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A Concept Analysis: Adherence in Type 2 Diabetes

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Abstract

Aim: The aim of this analysis is to develop a better understanding of the concept of adherence among individuals with Type 2 Diabetes.

Background: The incidence and prevalence of diabetes in the United States continues to increase at epidemic proportions yearly.

Design: The analysis was conducted using Rodgers' evolutionary method including database searches from Cumulative Index to Nursing Health Literature (CINAHL), COCHRANE, EBSCO, Education Resources Information Center (ERIC), MEDLINE, PsycINFO, Institute of Electrical and Electronics Engineers (IEEE), and SocINDEX. Keywords included adherence, compliance, diabetes care, type 2 diabetes and theories.

Results: Rodgers' evolutionary method guided this inquiry of concept of adherence across several disciplines. Analysis revealed definitions, related terms, attributes, references, antecedents, consequences, and related concepts that helped construct a model case for a client.

Conclusion: Researching the concept of adherence across diverse disciplines revealed that the definition of adherence in nursing and medicine entails persistence in following a health care provider's recommendation. Future studies must define adherence in relation to culture to establish a framework for holistic and client-centered care.

Keywords: Adherence, compliance, diabetes care, type 2 diabetes, and theories

A Concept Analysis: Adherence with Type 2 Diabetes

This paper aims to define the concept of adherence as it relates to managing type 2 diabetes mellitus (T2DM) and its impact on outcomes in various populations. The authors discuss the evolution of the term adherence in healthcare, addressing its use across other disciplines, and explore its impact in the

health context. Additionally, in analyzing the concept of adherence, the writers identify its attributes, references, antecedents, consequences, and related concepts. A model case is highlighted to illustrate the concept of adherence.

Diabetes consists of several metabolic disorders marked by persistently elevated blood glucose readings. Diabetes mellitus is a public health issue in the United States and worldwide. According to the World Health Organization (WHO, 2018), diabetes cases are estimated at 422 million globally. According to the American Diabetes Association (ADA, 2016), in 2015, 79,535 mortalities in the United States were directly attributed to diabetes with 252,806 more deaths related to diabetes complications. In 2017, diabetes-related healthcare in the United States resulted in costs of \$327 billion (ADA, 2018). As reported by Nieuwlaat et al. (2014), these statistics have raised the level of alarm among health professionals globally. Of specific concern, the issue of adherence to a diabetic regimen. Fewer than 50% of individuals with diabetes follow their protocol or adhere to their treatment plan, according to Nieuwlaat et al. (2014), who defined adherence as taking prescribed medication over 80% of the time. Nieuwlaat et al. (2014) also noted that nonadherence is related to worse health outcomes and increased side effects and deaths. Trief et al. (2013) addressed the mediating factors that continue to negatively impact adherence in clients.

Definition

Several interrelated terms are used in the literature to describe clients' ability to follow a plan to manage their condition, including compliance, concordance and, of specific interest for this paper, adherence. Gardner (2014), Lehane and McCarthy (2009), and Sabate (2003), with the World Health Organization (WHO), used the theoretical definition of adherence as "the extent to which a per-

son's behavior — taking medication, following a diet and/or executing lifestyle changes — corresponds with agreed recommendations from a health care provider." Similarly, an article joining the fields of pharmacology and psychology by Matthes and Albus (2014) defined adherence as collaboration with shared accountability between client and health care provider for therapeutic purposes. Of interest, De Las Cuevas (2011) used the related terms adherence and compliance interchangeably when specifically discussing how clients follow their healthcare provider's recommendations for taking prescribed medication. By contrast, the related term concordance is used more broadly to apply to a target or a goal in client behavior and is not limited to medication-taking behavior.

Other disciplines using the term adherence include psychology, pharmacology, physiotherapy, nutrition, engineering, computer science and software engineering, architecture, the construction industry, nursing, and medicine. In medicine, adherence is a term widely used in the field of psychiatry, as psychiatric clients often find it challenging to maintain their medication regimen (De Las Cuevas, 2011). In fact, its focus on mental and behavioral health, psychiatry, as opposed to other branches of medicine, has played a substantial role in defining the concept of adherence.

Historical Evolution of Adherence.

Insulin was discovered by and credited to Frederick Banting, Charles Best, John Macleod and James Collip in 1922. The terms adherence and compliance most notably became associated with diabetes (Bliss, 2013). Alikari and Ziga (2014) asserted that adherence pertains to how well an individual follows a treatment plan. Haynes (1979) has been credited with establishing adherence and compliance as the terms associated mainly with diabetes treatment. According to Haynes (1979), adherence relates to an indi-

vidual's ability to observe lifestyle modifications, diet, and medications as instructed by the health provider. Adherence, compliance, and concordance have been used simultaneously since the 1970s to describe an individual's habitual taking of a prescribed medication. Lastly, concordance focuses on an equal relationship between the client and health provider (Mitchell, 2014).

Adherence Linked to Theoretical Framework

Chinn and Kramer (2015) purported that evidence-based practice is essential to clinical nursing and has a strong link between theory and research. As such, in an effort to consider the philosophy, theories associated with adherence will be discussed. Sirur, Richardson, Wishart, and Hanna (2009) and Jeihooni, Hidarnia, Kaveh, and Hajizadeh (2015) asserted that social cognitive theory (SCT) and the health belief model (HBM) are often associated with adherence and compliance in contemporary times. Regarding adherence to diabetes treatment and management of clients, the applicable models and theories are SCT, HBM, and the transtheoretical model (TTM) (Sirur, Richardson, Wishart & Hanna, 2009; Jeihooni, Hidarnia, Kaveh, & Hajizadeh, 2015).

Psychologist Rosenstock and his associates developed the HBM in the 1950s (Irwin, 2015; Jeihooni, Hidarnia, Kaveh, & Hajiza-

deh, 2015; Rosenstock 2005/1966). Irwin (2015) posited that an individual must be ready before a change will take place. The concepts are perceived susceptibility, severity, benefits, barriers, cue to action, self-efficacy, and modifying variables such as demographics, psychosocial concerns, and culture.

Sirur, Richardson, Wishart and Hanna (2009) asserted that SCT is founded on the behavioral and cognitive theories of Bandura (1986). Bandura posited that there is a dynamic triad created by the individual, the behavior, and the environment and that modeling and repetitive behavior can change how the triad functions. Self-efficacy, an important aspect of SCT, was included as a concept to the theory as it is essential to predicting an individual's behavior. Bandura (1997, p. 3) described self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments."

Platt, Green, Jayasinghe, and Morrissey (2014) argued that the TTM Prochaska and Diclemente developed in 1983 is a behavioral change model. In fact, TTM has been used to manage smoking cessation and other health problems. In their book *Change for Good*, Prochaska, Diclemente, and Norcross (1994) used the key component from other biopsychological theories to TTM. It consists of six dynamic phases of behavioral change: pre-contemplation, contemplation, preparation,

action, maintenance, and the final stage, termination. TTM borrowed additional concepts from other behavioral and cognitive theories. One such concept is self-efficacy, which is imperative because it allows an individual to move from the pre-contemplation to contemplation stages. TTM has been used mainly to treat addiction disorders and other illnesses, such as obesity, diabetes, and coronary artery disease (Andres, 2008; Chasan-Taber, 2015; Platt, 2014).

Identifying Issues of Diabetes Treatment, Adherence, and Management

This section will present three relevant studies using the concept of adherence in treating and managing the care of individuals with diabetes. Vervloet et al. (2014) conducted a quantitative study to assess short- and long-term outcomes of medication adherence in T2DM individuals. The goal was to determine the short- and long-term impact of a short message system (SMS) prompter for T2DM individuals with previous history of nonadherence to taking their medication. The study comprised 48 subjects in the non-SMS group, 56 subjects in the SMS group, and 57 in the control group. The study findings were significant at a $p < 0.05$. Further, the study revealed that SMS with medication follow-up can assist with adherence and improve medication refills. Based on the findings, the recommendation is that the SMS may contribute

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to increased adherence and decreased spending in distinct groups.

Huffman et al. (2013) conducted a quantitative descriptive study of African American and Haitian individuals with T2DM to evaluate their adherence by examining their relationship between dietary counseling on diabetes self-management (DSM) and glucose control. The sample consisted of 254 Blacks with T2DM recruited in community centers in Miami-Dade and Broward counties: 125 African Americans and 129 Haitians. The results reached statistical significance in demonstrating higher DSM scores and better glucose control in the African American participants than their Haitian counterparts. These findings suggest that the DSM given to the Haitian participants may have been inadequate. The researchers concluded that more studies should be conducted to better understand which factors may improve DSM delivery in this Haitian population.

Ens, Seneviratne, Jones, and King-Shier (2014) conducted a mixed method study to determine factors influencing adherence to medicine regimens among individuals from South Asia with cardiac illnesses. This study did not address any diabetes issues but was selected for its cultural aspect and the importance of adherence among individuals with cardiac disease. An ethnographic design and a survey were used to determine how culture contributes to medication adherence in individuals of South Asian descent.

The sample included eight South Asian individuals, ages 65-78. Participants consented to be observed by a physician and pharmacist, enabling the researchers to obtain data on challenges study participants faced and the level of adherence they achieved. The researchers concluded that tools to enhance communication should be developed to increase adherence in culturally distinct cultural populations.

The studies described in this section underscore the complex nature of treatment adherence in T2DM clients and show adherence to be a universal challenge intensified by diverse cultural components.

Concept Analysis

Researchers across multiple disciplines have taken numerous approaches to developing an academic framework for concept analysis. This is especially true in nursing. According to Rodgers and Knafl (2000), methods are grounded in a philosophical stance aimed at using the analytical process to delineate a concept. Among the most common approaches are those developed by

Chinn and Jacobs (1983), Walker and Avant (2005), and Rodgers and Knafl (1989), whose concept analyses will be discussed in this paper. The following examples illustrate that in addition to remaining abreast of concept development in healthcare, nurses must remain connected to other interdisciplinary revolutions to achieve better care for their clients. For instance, awareness of technological advances in engineering can provide innovative and practical choices to assist clients. Did you follow one of these models?

According to Chinn and Kramer (2015), a concept is how one ascribes meaning to a word using objective and subjective data as well as symbols. A concept also refers to how the word is understood by individuals. Chinn and Kramer explain further that conceptual analysis is used to determine a concept's parameters and distinguish it from other similar concepts. Once a concept is defined, how it is used in the literature can lead to critical reflection and enhanced understanding of the subject it addresses. Theoretical definitions help clarify how a concept is used in the profession or another social context, as well as how and where it was first used (Chinn and Kramer, 2015).

According to Rodgers and Knafl (2000), Rodgers' evolutionary concept analysis was developed in 1989 and builds on the work of philosophers Stephen Toulmin and Ludwig Wittgenstein (1953) regarding knowledge acquisition. Per Rodgers (2005), Toulmin believed that to understand a concept, one should focus on both the human being's inner experience of an object and on the object as it exists in the outside world, independent of perception; this philosophy of inquiry was holistic in nature. Toulmin further explained that the relevant time period, society, and anthropology all play significant roles in defining a concept. For his part, Wittgenstein emphasized the importance of knowledge acquisition through a deeper understanding of language to clarify concepts. Rodgers' concept analysis incorporates both of these epistemic principles in her process and will be used to analyze and clarify the term adherence (Rodgers & Knafl, 2000). The following examples of how adherence is understood and used in disciplines other than healthcare and nursing illustrate a broader view of adherence that can, in turn, inform its expanded use in health discussions.

Engineering, Construction, Architecture, and Physics

At the intersection of the fields of engineering, construction, and architecture, Slak

and Kilar (2012) described the importance of building structures according to codes designed to enable them to withstand earthquakes. Specific to the context of multidisciplinary dictates for sound and resilient building structures, compliance here is defined as maintaining construction standards to follow codes and regulations applicable to the field.

This concept of adherence from engineering and physics is important as an adjunct to nursing and to understanding the governing definition of adherence. The writer defines adherence in the aforementioned disciplines of engineering and physics as the ability of an object to stick to another or to the act of abiding to a rule. According to Vaughan and Turner (2013), in a study along similar lines relating to the construction industry, adherence and compliance referred to following strict procedures and regulations to achieve optimal results. They described the necessity of adhering to building codes to provide energy efficiency, create resistant structures, improve safety, and ultimately impact the health of any individuals who come into contact with these structures. From earthquakes in Haiti and Chile to powerful hurricanes like Andrew and Katrina, which caused catastrophic damage in South Florida and New Orleans, respectively, recent disasters have increased awareness among both the public and industry regulators of the imperative for strict adherence to and compliance with building codes.

Computer Science, Physics, and Software Engineering

In the field of computer science, Panesar-Walawege, Sabetzadeh, and Briand (2011) address the general concept of adherence in terms of compliance with specified industry safety standards. They measure adherence by the degree of compliance with these established standards to ensure safe practice. In an article by Santoso and Redmond (2015), the authors described a proposal by the Institute of Physics and Engineering in Medicine Telecare and Telehealth for targeted monitoring of and technological assistance for health-related tasks in the homes of aging adults living alone. The program's goal was to have indoor positioning systems (IPS), including sensors, robots, and security systems, monitor activities in both civilian and military settings to assist members of this population with their daily tasks. The proposal's aim of promoting health and preventing harm through adherence called for following and assisting individuals with chronic illnesses such as cardiovascular and pulmonary disease, a history



of falls, Alzheimer's disease, and other complex health conditions. The authors reviewed IPS home care applications, discussing pros and cons such as cost, complexity, security, and privacy issues. They also addressed the inevitable increased complexity and use of technology in all facets of healthcare as potential deterrents to using IPS.

Likewise, with Emmerich et al. (1999), who are active in the domain of software engineering, compliance is also used in relation to standards "... technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics to ensure that materials, products, processes, and services are fit for their purpose." In addition, Silva, Rodrigues, Barreto, and Ferreira de Lucena (2016), and Fallahzadeh, Minor, Evangelista, Cook, and Ghazemzadeh (2017) explain that engineers may assist clients by using technological systems such as smartphones or tablets in order to increase client medication adherence. These systems are based on specific processes that monitor the time the medication is taken and send reminders to increase medication adherence in those clients.

Defining Attributes to Adherence

Toftagen and Fagerström (2010) defined attributes as a list of criteria that contributes to identifying a concept. According to Sapkota, Brien, Greenfield, and Aslani (2015),

the following attributes have to be present to achieve adherence in diabetes management: consistent physical activity, proper foot care and nutrition, consistent checks of blood glucose levels at home, and routine visits to primary providers. Nieuwlaat et al. (2014) added taking medications as directed as another attribute.

Methodology and References to Adherence

The following search engines CINAHL, COCHRANE, EBSCO, ERIC, MEDLINE, PSYCINFO, IEEE, and SOCINDEX yielded 255,931 articles. Focusing on English-language sources with the terms *adherence* and *medication* resulted in 73,102 articles. Limiting publication from 2010-2018 yielded 27,359 articles. Specifying key words *adherence* and *diabetes care* generated 7,017 articles. Further limiting the years to 2014-2018 produced 4,227 items. The search progressed with the words *adherence* and *diabetes treatment and management*, resulting in 678 articles. Single searches and meticulous reading of abstracts and full text journals unearthed relevant sources that spoke to the concepts of adherence and produced 41 articles in total: 12 from nursing, 12 from medicine and psychiatry, 6 from psychology, 1 from physiotherapy, 1 from nutrition, 2 from other international organizations, and 7 combined from the fields of architecture, construction, and

physics, including engineering and computer science studies.

Antecedents of Adherence

According to Toftagen and Fagerström (2010), antecedents are experiences necessary to the emergence of a concept and happen before that concept can take shape. In a nursing study examining clients with tuberculosis, McDonnell, Turner, and Weaver (2001) identified several antecedents as pertinent to achieving positive client outcomes and adherence. The antecedents included ability to self-care, intention to adhere (akin to self-efficacy), confidence in an existing support system, and no observable barriers to antecedents of adherence. Of significance, the last factor proved the most difficult to achieve, with most clients attesting to some type of barrier.

In a hypertension study, Polinski et al. (2014) identified several antecedents of adherence, including client-provider relationships built on trust, cooperative decision-making, discussion of all adverse effects, and economic factors. Matthes and Albus (2014) observed and identified the following antecedents in their participant population: being educated about the course of treatment, taking relatively few pills, and being married (having a stable marital status); these antecedents proved essential to maintaining adherence. Nieuwlaat et al. (2014) identified other an-

ecedents to adherence, including the client's confidence, age, and psychological state.

Consequences and Related Concepts of Adherence

According to Chinn and Kramer (2015), consequences are defined as events that occur after and as a result of the concept. As reported by Garcia-Perez, Alvarez, Dilla, Gil-Guilien, and Orozco-Beltran (2013) in a study of T2DM, they recognized the following consequences: lack of adherence, morbidity, and mortality. Per Sapkota, Brien, Greenfield, and Aslani (2015), in the literature, many negative outcomes were reported due to lack of adherence. One factor identified as impacting outcomes was the client's socioeconomic status, as diabetes is a chronic condition that requires expenditure of extensive financial and social resources. A lack of resources can lead clients to negative outcomes. Client resources must be examined critically in order to maximize adherence, which improves outcomes (Sapkota, Brien, Greenfield, & Aslani, 2015). Of note, although the writer reported the psychological state in the antecedents, Nieuwlaat et al., (2014) also mentioned psychological state as a consequence of a client's medical regimen. Finally, as Toftshagen and Fagerström (2010) state, related concepts are terms that are similar to the concept yet do not possess the same distinctive features. According to Alikari and Zyga (2014), Lam and Fresco (2015), and Nieuwlaat et al. (2014), related concepts include nonadherence, noncompliance, and persistence.

Model Case of Adherence

Marion, a 45-year-old man, comes to the healthcare provider's office for the first time. Marion, a married father of two, is a janitor who often calls in sick due to diabetes-related leg pain and nighttime awakening. Today's appointment follows a surgical consult he had about his leg pain. During today's visit, the nurse practitioner gathers a complete history, performs a physical assessment, and discusses his laboratory results. Marion's blood glucose is 270 and his hemoglobin A1C is 12%. The nurse practitioner (NP) revises a treatment plan designed to achieve a normal blood glucose and a hemoglobin A1C of less than 7%, initiating pharmacotherapy to control Marion's blood glucose and ameliorate his nerve pain symptoms.

Marion states that he does not routinely check his blood glucose as it is usually high. His diet is high in carbohydrates, and he does not attest to engaging in any physical activity outside of his job. Upon fully appreciating

what is expected of him, Marion is unsure of being able to achieve all of the goals he has set with his healthcare provider, so a negotiation between him and the provider ensues.

Marion returns in one month with a diary of his blood glucose readings ranging from 140-160 and reports a reduction of pain in his legs and less nighttime awakening. Now he reports being more confident about the plan and newly motivated to achieve its goals. Marion's short-term success has elicited a belief in him that he can achieve the progressively larger health goals he and his provider have determined are necessary, but at a pace he can handle. The long-term plan for Marion consists of frequent follow-ups to stabilize his blood glucose. Marion has also agreed to record his blood glucose, dietary habits, and physical activity.

After nine months, Marion is pain-free and eating a diet conducive to a euglycemic (normal blood glucose) state. He feels much better, and his blood glucose ranges from 100-130 with an A1C of 7%. He is optimistic about achieving his goal of an A1C of 6.5% in short order. Also conducive to his adherence, Marion has incorporated his family into his plan, so they are now involved in helping him eat a healthier diet. Further evidence of his adherence, Marion keeps routine appointments and follow-up visits with his ophthalmology, podiatry, and primary care providers.

Discussion

The writers gathered a wealth of information reviewing literature on the concept of adherence. Several themes emerged in the process of defining adherence through various disciplines. A review of multiple disciplines, including nursing, medicine, psychology, psychiatry, pharmacy, physiotherapy, nutrition, engineering, computer science, architecture, and construction led to a consensus definition of adherence for nursing as both physical stickiness and figuratively sticking to a plan and closely following a provider-recommended regimen.

Conclusion

Historically, adherence in the health fields has focused on medication compliance. But based on this preliminary concept analysis, the writers conclude that adherence in medicine and nursing contexts alike should be redefined to reflect the following: first, the role of an individual's culture and specific engagement in a plan of action, and second, the application of adherence to components beyond medication, such as dietary and lifestyle changes, all of which may help ameliorate

health outcomes in a holistic manner.

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