding of the topic one wishes to research, to research which sources are relevant to include, as well as to analyse different search strategies. The second stage of the search, the systematic search for the research material, was done to attain the final selection of literature that is presented in the results. The searches done within the second stage use only academic databases for the research material that can supply one with articles that answer the purpose of the study and can be used within the results. The boolean operators AND and OR are used within the systematic search. Karlsson (2017) states that the boolean operator AND is used as a means of specifying the search results. The search terms and free text used within the search coupled with AND incorporates all of the included terms within the search results. When the boolean operator OR is used, it is to make the search more sensitive, thereby incorporating more possible choices within the search result. In this study the use of AND and OR were to include specific factors of patient data in order to find the correct subject matter. The searches used were (Diabetes mellitus) AND (hypoglycemia or hypoglycaemia or low blood sugar) AND (Patient experiences OR patient perceptions OR patient opinions OR patient attitudes OR patient views). In this study, the databases used to find articles for the results were Cumulative Index of Nursing and Allied Health Literature (CINAHL), which according to Karlsson (2017) contains material within nursing, physical therapy, and occupational therapy, and contains more than 5,400 periodicals primarily in English. Public Medline (PubMed) was used as it contains material from the entirety of biomedicine including medicine, nursing, and dentistry, and contains more than 25 million references primarily in English.

Literature search

The literature search was done with specific search words including diabetes mellitus AND hypoglycemia (hypoglykemi) AND patient experiences (patient erfarenheter) along with alterations of spelling and phrasing. Hypoglycemia was also spelled hypoglycaemia and referred to in layman’s terms as low blood sugar coupled together with OR within parentheses. Patient experiences was bundled with patient perceptions by OR as well as patient opinions, patient attitudes, and patient views within parentheses. The literature search was done with two different styles of
search words, the second was done using the search phrases: (Diabetes patients with hypoglycemia) AND (experiences OR attitudes OR perceptions OR feelings OR perspectives) AND (focus group OR interview) to find more qualitative material. The keyword search is presented in appendix A, and the search history in appendix B.

Inclusions and exclusions criteria

The inclusions criteria for the study were that qualitative, quantitative, or mixed method articles were peer reviewed, published within the last 10 years, and written in the English language. The research articles used were also required to be approved by an ethical committee or adequately describe the strides taken to uphold research ethics including informed consent, ability to excuse oneself from the study at any point, and maintaining anonymity through proper care of sensitive personal information. Exclusion criteria were articles whose results were not valid to the purpose of this study, and those that scored less than grade 2, 70% based on Carlsson and Eiman (2003) scientific quality review formula. All of the results articles chosen had a scientific quality score of at least grade 2.

Article searches via CINAHL

The first search using CINAHL was done with (Diabetes mellitus) AND (hypoglycemia or hypoglycaemia or low blood sugar) AND (patient experiences or patient perceptions or patient opinions or patient attitudes or patient views) which resulted in 196 articles, in which all article titles were read, 8 articles were chosen based on title and abstract of which 2 qualitative and 2 quantitative articles were chosen based on fully read research and were of a scientific value of grade 1 based on Carlsson and Eiman (2003). The second search was done with Diabetes patients with hypoglycemia AND (experiences or attitudes or perceptions or feelings or perspectives) AND (focus groups or interviews) which resulted in 9 articles with 0 viable from title and abstract.

Article searches via PubMed

The first search via PubMed was done with (Diabetes Mellitus) AND (Hypoglycemia or hypoglycaemia or low blood sugar) AND (Patient experiences or patient perceptions or patient opinions or patient attitudes or patient views). This resulted in 1012 results, of which all were read by title, 30 abstracts were read, and 2 were read in full and accepted after reviewing their scientific quality. The second search was done with Diabetes patients with hypoglycemia AND (experiences or attitudes or perceptions or feelings or perspectives) AND (focus groups or interviews) which resulted in 86 results of which all titles were read and 1 was chosen after reading the abstract and full article as well as being reviewed for scientific quality. All
results articles were reviewed using Carlsson and Eiman (2003) and scored grade 1.

**Manual Search**

One manual search was done to collect a single qualitative article from the reference list of Martyn-Nemeth et al. (2018) and was coupled within the results discussion of said article. It was first read through, and after assessing its validity to the purpose of this study it was reviewed via Carlsson and Eiman (2003) and after being assessed to be grade 1, was included in the results.

**Data analysis**

The data analysis was done in 3 step process in accordance with the description of data analysis guided by Popenoe et al. (2021). First the results articles were read multiple times to understand the context of each article. In step one, each article was summarized based on the relevant data which addresses the purpose of this study. In step two the data from the results articles that pertained to the purpose of this study were condensed and summarized, and were documented within an oversight table, appendix C table 3. In step three, the results that spoke to the purpose of this study were categories thematically. Two main categories and five subcategories were identified within the results, the two main categories were *Challenges associated with hypoglycemia & Hypoglycemia confidence*. The subcategories for Challenges associated with hypoglycemia were as follows: *Fear, Helplessness, lack of control & avoidance, restrictions & stress factors*. The sub-categories of hypoglycemia confidence were as follows: *Hope and Preventing recurrence*.

**Ethical considerations**

The World Medical Association (WMA, 2022) developed the declaration of Helsinki which states that medical research involving human subjects may only be conducted if the importance of the objective outweighs the risks and burdens to the research subjects. All medical research involving human subjects must be preceded by careful assessment of predictable risks and burdens to the individuals and groups involved in the research in comparison with foreseeable benefits to them and to other individuals or groups affected by the condition under investigation. Measures to minimise the risks must be implemented, continuously monitored, assessed and documented by the researcher. Every precaution must be taken to protect the privacy of research subjects and the confidentiality of their personal information. Participation by individuals capable of giving informed consent as subjects in medical research must be voluntary. No individual capable of giving informed consent may be enrolled in a research study unless he or
she freely agrees (WMA, 2022). According to SFS (2003:460) research can only be accepted if it can be performed with respect for human value. Research may only be accepted if the risks for research subjects health, safety and personal integrity is weighed greater than the scientific value. Research may not be done if it can be accomplished through another method that provides less risk for research subjects health, safety, and personal integrity. Research may be accepted only if being done by or under the guidance of a researcher with the scientific competency that is required. Research can only be performed if the research participant has given consent for the research that affects him or her. The consent only applies if the research participant has received information about the research, and must be of their own volition, explicitly and precisely to certain research, consent should be documented (SFS 2003:460). All results articles in this study were approved via an ethical committee, service, or review board or exempted by an ethical review board. Four of the results articles received ethical approval via an ethical review board, two of the articles received ethical approval via an ethics service, two of the articles were exempted from the need for ethical approval by ethical an review board, which was documented in the article overview for each results article, under appendix C. This literature review was done with the guidance of a thesis advisor with the necessary scientific competenty, and was assessed to present no risk as no new information nor personal information about the patients diagnosed with diabetes was attained, and all results articles followed the appropriate ethical regulations.

**Results**

*Challenges associated with hypoglycemia*

Challenges associated with hypoglycemia is comprised of three subcategories, fear, helplessness, a lack of control & avoidance, and restrictions & stress factors. Fear was shown to be particularly based around fear of experiencing nocturnal hypoglycemia and hypoglycemic episodes while alone, but fear was also experienced in other contexts. Helplessness, lack of control & avoidance was experienced by many people diagnosed with diabetes, which too was coupled with nocturnal hypoglycemia, an inability to properly treat an event, and avoidance tactics to prevent incidents. Patients diagnosed with diabetes felt restrictions and stress factors, such as being perceived negatively by others during a hypoglycemic event, having it affect their careers, physical activities, and general mood.
Fear was the most salient experience of patients diagnosed with diabetes who experience hypoglycemia (Brown et al., 2019; Grammes et al., 2017; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Speight et al., 2014; Stuckey et al., 2021). Specific fears related to hypoglycemia manifested for people diagnosed with diabetes in a variety of ways. Fear of sleep and its associated nocturnal hypoglycemia was expressed frequently by people diagnosed with diabetes (Brown et al., 2019; Grammes et al., 2017; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Snoek et al., 2022). Those who lived alone felt an intensified fear of nocturnal hypoglycemia and was associated with the risk of death and impacted the person diagnosed with diabetes quality of sleep (Brown et al., 2019; Grammes et al., 2017). Some people diagnosed with diabetes voiced terrifying situations they had experienced due to nocturnal hypoglycemia, such as seizures as well as waking up covered in a pool of sweat (Martyn-Nemeth et al., 2019). Sleep was impacted by fear of hypoglycemia as well as by hyperglycemia due to preventative measures in avoidance of hypoglycemic incidences, which consequently resulted in a diminished well-being the next day (Martyn-Nemeth et al., 2018). Many of the people diagnosed with diabetes expressed a fear of being alone and helpless due to the risk of hypoglycemia and the possible traumatic events that could occur (Brown et al., 2019; Grammes et al., 2017; Rankin et al., 2013). One person diagnosed with diabetes expressed feeling paranoid of becoming hypoglycemic when her spouse would go on business trips. People diagnosed with diabetes who had difficulty with self-management of checking their blood sugar levels reported the need of an extra set of eyes to manage their condition properly and felt increased levels of anxiety when left alone due to their hypoglycemia unawareness and the possibility of a hypoglycemic event (Rankin et al., 2013). In one study, many people diagnosed with diabetes expressed concerns about being alone during hypoglycemic events and not being able to ask for help, which caused a sense of helplessness and was particularly emphasized in conjunction with nocturnal hypoglycemia. (Grammes et al., 2017). Some people diagnosed with diabetes who were living alone felt an intensified anxiety and worry as their blood glucose levels dropped at expedient rates and expressed a fear of being unable to reach and administer a corrective measure. (Brown et al., 2019). In one study, people with type 2 diabetes expressed a fear of hurting someone, especially related to car accidents, specifically shorter duration car rides were of more worry, due to checking their glucose levels less frequently before short trips. Stories these people with type 2 diabetes had heard of such as other people diagnosed with diabetes getting into car accidents due to hypoglycemia increased this fear (Grammes et al., 2017). Fear could also cause higher frequency of hypoglycemia, in one study.
people diagnosed with diabetes expressed that their fear of hyperglycemia and the risk of long-term complications such as going blind, which resulted in an increased risk and prevalence of hypoglycemia (Speight et al., 2014).

**Helplessness, lack of control & avoidance**

Helplessness was expressed by many people diagnosed with diabetes as a subsequent result of their experiences with hypoglycemia, especially by those who had suffered severe events (Brown et al., 2019; Grammes et al., 2017; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Speight et al., 2014; Stuckey et al., 2021). Helplessness could be expressed by people diagnosed with diabetes specifically regarding nocturnal hypoglycemia and the possibility of falling asleep and never waking up again, without anyone knowing (Grammes et al., 2017). People diagnosed with diabetes expressed a sense of helplessness and frustration when it came to treating hypoglycemia, despite knowing what to do in a textbook sense, trying to treat the event and not having the desired result was common, and often led to a rebound effect resulting in hyperglycemia, which increased the feelings of helplessness and lack of control (Brown et al., 2019). This study found that many people diagnosed with diabetes expressed the use of avoidance techniques as to not be controlled by hypoglycemic events (Martyn-Nemeth et al., 2018; Rankin et al., 2013; Speight et al., 2014). Some people diagnosed with diabetes avoided physical exercise due to the high risk of hypoglycemia in conjunction with increased physical activity. Some people diagnosed with diabetes avoided hypoglycemia and their feelings of helplessness by running their glycemic values higher than desired, as to mitigate the risk of hypoglycemic events (Martyn-Nemeth et al., 2018). In one study a person diagnosed with diabetes, who suffered from hypoglycemia unawareness, avoided hypoglycemia through purposefully maintaining hyperglycemic values during important events, such as business presentations, as to avoid impairment (Ranking et al., 2013). While some people diagnosed with diabetes avoided activities that would cause hypoglycemia, others raised their blood sugar levels prophylactically, many people diagnosed with diabetes avoided hyperglycemia and subsequently incurred more frequent hypoglycemia. Some people diagnosed with diabetes were far more frightened of the long-term complications that frequent hyperglycemia could result in, that they allowed themselves to remain at risk for hypoglycemic events (Speight et al., 2014).

**Restrictions & stress factors**

Many people diagnosed with diabetes who experience hypoglycemia subsequently feel limitations in their lives and feel a burden which compounded with the daily stressors life presents (Grammes et al., 2017;
Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Speight et al., 2014). People diagnosed with diabetes expressed a worry about potentially embarrassing themselves during a hypoglycemic event. They feared being misunderstood as drug addicts or drunk as well as being seen as stupid due to the symptoms of and reactions to hypoglycemia, some people diagnosed with diabetes also did not want to feel judged based on the diagnosis of diabetes. People diagnosed with diabetes also expressed the burden of possible long-term complications such as damage to their health or bodies, and not wanting to become a burden on their loved ones (Grammes et al., 2017). Some people diagnosed with diabetes expressed how stressful situations and days at work caused hypoglycemic incidences, and because of the inconvenient timing of the event, felt that it was a burden that took away from their ability to perform in their careers. Exercise was an important factor for some people diagnosed with diabetes, as it was a necessity for maintaining good health, those that exercised regularly felt the need to extensively plan for the activity, others refrained from exercising due to its causal effect of hypoglycemia. For some people diagnosed with diabetes, their relationship with food in combination with hypoglycemia changed some people diagnosed with diabetes chose to use hypoglycemia as a license to overindulge in sweets and saw it as medicinal (Martyn-Nemeth et al., 2018). People diagnosed with diabetes experienced restrictions and impacts in their lives due to hypoglycemia, especially those who suffered severe cases of hypoglycemia, the life domains affected by people with type 1 diabetes and people with type 2 diabetes physical activities of which nearly one twentieth and one tenth were affected, respectively. Mood or emotional status was affected by roughly one fifth of people diagnosed with diabetes, social or leisure activities were affected by less than one in ten people diagnosed with diabetes, work or school were affected by a significant minority, daily activities were affected for roughly 15% of people with type 1 diabetes and slightly more for people with type 2 diabetes. People diagnosed with diabetes relationships with family or friends were affected by a small minority. People diagnosed with diabetes sleep was affected by roughly one in six. A little more than a third to roughly 40% of people diagnosed with diabetes reported that more than one life domain was affected by their most recent severe hypoglycemic event (Snoek et al., 2022). Similarly, roughly one sixth of people with type 1 diabetes and nearly one fifth people with type 2 diabetes reported their physical activities being impacted, roughly a fourth of people with type 1 diabetes and people with type 2 diabetes reported their mood/emotional status being affected. Just about one in fifteen of people with type 1 diabetes and slightly more than one in seven people with type 2 diabetes reported their leisure/social activities being impacted, Close to one twentieth of people diagnosed with diabetes reported that work or school was impacted, and slightly more than one in ten people.
with type 1 diabetes and about a fifth of people with type 2 diabetes reported daily activities being affected. About one in twenty people with type 1 diabetes and a heavy minority of people with type 2 diabetes reported personal relationships being affected. Just under one fifth of people with type 1 diabetes and about a quarter of people with type 2 diabetes reported their sleep being impacted, however close to 60% of people with type 1 diabetes and about half of people with type 2 diabetes reported no impact in the aforementioned areas due to their most recent severe hypoglycemic event (Mojdami et al., 2021).

**Hypoglycemia confidence**

Hypoglycemia confidence was attained by many people diagnosed with diabetes who have suffered from the various stages of hypoglycemia. Acquiring hypoglycemia confidence was attributed to preventing recurrent episodes of hypoglycemia, and learning from the most frequent method in which people diagnosed with diabetes who experience hypoglycemia could learn and develop skills in handling the possibly catastrophic events, hope was gained through various methods such as research and successful actions taken during hypoglycemic events (Brown et al., 2019; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Stuckey et al., 2021).

**Hope**

Some people diagnosed with diabetes expressed hope when dealing with hypoglycemic episodes. The ability to improve their knowledge and understanding of treating hypoglycemic events and preventing them, as well as their current skills in handling these situations facilitated a hopeful disposition within people diagnosed with diabetes (Brown et al., 2019; Martyn-Nemeth et al., 2018). Some people diagnosed with diabetes who suffer from frequent hypoglycemic episodes also voiced that the possibility of researchers developing a cure for diabetes or developing new treatments that could ease their burden gave them a sense of hope for the future (Brown et al., 2019). Some people diagnosed with diabetes expressed gaining hope in different ways, one person diagnosed with diabetes who suffers from challenges due to hypoglycemia stated that they try to live a normal life, to not be consumed by the circumstances while still managing them. Another person diagnosed with diabetes voiced how many limitations they placed on themselves regarding activities when they were younger, they had begun to recognize that they could still pursue them, which had a hopeful effect. Another person diagnosed with diabetes who suffers complications of hypoglycemia expressed how they focus on their hypoglycemic issues and then after some time the idea of their mortality is no longer present (Martyn-Nemeth et al., 2018).
Preventing recurrence

People diagnosed with diabetes adjusted their lifestyle habits and treatment protocols to mitigate the risk and severity of hypoglycemic episodes and improve their diabetes management (Martyn-Nemeth et al., 2018; Mojdam et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Stuckey et al., 2021). In two studies people diagnosed with diabetes voiced how past experiences with hypoglycemia bolstered their hypoglycemia confidence (Brown et al., 2019; Martyn-Nemeth et al., 2018). People diagnosed with diabetes frequently felt that with time, reflection and experience their hypoglycemic confidence improved. The ability to act as well as determining the causal events that led to the onset of a hypoglycemic episode was a valuable learning tool in self-management, and bolstered self-confidence. This feeling was voiced even after having a recurring episode due to understanding that some combination of actions led to the new hypoglycemic episode but did not diminish their overall hypoglycemic confidence (Brown et al., 2019). Many people diagnosed with diabetes who suffer from hypoglycemic events voice coping methods they have developed to stay positive and create a supportive environment. One person diagnosed with diabetes voiced that after experiencing a hypoglycemic episode the first action they take is to analyze the data to determine what caused each specific event (Martyn-Nemeth et al., 2018).

In response to their most recent severe hypoglycemic events, many patients diagnosed with diabetes made changes to their insulin regimen, or timing of dose (Mojdami et al., 2021; Snoek et al., 2022). Nearly half of patients diagnosed with diabetes measured their blood glucose more frequently (Mojdami et al., 2021; Snoek et al., 2022). A minority of patients diagnosed with type 1 and type 2 diabetes began wearing continuous glucose monitors (CGM), patients diagnosed with type 1 diabetes were far more prone to acquiring and using a CGM (Mojdami et al., 2021; Snoek et al., 2022). Most people diagnosed with diabetes began carrying candy, sweets, food, sugary drinks or adjusted their meal plans in response to their most recent severe hypoglycemic events (Mojdami et al., 2021; Snoek et al., 2022). Very few people diagnosed with diabetes acquired a glucagon kit or confirmed having one in response to their most recent severe hypoglycemic event, and even fewer kept them on their person or in frequented areas (Mojdami et al., 2021; Snoek et al., 2022). A few people diagnosed with diabetes researched for increased knowledge pertaining severe hypoglycemia and preventative treatments in response to their most recent severe hypoglycemic event (Mojdami et al., 2021).
Discussion

Method discussion
This study was done using as a general literature review using a qualitative inductive approach which was relevant due to the purpose of the study being to elucidate the lived experiences of hypoglycemia in people diagnosed with diabetes mellitus. The purpose of the study did not call for coming to any conclusions nor stating a hypothesis in order to describe the experiences, therefore a deductive approach would have been invalid. To ensure the scientific quality of this study, following the guidance of Henricson (2017), the qualitative indicators credibility, dependability, confirmability and transferability were used as a guide throughout the study as they pertain to qualitative methods.

This study used two databases, CINAHL and PubMed in which both contain nursing based articles, which increases the sensitivity and credibility of the results, however adding a third database would have further increased the credibility which can be seen as a weakness (Henricson, 2017). Choosing mostly qualitative research articles was necessary in order to attain peoples experiences, while the additional quantitative articles provided context relating to the prevalence of various experiences as to show the commonality and importance of said experiences. Choosing only articles that were peer reviewed was necessary in order to solidify this studies credibility, as only research articles that have been reviewed by independent experts within their respective fields can be considered scientifically credible. According to Mårtensson and Fridlund (2017) in order to maintain scientific quality, only articles that have been peer reviewed, are original works and are from primary sources should be used, which this study followed.

The first search via PubMed resulted in 1012 articles, of which only 2 were applicable and used for this study, this can be seen as a weakness within the study as the amount of relevant articles were limited. After consulting a librarian and research expert, who assisted with various other search techniques, it was deemed necessary as those searches did not yield any applicable findings, including the results articles that were gained from the original search. The same search within CINAHL yielded 196 articles, of which 3 were used after proper verification of scientific quality, and was a far more manageable amount of results. The secondary search was done using the specific search terms, focus groups or interviews, which was chosen after guidance from a research expert in order to facilitate more qualitative studies, although this resulted in two more results articles from PubMed, it yielded no new studies from CINAHL, and can be seen as a weakness due to its lack of reliability within both databases.
The results articles came from numerous countries, Canada, Germany, The United States of America and the United Kingdom. This can be a strength to the study as it shows a variety of experiences from people diagnosed with diabetes mellitus experiences of hypoglycemia. Due to the nature of the information gathered, not being of any specific healthcare systems context, the transferability of the results to Sweden is sound, as people diagnosed with diabetes mellitus undergoing insulin treatment or other treatments that can lead to hypoglycemia is standard treatment protocol.

During the data analysis, as this study was done by a single researcher, all of the results articles were reviewed and assessed by the singular researcher, which is a strength in that all of the material was analysed by the same individual, which increases the results dependability. This can however also be seen as a weakness in not having a second pair of eyes and a partner to confer with (Henricson, 2017). All of the results articles were reviewed for scientific quality using Carlsson and Eiman (2003) by a single researcher, which can both be a strength and a weakness. It is a strength in that all material was reviewed and assessed by the same individual, however it can be seen as a weakness as no secondary researcher could provide validation or an alternative view of the assessment. The results articles of this study were all of grade 1 based on the scientific quality assessment tool by Carlsson and Eiman (2003), and that is a strength as it speaks to a high level of scientific quality within the results which increases the studies credibility (Henricson, 2017). The results of this study are from 6 qualitative and 2 quantitative studies which is considered an adequate amount of results with varied and similar experiences, however incorporating a few more qualitative studies would have further strengthened the results, having 2 quantitative studies which gave insight into the prevalence of certain experiences was a strength that improved the credibility of the study.

The research ethics of this study were strengthened by only using research articles that have been peer reviewed, accepted by an ethical committee, or exempted by an ethical review board which ensured that this study is not in breach of research ethics. The results articles included gave clear representation of their strides to uphold research ethics, and documented whether they were approved for or exempted from the need of ethical approval, as well as most of the researchers stating that informed consent was given by study participants.

This studies results and data analysis were reviewed both by a thesis advisor, as well as by fellow students working on their own bachelors disserations, and as such it increases the credibility and dependability of the study (Henricson, 2017).
Results discussion

This study has resulted in elucidating two main categories of experiences of hypoglycemia in people diagnosed with diabetes: Challenges associated with hypoglycemia which incorporated fear, helplessness & lack of control/avoidance, and restrictions & stress factors associated with hypoglycemia. The second key category was hypoglycemia confidence which incorporated: hope and Preventing recurrence.

Within the first main category, Challenges associated with hypoglycemia, the most salient experience was fear (Brown et al., 2019; Grammes et al., 2017; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Speight et al., 2014; Stuckey et al., 2021). In a new study, which validates the findings of the frequent experience of fear, fear of hypoglycemia was explained as normal or abnormal, the normal fear of hypoglycemia is an evolutionary developed defense against anticipated danger, however abnormal fear of hypoglycemia is persistent, recurrent, or objectively inappropriate to the risk (Przezak et al., 2022). Due to the life-threatening nature of severe hypoglycemia, fear of hypoglycemia is a rational response that people diagnosed with diabetes experience. The experience of fear so frequently expressed by people diagnosed with diabetes can be understood due to the symptoms that clinically important hypoglycemia presents, such as cardiac arrythmias, cognitive impairment, and that it is a predictor of severe hypoglycemia and mortality. (Amier, 2021). Amongst those with hypoglycemia unawareness, the lack of early warning signs of hypoglycemia could result in increased fear, due to being unable to detect and thereby treat a possibly life-threatening event. Fear of sleep was found in many people diagnosed with diabetes in this study (Brown et al., 2019; Grammes et al., 2017; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Snoek et al., 2022). hypoglycemia and the associated fear were shown to occur more frequently at night and were associated with diminished sleep quality along with a subsequent reduced quality of life (Przezak et al., 2022). People diagnosed with diabetes often expressed feeling fear of hypoglycemia when they were alone (Brown et al., 2019; Grammes et al., 2017; Rankin et al., 2013) which in a new study by Peter et al., (2023) 42% of participants who took the survey agreed or strongly agreed that fear was increased during times of solitude. The impact of clinically important and severe hypoglycemia resulting in cognitive decline and confusion along with feelings of weakness that if untreated can lead to severe hypoglycemia and death, as stated by Amier (2021), is likely to cause a sense of heightened fear and anxiousness for those that have experienced a severe incidence, and indicates that these people diagnosed with diabetes lack the necessary skills or knowledge in order to maintain a proper self-care balance as per Dorothea Orems theory of the self-care deficit (Wiklund Gustin & Lindwall, 2012). Nurses need to be aware of the various
treatments pertaining to severe hypoglycemia and preventative methods as to instruct patients on improvements that can facilitate their self-care balance and give the people diagnosed with diabetes the tools required to handle the burdens that daily life as a patient diagnosed with diabetes undergoing anti-hyperglycemic treatment demands. Furthermore, these recurrent fears of hypoglycemia make the affected people diagnosed with diabetes more vulnerable to developing psychological disorders according to the stress and vulnerability model (Linton & Flink, 2016). This indicates a particular need for nurses to identify and assist patient with diabetes in developing proper coping strategies and planning for possible hypoglycemic events, as to increase their feelings of security and improve upon their resilience through adequate preparation.

The second sub-category of challenges associated with hypoglycemia was helplessness, lack of control & avoidance. People diagnosed with diabetes expressed feeling helpless due to hypoglycemia often. In two studies more than half of people diagnosed with diabetes and nearly half of people diagnosed with diabetes felt helpless due to their most recent severe hypoglycemic episode, respectively (Mojdami et al., 2021; Snoek et al., 2022). Most of these severe hypoglycemic events by people diagnosed with diabetes found in the study by Mojdami et al. (2021) happened at night, which coincides with the findings of Przezak et al. (2022). One person diagnosed with diabetes in a study by Grammes et al. (2017) expressed a particularly salient feeling “My blood sugar is sometimes uncontrollable at night, you could fall asleep and never wake up again and nobody would notice. That’s why I like to have a glass of apple juice before I go to bed”. Similarly in new study, people diagnosed with diabetes expressed purposefully running their blood sugars high as to avoid nocturnal hypoglycemia, which was detrimental to their control and affected them the day after, feeling lethargic and unable to properly function. (Chatwin et al., 2021). The use of avoiding hypoglycemia through maintaining hyperglycemia as to mitigate the risk and the perceived control that hypoglycemia took from people diagnosed with diabetes was voiced as a frequent behavior, which only exacerbated the people diagnosed with diabetes lack of glycemic control (Brown et al., 2019). Avoidance of hypoglycemia was used in association with other aspects of daily life by people diagnosed with diabetes (Martyn-Nemeth et al., 2018; Rankin et al., 2013; Speight et al., 2014). Many people diagnosed with diabetes reported their physical exercise being impacted by hypoglycemia, which was similarly found in a study by Chatwin et al. (2021) where people diagnosed with diabetes felt that their ability to exercise for similar durations to those without the diagnosis of diabetes was significantly reduced due to the risk of hypoglycemia, as extensive exercise is found to be a main risk factor for a hypoglycemic event (CDC, 2022). In a new study people diagnosed with
diabetes expressed that their experiences with hypoglycemia make them reluctant to leaving the home alone, and that other than while asleep, hypoglycemia is frequently on their mind (Sari et al., 2024). In another new study, it was shown that people with type 2 diabetes frequently reported having to stay home due to worry of hypoglycemia, and that this specific worry was coupled to hypoglycemia avoidance (Wu et al., 2023). Reduced physical activity as a tool for mitigating hypoglycemic events is a detrimental health reducing strategy, nurses need to work with the affected PWD to find healthy strategies that promote health and increase the patient with diabetes self-care balance to correct this clear self-care deficit and imbalance, which would improve patients diagnosed with diabetes overall health outcomes and reduce the risk for developing comorbidities. In Sweden’s health and medical care law, SFS (2017:30) it states that healthcare services should work in health promotion, which due to the long-term complications associated with reduced physical activities and the slew of comorbidities that diabetes is a risk factor for, requires the attention of nurses so that healthy strategies for prevention of hypoglycemia, that do not increase the patients overall health burden, can be implemented. In accordance with the stress-vulnerability model, providing means by which patients diagnosed with diabetes can increase their resilience, would be a positive step in preventing the onset of psychological disorders as comorbidities which in turn would decrease patients diagnosed with diabetes quality of life and increase the self-care deficit of the affected people diagnosed with diabetes.

The third sub-category of challenges associated with hypoglycemia was restrictions and stress factors. This study found that many people diagnosed with diabetes experienced restrictions to their lives and expressed stress factors attributed to hypoglycemia which included physical restrictions and limitations as well as self-conscious mentalities pertaining to both autonomic and neuroglycopenic symptoms of hypoglycemia and feeling judged by those within their surroundings (Grammes et al., 2017; Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Speight et al., 2014). In one study people diagnosed with diabetes expressed how during times of hypoglycemia while out in public, they felt judged by those in their surroundings, due to symptoms of hypoglycemia causing them to seem under the influence of drugs, alcohol, or stupid and worried about embarrassing themselves during a hypoglycemic event (Grammes et al., 2017). As hypoglycemia progresses from stage 1 in which autonomic symptoms occur such as: tremors, diaphoresis, anxiety, palpitations, paresthesia, and a sensation of hunter. After hypoglycemia has progressed to stage 2, the neuroglycopenic symptoms kick in, which include: lack of concentration, headache, blurred vision, dizziness, confusion, convulsions, speech disturbance, restlessness, and an eventual
loss of consciousness (Nakhleh & Shehadeh, 2021). As many of these symptoms are often associated with drug or alcohol use, patients diagnosed with diabetes require support from nurses and their social circles to improve upon their mental health and coping strategies due to the risk of developing comorbid psychological disorders. In a new study, the risk of developing comorbid depression for people diagnosed with diabetes has been found to be 50-100% higher than the overall population and are at a substantially greater risk of developing anxiety (Akhaury & Chaware, 2022). This indicates that this specific group of people have a particular vulnerability, in which nurses need to be perceptive of their individual needs, so that they can mitigate the risk of falling prey to crippling comorbidities. In this study it was found that people diagnosed with diabetes expressed a burden imposed by hypoglycemia as it pertains to their professional life, it impacted both their productivity and their ability to maintain employment.

Hypoglycemia for some was brought on by increased stress, and for others was inverted (Grammes et al., 2017). The diminished productivity expressed by people diagnosed with diabetes could increase their overall risk for developing psychological comorbidities, as loss of employment due to health burdens can contribute to a diminished self-worth, which could result in increased vulnerability, health burden, and diminished quality of life.

The second major category: Hypoglycemia confidence was particularly expressed by means of developing preventative measures addressed in the subcategory Preventing recurrence. People diagnosed with diabetes expressed a variety of measures to prevent recurring severe and non-severe hypoglycemia (Martyn-Nemeth et al., 2018; Mojdami et al., 2021; Rankin et al., 2013; Snoek et al., 2022; Stuckey et al., 2021). A major aspect of preventing recurrence of hypoglycemic episodes was the use of trial and error, which was seen as an experience lived by many people diagnosed with diabetes. Learning from previous experiences as to what works when correcting, and how best to mitigate the onset of hypoglycemia is often determined by individual characteristics. A new study found that specifically in situations of physical activity, trial and error is a frequently used method in learning how to maintain the balance of euglycemia in patients diagnosed with diabetes. It is also stated that the need for education on safe physical activity practice is widely recognized and acknowledged (Cigrovski Berkovic et al., 2021). This study found that people diagnosed with diabetes hypoglycemic confidence increased due to the ability to successfully correct the event and learn from it. (Brown et al., 2019; Martyn-Nemeth et al., 2018). As insulin doses vary depending on individual characteristics such as insulin resistance, BMI, carbohydrate intake and physical activity, it is easily deduced that a primary method of making corrections for optimal glycemic control would be trial and error, as over time these variables change and as such the treatment plans will be altered.
Nurses have an integral role in patient education, in which considering these ever-altering variables, discussing with patients the best methods to manage their condition, as to prevent recurrent hypoglycemia, which over time would lead to a higher level of self-efficacy and self-care balance in patients diagnosed with diabetes.

Conclusions & implications

This study shows that hypoglycemia is an ongoing issue for patients diagnosed with diabetes mellitus, and both the short term and long-term experiences can vary heavily. The main results of this study were challenges associated with hypoglycemia which involved people diagnosed with diabetes feeling fear, which was heavily associated with nocturnal hypoglycemia, hypoglycemia while alone, or during outings, or whilst working. Helplessness, lack of control and initiating in avoidance tactics which were mainly coupled with handling hypoglycemic episodes and lastly restrictions and stress factors. People diagnosed with diabetes also felt hypoglycemic confidence, which was primarily due to learning actions to prevent recurrence and successful treatment of hypoglycemia, which often came through trial and error from past experiences. Nurses need to be aware of these varied experiences patients diagnosed with diabetes have of hypoglycemia so that they can facilitate appropriate care and help these patients diagnosed with diabetes attain a self-care balance. Suggestions for future studies would be to focus on identifying effective measures to improve patients diagnosed with diabetes mellitus hypoglycemia confidence, along with literary studies regarding patients diagnosed with diabetes mellitus experiences of specifically non severe hypoglycemia, as much of the current research pertains to experiences of severe hypoglycemia.
Referenser

https://doi.org/10.7759%2Fcureus.30733

https://doi.org/10.1007%2Fs00125-020-05366-3


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*Martyn-Nemeth, P., Duffecy, J., Fritschi, C. & Quinn, L. (2018, 6 may). Challenges Imposed By Hypoglycemia in Adults With Type 1 Diabetes. [https://doi.org/10.1177/1054773818774702](https://doi.org/10.1177/1054773818774702)*


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title


https://doi.org/10.2337/cd21-0131

https://doi.org/10.1177/2050312114527443

https://doi-org.ezproxy.bib.hh.se/10.1111/dme.14745

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https://doi.org/10.1186%2Fs12888-023-04698-9

https://doi.org/10.2337/diacare.28.12.2948

### Appendix A

**Table 1: Key word search**

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<th>CINAHL</th>
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<tr>
<td>1</td>
<td>Diabetes mellitus</td>
<td>Diabetes mellitus</td>
<td>Diabetes mellitus</td>
<td>Diabetes patients</td>
</tr>
<tr>
<td>2</td>
<td>Hypoglycemia</td>
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<td>3</td>
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<td>Patient experiences</td>
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<td>Patient Perceptions</td>
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<td>Patient perceptions</td>
<td>Focus groups</td>
</tr>
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<td>Text</td>
<td>interviews</td>
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## Appendix B

### Table 2: Search history

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<td>1</td>
<td>27/1/24</td>
<td>CINAHL</td>
<td><em>(Diabetes mellitus)</em> AND <em>(hypoglycemia OR hypoglycaemia OR low blood sugar)</em> AND <em>(patient experiences OR patient perceptions OR patient opinions OR patients attitudes OR patient views)</em>. Peer reviewed, 10 years, English language</td>
<td>196</td>
<td>15</td>
<td>4</td>
<td>3</td>
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<tr>
<td>2</td>
<td>29/1/24</td>
<td>CINAHL</td>
<td><em>Diabetes patients with hypoglycemia AND patient experiences AND focus group or interview</em>. Peer reviewed, 10 years, English language</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>3</td>
<td>27/1/24</td>
<td>PubMed</td>
<td><em>(Diabetes Mellitus)</em> AND <em>(Hypoglycemia or hypoglycaemia or low blood sugar)</em> AND <em>(Patient experiences or patient perceptions or patient opinions or patient attitudes or patient views)</em> peer reviewed, 10 years, English language</td>
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Appendix C

Table 3: Article identification

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<td><strong>dB Name</strong></td>
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<tr>
<td><strong>Purpose</strong></td>
<td>To gain a deeper understanding of patients’ emotions regarding hypoglycemia</td>
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<tr>
<td><strong>Method</strong></td>
<td>A descriptive qualitative approach, 30–45-minute semi-structured interviews focusing on the experiences of hypoglycemia from the patient perspective.</td>
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<td><strong>Selection</strong></td>
<td>16 men and women with type 1 or type 2 diabetes with a mean age of 53 and a mean time since diagnosis of 21 years. 10 women 5 with type 1 and 5 with type 2 diabetes, and 6 men 3 with type 1 and 3 with type 2. The mean age of those with type 1 diabetes was 40 (22-64) and 60 years of age for type 2 (45-77). Ethical approval was given by the Western University Review Board of Health Sciences Research involving Human Subjects. Informed consent was obtained.</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>After obtaining participants informed consent, 30 to 45-minute semi-structured interviews were conducted with each patient. The interviews were audiotaped and transcribed verbatim, data collection ceased after reaching saturation (when no new themes emerged).</td>
</tr>
<tr>
<td><strong>Data Analysis</strong></td>
<td>Both iterative and interpretative using individual and team analyses were used. 4 research members individually reviewed each transcript to identify key concepts emerging from the data, later the team met to compare independent reviews, which culminated to the development of the coding template. NVivo 10 software was used to code and organize the data, the team then met to synthesize and interpret the main themes using immersion and crystallisation methods.</td>
</tr>
<tr>
<td><strong>Research attrition</strong></td>
<td>There was no discussion in relation to research participants dismissing themselves nor being dismissed from the study.</td>
</tr>
<tr>
<td><strong>Results, Conclusion</strong></td>
<td>The analysis of the data resulted in intricate patterns of emotions regarding the patients with diabetes experiences of hypoglycemia. Fear, anxiety, frustration, confidence, and hope were the main themes that emerged. Fear was a predominant emotion expressed by participants. Fear for some led to seeking further control of their condition, and for others a sense of fatalism. Conclusion: Patients’ emotions and actions regarding hypoglycemia events evoke feelings of fear and anxiety, the role of hope may temper these emotions. Patients along with their healthcare providers may strengthen hope to assist in better management of their hypoglycemia.</td>
</tr>
<tr>
<td><strong>Scientific Quality</strong></td>
<td>83% Grade 1 Carlsson and Eiman (2003)</td>
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**Article 2**

**Information about the Article**

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<td>Purpose</td>
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<tr>
<td>Method</td>
<td>In depth semi structured focus groups, 13 focus groups conducted in 3 diabetes outpatient care units. Focus groups were between 3 and 8 participants, planned to be 90 minutes. Received ethical approval from the local medical board of the State of Rhineland Palatine</td>
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<tr>
<td>Selection</td>
<td>64 insulin dependent adults with type 2 diabetes recruited from 3 diabetes care centers, with insulin treatment for at least 6 months, aged 18+, fluent in German with the ability to provide consent. Exclusions of those with diagnosed psychiatric disorders, or somatic conditions that precluded the ability to give consent.</td>
</tr>
<tr>
<td>Data Collection</td>
<td>Self-report questionnaires were completed at the beginning of each group, J.G. and W.S. moderated all focus groups and C.G.M took word-by-word notes, the sessions were audio recorded. Field notes were taken by 1 of 2 moderating researchers.</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>Thematic analysis guided by analytical induction. A note-based analysis strategy was adopted: the field notes and participants’ written answers on the discussion points were collected and independently assigned into thematic categories using a bottom-up coding procedure. Themes were discussed in an iterative process until consensus was reached among researchers. The identified themes were supplemented by representative quotations using the audio recordings of the focus group sessions.</td>
</tr>
<tr>
<td>Research attrition</td>
<td>There was no discussion pertaining research participants dismissing themselves nor being dismissed.</td>
</tr>
<tr>
<td>Results, Conclusion</td>
<td>Eight themes were identified, unconsciousness/death, aloneness/helplessness, fear of hurting somebody, shame, loss of physical control, long-term complications, diabetes self-management issues and impaired awareness. 30 participants (46,9%) scored at 3 or greater on at least 1 item of the hypoglycemia fear scale, indicating elevated worries. Self-efficacy regarding diabetes management seemed to play an important role in fear of hypoglycemia in patients with type 2 diabetes. Conclusion: Given that even subclinical worries can have negative effects on quality of life and diabetes self-management, emphasis on diabetes education to help patients develop self-efficacy concerning diabetes self-management should be placed.</td>
</tr>
<tr>
<td>Scientific Quality</td>
<td>91% Grade 1 Carlsson and Eiman (2003)</td>
</tr>
<tr>
<td><strong>Article 3</strong></td>
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<tr>
<td><strong>Reference</strong></td>
<td>Martyn-Nemeth, P., Duffecy, J., Fritschi, C. &amp; Quinn, L. (2018, 6 may). Challenges Imposed By Hypoglycemia in Adults With Type 1 Diabetes. <a href="https://doi.org/10.1177/1054773818774702">https://doi.org/10.1177/1054773818774702</a></td>
</tr>
<tr>
<td><strong>Country</strong></td>
<td>United States of America</td>
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<tr>
<td><strong>dB Name</strong></td>
<td>PubMed</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>To understand how hypoglycemia and associated fears influence day-to-day life among adults with type 1 diabetes mellitus who use contemporary management strategies.</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>An exploratory qualitative study with 5 focus groups of 30 people aged 20 to 57 years with type 1 diabetes mellitus. The study was approved by the University of Illinois Chicago Human Subjects Institutional Review Board. All participants provided informed consent prior to participation.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>Adult men and women aged 18 to 65 years diagnosed with type 1 diabetes mellitus for at least 1 year and were fluent in English.</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>Focus group sessions with approximately 6 participants per session. Each focus group was 2 hours in length, sessions were led by a trained moderator and a research assistant took notes during the session. The moderator followed an organized script, the discussions were audi-taped, and participants complete questionnaires providing demographic and health information.</td>
</tr>
<tr>
<td><strong>Data Analysis</strong></td>
<td>Debriefings were held by the moderator, the principal investigator, and research assistant follow each focus group session to review the content and conduct of the sessions. Audiotapes were transcribed verbatim by a professional transcriptionist and reviewed for accuracy by the research team. De-identified transcripts were read and reread individually by team members, followed by coding the transcripts to content themes. Differences in content themes were identified and reconciled, interpretations were supported using verbatim quotes.</td>
</tr>
<tr>
<td><strong>Research attrition</strong></td>
<td>There was no discussion pertaining research participants dismissing themselves nor being dismissed.</td>
</tr>
<tr>
<td><strong>Results, Conclusion</strong></td>
<td>Eight themes emerged from the discussions. Hypoglycemic worry, unpredictability and loss of control, contending with life stress, exercise benefits and challenges, a changed relationship with food, sleep fears, a love/hate relationship with technology, and coping strategies to make it better. Conclusion: Hypoglycemia remains a major concern for adults with T1DM despite contemporary therapies. The challenges of managing a chronic condition with family and work demands create a high degree of stress. The influence of day-to-day diabetes care on diet, exercise, sleep, and overall quality of life is highly significant. Technology has enhanced self-management but created a perceived dependency with challenges.</td>
</tr>
<tr>
<td><strong>Scientific Quality</strong></td>
<td>83% Grade 1 Carlsson and Eiman (2003)</td>
</tr>
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<td>Article 4</td>
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**Reference**

**Country**
Canada

**dB Name**
CINAHL

**Purpose**
To better understand the severe hypoglycemia experiences of persons with diabetes and their caregivers.

**Method**
Cross sectional study. Ethical approval was given by the Chesapeake institutional review board and respondents provided informed consent.

**Selection**
Persons with T1D, T2D, and caregivers of PWD. 18 years or older, with insulin treated type 1 or type 2 diabetes who had been treated with insulin via injection or pump. Had at least 1 self-reported severe hypoglycemic event in the last 3 years, while treated with insulin. Caregivers who assistance was relied upon by PWD during severe hypoglycemic events were included. CGs were recruited separately. Those using sulfonylureas and insulin were excluded. PWD with bipolar disorder or schizophrenia were excluded. Participants, 324 respondents (184 PWD & 140 CGs), 116 T1D and 68 T2D.

**Data Collection**
An online cross-sectional 30-minute survey about PWD experiences of severe hypoglycemia. A qualitative pilot study was conducted prior to validate the final survey.

**Data Analysis**
Descriptive statistical analyses were performed using SAS version 9.4 statistical software. Categorical data are presented as number and percent, continuous data are presented as mean and standard deviation.

**Research attrition**
There was no mention of participants being dismissed nor dismissing themselves

**Results, Conclusion**
Within the past 12 months, the median (interquartile range, Q1 to Q3) number of severe hypoglycemic events reported by T1D was 1 (range, 1 to 3; mean standard deviation, 4.2 ± 9.1) and T2D reported experiencing 1 (range, 1 to 3; mean standard deviation, 3.1 ± 4.4) severe hypoglycemic events over the last 12 months, 52.9% of T1D and 69.9% of T2D severe hypoglycemic events were nocturnal.

Many PWD reported that they felt helpless (54.3% T1D PWD, 60.3% T2D PWD) unprepared (41.4% T1D PWD, 47.1% T2D PWD) and scared (61.2% T1D PWD, 64.7 T2D PWD). Actions taken after most recent severe hypoglycemic event: T1D & T2D, adjusted insulin dose (31.9% & 39.7%), checked blood sugar more frequently (59.5% & 48.5%), carried candy or sugar (41.4% & 42.6%), carried food or drink (23.3% & 17.6%), a small percentage of patients with diabetes obtained a glucagon kit after their most recent severe hypoglycemic event (6.5% & 2.5%).

Conclusion: According to PWD respondents, the most recent severe hypoglycemic even negatively affected their mood or emotional status, sleep and physical activities.

**Scientific Quality**
87% grade 1 Carlsson and Eiman (2003)
<table>
<thead>
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<th>Article 5</th>
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<td><strong>Country</strong></td>
<td>United Kingdom</td>
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<tr>
<td><strong>dB Name</strong></td>
<td>PubMed</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>To explore the experiences of people who have hypoglycaemia unawareness and its impact on their everyday lives</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Qualitative design with in depth interviews, exploratory design. Grounded theory based. Research ethics approval was granted by the National Research Ethics Service, King’s College Hospital Research Ethics Committee.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>38 people with type 1 diabetes from 2 UK diabetes centres as part of a larger study on hypoglycaemia unawareness. Purposive sampling.</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>Semi structured interviews, averaged of 60 minutes were digitally recorded with consent and then transcribed in full.</td>
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<tr>
<td><strong>Data Analysis</strong></td>
<td>The method of constant comparison was used to develop a framework of themes to code and further analyse the data. 2 researchers independently analysed all transcripts before cross comparing and all interviews. Regular meetings were attended by the researchers to discuss deviant cases, resolve differences in interpretation, and reach agreement in the findings. The final coding frame was the result of all data independently and jointly reviewed and reflected the topics explored with participants and emergent themes. NVivo qualitative software was used data coding and retrieval.</td>
</tr>
<tr>
<td><strong>Research Attrition</strong></td>
<td>There was no discussion in relation to research participants dismissing themselves nor being dismissed from the study.</td>
</tr>
<tr>
<td><strong>Results, Conclusion</strong></td>
<td>Participants reported imposed and self-imposed changes to their lives including leaving employment, curtailing pastimes, and spending more time at home or being supervised by others. Some reported downplaying the impact of the condition and getting on with their lives which put their health and safety at risk. Some expressed concerns with becoming a burden on family and responding aggressively/irrationally towards others during a hypoglycemic event. Conclusion: Hypoglycaemia unawareness can result in traumatic life changing experiences; health professionals should give more emphasis to the psychological difficulties reported by people with the condition and emphasize successful strategies employed by family members to identify and treat hypoglycaemia.</td>
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<tr>
<td><strong>Scientific Quality</strong></td>
<td>93% Grade 1 Carlsson and Eiman (2003)</td>
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<td><strong>Country</strong></td>
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<td><strong>dB Name</strong></td>
<td>CINAHL</td>
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<tr>
<td><strong>Purpose</strong></td>
<td>To examine conversations around, and experiences and treatments during, severe hypoglycemia among people with diabetes and caregivers of people with diabetes.</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Cross sectional online survey, quantitative. Exemption of ethics approval for the U.S. survey was requested and received from the Chesapeake institutional review board. Eligible respondents provided electronic consent through a web survey interface before the administration of any study procedures.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>Purposive sampling from online research panels, people with diabetes type 1 and type 2 treated with insulin aged 18+ who experienced a severe hypoglycemic event in the last 3 years, and caregivers who were relied upon during severe hypoglycemic events of a person aged 4+ diagnosed with type 1 or type 2 diabetes. 429 individuals, 110 with type 1 and 109 with type 2 diabetes, and 210 caregivers (110 caring for someone with type 1 diabetes, 100 for type 2). Exclusion included a diagnosis of schizophrenia, bipolar disorder, or gestational diabetes.</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>Use of an online survey which included demographics, diabetes management, recent medical history, and hypoglycemia awareness. Details of respondent’s recent severe hypoglycemic event were also recorded, including the setting, symptoms, actions taken, and emotional and life impacts. People with diabetes who were not conscious during the event reported what they had be told about the event. Caregivers reported their experiences during or what they were told about the events.</td>
</tr>
<tr>
<td><strong>Data Analysis</strong></td>
<td>Analyses were conducted for both people with diabetes and caregivers by type of diabetes, Statistical analyses were performed using SAS, v.9.4, statistical software.</td>
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<tr>
<td><strong>Research attrition</strong></td>
<td>There was no discussion of participants recusing themselves nor being dismissed otherwise from the study.</td>
</tr>
<tr>
<td><strong>Results, Conclusion</strong></td>
<td>The impacts (emotions and affected life domains) 61.8% of T1D &amp; 63.3% of T2D were scared, 35.5% of T1D &amp; 49.5% of T2D felt unprepared, 46.4% of T1D &amp; 45.9% of T2D felt helpless. Life domains affected by the events: physical activities (18.2% &amp; 11.9%), mood or emotional status (20% &amp; 17.4%), social or leisure time (6.4% &amp; 9.2%), work or school (2.7% &amp; 6.4%), daily activities (15.5% &amp; 17.7%), relationships with friends and family (5.5% &amp; 2.8%), financial matters (1.8% and 2.8%), sleep (14.5% &amp; 14.7%), and respondents that reported greater than 1 life domain affected (41.8% &amp; 36.7%). After their most recent severe hypoglycemic event, patients diagnosed with type 1 &amp; type 2 diabetes 43.8% checked their blood glucose more frequently, 60.8% carried candy or sweet food or drinks with them, 35% changed their insulin regimen or timing or dosing of insulin. 9.3% of patients with diabetes began wearing a CGM, only 3.7% obtained a glucagon kit or carried one close, 2.7% kept a glucagon kit within frequented areas. Conclusion: The CRASH study results can be used to improve the preparedness of people with diabetes and caregivers and increase their understanding of the medical importance of risk and avoidance of severe hypoglycemia. The actions that people with diabetes and caregivers take are influenced by conversations about severe hypoglycemia that occur with health care providers, therefore it is important that HCP consider these findings and apply them for their practice.</td>
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<tr>
<td><strong>Scientific Quality</strong></td>
<td>89% grade 1 Carlsson and Eiman (2003)</td>
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<td><strong>dB Name</strong></td>
<td>Manual search</td>
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<tr>
<td><strong>Purpose</strong></td>
<td>To explore the individualistic drivers of severe hypoglycaemia events</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>In-depth exploratory semi-structured interviews conducted with a purposive sample of 17 adults with type 1 diabetes and a history of recurrent severe hypoglycaemia. Ethical approval was provided by the national research ethics service.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>20 individuals with type 1 diabetes and a history of recurrent severe hypoglycaemia from a purposive sample from 2 multidisciplinary specialist diabetes clinics.</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>12 interviews were conducted in a private room in the hospital, 5 were conducted via telephone. Interviews were digitally recorded and transcribed verbatim.</td>
</tr>
<tr>
<td><strong>Data Analysis</strong></td>
<td>Analyzed with an adapted grounded theory approach to explore discrete and overlapping themes in participants accounts of their experiences. Transcripts were read individually by health psychologists and discussed at length. An iterative process to allow identification and coding of emergent themes. Memos were used to cross check and clarify coding’s between the 3 psychologists to develop a cohesive conceptual description</td>
</tr>
<tr>
<td><strong>Research attrition</strong></td>
<td>20 participants were recruited, 3 individuals recused themselves from the study based on logistical complications.</td>
</tr>
<tr>
<td><strong>Results, Conclusion</strong></td>
<td>Three main themes emerged, Hypoglycaemia-induced cognitive impairment, behavioral factors and psychological factors. Individuals often delayed intervention due to impairment/distraction, inaccurate risk assessment, embarrassment, worry about rebound hyperglycaemia or unavailability of preferred glucose source. Delay of treatment coupled with use of a slow-acting glucose source compromised prevention of severe hypoglycaemia. Patients experience as hypoglycaemia progressed from early to late symptoms was also elucidated. Conclusion: The findings highlight the multifaceted and idiosyncratic nature of SH and provide rich personal accounts. They support clinical observations and previous quantitative findings that individuals with a history of recurrent SH may have specific thought and behavior risk profiles. Individualized prevention plans are necessary for these people and an emphasis on the need to actively attend mild hypoglycaemic symptoms and intervene promptly to prevent progression to SH. For some, further work to cognitively reframe SH may be needed for those with extreme hypoglycaemia avoidance.</td>
</tr>
<tr>
<td><strong>Scientific Quality</strong></td>
<td>91% grade 1 Carlsson and Eiman (2003)</td>
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### Article 8

#### Information about the Article

| Country | United States of America |
| dB Name | CINAHL |
| Purpose | To assess the perceptions and decision-making processes of patients with diabetes and their caregivers during a severe hypoglycaemic event |
| Method | Cross sectional study with 60 dyads in 1 on 1 semi structured interviews via telephone. Qualitative. 45–60-minute interviews, person with diabetes and their caregiver were interviewed separately. The study was exempted from institutional review by the New England independent Review Board. |
| Selection | 60 dyads (120 people) of a diabetic either type 1 or type 2 who were insulin dependent for at least 1 year and their caregiver, most often a partner or spouse. Aged 18+. |
| Data Collection | 1 on 1 interviews with patients diagnosed with diabetes and their caregivers separately. Audio recorded, transcribed and de-identified for coding. |
| Data Analysis | An inductive thematic analysis was used to identify recurrent concepts from the interview data. Coded in the first phase by 2 independent researchers using NVivo 12 pro. Narratives were used as the basis for the themes, discussed and recoded to a final coding summary. |
| Research attrition | There was no discussion in relation to research participants dismissing themselves nor being dismissed from the study. |
| Results, Conclusion | Four main themes emerged, scrambling to do the right thing, how the caregiver supports the people with diabetes in treating SH. Facing an emotional challenge, how decision making is impaired during an SH crisis. Figuring it out as we go: how people with diabetes and caregivers learn about SH through experience and what worked in the past. Conclusion: Decision making capacity is limited during an SH event, often a panicked time, and much knowledge of treatment is from personal experience, there is a critical need for healthcare providers to proactively discuss treatment plans and educate patients and their caregivers. |
| Scientific Quality | 91% grade 1 Carlsson and Eiman (2003) |