



Using Analytic Hierarchy Process to Identify the Nurses with High Stress-Coping Capability: Model and Application

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Abstract

Background: Nurses have long been relied as the major labor force in hospitals. Featured with complicated and highly labor-intensive job requirement, multiple pressures from different sources was inevitable. Success in identifying stresses and accordingly coping with such stresses is important for job performance of nurses, and service quality of a hospital. Purpose of this research is to identify the determinants of nurses' capabilities.

Methods: A modified Analytic Hierarchy Process (AHP) was adopted. Overall, 105 nurses from several randomly selected hospitals in southern Taiwan were investigated to generate factors. Ten experienced practitioners were included as the expert in the AHP to produce weights of each criterion. Six nurses from two regional hospitals were then selected to test the model.

Results: Four factors are then identified as the second level of hierarchy. The study result shows that the family factor is the most important factor, and followed by the personal attributes. Top three sub-criteria that attribute to the nurse's stress-coping capability are children's education, good career plan, and healthy family. The practical simulation provided evidence for the usefulness of this model.

Conclusion: The study suggested including these key determinants into the practice of human-resource management, and restructuring the hospital's organization, creating an employee-support system as well as a family-friendly working climate. The research provided evidence that supports the usefulness of AHP in identifying the key factors that help stabilizing a nursing team.

Keywords: Analytic hierarchy process, Hospital, Stress coping, Determinants

Introduction

Stress is a kind of psychological tension that an individual perceived as a burden that affects one's attitude and behavior. Stressors that cause such a bad mood may originate from changes of life, family, job context and content, and varied kinds of personal relationship (1). As the major labor force in a hospital, nurses share the largest amount of works within the healthcare facility (2). Since service quality of healthcare of a hospital is anchored on the performance of the nursing

group, importance of stress coping capability can never be overstated (3).

Along with the National Healthcare Insurance system that launched in 1995 in Taiwan, nurses in a hospital are not only requested to perform conventional duties of patient care, but also requested to participate as major contributors to multiple improvement projects that required by the hospital accreditation. This in turn makes the stress problem worse (3-5).

Coping behavior is one of the important issues in the stress-coping process (6). There are problem-focus and emotion-focus approaches for nurse to counter the stress. Problem-focus approach could be more effective in helping victim to solve the problems associated with stress than the emotion-focus (7, 8). Just like a stress may have varied effects on individual workers, the magnitude a nurse perceives and the associated coping behavior may be varied as well (1, 5, 8-12).

A plethora of studies on stresses and coping strategies that limited their studies within the scope of types and sources of such stressors that nurses experienced or how nurses deal with these stresses (1-12), few if any have had explored the determinants of a reliable nurse.

This research will be one of the pioneers in an attempt to identify the criteria that contribute to a nurse's stress-coping capability through Analytic Hierarchy Process (AHP).

Analytic Hierarchy Process (AHP) was developed by Thomas L. Saaty in 1971 to be employed for multi-criteria decision making (MCDM) problem under an uncertain situation at that time (13-14). AHP is a logical approach that systematically structuring a complex decision-making problem by measuring weight and importance of each criterion and sub-criterion in a hierarchical way, through which solves the decision problem. AHP gained immediate acceptance in a wide range of both academic and industrial sectors because it provides reliable method to deal with problems with complex structure and measurement. Some notable examples include Xerox, General Motors, Scarborough Public Utilities, 3M (15), operation problems in healthcare management (16), communicating patient's and physician's preferences (17), the production and distribution dilemma of a cancer drug (e.g. 16), exploring the service quality contributors (e.g. 9, 18) among many others.

Compare to other alternatives, AHP includes multiple sources of opinion from experts who are generally experienced with the well-defined issues under research. In most cases in the real world, a multi-objective decision making will need to involve structure complexity, values measuring, and synthesize problems (13, 14). It is always hard for

people to make decisions in the real life since numerous criteria may be involved, and AHP is an approach that able to integrate these three in one (13, 14, 18).

Materials and Methods

To establish the hierarchy, the research starts by reviewing important local literature that was suggested by nursing management scholars (6, 19-26).

Participants

Participants in this research are from three different steps. In the first step, seven experienced nurses, followed by 105 nurses in the second step to build an AHP model, and ended with six selected nurses for practical application.

Firstly, seven extremely experienced nurses who just retired from their decades' nursing services were invited as experts in reviewing the items that the researcher concluded from the literature review.

Secondly, the current research then approach 105 nurses who worked in varied accredited levels of hospitals in southern Taiwan with a questionnaire that contains these items between a period of April and September of 2009. These participants were used to generate factors and sub-factors of stress-coping capabilities of the nurses in a hospital.

Thirdly, this study invites ten more highly experienced nurse-heads from hospitals and healthcare facilities three months after the second step. Since some of these experts work with the nurses in the same hospital or may have certain connections, a three-month lap can effectively avoid possible halo-effects. These experts are instructed to grade the importance of each element by a pair-wise comparison with their own expertise and experiences. These nurse-heads owned 15 to 31 consecutive years of nursing experience, with an average of 26.1 years, in healthcare facilities. At the last step, this research selects six nurses with different characteristics of service careers from different hospitals to test the model. Criteria adopted for selection including the years of overall nursing service as well as the years of the current hospital,

the number of children, and hospital accreditation (detailed in the note of table 4).

Methods

Twenty-two items were identified from the literature review. Several steps are conventionally conducted under an AHP procedure (13-14). Decision-maker first models the problem as a hierarchy, then establishes priorities among the elements of the hierarchy through a pair-wise comparison and synthesizes these judgments to yield a set of overall priorities for the hierarchy. Subject to the consistency of each judgment, a final decision based on the results of the process will be achieved.

The current research then compute the weights of each individual sub-criterion and the criterion based on the scores of all pair-wise comparisons (detailed could be seen in Saaty, 1980).

Results

Model the problem as a hierarchy

An AHP model is then built on the data gathered from the survey. A factor analysis is conducted by using principal factor method with normalized varimax to verify the factors. Nineteen elements with factor loading 0.5 or more as sub-criteria and four factors with Eigen value larger than 1 are then identified. These factors are termed and used as the second hierarchy of the problem structure. Variance explained with these four factors is 63.3%. The initial factor has four sub-criteria, and is termed as "Personal attributes". The second factor contains five sub-criteria and is termed as "Organizational infrastructure". The third factor composed by five sub-criteria as well and is termed as "Family factor", and followed by a five-element "Institutional factor", shown as Table 1.

Table 1: Stress coping capabilities of nurses

1 st Hierarchy Goal	2 nd Hierarchy Criteria (Eigen;% Value; Alpha)	3 rd Hierarchy Sub-criteria	Loading
Stress-coping capability	Family factor (9.06; 41.19%; .78)	Children education	0.829
		Stable marriage	0.817
		Pleasant family life	0.668
		Health, family members	0.609
		Healthy family finance	0.594
	Organizational infrastructure (1.95; 8.87%; .83)	Paid education	0.774
		Paid training	0.757
		Systemized accreditation preparing	0.735
		Back to work support	0.731
		Performance assessment	0.615
	Personal attribute (1.83; 8.31%; .87)	Clear career path	0.822
		Healthcare techniques	0.785
		Religious belief	0.654
		Emotion management	0.623
	Institutional factor (1.10; 4.98%; .86)	Fringe Benefit	0.713
		Good interpersonal relationship	0.701
		Amicable organization atmosphere	0.686
		Healthcare facilities	0.561
		Safety environment	0.558

Computing weight of factor in stress-coping capability

Priority among the elements of the hierarchy comes as the next step. Data is gathered from a series of judgments that based on the experts' pair wise comparisons of the 19 sub-criteria that contributes to the nurse's stress-coping capability. Ten talent nurse-heads with an average of 26.1 years, act as the experts in typical AHP approach (13-14). Base on the questionnaire completed by these professional experts, I compute the arithmetic average as weight of each factor. The family

factor comes as the first determinant with the highest weight at 0.356, followed by the personal attribute as the second with a weight of 0.275, and the organization factor and the environment factor are graded as the third and fourth with weights of 0.255 and 0.114 respectively, shown as in table 2. Notable sub-criteria at factor level are in descending order, the "career plan" (0.352) in personal attribute, the "paid education" (0.273) in organization factor, the "children education" (0.284) in family factor, and the "fringe benefit" in organization environment factor, shown as Table 2.

Table 2: Values of criteria and sub-criteria of stress-coping capability

Sub-criteria	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.
Career plan	0.56	0.37	0.62	0.19	0.05	0.50	0.35	0.51	0.22	0.15	0.35
Job techniques	0.27	0.15	0.20	0.56	0.05	0.27	0.12	0.20	0.34	0.44	0.26
Religious belief	0.13	0.24	0.11	0.06	0.50	0.08	0.27	0.08	0.11	0.11	0.17
Emotion management	0.05	0.24	0.08	0.19	0.39	0.15	0.27	0.20	0.34	0.30	0.22
C. R.	0.05	0.00	0.02	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Paid education	0.17	0.36	0.39	0.50	0.36	0.13	0.20	0.19	0.23	0.19	0.27
Paid training	0.08	0.12	0.30	0.10	0.14	0.27	0.20	0.41	0.13	0.19	0.20
Accreditation preparing	0.24	0.18	0.16	0.10	0.14	0.19	0.20	0.13	0.07	0.19	0.16
Back to work support	0.17	0.18	0.10	0.30	0.18	0.13	0.20	0.13	0.33	0.29	0.20
Performance evaluation	0.33	0.18	0.05	0.00	0.18	0.27	0.12	0.13	0.23	0.13	0.17
C. R.	0.00	0.04	0.02	0.00	0.01	0.00	0.06	0.00	0.03	0.00	0.00
Children education	0.50	0.34	0.19	0.50	0.34	0.07	0.50	0.50	0.50	0.29	0.37
Stable marriage	0.10	0.18	0.29	0.10	0.08	0.13	0.10	0.10	0.10	0.19	0.14
Pleasant family	0.10	0.10	0.19	0.10	0.08	0.10	0.10	0.10	0.10	0.19	0.12
Health, family	0.30	0.13	0.13	0.30	0.16	0.27	0.30	0.30	0.30	0.19	0.24
Home finance	0.00	0.25	0.19	0.00	0.34	0.43	0.00	0.00	0.00	0.13	0.13
C. R.	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fringe benefit	0.05	0.25	0.36	0.06	0.30	0.27	0.36	0.50	0.12	0.80	0.31
Interpersonal relationship	0.12	0.25	0.14	0.12	0.09	0.08	0.13	0.10	0.22	0.05	0.13
Amicable atmosphere	0.20	0.17	0.14	0.16	0.10	0.08	0.19	0.10	0.44	0.05	0.16
Service facilities	0.42	0.25	0.18	0.28	0.29	0.21	0.19	0.30	0.06	0.05	0.22
Work safety	0.20	0.08	0.18	0.37	0.22	0.36	0.13	0.00	0.16	0.05	0.18
C. R.	0.02	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Criteria											
Personal attribute	0.66	0.38	0.31	0.05	0.53	0.10	0.47	0.05	0.15	0.05	0.28
Org. infrastructure	0.06	0.19	0.19	0.05	0.10	0.15	0.15	0.05	0.15	0.05	0.11
Family factor	0.22	0.19	0.25	0.50	0.17	0.53	0.23	0.50	0.47	0.50	0.36
Institutional factor	0.06	0.25	0.25	0.39	0.20	0.22	0.15	0.40	0.23	0.40	0.26
C. R.	0.00	0.03	0.05	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00

Final decision on determinants

The current study then finalizes the rankings of each determinant by examining the composite value of criteria and sub-criteria. As shown in Table 3, the family factor is the most important factor with a weight of 0.356, followed by the personal attributes with 0.275.

The first two factors represent nearly 63% of the contribution to a stress-coping capability. The study then multiplies the factor weights and the

value of each criterion to gain final values for each element.

As a result, determinants of levels of stress-coping capability in descending order are the children education (0.13), the career plan (0.10), a good health status of family members (0.09), a satisfactory fringe benefit offered by the employer (0.08), and mastery job techniques for the works in a hospital (0.07), as shown in detail in Table 3.

Table 3: Determinants of stress-coping capability

Criteria (rank)	Sub-criteria	Weight	Composite (rank)
Personal attributes 0.275 (2)	Career plan*	0.35	0.096 (2)
	Job techniques*	0.26	0.072 (5)
	Religious belief	0.17	0.047 (9)
	Emotion management	0.22	0.061 (6)
Organizational infrastructure 0.114 (4)	Paid education	0.27	0.031 (15)
	Paid training	0.20	0.023 (17)
	Accreditation preparing	0.16	0.018 (19)
	Back to work support	0.20	0.023 (16)
	Performance evaluation	0.17	0.019 (18)
Family factor 0.356 (1)	Children education*	0.37	0.132 (1)
	Stable marriage	0.14	0.050 (8)
	Pleasant family	0.12	0.043 (12)
	Health, family member*	0.24	0.085 (3)
	Financial health of family	0.13	0.046 (10)
Institutional factor 0.255 (3)	Fringe benefit*	0.31	0.079 (4)
	Interpersonal relationship	0.13	0.033 (14)
	Amicable atmosphere	0.16	0.041 (13)
	Service facilities	0.22	0.056 (7)
	Work safety	0.18	0.046 (11)

* indicates the top 5 determinants of nurses' stress-coping capability

Practical application

Nurses who are more capable in handling stress may appear to be more a stable labor and are more willing to or able to stay longer with the same employer.

Six nurses from two different hospitals in southern Taiwan were invited to join the evaluation, three from each to verify how this set of determinants could be applied in identifying low turnover nurses. Two regional accredited hospitals, namely Ha and Hb, are all private invested hospitals, in which employees are exposed to a lower level of the job security and an inferior fringe benefit than

state-owned hospitals. By doing this, the influence of government service shelters could be eased. All of case nurses have more than five years work at experiences in patient care and nursing in varied healthcare services.

Three nurses are recruited from each hospital. One of the nurses has at least three times of turnovers in the last two years (i.e. high turnover) in each nurse group. The other one has stayed in the current hospital over three years (i.e. low turnover). The third nurse is randomly selected from nurses of the impatient department, in which the nurse is much higher stress.

Characteristics of each case are illustrated in the bottom of Table 4. All these nurses are interviewed to answer a question regarding how she perceives the importance of each following criterion when making a decision on whether to stay with an organization. Interviewees were asked to give each item a score from 1 as “not important at all” to 5 as “extremely important” based on their experiences. This study then applies the data gathered from interviews to produce a total score for

each individual interviewee. Results of stress-coping capability and its rankings are shown in table 4. The interview included full ethical considerations throughout the entire process. Respondents are advised with the ethical code of an academic research, informed consents are gained before interviews, and personal data of interviewees were duly concealed not for any public use. It is easy to find from the table that nurses who stay longer seems gain higher products (weights x scores).

Table 4: Values and rankings of interviewees in practical application

Criteria \ Case ^a	A	B	C	D	E	F
Career plan	5 0.48	5 0.48	5 0.48	5 0.48	5 0.48	5 0.48
Job techniques	4 0.29	4 0.29	5 0.36	5 0.36	4 0.29	2 0.15
Religious belief	3 0.14	2 0.10	4 0.19	3 0.14	2 0.10	4 0.19
Emotion	4 0.24	3 0.18	5 0.30	4 0.24	5 0.30	3 0.18
Paid education	3 0.09	4 0.12	3 0.09	3 0.09	2 0.06	5 0.15
Paid training	2 0.05	3 0.08	2 0.05	3 0.08	3 0.08	2 0.05
Accreditation	2 0.04	5 0.10	3 0.06	2 0.04	3 0.06	3 0.06
Back to work	2 0.05	2 0.05	2 0.05	2 0.05	3 0.08	3 0.08
Perf. assessment	3 0.06	4 0.08	3 0.06	2 0.04	4 0.08	3 0.06
Education, kids	5 0.66	3 0.40	5 0.66	5 0.66	2 0.26	5 0.66
Stable marriage	5 0.23	3 0.14	5 0.23	4 0.18	2 0.09	2 0.09
Pleasant family	4 0.17	2 0.09	4 0.17	3 0.13	4 0.17	4 0.17
Health, family	5 0.43	4 0.34	3 0.26	5 0.43	2 0.17	5 0.43
Family finance	4 0.19	5 0.24	3 0.14	3 0.14	3 0.14	3 0.14
Fringe benefit	2 0.16	3 0.24	4 0.32	5 0.40	5 0.40	2 0.16
Interpersonal	3 0.10	4 0.13	2 0.07	3 0.10	5 0.17	4 0.13
Amicable	5 0.20	2 0.08	4 0.16	3 0.12	4 0.16	2 0.08
Facilities	4 0.22	5 0.28	3 0.17	4 0.22	3 0.17	5 0.28
Work safety	3 0.15	5 0.23	4 0.18	4 0.18	5 0.23	4 0.18
Product	3.94	3.62	3.99	4.09	3.47	3.71
Rankings	3	5	2	1	6	4

Note: first column under each case is the score given by the interviewee during interview, and the second column is the product of weight of criterion times the interviewee's score. *a*

Case A (Ha): Female, married, 34, 1 child; 12 yrs in nursing, 10 yrs same hospital

Case B (Ha): Female, married, 30, 2 children; 10 yrs nursing, 1 yr same hospital.

Case C (Ha): Female, married, 32, 2 children; 10 yrs nursing, 10 yrs same hospital.

Case D (Hb): Female, married, 40, 2 children; 18 yrs nursing, 12 yrs same hospital.

Case E (Hb): Female, married, 38, 3 children; 20 yrs nursing, 2 yrs same hospital.

Case F (Hb): Female, married, 29, 1 child; 7 years in nursing, 7 yrs same hospital.

For example, the best score of Case D in the table 4 has stayed with the same hospital for 12 years in her 18-year nurse career. Case C and Case A appear as the second and the third highest scores, whose career experiences with present hospitals

are 10 years respectively. On the other hand, those received lower scores of product are all characterized with shorter years with their current employers, such as Case E for two years, and Case B for one year.

All case nurses are in their early or late 30s, and all are married with one to three children. Case D, case C, and case A are the most stable employees among others, who stayed with the same hospitals (a or b) for more than 10 years.

Discussion

As the simulation illustrated in the section of practical application, identifying a stable nurse is possible. This section further discusses more on this particular issue by examining every individual case. Case D in the simulation is the nurse who is the best in stress coping with an average score of 4.09, as shown in table 4. The result shows major contributive sub-criteria on her stress-coping capability are children education (0.66), career plan (0.48), family members' health (0.43), fringe benefit (0.40), and job techniques (0.36) in descending order. Case C, the second best with an average score at 3.99, ranked children education (0.66), career plan (0.48), job techniques (0.36), fringe benefit (0.32), and personal emotion management (0.30) as the top five attributes to her coping capability. The first two nurses with best stress-coping capabilities took the children's education and the career plan as the most important attributes that support their coping behaviors. This is consistent with previous research that confirmed the family relationship can mitigate the negative effect of work stress (25-27), since a social support from the family is one of the best sources for stress-coping (5, 25-26). In the contrary, a work-family conflict was generally accepted as an important variable in predicting job satisfaction and turnover (28).

Attributes that received five points as the top in the simulation are career plan (six times), children education (four times), family members' health status (three times), and followed by job techniques, emotion management, a stable marriage, fringe benefit, service facility, and a safety work environment (two times each). Noteworthy is that a clear career plan is perceived as a very important element in building a stress coping capability by all interviewees in the simulation. Given that all inter-

viewees are somehow experienced (from 7 to 20 years of nursing); this implies that the quality of a career plan may vary from one nurse to another.

Consistent to the model formulated, the simulation in a practical implementation has shown that the top two factors, the good career plan and the children's education, contribute most effects to foster a nurse's stress-coping ability. Since most nurses assume dual roles in their daily life, job and family (5, 29), they are obliged to accomplish the nursing duties for patients' as the organization assigned, in the meantime are also responsible (if not fully) for the family care as the societal norms imposed (5). Taken this capability as essential part of providing quality care services, a balance between patient-care career and family care would be a key to success for a motivation program (3, 5).

Since a healthy family tends to be used as one of the important criteria in determining the success of a woman (some other cultures may share similar norms), hospitals shall provide assistance to nurses by including certain free services in the compensation package other than fiscal salary. This may include certification assisting service, career plan reviewing service, academic tutoring service for after-class children, financial and legal consulting services, house-keeping consulting services, and free health examination services for family members. These free services could be provided by the organization or through an effective arrangement with contracted suppliers.

It is also important to note that the coverage and the level of usefulness and effectiveness of a career roadmap may vary from one nurse to another due to multiple reasons. Taken the vital role of a clear plan in nurses' stress-coping capability, the employer shall create and maintain an active system for career service to foster a family-friendly working climate. The service of the system may include A to Z of an employee's career development, i.e. PDCA (Plan, Do, Control, Action). Aligning this assistance system with the missions, visions, and strategies of the organization will further benefit the healthcare facilities and the entire work force in many aspects, thus may need a professional officer to operate and supervise. Estab-

lishing a workable and effectively clear career plan is an old story, and it is time to call it back again for duty.

Conclusion

The study suggested including these key determinants into the practice of human-resource management, and restructuring the hospital's organization, creating an employee-support system as well as a family-friendly working climate. The research provided evidence that supports the usefulness of AHP in identifying the key factors that help stabilizing a nursing team.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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References

1. Lazarus RS, Folkman S (1984). *Stress, appraisal, and coping*. New York: Springer.
2. Benoliel JQ, McCorkle R, Georgiadou F, Denton T, Spitzer A (1990). Measurement of stress in clinical nursing. *Cancer Nursing*, 13(4): 221 – 228
3. Elfering A, Semmer NK, Grebner S (2006). Work stress and patient safety: Observer rated work stressors as predictors of characteristics of safety-related events reported by young nurses. *Ergonomics*, 49(5/6): 457-469.
4. Chu C, Lee CT (2001). Globalization, workplace pressures and mental health at work: challenges and sustainable strategies. *Taiwan Journal of Public Health*, 20(6): 413-422. *In Chinese*.
5. Colligan M, Rosa R (1990). Shiftwork effects on social and family life. *Occupational Medicine*, 5(2): 315-322.
6. Miller, J.F. (1992). *Coping with chronic illness: overcoming powerless* (2nd ed.). Philadelphia: P.A.: Davis Company.
7. Monat A, Lazarus RS (1991). *Stress and coping* (3rd.). New York: Columbia University Press.
8. Monat A, Lazarus RS, Reevy G (2007). *The praeger handbook on stress and coping*. New York: Praeger.
9. Throckmorton T (2007). Stressors in oncology nursing: Potential sources of absenteeism and turnover. *Oncology Nursing Forum*, 34(2): 544-544.
10. Hsu SY, Su SB (2003). Health problems of permanent night-shift and rotating shift workers. *Chinese Journal of Occupational Medicine*, 10(2): 71-80. *In Chinese*.
11. Payne N (2001). Occupational stressors and coping as determinants of burnout in female hospice nurses. *Journal of Advanced Nursing*, 33(3): 396-405.
12. Stez TA, Stez MC, Bliese PD (2006). The importance of self-efficacy in the moderating effects of social support on stressor-strain relationship. *Work & Stress*, 20(1): 49-59.
13. Saaty TL (1980). *The analytic hierarchy process*. New York: McGraw-Hill.
14. Saaty TL (1990). *Decision making for leaders: the analytic hierarchy process for decisions in a complex world*. Pittsburgh, Pennsylvania: RWS Publications.
15. Heizer J, Render B (1993). *Production and operations management: strategies and tactics*. NJ: Allyn Bacon.
16. Vidal LA, Sahin E, Martelli N, Berhoune M, Bonnan B (2010). Applying AHP to select drugs to be produced by anticipation in a chemotherapy compounding unit. *Expert Systems with Applications*, 37(2): 1528-1534.
17. Dolan JG, Bordley DR, Miller H (1993). Diagnostic strategies in the management of acute upper gastrointestinal bleeding: Patient and physician preferences. *Journal of General Internal Medicine*, 8(10): 525-529.
18. Hsu TH, Pan FC (2009). Application of Monte Carlo AHP in ranking dental quality attributes. *Expert Systems with Applications*, 36(2): 2310-2316.
19. Chen SW, Chao HC, Shiao SJ, Lu M, Shih LC (1999). A study of the stress faced by clinical nurses. *Health Promotion & Health Education Journal*, 19: 83-90. *In Chinese*.
20. Lin JS, Lien WL, Huang SF, Ho HC, Sheu SJ (2003). The life experiences and adjustment process of registered nurses' participating in

- baccalaureate nursing programs. *The Journal of Nursing*, 50(1): 49- 56. *In Chinese*.
21. Shiau SJ, Chen SF, Chang C (1999). Exploring the effect of a stress-management workshop on stress symptoms among nurses. *Nursing Research*, 7(1): 90-98. *In Chinese*.
 22. Su MS, Wang CJ (1993). A study of clinical stress in caring for cancer patients. *Nursing Research*, 1(4): 351-358. *In Chinese*.
 23. Tang PL, Chen WL, Chen HF, Chang CL, Lin HS (2005). Depression level and its associated factors in nurses. *Formosa Journal of Mental Health*, 18(2): 55-74. *In Chinese*.
 24. Boey, KW (1998). Coping and family relationships in stress resistance: A study of job satisfaction of nurses in Singapore. *International Journal of Nursing Studies*, 35(6): 353-361.
 25. Lim J, Bogossian F, Ahern K, (2010). Stress and coping in Australian nurses: A systematic review. *International Nursing Review*, 57(1): 22-31.
 26. Lim J, Bogossian F, Ahern K, (2010). Stress and coping in Singaporean nurses: A literature review. *Nursing & Health Sciences*, 12(2): 251-258.
 27. Farquharson B, Allan J, Johnston D, Johnston M, Choudhary C, Jones M (2012). Stress amongst nurses working in a healthcare telephone-advice service: Relationship with job satisfaction, intention to leave, sickness absence, and performance. *Journal of Advanced Nursing*, 68(7): 1624-1635.
 28. Thirumaleswari T; Ragothaman CB (2013). A comparative study about the managing of stress by women nurses both at private and government hospitals at Kanchipuram district. *International Journal of Research in Commerce and Management*, 4(2): 99-106,
 29. Harris JS (1984). Home study program. Stressors and stress in critical care. *Critical Care Nurse*, 4(1): 83-97.