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Review

The role of education in type 2 diabetes treatment

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ABSTRACT

Diabetes mellitus is a major and growing medical problem, affecting patients of all ages worldwide. Diabetes education is an important component of diabetes treatment. The goals of diabetes education include not only providing knowledge and skills, but also changing the patient's behavior, increasing their motivation to comply with therapeutic recommendations, improving their quality of life, establishing a partnership within the treatment process, preparing the patient for self-care, increasing their awareness of cardiovascular risk factors, and increasing their psychological resilience. The education process is affected by a number of factors, primarily the patient's psychological and socio-economic characteristics, as well as educator-related variables. Benefits of diabetes education are mainly observed in terms of patient self-care and metabolic control of diabetes.

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1. Introduction

Diabetes mellitus is a major and growing medical problem, affecting patients of all ages, worldwide. Diabetes education is an important component of the treatment process, beside diet, exercise, and pharmaceutical and insulin treatment. As stated by professor Sieradzki: “Diabetes education is prerequisite for good diabetes control. A diabetic patient should know more on their disease than does their physician.” [1] A patient with type 2 diabetes should have the appropriate knowledge, skills, and attitudes in order to be able to control the disease. Group education has the added benefit of encouraging the sharing of experiences, and increasing motivation for self-care and cooperation with the therapeutic team.

Diabetes education is a preventive activity. Polish Diabetology Society guidelines emphasize that education is the foundation of effective diabetes prevention and care [2]. Through specific interventions, the educator can assist a patient with type 2 diabetes in minimizing the impact of environmental factors, preventing disease aggravation, and returning to their social roles. The goals that diabetes education should accomplish include not only providing knowledge and skills, but also changing the patient’s behavior, increasing their motivation to comply with therapeutic recommendations, improving their quality of life, establishing a partnership within the treatment process, preparing the patient for self-care, increasing their awareness of cardiovascular risk factors, and increasing their psychological resilience [3].

Studies performed to date confirm the impact of diabetic education on quality of life, satisfaction with diabetes treatment, compliance, self-care, and wellbeing in patients with type 2 diabetes.

2. Importance of therapeutic education in diabetes treatment

Education is an effective component of treatment. Literature data indicate that as few as 5% of patients who receive regular education are unable or unwilling to comply with treatment [4]. Patients who are not properly educated develop diabetes more often, and patients who received no education are up to 4 times more likely to develop diabetes complications [5].

2.1. *Education and social support*

Patients participating in organized diabetes education have a sense of social support [6]. Those who receive basic support from their families often ask whom to address in case they have any concerns. Such needs can be used in planning education for diabetic patients. Contact with an educator has been shown to improve the patient’s wellbeing and psychological condition, and consequently, to favor diabetes control. Lack of family- and social support is a cause of inconsistent treatment [3].

Patients who are not understood by their family are more anxious and less compliant [7]. Research shows that long-term education for chronically ill patients brings about benefits including a lower body weight, a lower blood pressure, and lower treatment costs. Studies aiming at determining the outcomes of long-term education (including nutritional education) showed a decrease of glycated hemoglobin levels, by 0.1–0.7% from a baseline of 7.3–7.7% [9,10].

2.2. *Education and quality of life*

Patients with type 2 diabetes who received diabetes education have a better quality of life [11,12] than at baseline. In their study of 200 patients, Chudiak et al. confirmed the positive impact of organized diabetes education on all quality of life aspects in patients with type 2 diabetes (physical functioning, physical limitations in functioning, pain, overall health, vitality, social functioning, emotional limitations in functioning, self-reported mental health) [13]. In her study, Korzon-Burakowska provided diabetes education to 53 diabetic patients. She found significantly better quality of life after the education than before (19.38 vs 23.13, $p \leq 0.001$) [14].

2.3. *Education and self-care*

Patients with a low level of knowledge on diabetes show deficits in self-care. Available studies confirm the impact of diabetes education on self-care in patients with type 2 diabetes. Shabibi et al. demonstrated the high educational effectiveness of the Health Belief Model (HBM), which allows for relating patients' health beliefs to their behaviors [15]. In accordance with the HBM, patients will engage in preventive actions if they believe that they are at risk of developing the problem (perceived susceptibility), that inaction may have serious consequences (perceived severity), that education may produce positive outcomes (perceived benefit), they recognize the negative factors associated with taking action (perceived barriers), and they believe they are able to successfully perform the actions (self-efficacy). Other available studies also confirmed the impact of the HBM on self-care, especially with regard to reducing perceived barriers [16,17] and improving self-efficacy [18,19]. In a study by Farzad et al., 120 patients in Iran were enrolled in a 6-week diabetes education program. The patients actively participated in the classes, but since most of them had a low level of education, a 2-hour session was also held for their caregivers, and a guidebook was developed. All these interventions successfully decreased barriers to self-control and improved overall outcomes [16]. In turn, Dizaji et al. studied 78 patients who participated in 5 training sessions, one per week, 20–30 min each, within the PRECEDE program. Mean scores for knowledge, attitudes, behaviors, and specific factors (predisposing, enabling, and reinforcing) increased after the educational intervention. The above findings confirm the positive impact of educational interventions based on the PRECEDE model and its main components on behaviors conducive to diabetes control [17]. Another study, by Drożdż et al., demonstrated that education increases patients' sense of responsibility for their own health [20]. The outcomes of the X-PERT educational program, which included 149 patients with diabetes, also demonstrate the impact of education on self-control in diabetes. After 14 months, a significant improvement in mean HbA1c levels was found in the X-PERT group, compared with controls (−0.6% vs. +0.1%; $p < 0.001$). Statistically significant benefits were also found with regard to decreases in total cholesterol (−0.3% vs. −0.2%; $p = 0.01$), body weight (−0.5% vs. +1.1%; $p < 0.001$), BMI (−0.2% vs. +0.4%; $p < 0.001$), waist circumference (women: −4% vs. −1%; men: −2% vs. 0; $p < 0.001$); and increases in fruit and vegetable consumption (+2.4% vs. +0.2%; $p = 0.008$), enjoyment of food (+1.5% vs. +0.2%; $p = 0.004$), knowledge on diabetes (+1.8% vs. +0.8%; $p < 0.001$), and physical activity (0.3% vs. −0.2%; $p = 0.01$); as to satisfaction with treatment, it decreased as time from the educational intervention increased (+15% vs. +17.5%; $p = 0.04$). Statistically significant differences were also found between the X-PERT group and controls in terms of total diabetes empowerment score ($p = 0.04$), and in subscales, including "readiness to change" ($p = 0.01$) and "setting and achieving goals" ($p = 0.003$) [8].

2.4. Education and satisfaction with treatment

Satisfaction with treatment is another parameter positively associated with education. In a study by Boels et al., patients who participated in diabetes education were more satisfied with their treatment (β 1.64, 95% CI 0.95–2.32). Moreover, the study demonstrated that the association between education and satisfaction persisted even in those patients who participated in the education interventions, but did not understand the content [21]. Thus, implementing educational programs to support patients with type 2 diabetes is very important.

2.5. Education and adherence to treatment

Patient education, covering topics such as treatment objectives, benefits, and adverse effects, is a way of improving adherence. In literature, lack of knowledge on the disease and self-control is cited as one reason for non-adherence [22–24]. In a study by Barat et al., poor knowledge on the treatment was associated with poorer adherence to the treatment recommendations — $^1/_5$ of patients understood the consequences of skipping a dose of medication, and only 5% were aware of the adverse effects of treatment [25]. Highest adherence levels were found in patients who understood the principles of treatment. Revee et al. confirmed the association of concerns about adverse effects with adherence levels. Patients who believed that the treatment was necessary had higher levels of adherence [26].

Literature describes a broad variety of educational instruments. In Seale et al., patients with type 2 diabetes who received printed educational materials showed improvement in terms of knowledge on the disease (64.6% vs 55.6%, $p < 0.01$) and metabolic control of diabetes (at 3 months: 8.00 ± 1.66% vs 9.06 ± 2.23%, $p < 0.01$; at 6 months: 7.67 ± 1.75% vs 9.06 ± 2.23%, $p < 0.01$) [27]. In the US, type 2 diabetes patients participated in a 3.5-hour educational session. The topics covered included principles for taking medication, adherence to non-pharmaceutical recommendations, and foot health monitoring. This method of transferring knowledge was well received by the patients, and resulted in better knowledge on the disease. After the educational intervention, the patients answered more questions correctly, in particular with regard to knowledge on eating sweets, drinking, normal sugar levels, and impact of being overweight on insulin and HbA1c activity. Overall, 60% of patients improved their knowledge, as shown by at least one additional correct answer. After the educational intervention, the number of correct answers increased, but the increase was larger in those treated with oral medication than in those treated with insulin (+5 vs +10; 95% confidence interval: 3–8 vs 9–12) [28].

3. Barriers to education

Factors affecting the education process may be classified as patient-related (psychological and economic), and educator-related (Fig. 1). Research shows that patients may be unwilling to participate in diabetes education for a number of reasons. Patient-related factors affecting education effectiveness include patient age, education, duration and course of illness, multimorbidity, complications, previous lifestyle, and baseline knowledge on the disease. One considerable barrier is the misconception that diabetes is not a serious illness. Other reasons for refusal to participate in diabetes education include good overall wellbeing and a sense of being able to manage the disease and of having sufficient knowledge [29]. The patient's psychological condition, including in particular stress, anxiety, and depression, may decrease

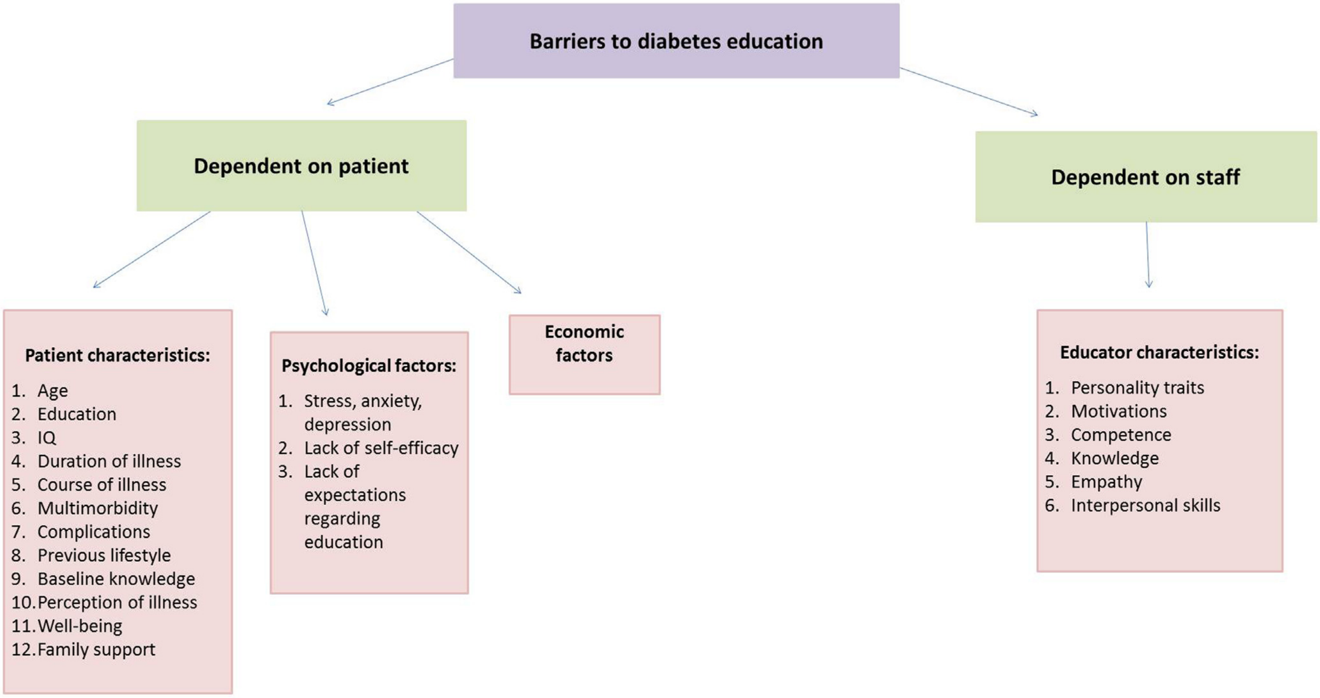

Fig. 1 – Barriers to diabetes education.

the effectiveness of education [1]. Another factor is a lack of self-efficacy, which causes the patient to withdraw from social relationships [30] and to have no expectations with regard to education.

Concerning educator-related factors, the most significant ones include the educator's personality, motivations, competence, knowledge, empathy, and interpersonal skills [1]. The DAWN 2 study, which included 4785 healthcare employees from 17 countries, demonstrated that many healthcare centers are not well prepared for diabetes education [31]. The staff mainly reported a lack of training regarding education for diabetic patients. Patients' involvement in self-care also depends on support from the educating staff, their attitudes and interpersonal skills. Alarmingly, over a period of several years from the DAWN study, no significant improvement was made with regard to the issues covered [32]. Medical staff, and nurses in particular, emphasize that they do not have enough time to educate diabetic patients [32]. The implementation of education remains a considerable problem, considering this is not a profitable activity. However, its multiple benefits warrant the consideration of financing for diabetes education services.

Including family members in the education process has a positive impact on the patient, enables the family to understand problems of living with diabetes, and facilitates compliance with treatment [1]. Family and caregivers often support the patient in taking action to improve their health. Diabetes education often fails to satisfy the expectations of patients and their families, primarily due to not being personalized. Knowing these expectations allows educators to be more effective. Patients who have specific needs and clear expectations towards the medical staff are more likely to be open to education. When planning educational interventions, one must bear in mind that most type 2 diabetes patients are older. Deficits in self-care result in a lack of expectations related to education, as well as incorrect behaviors of the patient and a mis-evaluation of their own health. Family support is the best predictor of adherence, but also contributes to improvement of self-care competence.

Patients' financial standing determines their ability to adhere to treatment. Therefore, a patient who cannot afford the treatment will not adhere to it, regardless of any education on self-care. This diminishes the patient's motivation to learn the desired attitudes, knowledge, and skills covered in a diabetes education program [1].

4. Role of the nurse in health education for patients

The latest guidelines recommend the composition of the therapeutic team participating in care for diabetic patients. The team comprises physicians and nurses, as well as a dietitian, a psychologist, and a social worker. This composition is the same for hospital wards and diabetes clinics, though the numbers of physicians and nurses change: for clinics the recommended number is 1 nurse and 1 physician per 800 diabetic patients, and for diabetes wards it is 2 nurses with experience in education and 2 diabetologists (or general practitioners, or endocrinologists) per 15–20 beds. A consistent approach of the entire team is prerequisite for therapeutic success, which requires team members to communicate effectively [2].

A significant role in diabetic patient education is played by the nursing staff. In a study by Kosicka and Wrońska, nurses provided patients with better information on diabetes than other studied staff. Nurses' tasks extend beyond assisting

Table 1 – A structured system for health education.

A structured system for health education
Establishing and maintaining communication with the patient:
• Active listening, showing interest and empathy, being polite
Evaluating patient needs:
• Evaluating medical needs
• Identifying the patient’s concerns
• Evaluating knowledge- and skill deficits associated with the patient’s illness
• Identifying the patient’s attitude and expectations
• Evaluating previous experiences
Evaluating barriers to adherence:
• Social: treatment cost, lack of support, social problems, illiteracy
• Physical: sensory impairment, reduced mobility
• Psychological: dementia, anxiety, mental disorders
Agreeing on a treatment plan:
• Discussing problems/obstacles in treatment with the patient
• Identifying decisions to be made by the patient, making therapeutic decisions together with the patient
• Discussing the diagnosis with the patient, and explaining the choice of treatment
• Simplifying the treatment plan (discussing the therapeutic recommendations)
Informing the patient on the treatment plan:
• Educating the patient on specific skills, depending on their knowledge gaps
• Consulting with specialists, cooperating with the family
• Emphasizing the most important points in the treatment plan
• Structuring the patient’s knowledge
Evaluating the patient’s understanding of the treatment plan:
• Cooperating with the family
• Evaluating the patient’s understanding of the treatment program
• Structuring the treatment plan
• Showing support, patiently explaining if anything is unclear
• If required, explaining again
Monitoring the patient:
• Discussing the treatment outcomes so far
• Scheduling the next follow-up appointment
• Making a plan for monitoring treatment progress
• Informing the patient on when they should immediately contact a medical professional

Source: [36].

physicians and following their orders, and include taking independent actions defined in the pre-planned nursing procedure. Oftentimes the nurse is the first member of the medical staff that patients meet. To be able to advise patients on their health, a nurse should have a number of skills, including [33–35]:

- being a health leader (living in accordance with the advice given to patients, which lends it credibility); being a good guide (providing information that fills the educational gaps);
- being a social contact specialist (being able to convince patients to implement the agreed upon plan);
- being a good "politician" (mediating between the family and local leaders responsible for the availability of health services and products).

Notably, the primary objective of diabetes education is to provide the patient with information on their illness and its treatment, as well as knowledge required for self-care, also including complications and other difficulties that the patient may encounter in diabetes self-control. Wojnarowska described a structured system of health education for patients, which may help nurses organize their education efforts for patients and their families (Table 1) [34]. Through their actions, nurses should convince patients to introduce lifestyle changes, and provide support to the family so as to maintain and solidify these changes. In their communication with patients, nurses should foster such traits as empathy, kindness, respect, and honesty towards the listener. Education is particularly challenging in "difficult" families, struck by domestic problems or poverty. In these situations, nurses should seek support and assistance in other local institutions, and cooperate with them to provide the patient and their family with solutions to their problems and difficulties accompanying the illness. Following a conversation with the patient and their family, the nurse may take actions to promote specific health-related behaviors (e.g. regular sugar level measurement in diabetic patients) or methods of prevention (e.g. encouraging patients at risk of developing type 2 diabetes to switch to a low-sugar diet) [33].

5. Psychological aspects of patient education

When providing health education, one must not forget the psychological aspects of the undertaken actions, which should aim at increasing the patient's "drive" towards effective control of the disease. Polish Diabetology Society guidelines state that each diabetic patient should have access to psychological consultation, both in inpatient and outpatient care. The staffing guideline for hospitals is 1 psychologist (employed or available for consultation) per 15–20 patients, and for diabetes clinics: 1 psychologist per 800 diabetic patients. Among psychological interventions for diabetic patients, the Polish Diabetology Society lists developing a sense of having an impact on one's illness, and developing and maintaining a coping style focused on problem-solving.

Accurate evaluation of the patient's personality plays an important role in shaping correct, healthy attitudes. Patients with dysfunctional personalities do not exhibit positive existential values and seek artificial support, which largely contributes to unhealthy behaviors. The need for continued diabetes treatment often leads to adverse personality-related responses, such as: developing false beliefs, transferring one's goals and responsibility for one's failures onto a third party, ignoring disorders, repressing unfavorable observations, replacing goals with other ones, developing pseudo-arguments to justify one's errors, infantile attitudes, constant repetition of the same ineffective behaviors [1,3].

Nurses should aim at developing and strengthening the patient's internal and external communication by promoting altruistic, open attitudes, and discouraging egoistic ones that make the patient focus exclusively on their disease. Further, they should prevent anxiety, negative emotions, and loss of purpose by helping the patient develop a creative attitude towards problems associated with the illness. Other important aspects include encouraging the patient to fulfill their social role, eliminating the sense of exclusion from their environment and self-exclusion, and developing a sense of dignity and independence. Increasing the patient's psychological resilience also involves explaining various aspects related to the disease and helping them adapt to the role of a patient.

5.1. *Diabetes "burnout"*

"Burnout" in diabetes management is understood as a state of the patient's personality structure, emotions, and activities that results, among other factors, from difficulties in diabetes control, poor psychological condition, lack of support, or loneliness. The above factors considerably interfere with correct treatment in the patient, which ultimately results in the development of complications necessitating hospitalization [7]. A diabetic patient who experiences diabetes burnout loses their motivation to adhere to treatment, and becomes exhausted with the disease and with the unsatisfactory effects of blood sugar control. As a result, they stop measuring their blood sugar, taking insulin or other medication, and adhering to dietary recommendations. Simultaneously, they experience stress symptoms, which are similar to depression, except for the fact that depression affects all aspects of a person's life, while diabetes burnout is only related to diabetes and its treatment. Research shows that 30–40% of diabetic patients, particularly at younger ages, experience burnout. One significant external cause of burnout is poor access to quality health care and a lack of trust towards medical personnel [36].

Considering the above, efforts are needed to better identify burnout in diabetic patients. The first step is learning to identify the syndrome when consulting with a patient. Proper treatment requires good communication within the therapeutic team, which must include a physician, a nurse, a dietitian, and a psychologist. The nurse plays a particularly important role in the team, with tasks consisting in providing education and care to diabetic patients. Any problems experienced by the patient should be continuously discussed among all members of the team, leading to the development of a common strategy and action plan for eliminating a given problem. Continued evaluation of the effectiveness of any actions taken, and their modification if necessary, is another important component of successful treatment. The medical staff should become familiar with the patient's attitude and emotions towards their illness. It is important to notice any negative feelings about the diabetic care the patient receives. The patient should be asked about any stress, fatigue, or discouragement due to the treatment methods used, which may be perceived as too restrictive and/or unsatisfactory. Another notable aspect is the patient's attitude (negative, neutral, or positive) towards treatment objectives that have not yet been achieved. The evaluation of the patient's psycho-social status is also important, and involves obtaining information on support and understanding provided by the patient's friends and family. It is essential to know whether the patient keeps their follow-up appointments and whether they have hope for improvement [7].

Following an initial diagnosis of diabetes burnout, it is important to strengthen the patient's relationship with their therapeutic team, implement new treatment methods, involve the physician in determining individual blood sugar recommendations that the patient is capable of keeping, and provide the patient with psychological comfort despite the difficulties they had faced due to their illness. Another step should involve a conversation with the patient to pinpoint the causes for their discouragement and negative feelings about diabetes and diabetes care, in order to eliminate them. If the problem involves insufficient social support, it is also helpful to have a conversation with the patient's family or friends, so as to encourage them to give the patient more support and motivation to combat the illness. It is also essential to increase the patient's awareness of the need to independently identify their problems and actively cope with difficulties encountered in diabetes treatment.

A definitive diagnosis can be obtained using a variety of questionnaires or scales. Useful instruments include the Acceptance of Illness Scale (AIS) and the Satisfaction with Life Scale (SWLS). The former has no prescribed normal scores, and the result is measured against the mean score for the diabetic clinical population. For the latter, the score is interpreted based on sten score ranges for adults [7].

5.2. *Communication with the patient*

Communication between health care personnel and the patient has a significant impact on the patient's attitude towards their illness. Multiple studies, performed both in Poland [37,38] and worldwide [39,40], demonstrate patients' widespread dissatisfaction with this communication. Most patients were not satisfied with the information they received about their health and the administered treatment. A large percentage of patients were also dissatisfied due to having insufficient opportunities to share and discuss their problems.

Effective communication results in better psychological, somatic, and social health. This is made possible by a holistic approach to patients. The greatest challenge is establishing first contact with the patient, as this requires a personalized approach, and a consideration of the strong emotions accompanying the first contact between the patient and medical personnel, which may interfere with cognitive processes. In these cases, any information provided should be concise, understandable, and repeated as many times as needed.

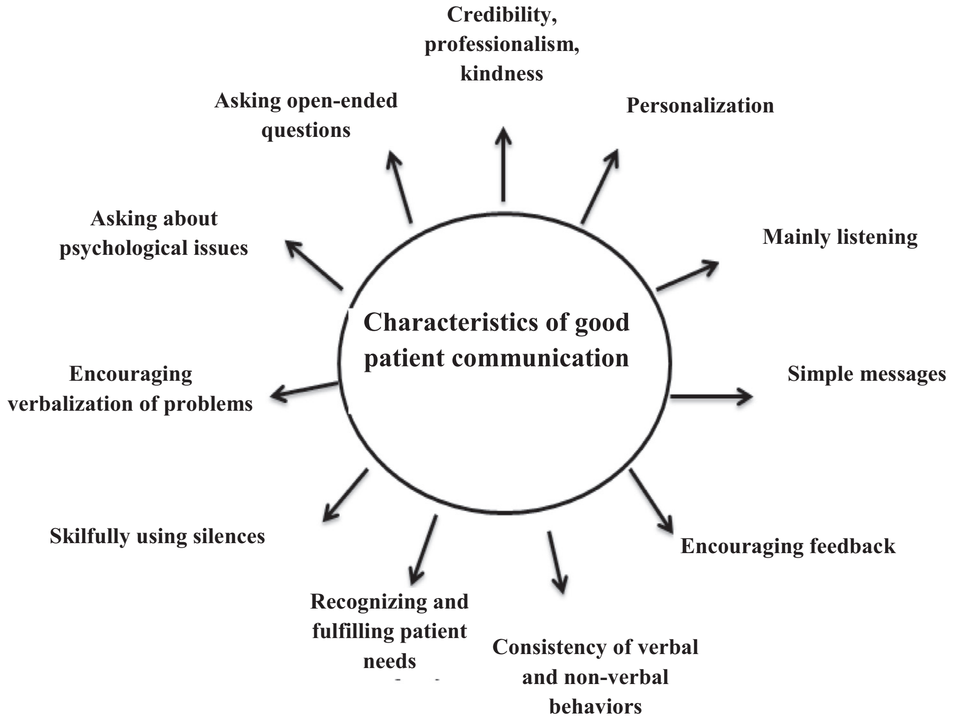

Fig. 2 – Characteristics of good patient communication. Source: Izabela Stangierska, Wanda Horst-Sikorska. Ogólne zasady komunikacji mieôdzy pacjentem a lekarzem.

Table 2 – Techniques for enhancing communication.

Feedback
Multiple channels
Short and simple messages
Redundancy (repeating the same information in different forms)
Surveys
Emphasis
Limited amount of information and ordering by importance
Verbalization (naming one's own and the patient's feelings)
Active listening skills

Source: Izabela Stangierska, Wanda Horst-Sikorska. Ogólne zasady komunikacji mieôdzy pacjentem a lekarzem. [General principles for patient–physician communication] Forum Medycyny Rodzinnej 2007;1(1):58–68.

Therapeutic team members should have a number of traits fostering good communication with patients in their care (Fig. 2). The following techniques may be used for enhancing communication: providing short and simple messages, emphasizing major points, verbalizing feelings (both one's own and the patient's), active listening, feedback, using multiple communication channels, using surveys, limited amount of information, and ordering information by importance [35] (Table 2).

The patient is more likely to process information that is: provided at the beginning and the end of a message; provided in an unusual manner, e.g. enthusiastically; often repeated; related to issues already known to the patient.

Importantly, one benefit of good, therapeutic communication with the patient and their family is increased patient security, with a lower risk of trauma. Other benefits include better treatment outcomes, fewer complaints, and better patient cooperation and adherence to treatment [34].

5.3. *Empowerment*

"Empowerment" is understood as developing and strengthening motivation in diabetic patients. Understanding the patient's emotional state, personality, and attitude towards the illness is crucial to developing their motivation for self-care and continued treatment. This, in turn, enables the development of a more therapeutically effective attitude towards one's illness. As an educator, the nurse should not only provide knowledge to the patient, but also remove their anxiety and help them develop stress-coping skills. It is essential to instill a sense of having an impact on the course of one's disease. As diabetes is a chronic disease, patient traits such as conscientiousness, perseverance, patience, as well as the desired mood, emotional state, and psychological attitude, are essential. All these characteristics can be evaluated using the appropriate surveys, and subsequently modified as necessary. This allows for increasing the patient's motivation for continued treatment [41].

The process of developing positive motivation in the patient involves providing them with constructive models and shaping skills that promote motivation for therapeutic efforts. The educator must aim at shaping the dominant thoughts related to the patient's life- and treatment goals. Another step is encouraging social activity and creating an attitude allowing the patient to support and inspire other diabetics. It is also important to help the patient develop or increase their self-esteem. Another aspect is a task-based approach to motivation, applicable both to the patient and their family. It involves the educator's efforts to help their audience understand the nature of the disease, learn about aspects of life that are unaffected by it, become familiar with actions that help control the diabetes, learn to recognize symptoms, and understand treatment objectives and dietary recommendations. These actions should enable the patient and their family to develop a relationship based on trust and acceptance.

In summary, a nurse providing diabetes education should be able to motivate the patient to combat the disease by promoting healthy behaviors, while considering the individual personality traits of each patient which require a personalized approach [41].

5.4. *Depression*

Depression symptoms are a significant factor interfering with diabetes education. Patients diagnosed with diabetes are at a higher risk of developing depression in the future, compared to the non-diabetic population. Epidemiologically, depression and diabetes have similar environmental contributors: difficult experiences in childhood, socio-economic deprivation, low physical activity. Diabetic patients report fatigue, poor concentration, and complications or fear of complications, all of which are strongly associated with depression [42]. Furthermore, research demonstrates that diabetes contributes to depression due to the adverse impact of hyperglycemia on neurotransmitter metabolism, or through altered glucose transport [43–45]. According to Luo et al., middle-aged and elderly diabetics with a low level of education are at the highest risk of developing depression [42]. Medical personnel should consider routine screening for depression among their diabetic patients.

5.5. *Psychological insulin resistance*

"Psychological insulin resistance" (PIR) was first described in 1994. It describes the risky delays in prescribing insulin therapy by physicians and patients' reluctance to take it [46]. Research shows that up to 40% patients taking insulin do so unwillingly [47]; a study by Allen found 61% of patients to exhibit some degree of PIR [46].

PIR is believed to be caused by insufficient knowledge and false beliefs about insulin therapy. Some patients believe that taking insulin is only necessary in acute states, or that it is a sign of disease progression, or even of personal failure in managing one's diabetes. Other concerns reported by patients include concerns about gaining weight or becoming hypoglycemic, a restriction of freedom, or a fear of injections and the associated pain [46].

A number of interventions for managing PIR have been developed. These include education, explaining the issues that are problematic to the patient, providing guidance on insulin therapy, discussing examples of patients successfully using insulin therapy, repeated guidance, help in reducing negative feelings, and positive expectation management [46]. In elderly patients with type 2 diabetes, systematic assessment of barriers to insulin therapy can be performed, and the treatment plan can be personalized, which contributes to better quality of life and compliance with treatment [48]. The above-listed interventions have yet to be tested for effectiveness in PIR treatment.

6. Conclusion

Diabetes education has an impact on diabetes treatment. Benefits of diabetes education are mainly observed in terms of patient self-care and metabolic control of diabetes. However, studies that would clearly demonstrate the impact of education on pharmaceutical adherence, satisfaction with treatment, and quality of life in type 2 diabetes patients are still lacking. The available studies emphasize the shortage of resources required to implement the needed educational interventions.

Conflicts of interest

The authors declare no conflict of interest.

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Appendix A. Supplementary material

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