

Applications of modeling of structural equations in nursing: integrative review

Juliane Umann¹, Rodrigo Marques da Silva², Cristilene Akiko Kimura³, Liana Lautert⁴

¹ Nurse, Ph.D. in Nursing. Nurse of the Brazilian Military Service. São Gabriel, RS, Brazil. E-mail: juumann@hotmail.com.

² Nurse, Ph.D. in Adult Health Nursing. Professor at Faculdade de Ciências e Educação Sena Aires. Valparaíso de Goiás, GO, Brazil. E-mail: marques-sm@hotmail.com.

³ Nurse, Ph.D. in Nursing. Professor at Faculdade de Ciências e Educação Sena Aires. Valparaíso de Goiás, GO, Brazil. E-mail: cris.akiko7@gmail.com.

⁴ Nurse, Ph.D. Associate Professor at Universidade Federal do Rio Grande do Sul. Porto Alegre, RS, Brazil. E-mail: lila@enf.ufrgs.br.

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ABSTRACT

We analyzed the scientific production using modeling of structural equations in nursing. We conducted an integrative review in June of 2016 in the databases PUBMED, MEDLINE, and LILACS. We identified 127 articles, and we selected 20 from those. We conducted the analyses – quality and level of evidence – using validated tools and a synoptic table. The articles attended to 80% of STROBE items (95%), level of evidence 5 (95%) and published in Asian (50%) and North American (30%) countries. There was an increase of the scientific production using models of structural equations during the study period and the predominance of investigations aimed at the work organization. The use of modeling of structural equations in nursing is growing. However, studies aimed at assistance and teaching are lacking. This method appeared useful for issues in research in this health field.

Descriptors: Nursing Research; Methods; Data Analysis; Multivariate Analysis.

INTRODUCTION

The nursing work process involves to Assist, Manage, Teach and Research, however, the research is the action that allows improving the other processes at the measure that it provides data and instruments to improve professional training, the management of care and as a consequence, the provided assistance. It is also noted that the researcher has been gradually strengthened in the past years and contributed to the body of nursing knowledge.

In nursing research, there is growing use of different instruments, especially psychometric scales to measure psychological variables. Concomitant, it is also verified the use of multivariate statistical analysis, allowing robust empirical tests, once it admits numerous simultaneous relationships, which is coherent to the complexity of some study objects. However, the management of these instruments and procedures

requires caution from the researcher to adequately analyze and interpret and, to avoid fallacy in research.

One of the research designs that has been noted in the health field is the modeling of structural equations (MSE). These allow testing factorial structures of psychometric scales, through confirming factorial analysis, as well as, regression analyses. Thus, the MSE allows confirming the psychometric structure of the scale to determine the sample and also to analyze the explicative relationships between multiple variables simultaneously, being those latent or observed⁽¹⁻²⁾.

Because it is a confirmatory technique, the modeling of structural equations involve four stages of the Confirmatory Factorial Analysis process. It is aimed at the measurement model (1- Definition of individual constructs; 2- Development of general measurement model; 3- Study planning to produce empirical results; 4- Assessment of the measurement model validity), as well as, two specific stages aimed at the structural model (5- Specification of Structural Model; and 6- Assessment of the structural model validity)⁽²⁾.

The most critical step for the MSE use is the definition of the model being tested, that is, the prior establishment of the relationships between the variables of the model. The model definition is guided by the combination of theoretical notions and empirical evidence of prior investigations. Thus, to apply the MSE, it is indispensable to consider theoretical aspects and the creation/specification of a model (hypothetical relationships between the variables), as well as, the graphic representation of the hypothetical model and the fixing of the measurement scale of the measurement model⁽¹⁻²⁾. Moreover, the data being analyzed should respect the calculations of univariate⁽²⁾ and multivariate normality for estimation⁽²⁾.

Therefore, the MSE can improve the measurement models, to help the creation of more adequate instruments, which benefits the development of more efficient models for the description and explanation of the human and social phenomenon.

For the construction of the theoretical model to be tested with the MSE, the researcher needs to be sure that there is sufficient association between two variables; temporal antecedents of the cause on the effect; the absence of causal alternative variables and theoretical referential to sustent the proposed relationships⁽¹⁾.

However, the development of explicative theoretical models, conducted through the MSE, it is still recent and little used in nursing⁽³⁻⁴⁾. For that, little is known about the applicability of this technique in teaching, assistance and administration fields, that is, how this method can contribute with the construction and validation of explicative models of inter-relationships between the variables of interest for the researcher.

Thus, this study aimed to analyze the scientific productions that used the Modelling of Structural Equations in nursing.

METHODS

An integrative review of the literature that searches for scientific evidence through the analysis of multiple published studies and allows synthesis for conclusions about the study theme⁽⁵⁾. For that, we

conducted the definitions of the study problem, of the guiding question, of the descriptors, of the inclusion and exclusion criteria of publications in the databases. Sequentially, we selected the articles for extraction, organization, and synthesis of information; assessment of studies; interpretation of results and synthesis of knowledge⁽⁵⁾. Based on this design, we created the following research question: What are the applications of the Modelling of Structural Equations in nursing research?

We captured the scientific articles in June of 2016 in the PUBMED interface and the databases MEDLINE and LILACS, using "Structural Equation Modeling"[text word] AND "Nursing" [MESH Descriptor] in the advanced search of these databases. We used the following filters: publications of the last five years (2012-2015), considering the recent dissemination of this nursing technique in this period and the scientific update of these papers, texts fully available online and the limit directed to humans. We highlight that, although Medline is a base from the Pubmed interface, the indexing of articles by the journals does not co-occur in this locations after the publication in the journals. Thus, we searched Pubmed and the Medline (access through Biblioteca Virtual em Saúde) separately. We included original studies that used Modeling of Structural Equations in the nursing field and published in English, Spanish and/or Portuguese. We excluded the publications that even with the planned strategy, they were out of the proposed theme, not fully available and with complete text in another language.

After the capture, we conducted the initial selection of articles reading titles and abstracts, having a first criterion, the theme coherence. After, we analyzed the texts in full according to pre-established criteria. For data collection and organization, we used a validated instrument for integrative review about the prevention of skin lesions in peri-operative patients⁽⁶⁾. It is composed of the following elements: identification of the original article, methodological characteristics, assessment of the methodological rigor, of the measured interventions and, of the results found. For this study, we excluded the intervention item, and we used additional items, as follows: year of publication, objective, sample size, study subjects, a nursing specialty that the MSE was applied and level of evidence for each study. We identified the selected articles using the letter A followed by the Arabic number following the order in which they were cited.

We evaluated the quality of the studies composing the final sample using a verification list – version translated into Portuguese (Brazil): Strengthening of the Reporting of Observation Studies in Epidemiology (STROBE). We opted for the STROBE because it is considered the current gold-standard to guide the construction and assessment of observational studies. Twenty-two items compose the STROBE, and it aims to assist the conduction of observational, including cohorts, case-control and cross-sectional studies⁽⁷⁾. From the total of 22 items, 18 are common to all designs, and four are specific for each study design⁽⁷⁾. Two independent reviewers conducted the blind quality assessment, and they kept those meeting at least 80% of STROBE items.

We added the studies with more than 80% of STROBE items in a database containing the extracted information based on the validated instrument cited above⁽⁶⁾. For the analysis of the study evidence, we used the classification proposed by Melnyk and Fineout-Overholt⁽⁸⁾. The quality of the evidence is classified in six

levels, as:

- Level 1: evidence from systematic reviews or meta-analysis of relevant clinical trials;
- Level 2: evidence from at least one well-designed randomized clinical trial;
- Level 3: well-designed clinical trial without randomization;
- Level 4: well-designed cohort and case-control studies;
- Level 5: systematic reviews of descriptive and qualitative studies;
- Level 6: evidence from only one descriptive or qualitative study;
- Level 7: opinion of authorities or reports of specialists' committees.

RESULTS

We identified 127 articles with the proposed search strategy. After reading titles and abstracts (pre-selection), we excluded 100 studies using the MSE without nursing emphasis. When reading the articles in full, two Pubmed articles were in Korean, and five from Medline were not fully available, which lead us to a final composition of 20 articles (Figure 1).

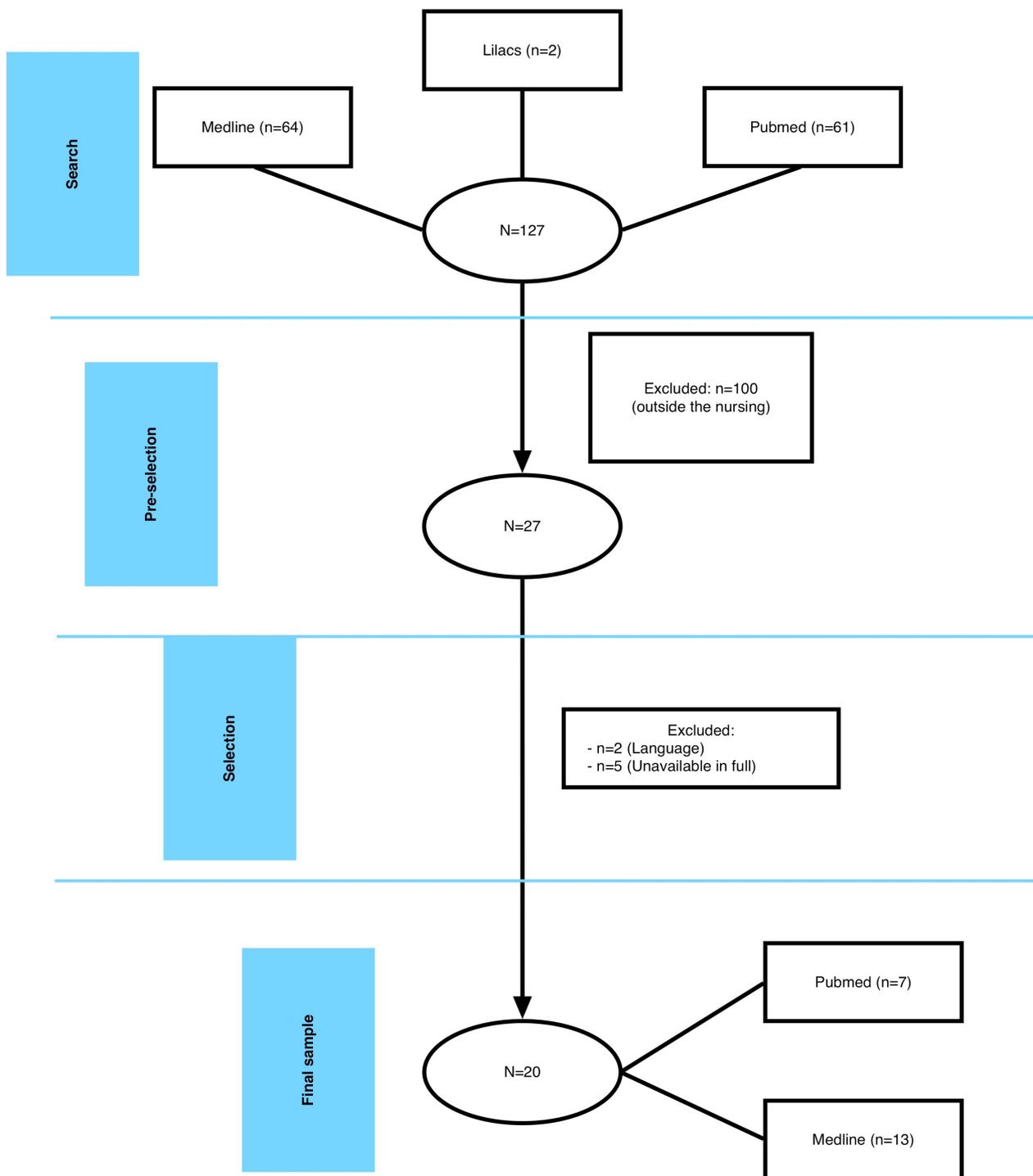


Figure 1: Flow of exclusion of articles selected in the review.

Assessment of the quality and characterization of scientific production

In the analysis of the production quality, 19 articles (95%) contemplated more than 80% of proposed items on STROBE. One article met 70% of items, but we opted to keep it in the review because of the adequate items about the fundamental sections of the study, being: objective, hypothesis and, applied method (Chart 1).

Chart 1: Synoptic chart of the included scientific production in the review, 2016.

Ref	Objective	Results	Sample/ Country	STROBE* Evidence
A1 ⁽⁹⁾	To investigate how the perception of organizational justice affects the trust and organizational identification of nurses, and if the trust and organizational identification encourage nurses to stay in work voluntarily and to compromise with hospitals.	The perceived organizational justice by nurses positively influences its organizational trust ($\gamma_{11} = 0.49$) and the organizational identification ($\gamma_{21} = 0.58$). The trust ($\beta_{31} = 0.62$) and the organizational identification positively affect the compromise with the institution ($\beta_{32} = 0.53$).	386 Nurses / The United States of America	18
A2 ⁽¹⁰⁾	To assess the efficacy of classical (availability of alcohol-based products, posters, instructions, and training) or advanced strategies (feedbacks and, formal and informal leadership), to improve the compliance of hands hygiene.	The reliability of proposed constructs was obtained (Cronbach's $\alpha=0.73$; 0.84; 0.70) and it was verified that health professionals acting in centers more compromised with hands hygiene are those who perceive advanced strategies as more effective ($\chi^2=298.3$, $df=39$, $CFI=0.972$, $TLI=0.961$, $RMSEA=0.057$, $SRMR=0.028$).	2.068 Health professionals / Spain	19
A3 ⁽¹¹⁾	To test a model to predict and explain the effectiveness of nurses at work in local hospitals.	The model of final paths showed a good data adjustment, generating a modified model. The work characteristics and the possibility of judicial compensation (for damages) presented a positive effect on the empowering. Work characteristics, the empowering and, the transformational leadership directly and positively affect the effectiveness at work. The work characteristics presented higher effect on the empowering and effectiveness at work than the other studied factors.	340 Nurses / South Korea	18
A4 ⁽¹²⁾	To assess a model based on the self-efficacy theory to comprehend the professional performance of nurses related to the weight control of obese patients.	The direct and positively self-efficacy predicted practices of weight control of nurses ($\beta = 0.36$, $p < 0.01$), and mediated the relationships between the perceived abilities, perceived barriers, professional identity, belief in teamwork and practices of weight control. The final model demonstrated a good data adjustment [$\chi^2 (14) = 13.90$, $p = 0.46$; $GFI = 0.99$; $AGFI = 0.98$; $NNFI = 1.00$; $CFI = 1.00$; $RMSEA = 0.00$; $AIC = 57.90$], contributing for 38.4% and 43.2% of the variance in the factors weight control practices and self-efficacy, respectively.	399 Nurses / United Kingdom	17
A5 ⁽¹³⁾	To investigate the effect of technological preparation of nurses on the acceptance of mobile electronic systems of medical registry (SEMRM)	The results point that nurses are optimistic, innovators and secure, but they feel uncomfortable about technology. Besides, these four traces of technological preparation presented a significant impact on the facility to perceive SEMRM, while the optimism trace significantly influenced the SEMRM perceived utility. The results also confirmed the relationships between use facility, utility and behavioral intention in the Model of Technological Acceptance considering the SEMRM use.	665 Hospital nurses / Taiwan	17

Ref	Objective	Results	Sample/ Country	STROBE* Evidence
A6 ⁽¹⁴⁾	To assess the environmental characteristics of the professional practice and its relationship with burnout, the perception of care quality, satisfaction at work and the intention to quit the job in the next twelve months.	The modeling of structural equations through pathway analyses showed that characteristics of the practice environment influence the satisfaction at work, the perception of care quality and the intention to quit the job, while mediated by the feeling of emotional exhaustion. The nurse with little autonomy, less control over the environment and with relationships with the doctor, presents higher emotional fatigue, which can negatively influence in their perception of care quality, satisfaction with work and intention to quit the job.	129 Adult ICU nurses / Brazil	18
A7 ⁽¹⁵⁾	To investigate if the perceived organizational learning capability (OLC) is associated to the informational technology acceptance among the surgical nursing staff.	The performance and effort expectations and the social influence positively contributed ($p < 0.001$) to the behavioral intention of users of the clinical information system, explaining 75% of variance. The OLC was positively associated to performance and effort expectations and the social influence ($p < 0.001$). However. The hypothetical relationship between perceived OLC and behavioral intention was not significant ($p = 0.87$). The statistical adjustment analysis indicated a reasonable model fit for the data (Root of the mean square error of approximation = 0.07 and Comparative Adjustment Index = 0.91).	84 Anesthesiologist nurses and 131 Surgical center nurses / Taiwan	17
A8 ⁽¹⁶⁾	To assess how the identification of nurses with the working group, unit or floor; their performed function; and their nursing career are related to the interaction capacity, the availability to manage conflicts, and the helplessness feeling and to work stability.	The findings demonstrate direct relationships between the identification of the nurse with the staff (latent variable) and her interaction capacity, readiness to manage conflicts and work stability. Feelings of helplessness are attenuated by higher identification of the nurse with the staff through the interaction capacity, and willingness to handle conflicts. Besides, the willingness to handle conflicts and the helplessness mediate the relationships between interaction capacity and work stability.	466 Hospital nurses / The United States of America	17
A9 ⁽¹⁷⁾	To relate the perceived leadership style (particularly the perceived leadership by the employee) perceived organizational support, trust in the leader and the organization, and burnout among nurses with the intention to quit their jobs.	The perceived leadership by the employee was positively associated to trust in the leader, and the perceived organizational support was positively associated with the trust in the organization. The trust in the leader and the organization showed a negative correlation with the emotional exhaustion and cynicism, and positive with the professional efficacy. The trust scores mediated the effects of the employee leadership and perceived organizational support on the burnout factors. The cynicism factor was negatively correlated to the intention to quit the job, and it mediated the effects of trust in the leader and in the perceived leadership of the employee over the intention to leave the job. The trust in the organization was direct and negatively related to the intention to quit the job.	711 Members of a nursing team from a large hospital / Italy	20

Ref	Objective	Results	Sample/ Country	STROBE* Evidence
A10 ⁽¹⁸⁾	To assess the satisfaction with the effectiveness of the clinical learning environment – CLE among nursing students in Oman.	The satisfaction correlated with the subdimensions of the clinical learning environment (CLE), and it demonstrated a positive relationship with the general CLE score. In the pathway model, 35% of the total variance with the CLE satisfaction was explained by the leadership style, compromise with the clinical nursing and relationship with the patient. The older age, the academic development and the number of clinical subjects taken were significant for the satisfaction with the CLE among these students.	310 Nursing students / Oman	18
A11 ⁽¹⁹⁾	To investigate the relationships between many factors of the academic context in a sample nationally representing the nursing professors from the USA.	Although different effects (direct and indirect) between the factors analyzed were observed, it is noted that the support perceptions of administration and the perceived expertise in teaching positively predict the intention of nursing professors to stay in the investigated teaching institutions.	657 Nursing professors / The United States of America	19
A12 ⁽²⁰⁾	To test the determinants and the effects of self-reflection and insight over the competency of nursing students during the first two months of their practice experience.	The results indicated that the self-reflection and the insight, the stress and the coping with practice activities were significantly associated with the competence of nursing students. The self-reflection and the insight were positively correlated to dealing with practical activities and negatively correlated with stress. The coping behaviors partially mediated the self-reflection and stress effects over the clinical competence. In total, these variables explained 39.4% of the variance in the clinical competence of students.	312 Nursing Students / Taiwan	18
A13 ⁽²¹⁾	To explain the acceptance and the real use of an electronic patient record (EPR) system and the satisfaction of nurses testing the theoretical model adapted of the Unified Theory of Acceptance and Use of Technology (UTAUT)	13 of the 20 proposed hypotheses were confirmed. The strongest effects were those between the expected performance (productivity) and the real EPR use ($r = 0.55$, $p = 0.006$), the facilitation of conditions and the expected effort (to learn the new system) ($r = 0.45$, $p = 0.009$), compatibility and expected performance ($r = 0.39$, $p = 0.002$). The variables explained 33.6% of the real use variance, 54.9% of the nurses' satisfaction, 50.2% of the expected performance and, 52.9% of the expected effort.	616 Nurses / Canada	20
A14 ⁽²²⁾	To test a multi-level model assessing the effect of individual and contextual factors on the nurse's work satisfaction.	The perception of the structural empowering of nurses by their groups indirectly influenced the perception of collective effectiveness (Level 2) through the perceived collective support in the professional exercise, which had a direct and positive effect in the collective effectiveness (Level 2). The collective effectiveness also correlated to the nurse's work satisfaction after one year. In the level 1, higher self-report scores produced direct and indirect effects on work satisfaction through the increase of psychological empowering.	545 Nurses / Canada	19
A15 ⁽²³⁾	To investigate the associations between the problem-solving abilities and the hardiness with the perceived stress of nurses.	High hardiness scores were associated with low levels of perceived stress. Nurses with low perceived stress presented higher chances to be accessible; a style of internal personal control; and the effective confidence to resolve problems.	252 Nurses / Iran	17

Ref	Objective	Results	Sample/ Country	STROBE* Evidence
A16 ⁽²⁴⁾	To explore the relationships between the social factor, self-efficacy with internet and, attitudes related to continuing online training in the clinical nursing context.	The social factor is related to self-efficacy with internet and other attitudes facing the continuing online training (including the perceived utility, perceived use facility, and affection). Basic internet self-efficacy has a fundamental role over the attitudes, including perceived utility, perceived use facility, and affection. However, the self-efficacy with advanced internet was not correlated to any attitude. The behavioral dimension was not related to the social factor and internet self-efficacy, but it was correlated to perceived use facility and affection.	244 Nurses / Taiwan	15
A17 ⁽²⁵⁾	To investigate the effects of stress, economic factors, altruism, and congruence of values in intentions to abandon work and the nursing career.	The results confirmed the stress and satisfaction effects on work over the intention to abandon the nursing career, as well as, highlighting the impact of the congruence of values and altruism over work satisfaction. The results note the importance of congruence of values and altruism in a field where stress and economic factors have been considered the most relevant factors.	861 Nurses/ The United States of America	17
A18 ⁽²⁶⁾	To assess the role of painful experiences related to work absence with other occupational and health factors, in Canadian nurses with work-related musculoskeletal disorders.	The final model suggests that pain severity and pain interference in laboral activity mediates the impact of the following occupational and health factors on the duration of work absence: depression, spine disorders, age, sindicalizations, physical demands at the work place and low control at work. The model explained 14% of the variance in the absence at work duration and 46.6% of variance in the pain interference on work.	941 Nurses / Canada	20
A19 ⁽²⁷⁾	To know the factors that led to medication errors of nursing students.	Five causal factors of medication errors among nursing students were identified: violation (not following protocols), writing, excessive demands, experience, and tension. The results of the analyses showed the interaction between these variables. The low adherence to the five factors was verified as an important mediator among violation, writing, excess, experience and tension and, the medication errors performed by students.	329 Nursing students / Philippines	18
A20 ⁽²⁸⁾	To investigate the factors affecting the adjustment between nursing activities and the mobile information system, and the relationships between the technology-task adequacy of the mobile system and the performance of nurses.	It was identified that the support functionalities offered by the system perform a positive effect in the acquisition, interpretation, and integration of information. These three variables are also positively affected by the system support service and contribute to the performance of nurses, with 83.2% of the explained total variance.	219 Nurses / Taiwan	17

* Value obtained after the assessment of 22 STROBE items per pairs and consensus with a third assessor (in cases of disagreements).

We verified a predominance of Evidence Level 5 studies (95%), published in 2015 (30%), in Asian (50%), North American (30%), and European (15%) countries and inclined to the administration field, more precisely to the nursing work organization process (70%).

In the classification and analysis of nursing themes addressed in the studies that used the MSE, according to year, we observed that publications related to nursing assistance (two), were published in 2013 and 2014 while the articles about nursing teaching (four) were published in 2013 (one) and 2015 (three). In the nursing administration/work organization field, there were publications during the whole study period, that is, one, four, five and four articles respectively between 2012 and 2015. Per year, the sum of publications was one, six, six and, seven articles in the period (2012-2015).

In Chart 1, we presented a synoptical frame of this review, including objective, results, sample/country and a score of selected studies according to STROBE.

MSE applications in Nursing

The publications contemplate different sub-areas of knowledge, which will be addressed according to focus: nursing assistance, teaching and nursing administration.

In what concerns to nursing **assistance**^(10,12), the analyzed studies refer to quality parameters, assessing the effect – of the organizational compromising about the effectiveness of hand hygiene techniques; and of the self-efficacy theory for weight control of adult patients. The results of studies demonstrate that the level of organization is compromising, feedback and leadership are contributing factors to the adherence of extended practices of hand washing⁽¹⁰⁾ and the self-efficacy perception of the nurse at work stimulate the weight control of obese patients⁽¹²⁾.

About nursing **teaching**^(18-20,27), the predicting elements for learning effectiveness were analyzed, being: age, academic development, number of subjects taken, leadership, compromise with the clinical nursing and relationship with the patient⁽¹⁸⁾; self-reflection and insight⁽²⁰⁾; while medication errors were attributed to the violation of protocols, difficulties with clinical registries, experience, tension and excessive demands in the clinical environment⁽²⁷⁾. These factors produced significant effects on the effectiveness and practice satisfaction⁽¹⁸⁾, the perceived competence⁽²⁰⁾ and the errors⁽²⁷⁾, respectively. About nursing teaching, still in this field, it was aimed to identify intention predictors of professors to stay in the teaching institution, and it was identified that the administrative support and the perceived expertise in teaching as variables of this prediction⁽¹⁹⁾.

In relation to **administration** of nursing services, the other studies that used MSE explored the work organization effect on: the compromising, satisfaction, empowering, effectiveness and professional confidence^(9,11, 22); the characteristics contributing to the adherence of information technologies' use^(13,15,21,24,28); the identity and interpersonal relationship⁽¹⁶⁾. Still, with this focus, studies involving the employee's health contemplated the analysis of predictors of burnout^(14,17), stress^(23,25) and musculoskeletal pains⁽²⁶⁾. The findings point the organizational justice increasing the confidence and professional

identification with the organization, elements strengthening the compromise with it⁽⁹⁾; and that work characteristic, the transformational leadership and the empowering increased the laboral effectiveness⁽¹¹⁾, is a determinant factor for work satisfaction⁽²²⁾. In the technology field, it is observed that optimistic, innovative, secure nurses about technology have more facility to use nursing mobile information systems and perceive them as useful in the work process, which contribute to adherence to these systems and for good performance of the nursing staff^(13,24). The intention to adhere to systems and consequently improve results of the nursing work also suffers actions of factors as, the social influence; expected performance and the technological compatibility with the work process; the conditions of use; the support functionalities offered; and the necessary effort to know and use the system^(15,21,28). The studies aimed at worker's health demonstrated that the nurse with little autonomy and control over the environment, little trust in the leader and, with worse relationships with the doctor present higher level of emotional exhaustion^(14,17) and the intention to quit the job and the trust in the leader contributed to the cynicism increment^(14,17) and reduction of professional efficacy⁽¹⁷⁾. On the other hand, the Hardy individuals presented low-stress levels; they are more accessible, they have an internal control style and confidence in problem-solving⁽²³⁾. It was also seen that depression, spine disorders, age, unionization, physical demands in the workplace and, love control at work increase the severity and interference of pain during work, which can impact the duration of work absence⁽²⁶⁾.

DISCUSSION

Research is built and developed with the intention to serve as a knowledge base to researchers and the society in general, to be used for critical reading and to motivate reflections about the professional practice⁽²⁹⁾. In this sense, the production of investigations using MSE helps the comprehension of many causal relationships, explaining how phenomenon/variables are related to producing a given outcome^(9-28,30).

We observed that although the Brazilian nursing has a considerable number of national and international publications, the prevalence of published studies using MSE as a specific type of analysis occurred in other countries of Asia, North America and, Europe. Therefore, there is a need to keep an open posture to new investigation and analysis possibilities, aiming at a competent and safe action⁽³¹⁾.

Due to its methodological characteristics, the MSE use allows to improve some measurement instruments used by nursing and helps to explain some phenomenon⁽²⁾ investigated in other countries, but that also concern Brazilian researchers. Thus, the MSE allows rectifying the factorial structure of measurement scales used in different samples of Brazilian subjects, as well as, to test the relationships between latent and observed variables⁽¹⁻²⁾.

Analyzing the data of studies included in this Integrative Review, we see a concern with the impact of the work process in the nursing worker's health.

Researchers point that unfavorable working conditions cause the worker to get sick, including the stress and burnout occurrence, reducing productivity, increasing costs with absenteeism, rotation and

withdraw of staff and it affects the sleep quality^(14,16-17,31). But, it also points that the identification with the team attenuated the impotence feeling and that the readiness to manage conflicts and the impotence mediate the interaction capacity and labor stability⁽¹⁶⁾. Equally, points that cynicism, underscore of the Burnout Inventory, measured the trust in the leader and the perceived leadership of the employee⁽¹⁷⁾. Therefore, demonstrating the variables' effects, or of its components, between themselves and how they behave in a tested hypothetical model.

Thus, researchers, as well as, nurses of assistance practice dispose of specific elements to propose measures to make the nursing professional relationship with the healthier and less hard work, which will impact in the worker's health and as a consequence, in institutional results.

Still in the organizational field, part of the studies analyzed factors affecting the adherence of professionals to nursing information systems, as electronic medical records and mobile information and registries systems^(13,15,21,24,28). The implementation of the health information technology has been preconized and stimulated in the past years as an instrument to increase the patient's safety, the quality of health services and to reduce costs^(13,15). However, despite the high implementation costs of these systems, the services have been facing difficulties regarding its adherence and use by professionals. Therefore, researchers identified different behavioral factors and relative of the system itself that contribute to the comprehension and adherence to computerized health systems^(13,15,21,24,28). From this, modifications in developed processes and implementation, including the review of functionalities, compatibility, support services, facility of use, will improve the adherence of users, increasing the quality of nursing care.

Regarding teaching and nursing care, studies with MSE confirmed the leadership and compromise with nursing cause satisfaction to students, that self-reflection and insight protect them from stress and, self-efficacy predicts the professional performance of nurses. Even if the management support, besides favoring the permanence of professionals in teaching institutions, when connected to feedback, improves the hand washing practice. Therefore, we observe that investigations once analyzed, present elements that can subsidize good nursing practices.

CONCLUSION

In our review, we verified the increase of studies applying MSE in the nursing field in the past five years, especially in the work organization process, with Evidence of level 5 and, developed in countries from Asia, North America and, Europe.

The notable focus of studies about the comprehension of work environment factors that affects the behavior, the satisfaction and the trust in the organization, the empowerment, the effectiveness and, the interpersonal relationship showed the importance of laboral conditions to nursing professionals' health and for the organization functionality and maintainance of professionals in the institution. This because unfavorable work conditions cause the worker to become sick, with an increase of costs related to absenteeism and withdraws, as well as, the reduction of quality provided by nursing. In this sense, the

technique has been contributed for the explanation of a group of relationships that helps to comprehend some outcomes present in the labor nursing routine. With these elements, it will be possible to develop more precise preventive measures and possibly, to obtain more effectiveness.

These contributions are also valid for models analyzed in the fields of teaching and nursing care, but the application of the modeling in these processes still is scarce. In this sense, the construction of hypothetical models turned to these areas are incentivized, considering that they present some objects that although greatly investigated, still lack solutions, as the case of adherence to hand washing. Therefore, it is important for Brazilian researchers to appropriate these analysis techniques and to develop studies with more explanatory designs.

The MSE is a technique that can propitiate the expansion of the theoretical and methodological nursing fields, but like any other one, it is not capable of expanding all types of research objects. One of the limitations is its use and the type of statistical analysis currently used that foresee the exclusively assess the linear relationships among variables. Another barrier of its use are the sample sizes. This because the MSE requires accentuated variability of data to conduct the estimative process. Still, this technique helps researchers to explain some phenomenon that cause restlessness in nursing.

REFERENCES

1. Hair JF, Black WC, Babin BJ, Anderson RE, Tatham RL. *Análise Multivariada de Dados*. 6th ed. Porto Alegre: Bookman; 2009.
2. Pilati R, Laros JA. Modelos de equações estruturais em psicologia: conceitos e aplicações. *Psicol Teor e Pesqui* [Internet]. 2007 [cited 2017 dec 31];23(2):205-16. Available from: <http://doi.org/10.1590/S0102-37722007000200011>.
3. Unruh L, Zhang NJ, Chisolm L. Job and Professional Leaving Among Newly Licensed RNs: A Structural Equation Model. *West J Nurs Res* [Internet]. 2016 [cited 2017 dec 31];38(1):5-26. Available from: <http://doi.org/10.1177/0193945914559290>.
4. Maillat É, Mathieu L, Sicotte C. Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT. *Int J Med Inform* [Internet]. 2015 [cited 2017 dec 31];84(1):36-47. Available from: <http://doi.org/10.1016/j.ijmedinf.2014.09.004>.
5. Mendes KDS, Silveira RCCP, Galvão CM. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. *Texto Context - Enferm* [Internet]. 2008 [cited 2017 dec 31];17(4):758-64. Available from: <http://doi.org/10.1590/S0104-07072008000400018>.
6. Ursi ES, Gavão CM. Prevenção de lesões de pele no perioperatório: revisão integrativa da literatura. *Rev Lat Am Enfermagem* [Internet]. 2006 [cited 2017 dec 31];14(1):124-31. Available from: <http://doi.org/10.1590/S0104-11692006000100017>.
7. Malta M, Cardoso LO, Bastos FI, Magnanini MMF, Silva CMFP. Iniciativa STROBE: subsídios para a comunicação de estudos observacionais. *Rev Saude Publica* [Internet]. 2010 [cited 2017 dec 31];44(3):559-65. Available from: <http://doi.org/10.1590/S0034-89102010000300021>.
8. Stetler CB, Morsi D, Rucki S, Broughton S, Corrigan B, Fitzgerald J, et al. Utilization-focused integrative reviews in a nursing service. *Appl Nurs Res* [Internet]. 1998 [cited 2017 dec 31];11(4):195-206. Available from: [http://doi.org/10.1016/S0897-1897\(98\)80329-7](http://doi.org/10.1016/S0897-1897(98)80329-7).
9. Chen S-Y, Wu W-C, Chang C-S, Lin C-T, Kung J-Y, Weng H-C, et al. Organizational justice, trust, and identification and their effects on organizational commitment in hospital nursing staff. *BMC Health Serv Res* [Internet]. 2015 [cited 2017 dec 31];15(1):363. Available from: <http://doi.org/10.1186/s12913-015-1016-8>.

10. Herrera-Usagre M, Pérez-Pérez P, Vázquez-Vázquez M, Santana-López V. Profesionales de salud ante la mejora de la higiene de las manos: estrategias clásicas versus estrategias avanzadas. *Rev Chil infectología* [Internet]. 2014 [cited 2017 dec 31];31(5):534-41. Available from: <http://doi.org/10.4067/S0716-10182014000500004>.
 11. Eo Y-S, Kim Y-H, Lee N-Y. Path Analysis of Empowerment and Work Effectiveness among Staff Nurses. *Asian Nurs Res (Korean Soc Nurs Sci)* [Internet]. 2014 [cited 2017 dec 31];8(1):42-8. Available from: <http://doi.org/10.1016/j.anr.2014.02.001>.
 12. Zhu DQ, Norman IJ, While AE. Nurses' self-efficacy and practices relating to weight management of adult patients: a path analysis. *Int J Behav Nutr Phys Act* [Internet]. 2013 [cited 2017 dec 31];10:131. Available from: <http://doi.org/10.1186/1479-5868-10-131>.
 13. Kuo K-M, Liu C-F, Ma C-C. An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *BMC Med Inform Decis Mak* [Internet]. 2013 [cited 2017 dec 31];13(1):88. Available from: <http://doi.org/10.1186/1472-6947-13-88>.
 14. Panunto MR, Guirardello E de B. Professional nursing practice: environment and emotional exhaustion among intensive care nurses. *Rev Lat Am Enfermagem* [Internet]. 2013 [cited 2017 dec 31];21(3):765-72. Available from: <http://doi.org/10.1590/S0104-11692013000300016>.
 15. Lee C-C, Lin S-P, Yang S-L, Tsou M-Y, Chang K-Y. Evaluating the influence of perceived organizational learning capability on user acceptance of information technology among operating room nurse staff. *Acta Anaesthesiol Taiwanica* [Internet]. 2013 [cited 2017 dec 31];51(1):22-7. Available from: <http://doi.org/10.1016/j.aat.2013.03.013>.
 16. Moreland JJ, Ewoldsen DR, Albert NM, Kosicki GM, Clayton MF. Predicting Nurses' Turnover: The Aversive Effects of Decreased Identity, Poor Interpersonal Communication, and Learned Helplessness. *J Health Commun* [Internet]. 2015 [cited 2017 dec 31];20(10):1155-65. Available from: <http://doi.org/10.1080/10810730.2015.1018589>.
 17. Bobbio A, Manganelli AM. Antecedents of hospital nurses' intention to leave the organization: A cross sectional survey. *Int J Nurs Stud* [Internet]. 2015 [cited 2017 dec 31];52(7):1180-92. Available from: <http://doi.org/10.1016/j.ijnurstu.2015.03.009>.
 18. D'Souza MS, Karkada SN, Parahoo K, Venkatesaperumal R. Perception of and satisfaction with the clinical learning environment among nursing students. *Nurse Educ Today* [Internet]. 2015 [cited 2017 dec 31];35(6):833-40. Available from: <http://doi.org/10.1016/j.nedt.2015.02.005>.
 19. Candela L, Gutierrez AP, Keating S. What predicts nurse faculty members' intent to stay in the academic organization? A structural equation model of a national survey of nursing faculty. *Nurse Educ Today* [Internet]. 2015 [cited 2017 dec 31];35(4):580-9. Available from: <http://doi.org/10.1016/j.nedt.2014.12.018>.
 20. Eng C-J, Pai H-C. Determinants of nursing competence of nursing students in Taiwan: The role of self-reflection and insight. *Nurse Educ Today* [Internet]. 2015 [cited 2017 dec 31];35(3):450-5. Available from: <http://doi.org/10.1016/j.nedt.2014.11.021>.
 21. Maillet É, Mathieu L, Sicotte C. Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT. *Int J Med Inform* [Internet]. 2015 [cited 2017 dec 31];84(1):36-47. Available from: <http://doi.org/10.1016/j.ijmedinf.2014.09.004>.
 22. Spence Laschinger HK, Nosko A, Wilk P, Finegan J. Effects of unit empowerment and perceived support for professional nursing practice on unit effectiveness and individual nurse well-being: A time-lagged study. *Int J Nurs Stud* [Internet]. 2014 [cited 2017 dec 31];51(12):1615-23. Available from: <http://doi.org/10.1016/j.ijnurstu.2014.04.010>.
 23. Abdollahi A, Talib MA, Yaacob SN, Ismail Z. Problem-Solving Skills and Hardiness as Protective Factors against Stress in Iranian Nurses. *Issues Ment Health Nurs* [Internet]. 2014 [cited 2017 dec 31];35(2):100-7. Available from: <http://doi.org/10.3109/01612840.2013.843621>.
 24. Chiu Y-L, Tsai C-C. The roles of social factor and internet self-efficacy in nurses' web-based continuing learning. *Nurse Educ Today* [Internet]. 2014 [cited 2017 dec 31];34(3):446-50. Available from: <http://doi.org/10.1016/j.nedt.2013.04.013>.
 25. Dotson MJ, Dave DS, Cazier JA, Spaulding TJ. An Empirical Analysis of Nurse Retention. *JONA J Nurs Adm* [Internet]. 2014 [cited 2017 dec 31];44(2):111-6. Available from: <http://doi.org/10.1097/NNA.0000000000000034>.
 26. Murray E, Franche R-L, Ibrahim S, Smith P, Carnide N, Côté P, et al. Pain-Related Work Interference is a Key Factor in a Worker/Workplace Model of Work Absence Duration Due to Musculoskeletal Conditions in Canadian Nurses. *J Occup Rehabil* [Internet]. 2013 [cited 2017 dec 31];23(4):585-96. Available from: <http://doi.org/10.1007/s10926-012-9408-7>.
- Rev. Eletr. Enf. [Internet]. 2017 [cited __/__/__];19:a51. Available from: <http://doi.org/10.5216/ree.v19.42988>.

27. Valdez LP, de Guzman A, Escolar-Chua R. A structural equation modeling of the factors affecting student nurses' medication errors. *Nurse Educ Today* [Internet]. 2013 [cited 2017 dec 31];33(3):222-8. Available from: <http://doi.org/10.1016/j.nedt.2012.01.001>.
28. Hsiao J-L, Chen R-F. An Investigation on Task-Technology Fit of Mobile Nursing Information Systems for Nursing Performance. *CIN Comput Informatics, Nurs* [Internet]. 2012 [cited 2017 dec 31];30(5):265-73. Available from: <http://doi.org/10.1097/NCN.0b013e31823eb82c>.
29. Silva RM, Peres RR, Camponogara S, Brum CN. A produção científica brasileira sobre cuidados de enfermagem a pacientes portadores de úlceras por pressão. *Revista de Enfermagem da UFSM* [Internet]. 2011 [cited 2017 dec 31];1(2):246-53. Available from: <https://periodicos.ufsm.br/reufsm/article/view/2486>.
30. Hulley SB, Cumming SR, Browner WS, Grady DG, Hearst NB, Newman TB. *Delineando a pesquisa clínica: uma abordagem epidemiológica*. Porto Alegre: Artmed; 2008. 384 p.
31. Pires DEP. Transformações necessárias para o avanço da Enfermagem como ciência do cuidar. *Rev Bras Enferm* [Internet]. 2013 [cited 2017 dec 31];66(spe):39-44. Available from: <http://doi.org/10.1590/S0034-71672013000700005>.