

## Cortisol, Stress and Burnout in Nurses: An Integrative Review

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### Abstract

**Introduction:** Burnout Syndrome (BS) appears in different working conditions, generating sense of frustration, coldness and indifference to the suffering of others. Cortisol is a glucocorticoid hormone and biomarker that has its secretion increased during acute stress situations.

**Objective:** This review aims to summarize the knowledge produced in international journals on the correlation between occupational stress, BS and biological marker cortisol in nurses.

**Method:** An integrative review that had the main question: "What is the production of knowledge related to cortisol levels, occupational stress and BS in nurses?". The following databases were used for data collection: CINAHL, PubMed, LILACS, Scopus and Web of Science. Descriptors like 'hydrocortisone', 'burnout professional', 'nursing' and 'primary health care' were searched.

**Results:** 232 articles were selected and after the screening with summaries evaluation and full texts reading, five articles were analyzed and placed in the following categories: Stress, Burnout and Nursing; and cortisol levels, occupational stress and burnout.

**Conclusion:** This study found both stress and BS are diseases present in nursing work process. The several methodologies used for analysis of cortisol found heterogeneous results, making it difficult to compare studies.

**Keywords:** Cortisol; Burnout; Nursing

### Introduction

The new job market, with individualistic tendencies of modern society, increasingly requires professionalization, bureaucratization and isolation, with few resources to deal with the frustrations that favor the development of mental disorders in workers, which negative consequences are in individual, family, social, professional and institutional context, with loss of ability to adapt to the work circumstances [1,2].

The high impairment level of health professional, regarding mental disorders, is arising from environmental stress and work process by non-recognition of the worker and significance depreciation. Regarding the health of nursing workers in their daily work, there are different and complex physical and psychological demands, which may adversely affect the health of nurses [3,4].

The nurse performs a work that demands attention and often plays activities with a high degree of difficulty and responsibility, constituting psychosocial factors that affect the presence of stress at work. The accelerated pace and the excessive working journey are factors that can develop occupational stress [5,6].

A person in chronic and work-related stress can develop Burnout Syndrome (BS), evidenced by emotional exhaustion, depersonalization and incompetence feelings. The BS is a professional exhaustion, defined as a psychological syndrome resulting from chronic emotional stress at work and includes fatigue and energy depletion of professional [3,7].

It is important to identify the differences between routine stress and burnout. In BS predominates symptoms of mental exhaustion, fatigue, depression and work-related behavioral symptoms over physical ones, decreased affection and performance in activities by negative attitudes in people not suffering from any mental disorder [8].

In health work process, the BS comes in different contexts generating feelings of frustration, coldness and indifference to the suffering and needs of the patient. Thus, the affected employee does not let himself be bound by the problems and emotional difficulties of others, suppressing the establishment of interpersonal relationships, as if the object of his care was something with no warmth and human affection. It also present a major irritability in the workplace and personal and family environment [9,10].

Concerning stress, there is a close relationship between the nervous and endocrine systems, considering the role of the hypothalamus as common organ for both systems. The hypothalamus exerts control over the function of several endocrine glands, highlighting the adrenal glands, which are responsible for the production and release of the hormone cortisol [11].

The cortisol is a glucocorticoid hormone secreted by the adrenal cortex under the stimulation of Adrenocorticotrophic hormone (ACTH) or corticotropin, in turn released from the anterior pituitary. Those hormones promote rapid mobilization of amino acids and fats from their cell stocks, making them available for the energy supply and synthesis of glucose needed for the body's tissues [12].

Any kind of stress whether physical or mental causes immediate lifting of adeno-pituitary secretion of ACTH, which controls the secretion of cortisol by the anterior lobe of the pituitary gland. There also an important release factor that controls the secretion of ACTH-corticotropin-release factor (CRF). This factor is secreted in the primary capillary plexus of the door-pituitary system and transported to the anterior pituitary inducing the secretion of ACTH. The anterior lobe of the pituitary can only secrete small quantities of ACTH in the absence of CRF. Thus, the stress and other conditions that promote intense increase secretion of corticotropin triggers this secretory activity by signals from the basal hypothalamus region transmitted for the anterior side of the organ by CRF [12].

Almost all types of physical or psychological stress are able to increase sharply and within minutes, the ACTH and cortisol by up to twenty times. Physiologically, cortisol secretion occurs in a pattern of circadian regulation with concentrations of CRF, ACTH and high cortisol in the morning, decline in afternoon and low levels concentrations at night. In the circadian cycle, the plasm level of cortisol concentration is between 20 jg/dl one hour before wake up until about 5/xg/dl around midnight, thus, this information is important to determine the hormone levels related to the timing of the cycle in which they were measured [13,14].

Cortisol level increases in the last stages of sleep in humans, aiming to prepare the body for the wake, glucocorticoids reach their peak in the third of nocturnal sleep, immediately preceding the vigil. In acute stress situations, there is an increase in cortisol secretion, which returns their baseline by the end of the stressor. Thus, Burnout is associated with chronic stress at work and long-term adaptation of the body to such situation is regulated by the hypothalamic-pituitary-adrenal axis (HPA) [11,15].

## Aim of the Study

Therefore, this study aimed to synthesize the knowledge produced in national and international articles about the correlation between occupational stress, burnout and biological marker cortisol in nurses.

## Method

This is an integrative literature review, the most comprehensive methodological approach regarding the revisions, allowing the inclusion of experimental and non-experimental studies for a complete understanding of the analyzed phenomenon. We used this method as it provides a synthesis of knowledge and the incorporation of the applicability of the results of significant studies in practice [16].

The steps taken in this integrative review were:

1. Issue identification and selection of the hypothesis or research question to elaborate the integrative review;
2. Establishment of criteria for inclusion and exclusion of studies / sampling or literature search;
3. Definition of information to be extract from selected studies/categorization of studies;
4. Evaluation of the studies included in the integrative review;
5. Interpretation of the results;
6. Presentation of the review/knowledge synthesis [16].

In order to guide the study, we formulated the following research question: "What is the production of knowledge related to cortisol levels, occupational stress and burnout in nurses?"

Data collection was conducted in June of 2014, in the databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Public Medline (PubMed), Latin American and Caribbean Health Sciences (LILACS), Scopus and Web of Science. All bases were accessed by two researchers on different computers, at the same time, ensuring greater reliability in the selection of publications.

The search was conducted in an uncontrolled way, through the Medical Subject Headings (MESH) descriptors: Hydrocortisone; Burnout Professional; Nursing; Primary, Health Care. Crossed through the Boolean operator „AND”.

Original articles available in the selected databases that addresses the proposed theme were included. Published articles in the last ten years in English, Portuguese and Spanish languages, with participation of nurses in the sample. Articles in editorial format were excluded as well as letter to the editor, opinion of experts, theses, dissertations and literature reviews.

The articles were analyzed by thorough reading of the titles and analysis of the full text information. For screening of the articles, a protocol containing the publication identification, headquarters institution of study, type of publication, methodological characteristics of the study (objective, sample, data processing, results, analysis, implications, evidence levels) and evaluation the methodological rigor was used. Subsequently two categories among the common areas were formulated: stress, burnout and nursing; and cortisol levels, occupational stress and burnout.

## Results

We identified 232 studies in the database Lilacs, Pubmed, Web of Science and Scopus, that after a thorough analysis, 5 suited in the inclusion criteria. In the database Scopus was located 1 study and 2 studies in Lilacs and Pubmed, respectively. Thus, we excluded 227 studies that did not meet the criteria of this integrative review (Figure 1).

The selected articles were published in English and Portuguese, found by crossing the descriptors „Hydrocortisone”, „Professional Burnout”, „Nursing”. Regarding indexing, one was located in Scopus, two in PubMed and two in Lilacs. No study was found on the Web of Science database.

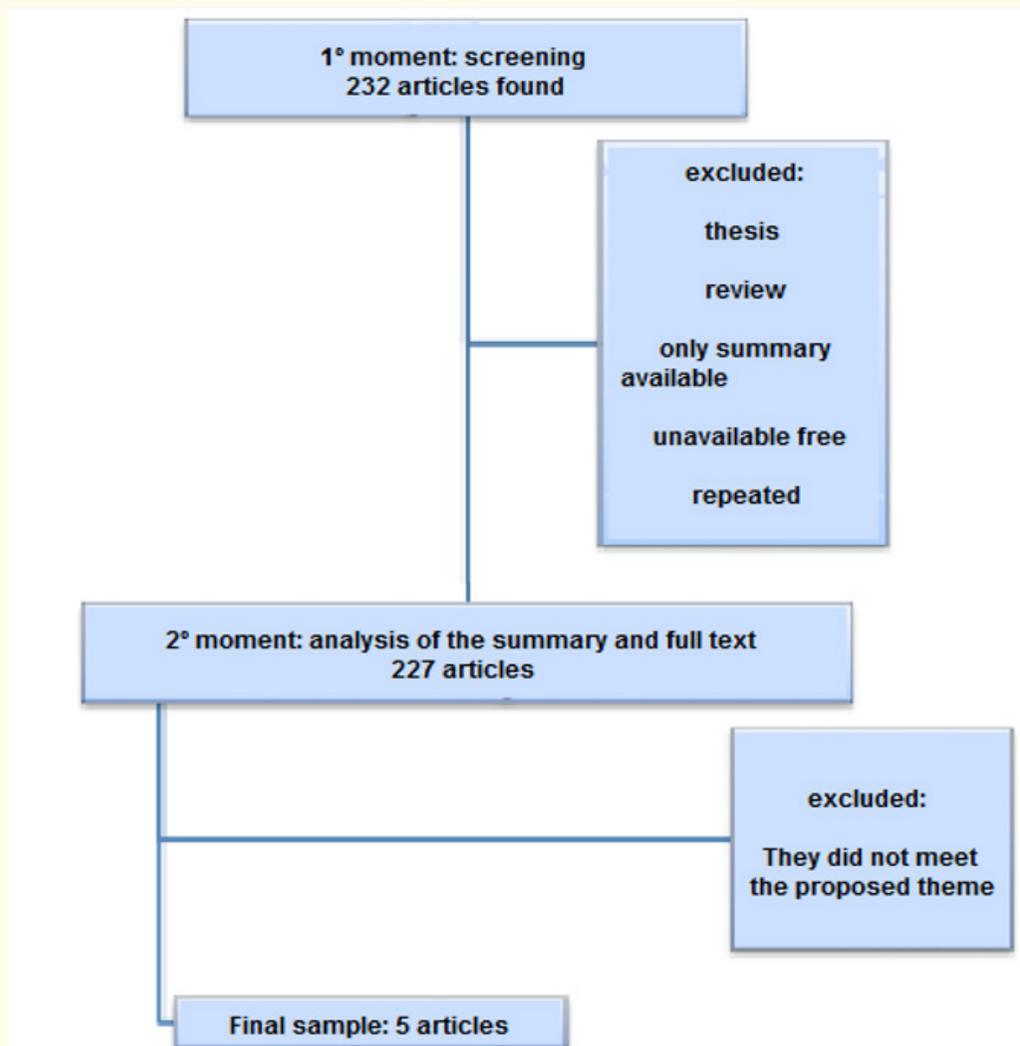


Figure 1: Articles selection flow.

The publications of the studies took place in 2009, 2011, 2013, 2014 and 2015 in the areas of Nursing, Psychology, Biology and Gastroenterology. As for the locals of studies-three articles were developed in Brazil, one in Germany and one in Spain, all in hospitals. The characterization with respect to authorship, year of publication, title, objective and results of the relationship between cortisol and burnout levels are described in table 1 and 2.

Regarding the type of study, all used the quantitative approach. Though two are descriptive and cross-sectional, one is observational-sectional and two are experimental (one prospective clinical and other double-blind randomized trial).

Basis/Periodical	Title	Author (Year)	Objective
Lilacs RevEscEnferm USP 2013, 47 (5): 1194-01	Estresse em enfermeiros: o uso do cortisol salivar no dia de trabalho e de folga	Rocha, MCP; Martino, MMF; Grassi-Kassisse, DM; Souza, AL.	Identifying the presence of stress in nurses, using as instrument the correlation between the analysis of the salivary cortisol concentration as an physiological indicator of the degree of stress and questionnaire application as a form of psychological stress assessment.
Lilacs RevEnferm UERJ 2014, 22 (4): 447-53	Análise de cortisol salivar como biomarcador de estresse ocupacional em trabalhadores de enfermagem	Campo, JF; David, HMSL	Evaluating the salivary cortisol levels of hospital nursing staff.
Pubmed Psychoneuroendocrinology (2009) 34, 1144-1151	Elevated diurnal salivary cortisol in nurses is associated with burnout but not with vital exhaustion	Wingenfeld, K.; Schulz, M.; Damkroeger, A.; Rose, M.; Driessen, M.	Exploring the relationship between burnout and cortisol in nurses working in different departments such as general hospitals and German psychiatric hospitals. In addition, we sought to investigate the functioning of the hypothalamic-pituitáriao-adrenal axis in routine focusing on vital exhaustion and release of salivary cortisol.
PubMed Biological Research for Nursing 13(4) 376-382, 2011.	Immediate Effects of Reiki on Heart Rate Variability, Cortisol Levels, and Body Temperature in Health Care Professionals With Burnout.	DIAZ-Rodriguez, L.; Arroyo-Morales, M.; Fernandez-De-Las-Penas, C.; Garcia-Lafuente, F.; CARMEN Garcia-Royo, M.; Tomas-Rojas, I.	Investigating the immediate effects of a Reiki session in the variability of heart rate, body temperature, salivary flow rate, and salivary cortisol levels in nurses with burnout. A second objective of the study was to analyze the relationship between the variability of the heart rate, body temperature and salivary changes.
Scopus ArqGastroenterol v. 52 no. 2 - abr./jun. 2015	Nutritional, metabolic and cardiovascular correlations of morning cortisol in health care workers in a gastroenterology service.	Guerra A, Soares RM, Pezzi F, Karkow FJ, Faintuch J.	Analyzing the association between plasma cortisol in the morning, and risk factors for hospital staff, including nutritional, metabolic and cardiovascular markers contexts.

**Table 1:** Characterization according to the basis, periodical, title, authorship and aim.

About the instruments used for analysis of occupational stress/burnout, two studies have used psychological questionnaires, one study used the Maslach Burnout Inventory with the Maastricht Questionnaire of Vital Exhaustion and Self-Rating Depression Scale for depressive symptoms; another study used the inventory of stress in nurses and the last made use of a questionnaire about work characterization and exclusion criteria. For analysis of cortisol, four of the studies used the saliva and only one plasm. All underwent chemiluminescence immunoassay technique.

Title	Results
Estresse em enfermeiros: o uso do cortisol salivar no dia de trabalho e de folga	<p>There was no significant correlation between the cortisol level of the working day and the stress of nurses. Only a positive influence between the proportional increase in cortisol and scores of stress concentrations.</p> <p>There was no correlation between cortisol scores in day off and stress, the values remained and lower. Female nurses with double-shifts showed higher level of cortisol in the working day. Nurses who practice physical activity showed lower cortisol level in the working day. Nurses in surgical clinic II showed the greatest level of cortisol.</p>
Análise de cortisol salivar como biomarcador de estresse ocupacional em trabalhadores de enfermagem	<p>Cortisol was quantified through indices: average increase (MnInc), excretion in the period after waking (AUctrab) and area under the curve relative to the zero of the diurnal cycle (AUCCD). The characterization of salivary cortisol levels, according to sociodemographic characteristics showed that MnInc was associated with variables: marital status and income (<math>p &lt; 0.001</math> and <math>p &lt; 0.05</math>, respectively), and professionals without a partner and with income up to R \$ 2000 00 have higher averages for MnInc. As for AUctrab, only sex was statistically significant association (<math>p &lt; 0.01</math>). Men showed AUctrab with the highest average. Regarding AUCCD, only marital status showed a statistically significant association (<math>p &lt; 0.01</math>). Professionals without a partner revealed AUCCD with the highest average. The analysis of salivary cortisol levels (MnInc, AUctrab and AUCCD) showed no statistically significant associations with any variable referring to the habits related to health and occupational characteristics.</p>
Elevated diurnal salivary cortisol in nurses is associated with burnout but not with vital exhaustion	<p>Relating to burnout syndrome, 75 subjects experienced professional exhaustion scores above normal, 31 subjects had scores above normal for professional depersonalization. On the other hand, significant score for personal achievement was above normal, which means that the effectiveness of the work was assessed as good. On vital exhaustion, only 46 individuals had a score without exhaustion, 122 subjects had mild to moderate exhaustion, and 109 individuals were in severe exhaustion indication. Overall, there was no evidence of significant depressive symptoms in the study group. About cortisol and vital exhaustion, no statistical significance for age and years of work was detected. There was no significant correlation between log-transformed cortisol and vital exhaustion, depressed mood, depersonalization and personal accomplishment. The study showed an increased release of cortisol throughout the day in individuals with high scores in two dimensions of burnout measured by Malash Burnout Inventory. The circadian rhythm of cortisol was not affected, but estimated levels showed a greater release in the morning and in the afternoon when compared to the night. Vital exhaustion, moreover, didn't show to be associated with abnormal cortisol secretion.</p>
Immediate Effects of Reiki on Heart Rate Variability, Cortisol Levels, and Body Temperature in Health Care Professionals With Burnout.	<p>The results showed that a single Reiki treatment increased the variability of the heart rate and body temperature, but not of the cortisol levels in saliva of nurses to burnout. The placebo Reiki session did not exercise changes in body temperature. These results support the hypothesis that Reiki has an effect on the parasympathetic nervous system when applied to health professionals and nurses to burnout. Neither the salivary flow rate nor salivary cortisol concentrations showed significant differences between the placebo and Reiki sessions. However, the concentration of cortisol levels showed a tendency to decrease after the Reiki session.</p>
Nutritional, metabolic and cardiovascular correlations of morning cortisol in health care workers in a gastroenterology services.	<p>The average values of cortisol were acceptable, while 21.6% (40/185) exceeded the upper limit of normal (5-25 ug / dL) among obese. When stratifying the participants including nurses, based on glucose homeostasis and metabolic syndrome state, the most metabolically compromised exhibited a unhealthy clinical condition, but the level of cortisol was not found abnormal. The analysis according to gender reveal no different concentrations of cortisol. Univariate regression analysis indicated that cortisol levels was negatively associated with various clinical and metabolic markers arising from obesity, and positively to HDL (cholesterol). Age, BMI and waist circumference were confirmed as independent variables in the multivariate analysis. Participants in the highest quartile of cortisol were compared with the lowest quartile. Nutritional and metabolic differences in BMI, waist circumference and HDL (cholesterol) characterized the leanest individuals with stronger cortisol response.</p>

**Table 2:** Characterization according to the significant results in relation to salivary cortisol levels and burnout.

Among studies included in this review that used instruments to investigate occupational stress and/or burnout, all demonstrated signs of exposure to this type of illness arising from the health care work processes.

### Discussion

Interest in BS has been growing both because of the expansion of health concept by the World Health Organization (WHO) and the interests of research and public health agencies, as well the increased demand and requirements of social service providers population-in education and health. Worldwide, Burnout comes in different work contexts, generating feelings of frustration, coldness and indifference to the suffering and needs of patients [1,9,10].

After critical analysis of five selected articles, two thematic categories were constructed, as follows: Stress, Burnout and Nursing; and cortisol levels, stress and burnout.

### Stress, burnout and nursing

Nursing is one of the most stressful professions in public sector, due to lack of social recognition as well as to occupational factors such as excess of activities performed, reduced number of professionals per service, relationship difficulties in a nursing team, double or triple working-day with multiple job links, resulting in long and exhausting workloads [6].

On a daily basis, nurses have to deal with the rapid evolution of technology, including subordination of work, hierarchies of authority and various norms and routines to be followed, as well as the emotional demands and psychic burdens arising from the pain and suffering of patients and their families. This reality can lead to conflicts between professionals and managers, contributing to stress in work environment, aggravated by poor working conditions and precarious employment links, or physical and mental exhaustion of direct and continuous interaction with health problems and death [17].

Thus, when nurses are exposed to these risk factors at work, they can develop a state of exhaustion in which the nurse does not feel any interest in performing the tasks, creating a sense of rejection to work and patients, treating those patients as objects, increasing the lack of personal accomplishments with irritability and low-self-esteem. These characteristics are found in burnout syndrome. This syndrome has important social, family and health repercussions, resulting in innumerable physical and mental disorders, as well as for the work environment and management, with service user dissatisfaction, loss of productivity and increase of absenteeism [18].

According to studies analyzed in this review, nurses were exposed to occupational stress conditions. Rocha and colleagues [19] used a sample of nurses diagnosed with stress by stress inventory in Nurses (SIN). Nurses did not practice exercises, worked a double shift in emergency or surgical infirmary in hospitals - where the patients required complex nursing care and constant monitoring of vital signs, resulting in increased responsibility of nurses and stress routine.

Guerra, Soares, Pezzi, Karkow e Faintuch [20] in a study with female workers in a university hospital of medium size with predominance of nurses used metabolic and cardiovascular variables. The study of Campos and David [21] found a heavy alcohol consumption in addition to work-related stress factors, poor quality of sleep and physical inactivity in investigated nurses, factors that contribute to the development of work stress with low resilience by the professional.

Wingerfeld, Schulz, Damkroeger, Rose and Driessen [15] used the Maslach Burnout Inventory (MBI) in nurses of the sample by analyzing emotional exhaustion levels (EE), depersonalization (DE) and Professional Accomplishment (PA). As result, the authors identified 75 individuals with EE above normal levels and 31 with ED also above normal and a significant score for PR, showing efficacy in the diagnosis of burnout. Díaz-Rodríguez and colleagues [22] selected 21 health professionals, including nurses, with professional exhaustion of the emergency service of a university hospital, diagnosed with BS by a psychologist with experience in the treatment and using the theoretical framework established by Maslach and Jackson [23].

Therefore, nurses in their work process exerting different occupational positions deal with many elements that favor the stress. Nurses in clinical practice often deal with inadequate resources, users consultation, interpersonal relationships, emotional load from work, bond and care to the patient or family. Furthermore, administrative nurses, in addition to the factors described, are faced with bureaucratic workload, power and decision-making and collection managers. Nursing in the academic field still have to add activities with students, university policies and regulations, work overload and time-class loading issues. Thus, the practice of nursing requires physical and mental health and social protection for nurses' performance, in order to prevent accidents and mental illnesses related to work [6].

### Cortisol levels, occupational stress and burnout

The articles analyzed in the review showed that cortisol during and after stressful situations has its production and release increased by the adrenal cortex. Quantification of cortisol in blood plasma, urine, or using saliva, as a more accessible method, allows to quickly and effectively identify stress situations at work at certain times of the circadian cycle.

Salivary Cortisol is considered the most promising marker for evaluating the response to neurobiological stress [24]. In nursing, among the studies analyzed in this review, using cortisol as a biomarker, we found that Rocha and colleagues [19] evaluated the concentration of salivary cortisol as a physiological indicator of stress in nurses on and off the workday. The authors found a positive influence of the proportional increase of cortisol levels and stress scores. They did not show correlation between cortisol scores on day off and stress. In addition, the nurses had higher levels of cortisol in the working day and those who was in the surgical clinic II.

Campos and David [21] measured the salivary cortisol levels in nursing in a public hospital and found no statistically significant associations with any variable related to health habits and occupational characteristics, only association with marital status and income variables. Wingerfeld, Schulz, Damkroeger, Rose and Driessen [15] studied the relationship between salivary cortisol during the day and burnout and vital exhaustion in nurses. Data showed statistical significance for age and years of work and a significant correlation between hormone, depressed mood and the dimension of the BS. The study showed an increased release of cortisol throughout the day in individuals with high scores in two dimensions of BS measured by Malash Burnout Inventory, depersonalization and low personal accomplishment. The circadian rhythm of cortisol was not affected, but estimated levels showed a greater release in the morning and afternoon on the released overnight. Moreover, vital exhaustion did not seem to be associated with abnormal cortisol secretion.

Guerra, Soares, Pezzi, Karkow e Faintuch [20] studied the correlation of morning cortisol in blood plasma with nutritional and metabolic variables, body mass index (BMI) and waist circumference in nurses and other health professionals. The analysis by gender shows no different concentrations of cortisol, the concentration was negatively associated with various clinical and metabolic markers arising from obesity and positively associated to HDL (cholesterol). Participants with the highest quartile of cortisol were compared with the lowest quartile and nutritional and metabolic differences in BMI, waist circumference and HDL (cholesterol) characterized the leanest individuals with stronger cortisol response.

Diaz-Rodriguez and colleagues [22] conducted a randomized clinical trial to test the immediate effects of Reiki on heart rate variability, body temperature, salivary flow and cortisol level in healthcare providers - including nurses, with burnout syndrome. Reiki is a healing body and mind modality that aims to help in the restoration of the body system, by stimulating the natural healing processes of the body. The results showed a tendency to decrease in cortisol levels after the therapy session, as well as increased variability in heart rate and body temperature.

Health policies can effectively contribute to face the BS, such as the National Policy of alternative and complementary practices that uses an approach to stimulate the natural mechanisms for prevention and recovery of health. These health technologies has been increasing effectiveness and safety, because it is based on welcoming listening, the development of therapeutic bond and integration of people with society and the environment [25].

The Burnout is associated with chronic stress at work. Long-term adaptation of the body to such situations is regulated by the hypothalamic-pituitary-adrenal axis (HPA). The studies analyzed showed mixed results when related to cortisol levels that appear normal, increased or reduced. Among the reasons for this inconsistency are the different scales of burnout used for diagnosis, different measurements of the endocrine system, small samples that are not possible to compare [15].

Thus, there is no gold standard to measure this type of illness and not all studies use the same tool to diagnose the syndrome. Most studies used small and with different severities syndrome samples, making it difficult to generalize and compare them. Thereby, further studies employing well-defined samples subjects, comparison between groups with different levels of SB and more sophisticated methods to assess the endocrine regulation of the HPA axis, like laboratory or pharmacological stimulation of stress test, are necessary. Furthermore, new methods of analysis of cortisol release throughout the day, under natural conditions of stress in the work, should be developed.

### Conclusion

This study found both stress and the BS are diseases present in nursing work process. Few studies have been published using salivary cortisol concentration to analyze the stress situations and Burnout in nurses, although this is a reliable biomarker easily collected and analyzed from saliva, which can contribute to psychological inventories for diagnosis of the syndrome.

An important point to consider is the various methodologies for analysis of cortisol that have been used, showing mixed results, making it difficult to compare studies. One should take into account the circadian cycle and the schedules for completion of cortisol in saliva collections.

Further research is recommended to be conducted using other types of studies, such as longitudinal and experimental, new methods of analysis, other biomarkers for occupational stress and burnout, interventions to reduce stress levels and evaluation of physiological and psychological variables, involving work environment, interpersonal relations and occupational hazards.

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