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Maturity in Adolescents with Type 1 Diabetes Mellitus: A Concept Analysis

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ABSTRACT

Theoretical Principles: The transition from adolescence to adulthood can be a particularly challenging time for teenagers with type 1 diabetes mellitus (T1DM). Adolescents with T1DM must manage a treatment regimen which requires a high level of responsibility and self-care. Often the responsibilities of self-care are given to these teens without a clear assessment of their maturity, resulting in poor health outcomes. In order to accurately assess a youth's ability to assume self-management of T1DM, a clear understanding of the concept of maturity is needed.
Phenomena Addressed: The purpose of this paper is to provide a theoretical definition of the concept of maturity in the context of adolescents with T1DM and support this definition based on a literature review. This discussion was developed utilizing the Walker and Avant approach to concept analysis.
Research Linkages: This concept analysis defined maturity in adolescents with T1DM as a multi-dimensional state of development that encompasses the physical, cognitive, psychological, and social dimensions of being. Maturity requires that an individual is capable of functioning with behavioral, cognitive, and emotional autonomy in self-care activities related to TIDM on a consistent basis. This explanation also emphasizes that the process of achieving maturity is gradual and dynamic in nature. Caregivers must understand that physical age alone does not indicate that an adolescent is adequately prepared to assume independent diabetes management. Nurses are in the unique position to assist youth with the transition from dependent diabetes care to independent self-management of the disease; thus, increasing the likelihood of positive outcomes.

Introduction

According to the Centers for Disease Control and Prevention (CDC, 2017), 1.25 million Americans, including 200,000 youth are living with type 1 diabetes mellitus (T1DM). Approximately 40,000 new cases of TIDM are diagnosed in the United States each year (Juvenile Diabetes Research Foundation [JDRF], 2017). By the year 2050, it is expected that five million Americans will have TIDM, including 600,000 youth (CDC, 2014). The current healthcare costs associated with diabetes reach $14 billion (JDRF, 2017). However, less than one third of people with TIDM are successful in achieving target blood glucose levels (JDRF, 2017).

Research has indicated that the young adult years represent a time when the early signs of diabetic complications will first manifest (Betts, Jefferson, & Swift, 2002). Furthermore, studies have shown that adolescence is a period when youth exhibit a higher rate of acute complications and mortality risks (Betts et al., 2002; Helgeson, Siminerio, Escobar, & Becker, 2009). As children transition to adolescence they also have many other developmental tasks to accomplish. Often self-care is assumed by teens without a clear assessment of their abilities by healthcare providers (Jensen et al., 2017). Further, youths report many challenges in transitioning services as adults with diabetes (Hanna & Woodard, 2013).

Thus, the transition from adolescence to adulthood can be a particularly challenging time for teenagers with T1DM when they gradually assume their self-care (Skinner & Hampson, 2001). Generally, this is also the time when life-long patterns of diabetes management are established (Kelly, Kratz, Bielski, & Rhinehart, 2002). To assume the high level of self-care necessary to independently manage T1DM, adolescents must reach a required level of maturity. Although there is an abundance of research regarding the concept of cognitive and psychological maturity in adolescents, a complete definition of maturity, encompassing all areas of development and specific to T1DM, has not been established (King et al., 2012; Pacaud et al., 2007).

Purpose

To accurately assess a youth's ability to assume self-management of T1DM, the nurse must have a clear understanding of the concept of

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maturity. The purpose of this paper is to provide a comprehensive definition of the concept of maturity in relation to adolescents with T1DM, and offer evidence to support this definition, based on a literature review. Furthermore, the critical attributes, antecedents, and consequences of the concept of maturity will be addressed. Finally, empirical referents will be offered so that the concept can be applied to research and practice.

Method of Analysis

This concept analysis followed Walker and Avant's (2011) framework. The following steps are included in this analysis: (1) concept selection, (2) determination of the purpose of the analysis,(3) identification of all uses of the concept, (4) determination of the defining attributes,(5) construction of a model case, (6) identification of borderline, related, contrary, invented, and illegitimate cases (note: this analysis includes a borderline and contrary case), (7) identification of antecedents and consequences, and (8) definition of empirical referents (Walker & Avant, 2011, p. 160).

Data Sources

A literature search was conducted using CINAHL, PsychINFO, ERIC, PubMed, and Web of Science databases. The search utilized the Boolean phrase "maturity and adolescents and diabetes." A separate search was conducted using the phrase "adolescent development" in the title, abstract, or key words. Inclusion criteria were: (a) paper published in English; (b) subjects between 12 and 18 years of age; and (c) paper available in full text. Publication time limit was not specified in order to capture the important early work related to this area of study. Publications that addressed only type 2 diabetes were excluded. After duplicates were removed, the abstracts were reviewed for relevance to the concept of maturity in adolescents with T1DM. A total of 41 papers were selected that utilized the concept of maturity in adolescents with T1DM and met the inclusion criteria. Additionally, a search of Google Scholar for articles providing tools for measuring maturity was conducted, yielding six relevant articles. Finally, a Google search was performed for "definition of maturity" to reveal dictionary, legal, and commonly used definitions of the term.

Results

Dictionary Definitions

Merriam-Webster Online Dictionary (2016) defines maturity as "full development." A second definition, related to finance, is "termination of the period that a note or other obligation has to run: a state or condition of having become due." Dictionary.com (2016) adds that maturity is "the state of full development in body or mind," and provides the synonyms of ripeness, fully aged, and adulthood. The psychology glossary provided by Alleydog.com (2016), which offers a lay meaning of the word, states that "maturity has little to do with age, but with the ability to react, cope, and reason in an appropriate way for the situation." It goes further to state that maturity is "learned through experiences and comes from healthy growth." This definition stresses that there are both physical and psychological components to be considered when defining maturity.

Agriculture

In the field of agriculture, the term maturity is used to refer to the point in time when fruit is ready for harvest. However, farming distinguishes a difference between maturity and ripeness. Crisosto (1994) defines maturity as the point at which a product has reached a sufficient stage of development so that after harvesting and postharvest handling, its quality will be acceptable to the consumer. When produce is ripe, it is ready for consumption. Nevertheless, ripening can continue outside of the parent plant, suggesting that maturity is the time at which produce is able to be live independently from the parental source (Adedeji, 2014).

Law

The profession of law addresses maturity in establishing a difference between minors and adults (Fagan, 2005). Historically, maturity has been based primarily on social norms and other tasks perceived as "adult," such as driving, voting, marrying, and signing contracts. This generally occurs between the age of 16 and 18 years (Fagan, 2005). According to this categorization, minors are vulnerable and incompetent, whereas, adults are autonomous and responsible. Policy makers use this legal definition to argue that immature brains make adolescents less culpable than adults (Fagan, 2005). However, legal dispositions of juvenile offenders may not be influenced by developmental maturity, despite immaturity being related to personal responsibility, a long-term perspective, weighing the perspectives of others, and having difficulty restraining impulsivity (Cauffman et al., 2007).

Engineering

In the discipline of engineering and technology, maturity is measured by a product's reproducibility and its ability to operate consistently, without malfunction, over a period of time (Mallory, 2016). The National Aeronautics and Space Administration (NASA, 2017) *assesses* the maturity of a particular technology by determining its readiness for operations in a variety of environments, with a final objective of transitioning the product to the user. The process also includes determining the ability of a particular technology to meet the customer's requirements and desired outcome for operations.

Adolescent Development

Brain Development and Neuroscience

Experts in the field of brain development and neuroscience have found that significant changes occur in the development of the brain during the adolescent period. Throughout adolescence, the brain undergoes pruning of the gray matter as well as an increase in white matter, particularly in the prefrontal cortex (Dumontheil, 2016; Van Den Bos, Rodriguez, Schweitzer, & McClure, 2015). Until the prefrontal cortex is adequately developed, which occurs in late adolescence or early adulthood, youth exhibit increased impulsivity and risk-taking behaviors (Van Den Bos et al., 2015). Furthermore, recent research indicates that there is an increase in subcortical stimulation in adolescence compared to that of childhood and adulthood. This overstimulation is thought to yield increasing risk behavior in adolescence (Steinberg et al., 2008; Steinberg & Chein, 2015). Consequently, full development of the prefrontal cortex and decreased subcortical activation are often the means by which maturity is defined in the field of neuroscience and adolescent brain development.

Psychology and Education

The fields of psychology and education have taken a strong interest in psychological and cognitive maturity. Psychologist Jean Piaget, a pioneer in child development, addressed the levels of cognitive development and defined formal operational thinking as the stage at which the child's thought process is no longer dependent on the concrete world (Piaget, Gruber, & Vonèche, 1995). When one reaches this level of thinking, he or she is able to imagine, reflect, and draw conclusions about events in the world. During this stage one begins to reason logically and can ponder the consequences and possibilities of actions. Furthermore, Piaget et al. (1995) asserted that during this period a sense of