

## Reflections based on the Tidal Model about the concept of psychosis

*Reflexões baseadas no Tidal Model sobre no conceito de psicose*  
*Reflexiones basadas en el Tidal Model sobre el concepto de psicosis*

Carlton Washington Pinheiro<sup>a</sup> 

Ana Ruth Macêdo Monteiro<sup>a</sup> 

Shéri da Karanini Paz de Oliveira<sup>a</sup> 

Saiwori de Jesus Silva Bezerra dos Anjos<sup>a</sup> 

Rhanna Emanuela Fontenele Lima de Carvalho<sup>a</sup> 

### How to cite this article:

Pinheiro CW, Monteiro ARM, Oliveira SKP, Anjos SJSB, Carvalho REFL. Reflections based on the Tidal Model about the concept of psychosis. Rev Gaúcha Enferm. 2022;43:e20210308. doi: <https://doi.org/10.1590/1983-1447.2022.20210308.en>

### ABSTRACT

**Objective:** To reflect on the concept of psychosis using the Tidal Model framework.

**Method:** Reflective study developed from the book *El modelo Tidal: salud mental, reivindicación y recuperación* by Phil Barker and Poppy Buchanan-Barker and other texts.

**Results:** The reflection was organized into three axes of discussion: "The Tidal Model", "The metaphor, psychosis and the domain of the self" and "The Tidal Model, nonlinearity and psychosis: synergisms with the Brazilian mental health policy".

**Final considerations:** The Tidal Model encompasses the concept of psychosis, in addition to being synergistic with aspects of psychiatric reform and mental health policies in Brazil. The limitations of the study are the fact that it only presents initial and general approximations about the relationship between the concept of psychosis and the Tidal Model, and it is necessary to deepen this knowledge in the specific context of care practice.

**Keywords:** Mental health. Psychiatric nursing. Nursing theory.

### RESUMO

**Objetivo:** Refletir sobre o conceito de psicose usando o referencial do Tidal Model.

**Método:** Estudo reflexivo desenvolvido a partir do livro *El modelo Tidal: salud mental, reivindicación y recuperación* de Phil Barker e Poppy Buchanan-Barker e demais textos.

**Resultados:** A reflexão organizou-se em três eixos de discussão: "O Tidal Model", "A metáfora, a psicose e o domínio do eu" e "O Tidal Model, a não linearidade e a psicose: sinergismos com a política de saúde mental brasileira".

**Considerações finais:** O Tidal Model abrange o conceito de psicose, além de ser sinérgico aos aspectos da reforma psiquiátrica e as políticas de saúde mental do Brasil. As limitações do estudo estão relacionadas ao fato de apresentarem apenas aproximações iniciais e gerais sobre a relação entre o conceito de psicose e o Tidal Model, sendo necessário o aprofundamento desse conhecimento no contexto específico da prática assistencial.

**Palavras chave:** Saúde mental. Enfermagem psiquiátrica. Teoria de enfermagem.

### RESUMEN

**Objetivo:** Reflexionar sobre el concepto de psicosis utilizando el marco del Tidal Model. Método: Estudio reflexivo desarrollado a partir del libro *El modelo Tidal: salud mental, reivindicación y recuperación* de Phil Barker y Poppy Buchanan-Barker y otros textos.

**Resultados:** La reflexión se organizó en tres ejes de discusión: "El Tidal Model", "La metáfora, la psicosis y el dominio del yo" y "El Tidal Model, la no linealidad y la psicosis: sinergismos con la política brasileña de salud mental".

**Consideraciones finales:** El Tidal Model abarca el concepto de psicosis, además de ser sinérgico con aspectos de la reforma psiquiátrica y las políticas de salud mental en Brasil. Las limitaciones del estudio están relacionadas con el hecho de que sólo presentan aproximaciones iniciales y generales sobre la relación entre el concepto de psicosis y el Tidal Model, siendo necesario profundizar ese conocimiento en el contexto específico de la práctica asistencial.

**Palabras clave:** Salud mental. Enfermería psiquiátrica. Teoría de enfermería.

<sup>a</sup> Universidade Estadual do Ceará (UECE), Programa de Pós-Graduação em Cuidados Clínicos em Enfermagem e Saúde. Fortaleza, Ceará, Brasil.

## ■ INTRODUCTION

Psychosis can be defined as a set of experiences that involve hallucinations, delusions, changes in thinking and changes in behavior. It is a concept worked in different psychological approaches, with different aspects in each one, with no consensus about its definition<sup>(1,2)</sup>.

Despite the plurality of views on the phenomenon of psychosis, there is a hegemony in the adoption of definitions from the International Classification of Diseases (ICD) and the Diagnostic and Statistical Manual of Mental Disorders (DSM), which end up directing the way of perceiving this concept in care practice<sup>(1)</sup>.

As a way of providing new subsidies to understand the phenomenon of psychosis in the context of mental health, the Tidal Model is used as a theoretical framework that considers the human experience as something natural, with its own flow and in constant change. This theory values the singularity of the person and their capacity for intrinsic resolution, enabling the achievement of new horizons of human experience<sup>(3-5)</sup>.

The Tidal Model is an alternative to the hegemonic model, with a philosophical approach, proposed by Philip J. Barker and Poppy Buchanan-Barker. The theory defines mental health as a discovery to be made by each person, in the hope that the individual finds the meaning of mental health for himself, as a unique person<sup>(6)</sup>.

Within this perspective, the terms used to label the phenomena of mental illness, mental disorders, neurosis, psychosis and others, represent forms of manifestations of human life, with a person-centered view, which is often overshadowed by signs and symptoms. This view allows us to understand that mental health changes are transversal to human psychological processes, and it is not an exceptionality restricted to a group of individuals<sup>(3)</sup>.

The authors<sup>(3-5)</sup> approached the Tidal Model developing studies with integrative review methods, theoretical reflection and theory analysis, however, in none of the studies the concept of psychosis was included in the results presented. In the references<sup>(6,7)</sup> the author of the theory approaches psychosis, but does not treat this concept in a central way, characterizing gaps in knowledge to be developed. Faced with this problem, the following research question was developed: would the Tidal Model be a theoretical framework capable of encompassing the concept of psychosis?

The present study involves the possibility of working the concept of psychosis from the references of the nursing discipline, strengthening the use of theories in the scope of care, favoring the professional identity of mental health

nurses, in addition to providing new insights into the answers during the therapeutic relationship<sup>(8)</sup>.

Moreover, the resolution 678/2021 of the Federal Council of Nursing (*Conselho Federal de Enfermagem* - COFEN) establishes that the generalist nurse in the context of mental health must use theoretical models to support and systematize care actions, through the Nursing Process (NP). It is up to the Nurse, with the title of specialist in mental health, to develop the therapeutic relationship as the basis of the mental health care process, based on nursing theories<sup>(8,9)</sup>.

It is noticed that there is a synergy between the aforementioned theoretical framework and the context of public mental health policies in Brazil, especially when considering the values of psychiatric reform and the anti-asylum movement. Both were important social movements to consolidate Law 10,216 of 2001, which states about the protection and rights of people with mental disorders and redefines the mental health care paradigm in Brazil<sup>(2,10)</sup>.

According to the aforementioned authors, these values are guided towards the dissemination of a community-based, territorialized mental health model, with multiprofessional care and integrated into a Psychosocial Care Network (*Rede de Atenção Psicossocial* - RAPS).

Given the above, the present study aims to reflect about the concept of psychosis using the Tidal Model framework.

## ■ METHOD

Problematizations that resulted in the development of this present reflection came from the subject Concepts and Practices of Nursing and Health Clinical Care, from the master's course of the Postgraduate Program in Nursing and Health Clinical Care (*Programa de Pós-Graduação em Cuidados Clínicos em Enfermagem e Saúde* - PPCCLIS).

From the study of the book *El Modelo Tidal: salud mental, reivindicación y recuperación* by Phil Barker and Poppy Buchanan-Barker and other texts, the reflection was organized into three axes of discussion: "The Tidal Model", "The metaphor, the psychosis and the domain of the self" and "The Tidal Model, nonlinearity and psychosis: synergisms with the Brazilian mental health policy".

The first axis presents the history of the theory, its classification, its 10 commitments, influences and some of the other central concepts. The second axis addresses aspects of the Tidal metaphor, in addition to exploring connections between Barker's concept of the domain of the self with the ego, self and the unconscious, from the perspective of Carl Gustav Jung. The third axis addresses the nonlinear aspects involved in the dynamics of psychosis, contemplating the

Tidal Model and the contextualization with elements of mental health policy in Brazil, in addition to proposing the 10 commitments guided to the person with psychosis.

## ■ THE TIDAL MODEL

The Tidal Model started to be developed between 1995 and 1997, with the first scientific studies applied between 1997 and 1999, in psychiatric emergency services in England. Theorist Philip J. Barker was the pioneer of this theoretical model, being the first professor of Mental Health and Psychiatry Nursing in the United Kingdom. The theory later had contributions from Poppy Buchanan-Barker, who is a specialist in social work<sup>(6)</sup>.

In an analysis of the Tidal Theory, based on Meleis' perspective, clarity was found in the functional components, assumptions, concepts, and propositions of the theory. The number of propositions was higher than the number of assumptions, and the concepts have logical adequacy. Its person-centered aspect eases the identification of human needs. The metaphorical language, adopted in the theory, is incorporated in the daily aspect of several cultures, increasing the capillarization in different settings, providing care based on scientific data<sup>(5)</sup>.

The Tidal Model has influences from other Nursing theorists, such as Hildegard Peplau and Joyce Travelbee, indicating a position within the field of interactionist theories. As it is a middle-range theory, with fewer concepts and less abstraction, it becomes advantageous for implementation in the care routine<sup>(3,8)</sup>.

This implementation of care seems to be being materialized, considering its application in several countries, such as Australia, Canada, New Zealand, Japan, Scotland and Wales. This diversity of scenarios may indicate its importance to improve care for people living with psychosis, a public present in mental health services<sup>(3,4)</sup>.

Regarding the propositions of the theory, they are expressed through 10 commitments, namely: 1) value the voice of the subject, 2) respect their daily language, 3) become the learner of history of the subject, 4) use personal tools to mobilize intrinsic resolutions, 5) help take a step further towards resolution and goal, 6) value the time spent between

nurse-patient, 7) develop genuine curiosity, 8) know that change is constant, 9) show personal wisdom by helping the subject to be aware of their strengths and weaknesses to develop self-confidence and personal helping skills, 10) to be transparent in the care process<sup>(6)</sup>.

The name Tidal Model can be translated into Portuguese as the Tidal Theory<sup>(5)</sup>, representing a metaphor that establishes a relationship between the human experience with the water in the ocean, considering that both are endowed with a natural flow, in constant movement and change. This being in the world of the ocean of human experiences brings to the navigator the development of his being, through his journey.

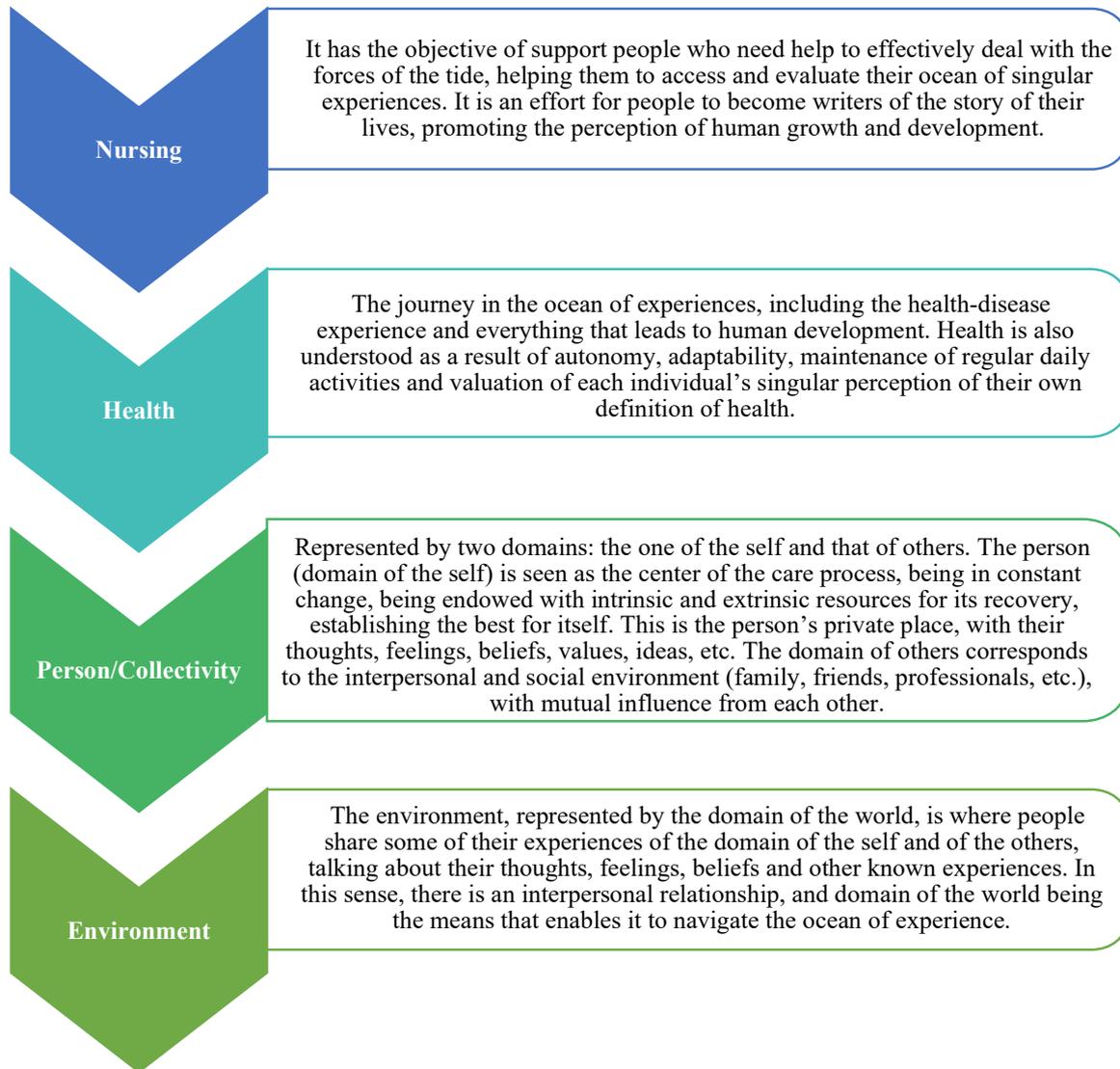
The authors of this reflection used the studies<sup>(3,5,6)</sup> to address the health, person, nursing, and environment metaparadigms, according to the Tidal Model framework, also carrying out the process of organization and definition of these concepts, which are represented in figure 1.

The nurse is seen as a lifeguard, but as expected for a rescue, he/she needs the collaboration of the person who is drowning, making explicit the need to be with, claiming the subject's protagonism, making the therapist and the person to float together towards recovery<sup>(6)</sup>.

Another important aspect is the definition about nursing care, a process guided by the 10 commitments of the Tidal Model, and has as reference the person's point of view, its associated meanings, helping them to have the necessary conditions to promote growth and development. It is noteworthy that, in this perspective, the nurse is not the holder of what is best for the client, but someone who makes possible the construction of this best from the person, recognizing him/her as the one who has the greatest knowledge about his/her own life<sup>(3)</sup>.

This care is considered as immediate when it is related to acute events; it is intermediate care when there is a transition from acute care to long-term care. Finally, development care is the one characterized as long-term<sup>(6)</sup>. The compatibility of these care concepts can be seen when considering the different contexts of mental health services<sup>(3)</sup>.

In view of the above on the Tidal Model, it is noteworthy the relevance to mental health nursing, making its importance and application of its concepts clearer.



**Figure 1** – Representation of nursing metaparadigms with their respective definitions based on the Tidal Model perspective. Fortaleza, Ceará, Brazil, 2021  
Source: Designed by the authors.

## THE METAPHOR, THE PSYCHOSIS AND THE DOMAIN OF THE SELF

Navigating the ocean of experience does not necessarily imply having a peaceful journey, as the sea also holds storms, shipwrecks, piracy, and beaching. Within this context, the navigator uses his boat to explore the journey of his life, setting himself on the high seas. It is possible to perceive that there is a parallel between the metaphorical ship and the concept of domain of the self, representing the singular possibilities that each being has, in addition to its own way of navigating<sup>(5)</sup>.

Psychosis is exemplified by Barker as a shipwreck process, in which the experiences flood this ship's constitution, the domain of the self. In view of this scenario, mental health care is necessary, as these signs indicate that something needs to be done, and interventions are aimed at helping to deal with the waters of the crisis or to submerge towards its causes<sup>(6)</sup>.

The therapeutic process offers this solid ground within the metaphor of the Tidal Model, in which the narratives are constructed and that will lead to the consciousness necessary for the assimilation of this experience, for the repair of this ship, so that it returns to the ocean of the experience of life. Here water also represents both intrapsychic and

interpersonal dynamics, keeping unknown depths, internal monsters, storms, strong water currents, etc.<sup>(7)</sup>.

In this context, the domain of the self is a personal, intimate environment in which the person experiences thoughts, sensations, emotions, being the private world where mental problems are experienced within the scope of the person<sup>(6)</sup>.

There is a correspondence of this concept with other theoretical frameworks from different psychological approaches. One can highlight the different conceptions about the Self of authors such as Freud, Carl Jung, Carl Rogers, William James, Karl Jaspers among others. Changes in this field of the self can manifest in psychotic disorders, which include: processes related to the loss of consciousness of the unity of the self, of the self's identity in time, of the limits between the self and the world, of changes in the sound of thought, thought echo, thought stealing, in addition to sensory and somatic changes<sup>(1)</sup>.

The perspective of Carl Jung's Analytical Psychology considers the ego as the center of consciousness and immersed in an unconscious with a personal stratum and collective as well. In the context of psychosis, the instance of the ego suffers from invasions, which cause damage to this integrated being, splitting it and making it permeable to the content of the personal and collective unconscious. The loss of this integrality results in a level of psychic disorganization<sup>(11)</sup>.

According to the aforementioned author, the importance of the symbol stands out as a representation of images from the unconscious, being endowed with a great affective charge. The person with psychosis, when confronted by these psychic contents of a personal and archetypal nature, is forced to deal with the intensity of this phenomenon. Jung works with a notion that the ego is directed to become the Self, in this sense, the individual is not finalized or given, but in a progressive dynamic aimed at becoming who he/she is.

It is noteworthy that it was, predominantly in the approach of analytical psychology, that the psychiatrist Nise da Silveira became one of the greatest references in the field of Brazilian Mental Health, having met Carl Jung in person and applied many of his concepts in a humanized care, using the art and defining its practice as an emotion to deal with<sup>(2)</sup>.

The notion of the ego for analytical psychology has parallels with the domain of the self in the Tidal Model, considering that both definitions of the concepts seem to converge to the notion of an integrated instance of the self. In this sense, the Tidal metaphor of the shipwreck can represent, in a symbolic way, events in psychic processes. The study of these symbolic representations is highlighted in the approach of the analytical psychology, mainly because Jung develops his theory based on psychosis<sup>(6,11)</sup>.

It is noticed that the concept of the domain of the self brings important aspects to the subject of Mental Health Nursing, fitting into different applicability in the phenomenon of psychosis, mainly to correlate with other concepts of shared theories of other academic disciplines. It is important to reinforce the need for practical theories that strengthen this field of care, making the operationalization of concepts a reality of clinical care<sup>(3,12)</sup>.

In view of these aspects, it is clear that the metaphor, psychosis and the domain of the self are phenomena with relationships among themselves, with importance both for the nursing discipline and for other areas of knowledge. It is highlighted the need for further studies to explore the relationship of these concepts to the context of clinical care in mental health.

## ■ THE TIDAL MODEL, NONLINEARITY AND PSYCHOSIS: SYNERGISMS WITH THE BRAZILIAN MENTAL HEALTH POLICY

The verbal and nonverbal language involved in the care for the person with psychosis does not always tend to be linear, logical and rational, that is, the disorganization of thought, speech, hallucinations and changes in behavior also require nonlinear ways of being with the person<sup>(1)</sup>.

Chaos theory grounds different concepts involved in the Tidal Model, being important to justify this different look at the context of psychosis and the nonlinearity of its phenomena. This theory considers that reality also has a chaotic, unpredictable aspect, without well-established boundaries<sup>(6,7)</sup>.

Within this perspective, it is possible to notice that the context of the mental health crisis also brings to light new elements about the human experience, not only a reductionist look at this phenomenon. Even in the face of challenging situations, the nurse must continue to invest in the person, who, despite being in a health context that demands immediate care, also continues to be the center of this assistance<sup>(4)</sup>.

It is important to point out that once the crisis context is over, this person begins to experience transitional care, in which the nurse helps the person prepare to be inserted back into the environment in which they live, and it is up to the development care the effectiveness of this care at the community level<sup>(6)</sup>.

These types of care established by the authors<sup>(6)</sup> are synergistic with the work of nurses in Brazil, especially in Psychosocial Care Centers (*Centros de Atenção Psicossocial - CAPS*), where territorial and community actions are developed, with multiprofessional actions and also hospitalization. These actions focus on promotion, protection, treatment and psychosocial rehabilitation<sup>(7)</sup>.

It is known that most people living with psychosis are CAPS users, considering that, in most cases, psychoses characterize severe and persistent mental disorders. Other services of the Psychosocial Care Network (*Rede de Atenção Psicossocial - RAPS*) also provide assistance to psychoses, such as the Urgent and Emergency Medical Service (*Serviço Médico de Urgência e Emergência - SAMU*), General Hospitals with specialized wards, Emergency Care Units (*Unidades de Pronto Atendimento - UPA*), Basic Health Units (*Unidades Básicas de Saúde - UBS*) among others.

The RAPS should value care in freedom based on the perspectives of the psychiatric reform movement and the anti-asylum movement, which historically has been spreading the need for a substitutive network of community mental health services. These movements marked important transformations in public health policies in Brazil, as they were added to the health reform, resulting in the process of redemocratization and the creation of the Unified Health System (*Sistema Único de Saúde - SUS*) by the federal constitution of 1988<sup>(10)</sup>.

With this, the Tidal Model provides propositions that favor the humanization of care, community care, overcoming the biomedical paradigm, social inclusion, in addition to supporting concepts that form a person-centered theory and from which comes the entire therapeutic process<sup>(3)</sup>.

This is a nursing theory sensitive to the context of mental health, which provides a basis for the nursing care within this specialty, as recommended by Resolution 678/2021, in addition to having convergent aspects with public mental health policies, contemplating new perspectives on the practice of clinical nursing care<sup>(9)</sup>.

The main limitations of the Tidal Model are related to the small number of national publications that disclose experiences with the applicability of the theory and the low level of evidence of the studies found<sup>(3)</sup>. It is noteworthy that the strategies and practices within the field of psychosocial care, in the context of psychiatric reform, are quite broad and diverse, transcending the nursing discipline and its specific practice, encompassing a global process of mental health care. It is up to the Tidal Model to be adopted as another framework in the practice of nurses in the context of mental health.

Based on what was presented during the text, there was a need to explain again about the propositions of the 10 commitments of the Tidal Model, but now focused on the care for people living with psychosis.

It is noticed that, in the context of psychosis, the person continues to claim for their capacity to do what needs to be done, continues to need their voice to be valued, that the content of their language be respected, including nonverbal

ones. The person continues to weave his/her personal theory, which may contain non-logical and nonlinear aspects. The professional needs to continue to become the learner, to value and identify intrinsic resolution tools and help to take it a step further, even if the objectives are not completely structured and predictable.

Nurses must continue to value the time in this therapeutic relationship, developing their genuine curiosity and understanding that there is personal wisdom at different levels of insight. Constant changes keep happening and they should influence this revelation of personal wisdom that needs to be made aware. In addition, the person with psychosis needs this transparent relationship with the nurse, to make possible their value and autonomy, and also to effect care focused on who they are and not on their diagnoses, signs and symptoms.

It is also necessary to recognize that the implementation of these propositions is not an easy process and that at times it goes beyond the individual governability of the nurse, however, the therapeutic process is a particular formalization of human relationship and needs support from management, a proper structure and other factors involved in the implementation of nursing practices<sup>(8,10)</sup>.

## ■ FINAL CONSIDERATIONS

The present study aimed to reflect on the concept of psychosis using the Tidal Model, with this, it became apparent that the theoretical framework can encompass the concept of psychosis in different aspects, in addition to being synergistic with aspects of the psychiatric reform and the mental health policies in Brazil. These elements characterize the potential that the Tidal Model has to be inserted in care practice in the context of the person with psychosis.

The main limitations are related to the fact that this theoretical reflection presents initial and general approximations about the relationship between the concept of psychosis and the Tidal Model, and it is necessary to deepen this knowledge in the specific context of care practice aimed at the person with psychosis, through the development of a concept analysis and a theoretical derivation, starting from the Tidal Model. Also noteworthy is the need for more studies using the Tidal Model in clinical practice to be reported in the national literature, in addition to research that expands the level of evidence of the theory.

Therefore, stands out the importance of the Mental Health Nursing discipline being strengthened by nursing theories, with the Tidal Model being one of the strategic possibilities to improve the clinical practice of nurses in the mental health specialty, especially for people with psychosis.

## ■ REFERENCES

1. Dalgalarondo P. Psicopatologia e semiologia dos transtornos mentais. 3. ed. Porto Alegre: Artmed; 2019.
2. Messias CL. Arte e psicanálise no tratamento da psicose: proximidades e diferenças entre a proposta de Nise da Silveira e Henry Bauchau. *Temáticas*. 2020;28(55):195-226. doi: <https://doi.org/10.20396/tematicas.v28i55.14163>.
3. Freitas RJM, Araujo JL, Moura NA, Oliveira GYM, Feitosa RMM, Monteiro ARM. Nursing care in mental health based on the Tidal Model: an integrative review. *Rev Bras Enferm*. 2020;73(2):e20180177. doi: <https://doi.org/10.1590/0034-7167-2018-0177>.
4. Bag B. Tidal model in mental health and psychiatric nursing practices. *Curr Approaches Psychiatry*. 2019;11(4):547-60. doi: <https://doi.org/10.18863/pgy.411672>.
5. Teixeira LA, Monteiro ARM, Guedes MVC, Silva LF, Freitas MC. The Tidal model: analysis based on Meleis's perspective. *Rev Bras Enferm*. 2018;71(2):457-62. doi: <https://doi.org/10.1590/0034-7167-2016-0394>.
6. Barker P, Buchanan-Barker P. El modelo Tidal: salud mental, reivindicación y recuperación [Internet]. Sevilla: Servicio Andaluz de Salud; 2007 [cited 2021 May 27]. Available from: [https://www.1decada4.es/pluginfile.php/760/mod\\_label/intro/TidalManual\\_espaniol.pdf](https://www.1decada4.es/pluginfile.php/760/mod_label/intro/TidalManual_espaniol.pdf).
7. Barker P. From chaos to complex order: personal values and resources in the process of psychotherapy. *Perspect Psychiatr Care*. 2000;36(2):51-7. doi: <https://doi.org/10.1111/j.1744-6163.2000.tb00691.x>.
8. Pinheiro CW, Araújo MAM, Rolim KMC, Oliveira CM, Alencar AB. Teoria das relações interpessoais: reflexões acerca da função terapêutica do enfermeiro em saúde mental. *Enferm Foco*. 2019;10(3):64-9. doi: <https://doi.org/10.21675/2357-707X.2019.v10.n3.2291>.
9. Conselho Federal de Enfermagem (BR). Resolução Cofen nº 678 de 19 de agosto de 2021. Aprova a atuação da Equipe de Enfermagem em Saúde Mental e em Enfermagem Psiquiátrica. *Diário Oficial União*. 2021 ago 26 [cited 2021 May 27];159(162 Seção 1):97. Available from: <https://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?data=26/08/2021&jornal=515&pagina=97&totalArquivos=97>.
10. Pitta AMF, Guljor AP. A violência da contrarreforma psiquiátrica no Brasil: um ataque à democracia em tempos de luta pelos direitos humanos e justiça social. *Caderno CEAS*. 2019;(246):6-14. doi: <https://doi.org/10.25247/2447-861X.2019.n246.p6-14>.
11. Jung CG. O eu e o inconsciente, vol. 7/2: dois escritos sobre psicologia analítica. Petrópolis: Vozes; 2011.
12. McEwen M, Willis EM. Theoretical basis for nursing. 5. ed. Philadelphia: Wolters Kluwer; 2019.

■ **Acknowledgments:**

For the master's scholarship granted by *Função Cearense de Apoio ao Desenvolvimento Científico e Tecnológico* (FUNCAP), process: BMD-0008-02239.01.04/2021.

■ **Authorship contribution:**

Project administration: Ana Ruth Macêdo Monteiro.  
Formal analysis: Carlon Washington Pinheiro, Ana Ruth Macêdo Monteiro, Shériida Karanini Paz de Oliveira.  
Funding acquisition: Fundação Cearense de Apoio ao Desenvolvimento Científico e Tecnológico (Funcap).  
Conceptualization: Carlon Washington Pinheiro, Ana Ruth Macêdo Monteiro.  
Data curation: Carlon Washington Pinheiro, Ana Ruth Macêdo Monteiro.  
Writing-original draft: Carlon Washington Pinheiro.  
Writing-review & editing: Carlon Washington Pinheiro, Ana Ruth Macêdo Monteiro, Shériida Karanini Paz de Oliveira, Saiwori de Jesus Silva Bezerra dos Anjos, Rhanna Emanuela Fontenele Lima de Carvalho.  
Investigation: Carlon Washington Pinheiro.  
Methodology: Carlon Washington Pinheiro, Shériida Karanini Paz de Oliveira, Saiwori de Jesus Silva Bezerra dos Anjos, Rhanna Emanuela Fontenele Lima de Carvalho.  
Resources: Não se aplica.  
Software: Não se aplica.  
Supervision: Ana Ruth Macêdo Monteiro, Shériida Karanini Paz de Oliveira, Saiwori de Jesus Silva Bezerra dos Anjos, Rhanna Emanuela Fontenele Lima de Carvalho.  
Validation: Ana Ruth Macêdo Monteiro, Shériida Karanini Paz de Oliveira, Saiwori de Jesus Silva Bezerra dos Anjos, Rhanna Emanuela Fontenele Lima de Carvalho.  
Visualization: Carlon Washington Pinheiro, Ana Ruth Macêdo Monteiro.

The authors declare that there is no conflict of interest.

■ **Corresponding author:**

Carlon Washington Pinheiro  
E-mail: carlonwpinheiro@gmail.com

Received: 11.09.2021  
Approved: 06.20.2022

**Associate editor:**

Dagmar Elaine Kaiser

**Editor-in-chief:**

Maria da Graça Oliveira Crossetti