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Total Serum Cholesterol Level and Prognosis of Acute Cerebral Ischemic Stroke

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Abstract

Background & purpose: Although Cholesterol is a potential risk factor for stroke, there are some studies showed a reversal positive effect of cholesterol level on survival after ischemic stroke. The aim of this study was to demonstrate relationship between serum Total Cholesterol (TC) level and prognosis of acute ischemic stroke in Iranian patients with ischemic stroke

Material & methods: In this cross sectional descriptive & analytic study (2010-2012), 140 patients with diagnosis of acute ischemic stroke at emergency ward of 5th Azar hospital in Gorgan, in north of Iran, were included via systematic random sampling. TC level was extracted from clinical record of patients and the normal reference was less than 200 mg/dl. Barthel Index (BI) was used to assess general functional status in which scores range between 0-100 and greater scores indicate more independency and better functional status. Data were analyzed by SPSS version 16, descriptive statistics, and statistical tests (Spearman Correlation and Mann-Whitney U-test).

Results: 53.6% of patients were women. Mean age of them was 66.17 ± 12.78 years. Mean TC level was 204.29 ± 49.55 mg/dl. The mean rank score of functional status by BI among two groups of TC <200 mg/dl and TC \geq 200 mg/dl was 63.34 and 76.53, respectively (P = 0.05). Spearman correlation did not show the significant relationship between total serum cholesterol level and function score (r= 0.16, P = 0.057).

Conclusion: High TC in patients with acute ischemic stroke is associated with better prognosis and higher general functional status according to BI. Therefore, evaluation of mechanisms leading to this relationship could be focus of future studies. **Key words:** Total Cholesterol, Stroke, Prognosis, Barthel Index

Introduction

Stoke is a costly and debilitating disease in worldwide (1). It remains as one of the top causes of mortality and disability-adjusted life-years (DALYs) loss (2) that accounts for approximately 5.5 million deaths annually and 44 million disabilities (3).

The annual incidence of stroke for various ages ranged from 23 to 103 per 100, 000 population in Iran but is lower than developed countries (4).

According to some studies, history of hypertension, waist-to-hip ratio, high risk diet, diabetes mellitus, current smoking, alcohol intake and substance abuse, psychosocial stress and depression, cardiac causes and defects, pregnancy, ratio of Apo-lipoproteins B to A1, and migraine headache are conditions which associated with ischemic stroke (5-7).

In a cohort study on predictors of stroke-associated mortality in the elderly, no significant effect of cholesterol was found (8) Firstly, in Dyker et al. research, the influence of the serum TC level on survival after stroke was studied and higher serum TC level associated with reduced long term mortality after stroke (9). Recent studies also indicated similar findings and lower risk of death or poor functional outcome in the first month after ischemic stroke was seen in patients with a high TC concentration (10-12). Moreover, Olsen et al. found relationship between high TC level and less stroke severity and lower long term mortality, too (13) and high cholesterol was not a risk factor for mortality (14).

As the global burden of stroke is high (2) and the 28-day case fatality rate has been reported about to 19-31%, in Iran (4) and due to the high prevalence of stroke and importance of patients' recovery and

better surveillance system, the aim of this study was to demonstrate the relationship between serum TC level and prognosis of acute cerebral ischemic stroke for the first time in Iranian patients.

Materials and methods

In this cross sectional descriptive analytic study, 140 patients with acute ischemic stroke recruited from emergency ward of 5th Azar hospital affiliated to Golestan University of Medical Sciences (Gorgan, North of Iran) via systematic random sampling during Aug 2010 to Feb 2012.

In this study, the sample size was estimated based on a pilot study and finally 140 patients with acute ischemic stroke were included.

Patients with definite diagnosis of acute cerebral ischemic stroke based on clinical findings and after confirmation on CT scan during 24 hours after admission enrolled in the study. Exclusion criteria for this study were patients with transient ischemic attack or hemorrhagic stroke, and patients with symptoms of aphasia which is not assessed by BI.

Following variables were included in the analysis; age, sex, chief complaint, past medical history of Diabetes Mellitus (DM), Ischemic Heart Disease (IHD), Hypertension (HTN), stroke, hyperlipidemia, smoking and substance abuse, findings of CT scan at admission, laboratory findings of Blood Sugar (BS), Triglycerides (TG), TC, Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL) levels, and general functional status level according to BI at first 48hours and 1st month after admission. All of variables extracted from the clinical record of hospitalized patients except general function status at 1st month after admission which is asked by telephone contact to patients and their family.

To assess the general functional status, BI was used (15) during 48 hours and 1 month after admission (16). The 15- item version of BI was used and score range for individual items is feeding 0-10 (3 functional descriptions, unable, needs some help, independent, score as 0, 5, or 10), moving from wheel chair to bed/return 0–15, personal hygiene 0–5, toileting 0–10, bathing 0–5, walking on level surface 0–15, ascend/descend stairs 0–10, dressing 0–10, controlling bowels 0–10, and controlling bladder 0–10 and total score range was from 0 to

100 and higher scores indicate greater independency and better general functional status (17).

In the present study, laboratory findings were reported based on the analysis of venous blood samples (5cc) obtained from patients at admission time. In laboratory, blood samples centrifuged by Autoanalyser model Biotecnica BT 3500 (Biotecnica, Rome, Italy). Serum levels of TC were measured by Pars Azmoon kit and (Pars Azmoon Inc., Tehran, Iran) with a normal reference less than 200 mg/dl.

Data analysis was carried out by SPSS software version 16. For statistical analysis, the level of TC categorized into two groups of TC < 200 mg/dland TC ≥ 200 mg/dl. Moreover, the general function score of patients was calculated by subtracting admission scores (48 hours) from follow up scores (1 month). The more this subtraction, the better 1st month functional status of the patients. Descriptive statistics including frequency, mean and standard deviation (SD) was used to describe data. To compare the mean of general functional status in both groups and due to not normal distribution and ordinal type of TC level variable, Mann-Whitney U-test, a non-parametric statistical test, was used. Spearman correlation coefficient was used to assess the relationship between TC level and general functional status of patients. P value less than 0.05 was considered statistically significant.

Results

Overall, 140 patients with definite diagnosis of acute ischemic stroke with mean age of $78/12\pm$ 17/66 years were studied. 53.6 % of patients were women. Majority of patients (50.7 %) were hospitalized due to right hemiplegia and chief complaint in 49.3 % of patients were left hemiplegia.

Table 1 shows frequency distribution of past medical history of patients. Hypertension was the most common past medical history among population studied (Table 1). Mean and standard deviation (SD) of laboratory findings and general functional status score is shown in Table 2. The mean \pm SD of TC level was 204.29 \pm 49.55 mg/ dl (Table 2). In addition, results of CT scan at 24 hours after stroke showed right middle cerebral artery (RMCA) (37.2%), left middle cerebral artery (LMCA) (29.3%) and Lacunar (26.5%) were frequent involved artery, respectively (Table 3).

	Yes		No		
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	
DM	65	46.4	75	53.6	
IHD	24	17.1	116	82.9	
HTN	93	66.4	47	33.6	
Stroke	36	25.7	104	74.3	
Hyperlipidemia	43	30.7	97	69.3	
Smoking	24	17.1	116	82.9	
Substance abuse	29	20.7	111	79.3	

Table 1. Frequency distribution of past medical history of patients

Table 2. Mean and SD of laboratory findings and general functional status score

Laboratory Findings		Mean	SD
BS (mg/ dl)		154.76	86.42
TG (mg/ dl)		136.88	78.4
TC(mg/ dl)		204.29	49.55
LDL(mg/ dl)		114.05	27.39
HDL (mg/ dl)		64.1	17.76
General functional	48 Hours	34.93	26.27
Status (score)	1 month	55.54	33.23

Table 3.	Frequency	distribution	of involved	arteries	according to	CT scan

	Frequency (n)	Percent (%)
Right Anterior Cerebral Artery (RACA)	2	1.4
Left Anterior Cerebral Artery (LACA)	2	1.4
Right Middle Cerebral Artery (RMCA)	52	37.2
Left Middle Cerebral Artery (LMCA)	41	29.3
Right Posterior Cerebral Artery (RPCA)	4	2.8
Left Posterior Cerebral Artery (LPCA)	2	1.4
Lacunar	37	26.5
Total	140	100

Table 4. Mean and SD of general function status according to sex

TC level Mean rank score		TC<200 mg/dl	TC≥200 mg/dl	P value	
CON	Men	28.57	37.85	0.047*	
sex	Women	35.20	39.87	0.362	

In this study, 45.7 % of patients had TC<200 mg/dl and 54.3 % of them had TC \geq 200 mg/dl. Moreover, the mean rank score of general functional status in both groups were 63.34 and 76.53 (p=0.05). Spearman correlation coefficient did not show significant relationship between TC level and general functional status score (P=0.057; r=0.16) (Graph 1).

47.7% of men and 60 % of women had TC \geq 200 mg/dl. The mean rank score of general functional status had statistical difference among men (p=0.047), while no significant different was seen among women (Table 4).



Graph 1. Scatter diagram of correlation between TC and general functional status

Discussion

According to our findings, patients with high level of TC had better general functional status.

We know that high TC level is a risk factor for cerebrovascular accidents. It has already been reported that lower TC level in acute ischemic stroke patients is associated with better outcome. Dyker et al. indicated significant association between higher serum cholesterol concentrations and reduced long term mortality after stroke and patients with lower serum cholesterol had poor stroke outcome (9). Zuliani et al. indicated that short-term mortality following ischemic stroke was higher in patients with low TC levels and (47.4% in patients with low TC levels versus 23.0% and 24.1% in those with normal and high TC levels, respectively) (12). In Vauthy. et al. investigation, better outcome in early phase after ischemic stroke was found among patients with higher levels of cholesterol and patients with high cholesterol levels had a 2.2 and 2.1 folds lower risk of death and poor functional outcome at 1st month, respectively (11). Li et al. indicated good prognosis following stroke among patients with high TC level (18). Findings of previous studied supports the positive effect of high TC on better stroke prognosis. In our study, although the mean of general function status in high TC level group was better in comparison to the group with lower TC level; however, no correlation was found between TC level and general functional status score. While, this relationship was border line and very near to significant level. Although the reversal relationship between prognosis after ischemic stroke and level of TC in comparison to the nature of TC as a risk factor for ischemic stroke seems somehow paradoxical but this relationship can be justified according to previous studied that cholesterol can act as a buffer and neutralize free radicals and oxidative stress (19-21).

Moreover, there are small studies about sex differences in stroke management and prognosis. According to systematic review on sex differences in stroke epidemiology in 2009, stroke was more common among men but more severe among women and 1 month case fatality rate among women was higher than men (24.7% versus 19.7%) (22). In Di Carlo, et al. study, female sex was reported as a predictor of disability. Although there were no major sex differences in stroke presentation or management, compared with men, women had a slightly worse functional status at 6 months after stroke (23). In Glader at al. research, quality of life among women was worse in female patients in comparison to men and they were more dependent to other persons (24). In our study, although the mean rank score of general functional status among men had significant difference between the two groups, among women was not significant. Therefore, further investigations are suggested.

This study had some limitations, firstly, small sample size due to time and financial support limitations. Thus, long lasting studies with large sample size is suggested. Another limitation was use of BI to assess the general functional status of patients with acute ischemic stroke. BI has not the ability to evaluate the symptoms of language problem so this was the second limitation of our study.

Conclusion

Findings of the present study indicated that high TC level in Iranian patients with acute ischemic stroke may be associated with a better prognosis and general functional status. Thus, further studies are suggested to assess this finding and mechanisms which lead to this relationship.

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Clinical, epidemiological and histopathological aspects of American Cutaneous Leishmaniasis in patients of the Cariri Region

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Abstract

Introduction: American Cutaneous Leishmaniasis (ACL) is one of the significant zoonoses in Public Health, occurring in 88 countries, 72 of which are developing countries. In Brazil an average of 24.684 confirmed cases of ACL was recorded from 2000 to 2009. Six percents of the cases of ACL in the country are found in the state of Ceará (northeast Brazil). Except for epidemiological data published by the National Health Foundation (FUNASA) of the Brazilian government, there are few studies of ACL in Cariri, Ceará's region. This study presents 64 cases of American Cutaneous Leishmaniasis (ACL) which occurred in the Cariri and evaluates clinical, epidemiological and histopathological aspect of this pathology.

Methods: Cross-sectional study, quantitative and documentary. The sample consists of 64 medical records of patients and tissue samples with clinically suspected ulcerative lesions of ACL and later confirmed with laboratory analysis.

Results: ACL in Cariri Region is an endemic, particularly in rural areas with farmers that tend to enter in urban areas. Show a prevalence in male patients aged between 19 and 29 years. The ulcer was commonly verified in the lower limbs, with the infrequent mucosal injury. The observed histopathological pattern consisted of a chronic inflammatory reaction, exhibiting mixed exudation, predominantly monocuclear not uncommonly in granulomatóide arrangement associated with fibrosis and epidermal pseudoepiteliomatose.

Conclusions: Further studies should be conducted in other municipalities of the Cariri Region aiming for a realistic diagnosis of the distribution of cases of ACL, compare them with other regions and detailed knowledge of locations where Leishmania transmission provides public health agencies allowance to choose active methods of control and eradication of the disease.

Key words: American Cutaneous Leishmaniases; Cariri; Clinical, epidemiological and histopathological aspects.

1. Introduction

Leishmaniasis is caused by protozoan parasites of the genus *Leishmania* (Kinetoplastida: Trypanosomatidae)¹. This disease is one of the significant zoonoses in Public Health, occurring in 88 countries², 72 of which are developing countries³. The World Health Organization (WHO) estimates that 350 million people are exposed to the risk of becoming ill, with approximate record of two million new cases and different clinical forms per year⁴⁻⁶. The leishmaniasis condition is among the top five diseases that have a major impact on public health worldwide. In Latin America, the American Cutaneous Leishmaniasis (ACL) has a strong impact on public health, especially in Brazil, where it occurs in every State⁷.

In Brazil an average of 24.684 confirmed cases of ACL was recorded from 2000 to 2009, by System of Notifiable Diseases Information (Sinan), with a case fatality rate of 5.8% in 2009⁸. A geographical expansion was observed: the northern region has more cases of the disease (about 37.3% of the total cases registered in 2003), followed by the Central West region (32.6 cases per 100,000 inhabitants) and Northeast region (16.1 cases per 100,000 inhabitants)⁹.

Six percents of the cases of ACL in the country are found in the state of Ceará (northeast Brazil)¹⁰.

Thus, Ceará has endemic areas, particularly in the foothills of mountains and chapadas, as the Cariri region with its epicenter in the Araripe Chapada, crystalline solid with about 900m above sea level, ecological hotspot, equidistant about 600 km important northeastern capital as Teresina, Recife, Natal and João Pessoa. Except for epidemiological data published by the National Health Foundation (FUNASA) of the Brazilian government, there are few studies of ACL in Cariri.

Therefore, this study presents 64 cases of American Cutaneous Leishmaniasis (ACL) which occurred in the Cariri and evaluates clinical, epidemiological and histopathological aspect of this pathology.

2. Materials and Methods

Cross-sectional study, quantitative and documentary. The sample consists of 64 medical records of patients and tissue samples with clinically suspected ulcerative lesions of ACL and later confirmed with laboratory analysis. The records were obtained in two reference laboratories in Pathology of the Cariri between the years 1990 and 2003.

In evaluating the records, we used specific protocol developed to collect clinical and epidemiological data, were excluded from the study cases of mucocutaneous leishmaniasis ulcers demonstrably not by histopathology. The diagnosis was confirmed based on the following tests: positive Montenegro reaction (Kit Fio Cruz - Biomanguinhos) and/or positive serology for ACL, indirect immunofluorescence using Leishmania braziliensis as substrate and/or histopathological examination with presence of parasites. Histopathological studies were conducted from archived paraffin blocks, which were cut using a rotating microtomy type of Minot American Optical. The cuts had micrometers thick and were stained with hematoxylin/eosin method and Giemsa, according to the AFIP protocol¹¹. When necessary, staining was performed for silver, Grocott, PAS and Wade11, to remove fungal infections and mycobacteria. Protocol was elaborated for the morphological changes in the epidermis and dermis.

Statistical analysis was performed with Epi Info software 2002 version 6.0. Then, the data were compared with the morphological patterns described by Bitterncourt and Barral¹², using discrete adaptation.

3. Results

About 89.1% of patients acquired the ACL in the city itself, while 10.9% acquired the ACL in another municipality other than the their homes. The medical records and samples of 64 patients analyzed there was a predominance of males (69.9%). The age ranged between 9 and 85 years with an average of 37.4 and preponderance of the age group of 19-29 years.

The municipalities with the highest incidence were Barbalha (46.9%), followed by Juazeiro do Norte (16%) and Crato (12.5%). The majority of cases were located in rural areas (59.4%). In the municipalities of Juazeiro, Crato and Barbalha, the percentage of cases in urban areas was 75%, 50% and 36.3% respectively. The time between the patients realize the skin lesions caused by Leishmania and the search for medical aid was four weeks on average.

In clinical analysis, the ulcer was observed in 98.3% of cases, only general (79.7%), exclusive in the lower limbs (62.6%). In 9.6% of cases there was mucosal injury, usually in the nostril (3.2%). Detached two cases of lesions in atypical regions in the sample, one involving the right breast exclusively and another with extension to the larynx.

In 56.3% of cases were associated with lymphadenopathy satellite, not uncommonly preceding the cutaneous lesion. Two patients (3.1%) were associated with condylomatosis, being one diabetic. In 3.6% of cases were associated with peripheral venous disease of the lower limbs, one had rheumatic fever and the other was a person with AIDS.

Epidermal morphological findings were pseudoepiteliomatose (N=57), keratosis (N=39) and exocytosis (N=37) (Table 1). From these findings we highlight the importance of pseudoepiteliomatose front of patient age (P=0.829), age of the lesion (P=0.919), the growth velocity of the lesion (P=0.763).

Among the dermal morphological findings (Table 2), we highlight fibrosis (N=56), vasculitis (N=50), the presence of parasites (N=46), the fibrinoid necrosis (N=36), the shortage of mast cells in lesions (N=29), and granulomatous mononuclear exudate array (N=26). When correlated the patient age with important dermal changes as mixed exudate predominantly mononuclear (P=0.994),

Table 1. Frequency of epidermal histopathological changes in patients with ACL in Cariri Region, 1990-2003.

Epidermal Changes	Presence	Absence
Apoptosis	5	59
Atrophy	0	64
Keratosis	39	25
Exocytosis	37	27
Hyperplastic	6	58
Pseudoepiteliomatose	57	7
No change	64	0

Table 2. Frequency of dermal histopathological changes in patients with ACL in Cariri Region, 1990-2003.

Epidermal Changes	Presence	Absence
Abscess	0	64
Granulomatous arrangement	26	38
Epithelioid cell	3	61
Giant cell	3	61
Fibrotic scarring	56	8
Granuloma	2	62
Absence of mast cells	6	58
Little number of mast cells	29	35
Moderate number of mast cells	23	41
High number of mast cells	6	58
Fibrinoid necrosis	36	28
Liquefactive necrosis	1	63
Parasites	46	18
Mixed exudate	23	41
Mixed exudate predominantly mononuclear	20	44
Mononuclear exudate	21	43
Vasculitis	50	14

the absence of granulomas in most of lesions (P=0.877), and fibrosis (P=0.749) no significant correlation. Histopathological analysis showed no statistical correlation between apoptosis and patient age (P=0.332), the lesion age (P=0.345) and the growth velocity of the lesion (P=0.347).

The relevant dermal changes observed front of lesion growth velocity were fibrinoid necrosis (P=0.776) and rarefaction of the mixed exudate predominantly mononuclear (P=0.717). During treatment, the prevailing dermal changes were shortage of epithelioid and giant cells (P=0.920), persistence of the parasite (P=0.745) and the presence of fibrinoid necrosis (P=0.632).

4. Discussion

The survey results indicated that there was a predominance of males (69.9%) with a preponderance of age in the age group 19-29 years. A study conducted in the state of Mato Grosso do Sul, Brazil's center-west region, which evaluated the incidence of leishmaniasis between 2001-2008, showed that males had in all the years studied a higher occurrence of the disease (89% affected) being greater number of confirmed cases in the range 20 to 49 years old (64.78%)⁴. In Pontello Jr, Gon and Ogama⁹ there was predominance of males (62.62% of cases) with the age range of greatest prevalence of the disease was 21-40 years (35.1% of cases). Arraes et al¹³ refer that of the 329 patients evaluated in the state of Paraná, Brazil, 255 (77.5%) patients were males prevailing over females. The most affected age group was between 21 and 40 years with 138 (41.9%) patients of both sexes.

The ACL is considered a neglected disease. In general, affects populations with low socioeconomic status, with little political power and unattractive for the pharmaceutical industry¹⁴. In our sample, the majority of cases was located in rural areas (59.4%) and about 89.1% of patients acquired the ACL in the city itself, while 10.9% acquired the ACL in another municipality other than the their homes. Rural populations of the North, Northeast and Midwest are the most affected, and the North and Northeast regions responsible for about 75% of cases of ACL registered in the country¹⁵. To Piazzolla¹⁶, 100% of cases of ACL in Aningas, a small municipality in the state of Ceará, are from neighboring municipalities.

Starting from the analysis of the clinical history and semiological data has shown that an average of four weeks have passed from the appearance of injury to the search for medical service. These findings are similar to Murback et al¹⁷, in which the time elapsed since the appearance of the lesions to the initial care was less than six months in 53.2% of patients, from six months to a year in 17.0 % and greater than one year in 27.7%. Bustamente et al¹⁸ shows that of the 51 patients were visited for an interview and inspection of the environment, the interval between the occurrence of the lesion and the diagnosis of the disease ranged from days (N=16, 31.4%) to months (N=35, 68.6%).

The ulcer was present in 98.3% of the cases. Of these, 79.7% of the lesions were single and 62.6% were in the lower limbs. 9.6% of the cases showed mucosal injury, these 3.2% affected nostrils alone or in combination with other mucous membranes. Cutaneous leishmaniasis is the most common form of the disease. It is characterized by one or more papules, nodules, or ulcers. The lesions are, typically, described as looking somewhat like a volcano with a raised edge and a central crater. These are usually painless but can become painful if they become secondarily infected¹⁹.

In an assessment of 450 patients with leishmaniasis, localized cutaneous leishmaniasis corresponded to 83.4%, the mucous form 10.6%, the mucocutaneous form 4.5%, and 1.1% unknown. One single lesion was found in 71% of cases and ulcers with raised borders were present in 59.7% of cases. Nasal septum perforation without cutaneous lesion was found in 7.88%⁹. Bolivian study²⁰ evidenced that of the 2,909 cases examined the anatomical distribution of the localized cutaneous leishmaniasis lesions was as follows: 48.3% in the head/neck, 25.8% in the lower limbs, 19.4% in the upper limbs, and 6.6% in the trunk.

Condylomatosis venereal, diabetes mellitus, rheumatic fever, peripheral venous vascular disease and AIDS in association with ACL were found. To Oliveira et al²¹ of 55 patients with visceral leishmaniasis, 39 (70.9%) had at admission one or more pathologies associated as asthma, right bundle branch block of 2nd degree (RBBBD grade II), cytomegalovirus (CMV), Addison's disease, chronic obstructive pulmonary disease (COPD), hemoglobinopathies, acute myeloid leukemia (AML), multiple myeloma and human T-lymphotropic virus (HTLV). Oliveira et al²² state that of the one hundred and sixty-nine HIV-infected patients, PCR showed *Leishmania* (*Viannia*) DNA in 13 (7.7%) of blood samples.

Human infection with Leishmania leads to a broad spectrum of clinical, immunological and histopathological manifestations, ranging from selfhealing cutaneous lesions to the severe and destructive clinical form named mucocutaneous leishmaniasis^{23,24}. Fraga et al²⁵ report that in leishmaniasis, it has been suggested that many characteristics of this lesions are associated to hypoxic events and it could have a role in the disease outcome.

Regarding to absence of typical morphology of ACL to histopathology, found themselves certain peculiar epidermal changes and dermal, although not pathognomonic, as exocytosis and pseudoepiteliomatose in the epidermis, and mixed exudation predominantly mononuclear, often with granulomatóide arrangement, fibrosis, vasculitis, and fibrinoid necrosis in the dermis. A multiregional cohort consisting of 317 patients with cutaneous leishmania [Syria (157), Pakistan (66), Lebanon (47), Saudi Arabia (43), Ethiopia (2) and Iran (2)] was reviewed and granulomas were identified in 195 (61.5%) cases of ACL and these were divided to 49 caseating (25.2%), 9 suppurative (4.6%) and 137 tuberculoid without necrosis (70.2%)²⁶. Domingo et al²⁷ state that although studies describe

biological mechanisms associated with ATL pathogenesis, still are few studies dealing carefully lesions of ATL in humans.

5. Conclusion

The American Cutaneous Leishmaniasis (ACL) in Cariri Region is an endemic, particularly in rural areas with farmers that tend to enter in urban areas. Show a prevalence in male patients aged between 19 and 29 years. The ulcer was commonly verified in the lower limbs, with the infrequent mucosal injury. The observed histopathological pattern consisted of a chronic inflammatory reaction, exhibiting mixed exudation, predominantly monocuclear not uncommonly in granulomatóide arrangement associated with fibrosis and epidermal pseudoepiteliomatose.

Further studies should be conducted in other municipalities of the Cariri Region aiming for a realistic diagnosis of the distribution of cases of ACL, compare them with other regions of Brazil and verify the professions of patients affected by the ACL. For detailed knowledge of locations where Leishmania transmission provides public health agencies allowance to choose active methods of control and eradication of the disease.

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A pediatric checklist and key performance indicator for improving patient-centered consultations

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Abstract

Objective: To create a pediatric checklist and key performance indicator (KPI) for improving doctor-patient interaction in consultations in a hospital emergency department.

Methods: Two hundred proxy participants (parents or guardians) were recruited to respond to twelve 5-point questions about perceptions of doctor-patient and doctor-family interaction in clinical pediatric consultations. Both exploratory factor analysis (EFA) and parallel analysis were used to determine the domain factors and how many and which ones to retain, and to confirm the factor structure using confirmatory factor analysis (CFA). A visual representation was developed to help compute the KPI used in the studied emergency room (ER) pediatric department.

Results: Two factors were determined: *family satisfaction* and *doctor attitude*. Both had a significant prediction effect (Pearson's r = 0.43) and Cronbach's α 's of 0.81 and 0.84, respectively. The two-factor model adequately fit the data obtained in this study: [$\chi^2(53) = 83.072$; CMIN/DF = 1.57; GFI =.936; AGFI =.906; RMSEA =.053]. The standardized composite scores yielded by the two 6-item subscales were cross-classified to form a visual representation when computing the KPI (= 0.953; 95% CI = 0.924-0.982) used for future comparisons.

Conclusion: With the author-generated diagram of cross-classified person dispersion in MS Excel to compute the evaluated KPI results, we expect that a periodical semiannual survey can be done in ER pediatric department to improve doctor-patient interaction in consultations.

Keywords: doctor-patient interaction, exploratory factor analysis, confirmatory factor analysis, pediatrician

Introduction

Patient-centered care has been widely recognized in recent years as a key aim of hospitals and healthcare systems [1]. Hospital-based physicians are important determiners of the overall quality of patient care. The clinical consultation is an important aspect of the doctor's role [2], not only because the consumerist approach to healthcare [3] requires doctors to be more accountable to their patients [4-6], but also because many hospitals use questionnaires to assess patient and family satisfaction with physician performance as part of routine self-management [1,7]. In order to improve the quality of medical practice, these questionnaires draw attention to issues such as the doctor's communication skills and attitude errors [8,9]. The assessment of individual (or group) performance by physicians has thus gained increasing prominence worldwide [10].

Crew resource management and a checklist to help physicians mitigate attitude error

The aviation industry uses crew resource management (CRM), which originated from a NASA workshop in 1979 [11], to address the human aspect of error. In the healthcare environment, many hospitals incorporate these concepts to provide a checklist to help clinicians mitigate medical errors [12,13]. Through a teamwork approach, a CRM intervention (communication and teamwork, process and workflow organization, and standardized information debriefings) applied to a periodical questionnaire survey is of interest for creating a checklist that can improve patient-centered clinical care.

Research question

Taiwan's national health insurance system has been previously described [14-21]. A variety of quality assurance and monitoring programs has been initiated to move providers toward greater accountability for quality. It is essential to illustrate an example of CRM for creating a checklist to improve patient-centered care and further to respond to the claim by Eastaugh [22] that "those nations with global budgets have better health statistics, and lower costs, compared to the United States. With global budgets, these countries employ 75 to 85% fewer employees in administration and regulation, but patient satisfaction is almost double the rate in the United States."

Patient needs and communication challenges vary greatly in different clinical settings [23]. In a clinical setting, different types of patients encountered by a physician have their own characteristics and requirements related to patient-centered care to meet [2]. For instance, an emergency department pediatrician is in a different situation when in consultations involving children and their parents than in consultations involving adults and their families [2,24]. It is necessary to illustrate the example in a hospital emergency using a CRM approach with pediatricians to answer the following research questions: What kind of checklist can we create to mitigate doctor consultation behavior errors [25]? and what kind of performance indicators can we set to continuously improve the quality of patientcentered care [2,23]?

Objectives

Using a survey of questionnaires, we aimed to (1) develop a checklist to test the following hypothesis: The level of family satisfaction can be predicted by doctor attitudes in consultations involving children; and to (2) create a key performance indicator (KPI) that can be used in periodical surveys to continuously improve patient-centered pediatric care in hospital ERs.

Methods

Participants and Procedures

The study sample was recruited from pediatric patients who visited the ER of a 1300-bed medical center in Taiwan. During each interval period in the morning, afternoon, evening, night, and at midnight from Monday through Sunday in the last two weeks of November 2010, 3 patients who had just finished a consultation with an ER pediatrician were selected based on the first-found last number of their hospital chart number of 3, 6, and 9. A total of 210 patient proxies (e.g., family members such parents, brothers, sisters, or other relatives) finally completed the questionnaire.

This study was approved and monitored by the Research and Ethical Review Board of the Chi-Mei Medical Center.

Instrument

The 12 items of the patient-centered care in consultations involving children (refer to the P4C_12 scale) were selected from the literature [2,23-25] and revised by a consensus panel of 12 members (7 ER pediatricians and 5 ER nurses). Two domains were included: *family satisfaction* (6 items), and *doctor attitude* (6 items). Each item was assessed using a 5-point Likert scale with a range from 1 (completely disagree) to 5 (completely agree). In keeping with good practice in item selection, the questionnaires were tested in 30 iterative pilot trials to ensure that the question expression, the rating scales, and the layout were comprehensive, comprehensible, and acceptable to respondents.

Data Analysis

SPSS 15.0 was used throughout. The analysis was composed of three parts.

(1) To develop a checklist used by ER pediatricians:

The number of factors for the P4C_12 was detected using parallel analysis [26,27], which is one of the most recommended methods for dealing with the number-of-factors-to-retain problem [28-30]. Exploratory factor analysis (EFA) was then done to determine which items were involved in the respective dominant factors. The mean, standard deviation, and the difficulty (i.e., rare occurrence) of each item were calculated.

(2) To confirm factors of the P4C_12 by CFA:

Confirmatory factor analysis (CFA) was done for the results obtained from giving the P4C_12, and the structure of the questionnaire was analyzed to see whether it fit the previously obtained domains. To this end, the 2-factor model obtained (*fa*- *mily satisfaction* and *doctor attitudes*) was used for a regression analysis to examine the cause-effect relationship between domains. AMOS 7.0, a component of SPSS 15.0, was performed to depict the structural equation modeling (SEM) in the study.

In SEM, there is not a single index or a single set of indices to evaluate the fit of the model [31]. Several indices that contribute to determining the degree to which the model fits the data are normally calculated [32]. Following the guidelines in Jackson et al. [33], we used the following indices: relative χ^2 (CMIN/DF), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and root mean square error of approximation (RMSEA).

However, χ^2 is very sensitive to sample size, and therefore other indices must be considered [31]. The GFI and AGFI behave in a similar manner as R² in regression analysis. The closer the values are to 1 [34], the better the fit of the model. Values >0.9 suggest a good fit to the model. The RMSEA must have values <0.8, and the fit is considered to be very good when the values are <0.5 [35]. In addition, the most used and simplest index is the relative χ^2 (CMIN/DF). Values <1 suggest a perfect fit, higher values around 2 or 3 suggest an adequate fit, and values close to 5 suggest an inadequate fit [36].

(3) To set a KPI for improving the quality of patient care:

The person total score was converted to a percentage score $[p = X/(5 \times L)]$, where X is the total score in the subscale and L is the number of items in the subscale. For example, a respondent with a total score of 15 on the doctor attitudes will have a p score of 0.5, because X = 15 and L = 6. A p score centered around zero was then converted to p^* using $[p^* = (p - 0.5) \times 8]$, and then given a range from -4 to +4 to cross-classify respondents into the four exposure groups: (i) best practice (exposed to high attitude and high satisfaction); (ii) low supply (low attitude and high satisfaction); (iii) worst practice (low attitude and low satisfaction); and (iv) over supply (high attitude and low satisfaction). We constitute a KPI to assess ER doctor attitudes toward family satisfaction using a ratio (computed by formula 1) and its 95% confidence intervals (computed using formula 2), where n is the count in both quadrants (i) and (iv).



$$KPI_CI = KPI_r \pm 1.96 \times \sqrt{\frac{Kpi_r \times (1 - KPI_r)}{n}}$$
.....EQ (2)

Results

Participants

Of the 210 potential participants recruited, 10 were excluded because of response errors and missing values on the questionnaire. Our studied ER pediatric population in terms of gender, age, type, and education was shown in Table 1. The most frequent "type" of accompanying adult was the child's mother (80.5%), most (65.5%) of whom were between 31 and 40 years old.

Table 1. Distribution of proxy characteristics

Proxy	Category	Count	%		
Gender	Gender				
	Male	31	15.5		
	Female	169	84.5		
Age					
	Under 30	55	27.5		
	31-40	131	65.5		
	41-50	13	6.5		
	51-60	1	0.5		
Туре					
	Father	31	15.5		
	Mother	161	80.5		
	Grandparent	1	0.5		
	Sibling	3	1.5		
	Babysitter	1	0.5		
	Others	3	1.5		
Education	n				
	Less than high school	5	2.5		
	High school graduate	84	42.0		
	Some college	50	25.0		
	Bachelor's degree	52	26.0		
	Post-graduate	9	4.5		

To develop a checklist used by ER pediatricians

Two factors for the P4C_12 were determined using parallel analysis [26,27] (Figure 1). Two 6-item subscales were separately classified by the rotated factor loadings (>0.60) through the EFA approach (Table 2). The Cronbach's α 's for *Family* satisfaction and *Doctor attitudes* were 0.81 and 0.84 (>0.70), respectively. Items in the *Family sa*-tisfaction domain are easier (with higher means and lower values of difficulty) than those in the *Doctor* attitudes domain, but they have smaller *SD*s, which indicates that the internal convergent construct validity and consistency reliability are acceptable as a checklist tool for assessing the quality of patient care in a hospital ER pediatric department.



Figure 1. Parallel analysis on study datasets



Figure 2. Regression analysis on Doctor attitudes toward Family proxy satisfaction



Figure 3. Persons was cross-classified by two domains

Note. The KPI value(=182/191=0.953, 0.924-0.982); Quadrant: QI(182)=91.46%; QII(7)=3.52%; QIII(9)= 4.52%; QIV(1)=0.5%

Item	Content	Factor loadings	Mean	SD	Difficulty§
Fami	ly satisfaction (a = 0.81, EGV = 3.15, EGV/item length = 52.5%)				
12	Doctor repeatedly answered my questions about my child's illness when I misunderstood.	0.79	4.21	0.91	-0.35
7	*I feel that the doctor uses too much medical jargon.	0.75	3.46	0.74	-0.24
11	I understood all of the doctor's explanations about my child's illness.	0.74	3.72	1.12	-0.76
9	I feel the doctor gave us an appropriate amount of consultation time.	0.73	4.08	1.02	-0.41
10	I feel confident about the doctor's professional knowledge.	0.65	4.36	0.77	-0.54
8	I feel that the doctor explained the prescription and treatment in sufficient detail.	0.62	4.16	0.89	-0.13
Docto	or attitudes (a = 0.84, EGV = 2.73, EGV/item length =45.5%)				
1	The doctor immediately responded to my questions about my child's illness.	0.74	2.89	1.27	0.75
4	The doctor always directed and encouraged me to describe my child's illness.	0.68	3.68	1.13	0.20
2	*The doctor seldom makes eye contact with us when in consultation.	0.66	3.11	1.38	1.00
3	I like The doctor's making conclusions after the consultation.	0.65	3.88	1.04	0.98
6	The doctor listens to and is concerned about my description of my child's illness.	0.62	4.43	0.69	-0.60
5	The doctor often uses Yes/No dichotomy questions when asking about my child's illness	0.61	3.74	1.15	0.09

Table 2. Exploratory factor analysis on domains of items

SD, standard deviation; α, Cronbach's α; EGV, eigenvalue of the 1st principle component. *Inverse scoring

To confirm factors of the P4C_12 by CFA

CFA is used to test a hypothesis. We specified the number of factors extracted from EVA. Fewer loadings were estimated in CFA than in EFA because not all factors underlie all manifest variables in CFA [37].

The results obtained suggest that the two-factor model adequately fits the data obtained in this study: [$\chi^2(53) = 83.072$; CMIN/DF = 1.57; GFI =.936; AGFI =.906; RMSEA =.053]. χ^2 was significant (p <.005), which suggests that there is a part of the variance that is not explained by the model. Alternatively, other indices verify the acceptable degree to which the model fits the data.

The level of family satisfaction, with a standardized coefficient of 0.43, can be significantly predicted by doctor attitude in consultations involving children.

To set a KPI for improving the quality of patient care

To create a KPI for improving the quality of patient care in a hospital ER pediatric department,

we plotted a diagram of person dispersions cross-classified by the two subscales in Figure 3 (see Additional file), in which 4 quadrants consist of the number of persons with QI(182) = 91.46%, QII(7) = 3.52%, QIII(9) = 4.52%, and QIV(1) =0.5%. We found that the KPI value for this survey was 0.953 (= 182/191) with a 95% CI of 0.924-0.982 that can be used for future comparisons. It indicates that the KPI created in this study can be used for a periodical survey for continuously improving patient-centered care in a hospital ER.

Discussion

What is already known about patient-centered care

Good assessment of day-to-day clinical performance is important. Hospital-based doctors are vital in the overall quality of patient care [1] that requires feasible, valid, and reliable performance indicators for professional regulation (e.g., revalidation) and for quality improvement initiatives (e.g., clinical governance) [2]. In addition, doctors and their tra-

iners need assessments with an educational impact to drive learning and to provide formative feedback needed for revalidation and healthcare improvement [1,38,39]. There is a shortage of methods for assessing the quality of the clinical consultations involving children [2,38]. Many studies have examined separate elements of the consultation with item-by-item analysis [40], but not as in the present study, which uses EFA and CFA to verify its structure factors and applies subscale composite scores to create a KPI for continuously improving patient-centered care in a hospital. There is evidence that better interactions are associated with better patient understanding and recall of information [41-44], better compliance with treatment [41,42,44-46], and better health outcomes [47-50]. Doctors' attitudes toward patient satisfaction in consultation should be verified. In this study we can see that "visualizing measurement is applying common sense by the use of pictures, graphs, maps, etc. This approach is the key to success in communication, utility and generality" [51,52].

What this study adds

By using a consensus panel of pediatricians, we presented an evidence-based approach that develops a checklist and creates a KPI for continuously improving patient-centered care in a hospital. We used CFA plus EFA to verify a valid checklist for assessing quality of patient care in the ER for improving consultations involving children. We recommend that the teamwork leader of the study hospital ER list the items of doctor attitudes on computer desktop screens as a frequent reminder to pediatricians because the level of family satisfaction can be significantly predicted by *doctor* attitudes in consultations involving children. This work successfully synthesizes the components of the consultation reported in previous published papers into one rational evaluation system used for hospital ER pediatricians.

Limitations

This study has several limitations. First, the sample was homogeneous because it was selected from a single hospital in Taiwan. Samples recruited from a variety of worksites would be more heterogeneous, which should allow the findings to be generalized to consultations with children in different hospitals or even in different nations. Second, the α coefficients for the two subscales of the P4C 12 were 0.81 and 0.84 for the Family and Doctor domains, respectively, which were definitely high because each subscale contained only 6 items. In addition, it is possible that clear, comprehensive, and understandable Chinese translation of these items for the P4C 12 were made. This, however, is not always easily achievable if using only the translation and back-translation procedure suggested by Brislin [53]. Additional studies are required to ensure that the respondents clearly understood the word meanings when attempting to create a highly reliable and valid questionnaire.

Suggestions for future research

Future studies are encouraged to use item response theory-based Rasch rating scale model [54] to test model-data-fit. Visual representation such as that provided by Figure 3 is recommended for future psychological studies for easily observing cross-classified persons dispersed in quadrants and for calculating prevalence rates for mental health disorders [55]. It is of great value to apply it to other clinical consultations in other contexts and to computing their own self-managed KPI for quality improvement in patient-centered care.

Conclusion

With the author-made in MS Excel diagram of cross-classified person dispersion to compute the evaluated KPI results, we recommend a survey can be frequently conducted in the studied hospital ER pediatrics department. Through which, an intervention can be involved with a checklist of the subscale items on *doctor attitudes* that can be put on the desktop screen of a doctor-daily-used computer as a reminder for improving doctor-patient interaction in routine consultations with children.

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Prevalence and risk factors of allergic diseases among children in Duzce

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Abstract

Background/aim: Asthma, eczema and rhinoconjunctivitis have become between the most common chronic diseases which is seen in childhood. The asthma prevalence differs from country to country and sometimes even changes among the regions of the same geographical areas.

Materials and methods: In this study, ISAAC question form improved for 13-14 age groups is used. This questionnaire include 20 question related with asthma symptoms, eczema and rhinitis. This study was conducted between march and may in 2012 in Düzce city, and included 2508 secondary school children aged between 11-15 years. The questionnaire was applied to a total of 8 different secondary school which were randomly selected for each region in the city.

Results: In children, the rate of wheezing ever in the last year was found as 24%, wheezing in the last year was found as 10.2%, asthma was found as 6.9%, rhinitis symptoms ever was found as 39.1%, rhinitis symptoms in the last year was found as 33.4%, itchy rash ever was 4.4%, itchy rash in the last year was found as 3.3% and the rate of eczema was found as 3%.

Conclusion: The most predictive and crucial factor can be pointed out as family history of atopy. Low socioeconomical levels of families are important risk factors for allergic and chronic diseases. Thus, the symptoms of diseases for children can be related with the poor quality of physical environment.

Key words: Asthma, rhinitis, eczema, atopy, prevalence, risk factors

1. Introduction

Diseases like Asthma and allergic are still creating important public health problem because of their current prevalence and impact on socioeconomic burden (1,2). Genetic and environmental factors are important factor in the development of the disease. As evaluated worldwide, Asthma, rhinoconjunctivitis and eczema have become three of the most important diseases in childhood. Even though it was regarded that the occurrence level of these diseases more wide in developing countries than developed ones. According to the first global report of the International Study of Asthma and Allergies in Childhood (ISAAC) it has been proved that the prevalence of those conditions in some low-resourced populations was similar or sometimes higher than in the developed societies and even at country and regional level a wide variability in their prevalence can be occurred (3-5). So, ISAAC has reported a large amount of body of new national, regional and global information on the prevalence, intensity, risk factors, trends and another aspects related to asthma, rhinoconjunctivitis and eczema especially in childhood (6). The prevalence of asthma differs from countries and sometimes even changes among the regions in same geographical areas. (7-9). In the majority of the previous studies, familial atopy is primary and prominent risk factor for asthma and/or other allergic diseases in childhood (8, 10-13). Factors connected with asthma and allergic diseases contain personal atopy (10), male sex (10-12), passive smoking at home (8, 10, 14), pets in house (14, 15), past history of respiratory infection (8) and having moulds in houses (15).

Turkey presents various types of geographic and climatic diversities with a predominant moist climate character. Düzce is a relatively small city in North-west part of Turkey. It's population is approximately a half million. There is no recorded study regarding the prevalence of asthma and allergic disease in childhood for the region. The goal of this study was to evaluate the asthma and other allergic diseases prevalence in Düzce, by using the standard ISAAC questionnaire. Another aim of the study is to consider the various potentials contributing to the risk factors that may affect this prevalence in school aged children between 11 and 15 years old.

2. Materials and methods

Düzce city has a humid climate and located in west part of the Black Sea Region. Like the other coastal areas of Black Sea Region Düzce's average relative humidity rate is %75. The study was conducted between 2012 March and May in Düzce City, and included 2508 children aged between 11-15 years. The quastionnaire was applied to a total of 8 different secondary school which were randomly selected from each region of the city.

2.1. Study design

In this study, ISAAC question form improved for 13-14 age groups is used. This questionnaire include 20 question related with the symptoms of asthma, (8 questions; is there any type of shortness of breath in the last 12 months, how many times it became, is there any type of shortness of breath during sleep and does it affect speaking, is there asthma diagnosed by doctor, is there any type of shortness of breath with exercise, is there any type of hack except cold and flu) rhinitis (6 questions; is there any type of runny nose, nasal congestion and sneezing except cold and flu, in last 12 months, is there any type of runny nose, nasal congestion and sneezing and tearing, in which months was much more quiet and it affect daily activities) and eczema (6 questions; in the last 6-12 months, is there skin rash, is there skin rash at elbow folds, neck etc., did the color of exuviation change, did it become awakening due to itching, is there an eczema diagnosis diagnosed by doctor).

The participants are required to mark the forms on their own. Also characteristics such as gender and age of children, duration of nursing in infancy, mothers and fathers age, parents level of education, occupation and smoking status, number of individuals living in the house, total number of children in the family, family monthly income, properties of the house (Apartment, shanty, etc.), house heating type, fat types used in the meal, frequency of eating meat in a month, presence of pets and plants inside the house and smoking at home were included inside the questionnaire. European Community Respiratory Health Survey (ESRCH) questionnaire was also applied to the parents of the children determine as their education level, occupations, the physical environment they live, monthly income and pet feeding situation may have an impact on factors which affects the allergy situation of the children.

Prior to application of the questionnaire form, detailed information was given to participants. The aim of the trial was clearly shared and written approvals of the participants were taken. ISAAC phase I questionnaire (16) was given to the the parents in order to complete for each subject. The written questionnaire was translated into Turkish based on the ISAAC protocol. Düzce University Faculty of Medicine Clinical Research Ethics Committee approval was obtained (29.03.2012/266). Prior to data collection, it was taken permission for usage of ISAAC Phase 1 Form from ISAAC Board of Directors (Philippa Ellwood).

2.2 Statistical analysis

Statistical analysis was performed by using SPSS for Microsoft Windows 15.0 (SPSS, Chicago, Illinois, USA). The relationship among risk factors was performed by univariate analysis using univariate odds ratio (uOR) and chi-squared tests. Its confidence interval (CI) is 95%. All tests of significance were two sided. The differences were considered statistically significant when the p-value was <0.05.

3. Results

2508 forms were distributed and 2258 (90%) were recollected. 230 of the forms that were not approved by the parents have been excluded from the study. Demographic features of the children was showed in Table 1. The rate of wheezing ever in the last year for children was 24%, wheezing in the last year was 10.2%, asthma was 6.9%, rhinitis symptoms ever was 39.1%, rhinitis symptoms in the last year was 33.4%, itchy rash ever was 4.4%,

itchy rash in the last year was 3.3% and the rate of eczema was 3%. There were no difference between the schools in terms of asthma, allergic rhinitis, eczema, and other allergy prevalence (p > 0.05).

Income status, gender and family type was not detected as a risk factor in the prevalence of asthma. Presence of asthma in family (odds ratio [OR]: 1.55; 95% confidence interval [CI]: 1.41-2.39), and living in squatter conditions odds ratio [OR]: 3.38; 95% confidence interval [CI]: 1.25-9.38), was detected as independent risk factors for the development of asthma (p<0.01). Female gender was found as an independent risk factor in the development of rhinitis [OR]: 1.55; 95% confidence interval [CI]: 1.18-2,1; p<0.001). Income status, gender, inhabited home, family type has not detected as a risk factor in the development of eczema in children were not significantly associated with the presence of eczema in the family.

Table 1. Demographic Characteristics Of theChildren

Age	12.3±1.1
Gender (male/female)	52% (n=1303)/48% (n=1205)
Income status	
Low	2.2% (n=60)
Moderate	38.2% (n=958)
High	59.5% (n=1492)
Inhabited home	
Squatter	2.2% (n=56)
Single house	50.2% (n=1255)
Apartment building	47.5% (n=1188)
Family type	
Nuclear family	79.4% (n=1984)
Extended family	20.4% (n=510)
Pets feding at home	17.8% (n=444)
Smoking at home	35.6% (n=896)

4. Discussion

Asthma and atopy still remain as important health problems in Turkey as they are common in the rest of the World. They have relatively big cause on they decrease of life quality and impairment in school success of children. In this study, it is determined that in school children between 11 and 14 years old allergic rhinitis and its symptoms were more frequent than asthma, eczema and symptoms.

This study have emphasized the risk factors including the causes of asthma and allergic di-

sease development processes and have revealed conflicts with previous studies. The main conflicting risk factors causing development of asthma and atopy can be summarised as dietary habits; genetic factors; socioeconomic level differantiations; exposure to smoking; environmental conditions; and animal contact (11,12, 17, 18). It can be pointed out that economic, socio-cultural and environmental conditions are more common in non-homogeneous countries such as Turkey (7,9). This study have found higher level of prevalence in allergic disease which have been reported in United States (19), British Isles (20) and Australia (21). When the results of this study are compared with the data of the study from Germany (22), the frequency of allergic rhinitis is lower and frequency of wheezing is higher. Comparing our results with national data, it was seen that the prevalances of asthma, allergic rhinitis, and eczema were lower than Afyon city study which includes 13-18 year old children (23). Also, Saraclar et al.(24) have reported asthma prevalence as 14,4% in 1997 while Demir et al.(8) have reported asthma prevalence as 6.4% in 2002 where there is a decrease. The prevalence of asthma were found quite higher that have been reported between 13.7-16.4% in the western region of Turkey (9, 11, 25, 26). The prevalances in the studies at North of Turkey are between 5.6-14.5% (17, 27). Guner et al. (28) found asthma and rhinitis prevalance as 11.5% in Konya City which is located in the central region of Turkey. In the comparison of urban and rural cities, most researchers have declared that prevalance of asthma and atopic diseases are much higher in urban areas. Most hypotheses regarding the low prevalence of asthma in rural regions based on the hygiene hypothesis. However, Akcakaya et al.Guner at al. (25, 28) on the other hand emphasized that economic and environmental conditions have no or less effect on asthma development, as the results of our study. The results of this new study have quite similarities with North Turkey part studies (17, 27). Also, Kalyoncu et al. (12) have focused on gender risks and emphasized the that male gender is an important risk factor for current asthma and wheezing while, in our study, male gender is a risk factor for rhinits.

Many studies has emphasized that the most important risk factor for development of asthma and allergic disease is genetic susceptibility (7, 9, 29). In our study, it has been determined and evaluated many risk factors such as gender, socioeconomic level, number of persons in the household, living in the city center, dietary habits. We have found out that the most important risk factor for development of asthma/atopy seemed to living in poor physical conditions such as slum areas and history of atopy. Asthma, allergic rhinitis and eczama were found in 10.2%, 33.4% and 3% of children with family history of atopy (12.3% of all children having family history), respectively. Another important finding of the study is that there is no effect of environmental factors on prevalance of atopy.

This study is important since it is the first study conducted in Düzce using the ISAAC survey form. It can provide a basis for future studies that will have larger involvement. On the other hand, this study has some limitations as it was a questionnaire-based. Also the diagnosis of diseases was not based on objective measures and the scarce numbers of children included in the study regarding the fact that there were not face-to-face interviews. It would be better and useful involving the pulmonary function and bronchial provocation tests for the diagnosis of asthma, and skin prick tests for allergic rhinitis for more detailed analysis.

As a conclusion, this study clearly outlines the moderate level in the prevalance of allergic diseases comparing with national studies conducted before. The most predictive and crucial factor can be pointed out as family history of atopy. The effects of rural or urban factors are not obvious in the developmet of atopic disease. Low socioeconomical levels are important risk factors for allergic diseases and symptoms for children which can be related with the poor quality of physical environment. For the extensive analysis of the risk factors, larger scale and comparative studies using standard survey forms are needed in our local rural region and throughout the country.

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Peer Coaching – Building an Effective Alliance, Support, and Cooperation at the Workplace of a Graduate Nurse

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Abstract

Objectives: Peer coaching is aimed at supporting employees in terms of establishing mutual trust and cooperation between co-workers, as well as building one's own professional identity. It is important for the provision of comprehensive and high-quality patient treatment that health care workers are aware of the significance and role of peer coaching and its underlying purpose which is to support colleagues in various challenges they have to tackle in their line of work.

Methods: The data was gathered with a structured questionnaire. The sample includes 245 graduate nurses who work in primary and secondary health care. We have employed descriptive statistics and the non-experimental causal method of research.

Results: The results we obtained have shown that the respondents do follow the principles of peer coaching. The most important principles that are necessary for a comprehensive and high-quality treatment of patients are thus reported to be responsibility (\bar{x} =4.8), focusing on solutions (\bar{x} =4.6), awareness (\bar{x} =4.5) and self-confidence (\bar{x} =4.5).

Conclusion: Most of the respondents are unfamiliar with the expression *peer coaching*, however they carry out their work in accordance with its principles. They realize that all health care workers should implement the principles of peer coaching and attend workshops on the topic of peer coaching.

Key words: Peer coaching, coaching skills, peer coaching principles, learning process in peer coaching

1. Introduction

When it comes to employees one should keep in mind that productivity is not just the result of good wages and machine equipment, but largely the result of the total knowledge accumulated in the minds of employees manifesting itself as work-relevant qualifications and as work experience, both of which are necessary in their respective work and for the transfer of their respective knowledge to other employees. This type of knowledge can be identified by different names; some sources refer to it as knowledge capital, even though the essential point is not that it generates better economic results of an organization or another institution. Its distinctive feature is rather creativity which stimulates productivity rates and approximates the organization and the method of communication between its employees to the method found among working scientists. Recent analyses of successful organizations suggest that, for instance, successful leadership, distribution of information and the application of knowledge contribute more to the overall success of an organization than successful financial operations (1).

It is important to highlight the role of intergenerational knowledge transfer which broadens one's mind as it facilitates better understanding of the views and actions of a certain generation, thereby smoothing out the intergenerational differences and significantly promoting progress and steady progress levels within the organization without the fluctuations associated with the shift of generations. Participation of all generations in this process can be crucial for a positive way out from the overall negativism which was brought about by the economic crisis. As a result of the ageing of the population, developed countries are more and more embracing the concept of so-called active ageing. Here, countries, through legislation, and organizations, through various instruments, encourage older workers between the ages of 55 and 64 to stay in active employment as long as

they can. This brings about changes in the labour market and in the age structure of employees. Teams of staff are becoming increasingly varied in terms of age, where three or even four generations can come together at work, all of them possessing different knowledge and skill sets (2). Considering the demographic, economic and political factors, it is clear that this can only be achieved by fostering the focus of all generations and nurture solidarity between them (3).

The variety and diversity of knowledge and skills held by different generations employed in an organization can help the organization gain a competitive edge. Unfortunately, older employees are generally considered to be an obstacle and an issue which needs to be addressed, rather than an opportunity to be seized and exploited - especially in terms of the transfer of knowledge and experience. The young have plenty to learn from the elders. But this goes both ways: the older generation can learn from the young, especially regarding the newest technologies and computer skills. Hence, knowledge management must establish levers which have a strong influence on the intergenerational knowledge transfer, and foster positive and cure negative factors (2).

In order to maximize the effect of knowledge, it is not sufficient to merely codify, identify and generate knowledge. Organizations also require quick knowledge transfer. The knowledge transfer process indicates the transfer of knowledge from those who have knowledge and from where knowledge is generated, to those who require knowledge and to where knowledge is commercially applicable and useful. Knowledge transfer will be successful if the players involved have a vested interest for its success. Therefore, it is vital to ask how to achieve within an organization so that employees will share and distribute their knowledge among each other. The mission of the knowledge transfer system within an organization is to provide knowledge to employees precisely when they need it (4). Distribution of knowledge within an organization is an in-house process in which it should be determined which employees should possess what types of knowledge and to what extent. The most valuable knowledge for any organization is that which can be transferred to the largest number of employees as quickly and effectively as possible, regardless whether it was acquired in-house, i.e. within the organization, or externally.

One of the possibilities for knowledge transfer is peer coaching which is a process between two colleagues who support each other by means of specific techniques, methods and tools to achieve desired goals and nurture professional development (5). In peer coaching the emphasis lies on a co-worker supporting its interlocutor in their own research efforts and solution-finding processes, empowering them in the process. The main difference between peer coaching and other types of coaching is that in peer coaching, the colleagues carry out similar work assignments and support each other in the various challenges that come up in their line of work. They both know the nature of each other's work and realize the challenges that normally emerge in its course. Coaching skills are applied for mutual support. Regardless of the fact that the two work colleagues are not real coaches, it applies that coaching elements are used between two colleagues and not between a coach and a client (6). Peer coaches normally attend a few days of training to acquire coaching skills. Other coaching types, in contrast, mostly include professional coaches who become qualified to run the coaching process after having enrolled in a longer qualification programme. Normally, professional coaches do not carry out similar work assignments as their clients. It is therefore not necessarily the case that the coach has ever experienced a similar challenge as his client is currently facing (7).

This approach goes beyond the normal practice in work settings where one colleague complains to another colleague, and the other colleague joins in on the complaint or offers some quick advice or perhaps a reproach. In peer coaching we can support the colleague by illuminating their situation, identifying the obstacles and ways to overcome them (8). We can boost the colleague's *I can do it* attitude and activate their potential and encourage their problem-solving mindset. Frequently, colleagues chime in with their own experiences or advice. Alternatively, they can provide support by helping the colleague identify what is going on and what is to be done, conducting a conversation through a series of questions.

Peer support between two co-workers by means of questions in the framework of coaching promotes the natural learning process which takes place in day to day life within real-life circumstances instead of a classroom with an artificial environment. The learning process in peer coaching is circular (9): a) Experience (I work, I experience. How do I feel in the process?); b) Reflection (evaluation, reflection on the experience. What do I conclude?); c) Generalization (drawing conclusions; What have I learned?); d) Test (planning of adjusted activities, testing. What will my next steps be?). Peer coaching clearly illustrates the action research spiral which was first proposed by Lewin. The progress in learning is gradual and takes place in stages of planning, action, observation and evaluation of results. In peer coaching, we must first set out what it is we would like to achieve and how to achieve it. Then, we tackle the activities and undertake to observe them while they are being carried out. Finally, we reflect and evaluate the results, get an impression of our performance and undergo emotions with regard to the activities we just carried out. However, the spiral does not end here. Because we acquired new experience which takes us to the next level we are able to make new plans, take actions, observe, evaluate etc. by building on this new experience.

Peer coaching helps us expand our comfort zone. Two colleagues involved in peer coaching have their own limits of action inside of which they feel comfortable. When moving out of the comfort zone, we get into the adjustment zone which is not exactly comfortable for us, however we can settle for a while. Later, if we find ourselves in the panic zone, we react under high stress, because the situation seems unbearable (10). For instance, when a nurse provides nursing care to patients who were assigned to them as usual, the nurse will usually know what to do and how many patients are to be provided for. The nurse perceives this activity as a daily activity, in which the nurse feels comfortable, relaxed and successful, because the work conditions are well familiar (comfort zone). If a nurse has to provide nursing care to a larger number of patients than usual, because a colleague fell ill and misses work, the nurse will experience these circumstances differently. Since more work needs to be done, more planning and careful preparation are required. A higher level of commitment and slight stress also come into play (adjustment zone). Nevertheless, the nurse can manage, even though more time is required to fully adapt to the new situation. However, if such situations should repeat over and over again, the adjustment zone would gradually become a comfort zone. In the event of having to provide nursing care to a celebrity (president of the state, a famous musician, renowned actress), this could put extra pressure on the nurse, which the nurse perhaps could not handle, being pushed into the panic zone. Finding oneself in such an extraordinary position causes nervousness, failure to communicate effectively etc.

Once we are familiar with the basic skill set of coaching and peer coaching, we can easily identify and establish what it is we want and embark on the journey of fulfilling our goals (11). We discover that we are in tune with our authentic and beautiful inner self. We must appreciate ourselves as being experts for our personal and professional life and realize how creative, inventive and comprehensive we are. We grow more confident and learn to love our inner self. The coach is in charge of establishing new thinking patterns. The coach helps one to become able to find solutions and strategies on one's own instead of seeking other people's advice (12). The awareness of coaching pertains to a person's ability to work according to a plan. This can work if one becomes open-minded, flexible, self-confident, efficient and also possesses a sense of humour, seeing as life should be regarded both responsibly and lightly (13). Once we have faith in our intuition, new possibilities open up, and we become ready to take risks. Other people's emotions can hardly shake or beat true confidence. The key skills of coaching and peer coaching help us discover our current skill set and identify the skills we are still lacking. Each of the key skills is equally important and equally relevant for everyone (14): Self-respect and self-reliance, communication, efficient questioning, creating awareness, designing actions, planning and setting goals.

We would also like to point out the principles on which coaching is built and which lend it its distinct features. The coaching approach is characterized by principles which are implemented during the coaching process. These rather simple principles are also implemented in peer coaching (15):

Awareness: Coaching broadens the client's horizons. The coach helps the client to see

the situation with different eyes. The client becomes aware of certain aspects that were prior out of the picture for the client. This new awareness promotes creativity and helps the client to come up with new solutions.

- Responsibility: In coaching, clients come to a solution on their own, thereby assuming responsibility for their development. If the coach provides advice to the client, the responsibility remains with the coach – this is no longer coaching but advising. However, learning is easier if clients examine their current position on their own. Coming up with solutions on one's own creates a sense of greater belonging and ownership than using solutions that were provided by someone else.
- *Self-confidence:* Being convinced that one can indeed reach one's set goals is one of the key factors for attaining said goals. The coaching process is thus based on developing self-confidence. Peer coaching promotes learning through mistakes and learning through reaching minor goals, as well as learning by example. An important role of the coach is to inform the client of the progress made on every step of the way. In this way, clients can gradually enhance their belief that their goal will be reached.
- *Free of judgement:* In peer coaching, mistakes are considered to be opportunities for learning. The coach never judges and is never partial to the client. In coaching, evaluations are superfluous, because they can create a feeling of guilt in the client. The coach does not have to agree with the client, but they must embrace the client and trust that the client will come to a solution that will be best for their respective situation and match their personal values.
- *Focusing on solutions:* Focus plays a great part in our life. Constant mulling over a problem only makes it appear bigger. Once we redirect our focus to finding a solution, we imbue the situation with a sense of optimism which energizes us to go on. Because of this, peer coaching prefers thinking about the solutions, instead of a detailed analysis of the issue.

- *Challenge:* It is said that the coach holds the mirror up to the client. The coach challenges the client to look at the situation from a fresh perspective. The coach is not satisfied with client's simple answers and predictable solutions, but rather encourages the client within a confidential setting to find out-of-the-box solutions.
- *Action:* The coach does not stop at finding solutions, but also motivates the client to mobilize their energy and actually implement the change. A significant portion of the time in coaching is spent on planning the next step, providing motivation and identifying success.

3. Methods

3.1 Research purpose and objectives

The main research purpose was to establish and examine to what extent graduate nurses implement peer coaching in the course of their work as the process for comprehensive and high-quality treatment of patients.

The research objectives were as follows:

- To establish whether graduate nurses are familiar with the term peer coaching;
- To examine what principles of peer coaching are frequently used in the course of their work;
- To establish how they perceive the existence of peer coaching in their work setting;
- To establish whether they believe that peer coaching know-how is necessary to provide comprehensive and high-quality treatment to patients.

3.2 Methods

The research was based on a descriptive method and the non-experimental causal method of empirical research. Our instrument was a survey questionnaire which was used to provide information on the following: demographic data, opinions on the advantages of peer coaching, opinions on the advantages of individual principles of peer coaching and the presence of peer coaching in the work setting. Questions pertaining to peer coaching were constructed in accordance with the Likert-type scale. The scale levels were arranged from 1 to 5 in a logical continuum from minimal to maximal agreement with opinion statements. The interpretation of the survey results was supported with the following research work methods: analysis-synthesis, induction-deduction, generalization and comparison.

3.3 Sample

The survey included 245 graduate nurses who work in primary and secondary health care. Of those, 12% were men and 88% were women. Most of the respondents (60%) are aged up to 30 years, 21% are aged from 31 to 40 years, followed by 16% of respondents being aged between 41 and 50 years, and 3% being 51 years old or older. 21% of the respondents have been in service for up to 10 years, 12% from 11 to 20 years, 12% from 21 to 30 years, 5% from 31 to 40 years, 19% are unemployed and 2% are employed as students.

4. Results

It was established that 76% of the respondents are not familiar with the term peer coaching. 24% of the respondents believe that they know this term and described it as:

- Support, assistance, complementing between two or more colleagues in similar work places;
- Peer leadership (school, work etc.);
- Process between two colleagues, in which they support each other;
- A process aimed at establishing an effective alliance and cooperation in the work place; the point being establishing mutual trust, to know the work of the colleague or of the team, to support each other, and ultimately achieve optimum results through a joint effort;
- Training co-workers or work colleagues;
- It represents help of some kind between coworkers, i.e. education, guidance, leadership;
- Learning and teaching, help among coworkers;
- Peer coaching is a process between two co-workers or members of the same task group; the purpose is to establish efficient

operations in the work place, support, cooperation and alliance between two people (e.g. co-workers);

- Guidance, consultation among co-workers.

We were interested to know to what extent the principles of peer coaching are featured in the course of their work. Therefore, we provided nine statements across all seven principles (*awareness, responsibility, self-confidence, free of judgement, focusing on solutions, challenge, action*), which the respondents rated with a five-level Likert scale: 1 – *Strongly disagree*, 2 – *Disagree*, 3 – *Neither agree nor disagree*, 4 – *Agree* and 5 – *Strongly agree.* The statements were designed based on the study of individual principles of peer coaching.

It was established that all statements relating to the first principle of peer coaching, i.e. awareness, were rated highly by graduate nurses. The following statements scored the highest: I am aware of the importance of colleague support in various challenges which arise in the course of my work assignments ($\overline{x} = 4.6$); Consulting co-workers can yield entirely new solutions in the course of my work assignments ($\overline{x} = 4.5$) and Consulting co-workers can help me improve my job perfor*mance* ($\overline{x} = 4.5$). A mean score of 4.3 was given to statements: I am able to perform better at my job from now on; The quality of my work is prerequisite for the quality of the work of the entire nursing care team; Knowing my capacities/limitations and a clear picture of myself impact the performance quality of the entire team; and A strong sense of my own capabilities and values impacts the understanding and support by co-workers. The lowest mean score of 3.7 was assigned to the following two statements: Co-workers perform better than me at some of their assignments which are the same or similar to mine; and Co-workers perform worse than me at some of their assignments which are the same or similar to mine. The total mean score of all the statements pertaining to the first principle, i.e. awareness, is 4.2.

Among the statements that define the second principle of peer coaching, i.e. *responsibility*, respondents assigned the highest scores to the following statements: *I am aware of my competences and responsibilities* ($\bar{x} = 4.4$); *I embrace*

well-founded comments by co-workers regarding my work ($\overline{x} = 4.3$); I have a clear picture what is expected from me at work ($\overline{x} = 4.2$); I am independent in performing my work ($\overline{x} = 4.2$) and I discuss work results with my co-workers. ($\overline{x} = 4.2$). A mean score of 4.1 was assigned to the statement I am aware of the competences and responsibilities of my co-workers; the statement I encourage co-workers to assume more responsibility for their work received a mean score of 3.9, the statement Co-workers encourage me to assume more responsibility for my work a mean score of 3.8, and Co-workers accept my well-founded comments regarding their work a mean score of 3.7. The total mean score of all the statements pertaining to the second principle, i.e. responsibility, is thus 4.1.

Among the statements that define the third principle of peer coaching (self-confidence), respondents assigned the highest scores to the following statements: I am aware I can make a mistake in the course of my work, but I can also learn from mistakes ($\overline{x} = 4.5$); I can learn by example ($\overline{x} =$ 4.4); I am capable of reaching the set work goals $(\overline{x} = 4.4)$; and I subscribe to the motto: I have the conviction, abilities and knowledge. ($\overline{x} = 4.4$). The following statements were assigned a mean score of 4.1: I am capable of doing my job without bigger issues and mistakes; I always know which of my coworkers I can turn to for help or advice; and I am sure I will be able to advise and help a co-worker if I am asked to. The mean score of 3.8 was given to the statement My co-workers are also capable of doing their job without bigger issues and mistakes; and a mean score of 3.5 to I am not afraid of *unexpected situations*. The total mean score of all the statements pertaining to the third principle of peer coaching (responsibility) is thus 4.1.

It was established that graduate nurses assigned the highest mean scores to the following statements which define the fourth principle of peer coaching (free of judgement): I point out mistakes to my coworkers with the best intentions, so they don't repeat them ($\bar{x} = 4.3$); I embrace differing opinions of my co-workers ($\bar{x} = 4.2$); and Smart people learn from their own mistakes, wise people learn from the mistakes of others ($\bar{x} = 4.1$). The following two statements were assigned a mean score of 4.0: My coworkers and I consider mistakes opportunities to be *learned from;* and *I do not show prejudice against my co-workers.* The statements *Co-workers embrace my differing opinion* and *Even though I don't agree with co-workers, I accept them and trust them* were assigned a mean score of 3.9. The mean score of 3.6 was assigned to the statement *Co-workers who don't agree with me accept me and trust me nonetheless.* A mean score of 2.7 was received by the statement *My co-workers and I consider mistakes an opportunity to criticize the one who made the mistake.* The total mean score of all the statements pertaining to the fourth principle of peer coaching, i.e. *free of judgement,* is 3.8.

Of the statements in the scope of the fifth principle of peer coaching, which is focusing on solutions, the following statements received the highest scores from the respondents: A positive mindset impacts our response to problems and how co-workers respond to problems. ($\overline{x} = 4.3$); It is important that I first try to reach a solution on my own and thereby assume responsibility ($\overline{x} = 4.2$); Focusing on solutions is a quick and effective way to solve real-life problems ($\overline{x} = 4.2$); Consulting co-workers when seeking solutions to a particular problem, makes us more efficient ($\overline{x} = 4.2$); and My co-workers and I believe that thinking of problems with a positive *mindset is constructive* ($\overline{x} = 4.2$). The statement *The* more my co-workers and I think about the solutions, the more solutions we find received a mean score of 4.1, the statement When looking for solutions we analyse the paths to the future was rated with a mean score of 4.0, a mean score of 3.8 was assigned to the statement Our thinking always focuses on finding the solution and not on the problems, and a mean score of 3.4 was attributed to My co-workers and I spend too much time thinking about and discussing problems, rather than solutions and ideas. The total mean score of all the statements pertaining to the fifth principle of peer coaching, which is focusing on solutions, is thus 4.0.

Among the statements that define the sixth principle of peer coaching (*challenge*), respondents assigned the highest scores to the following statements: I am aware of the necessity of changes (\bar{x} = 4.5); I can learn much from older staff who performs the same or similar work tasks as me (\bar{x} = 4.5); and Continuous exchange of knowledge and experience reduces the costs of additional education and the time spent for learning ($\overline{x} = 4.5$). The statements I am constantly improving and updating my job performance; I can easily consult younger staff that performs the same or similar work tasks as me; and Younger co-workers who perform the same or similar work tasks as me can bring new know-how into the work setting scored 4.3 on average. A mean score of 4.1 was given to the statement I am prepared to assume the risk for implementing my initiatives. The total mean score of all the statements pertaining to the principle of peer coaching, i.e. challenge, is thus 4.4. Among the statements that define the seventh principle of peer coaching (action), respondents assigned the highest scores to the following statements: I appreciate the work of my co-workers who carry out the same or similar work tasks as me ($\overline{x} = 4.5$); It is vital that each of us knows the nature of each other's work and realizes the challenges that normally emerge in the course of work ($\overline{x} = 4.4$); and It is particularly important to highlight positive actions where each co-worker demonstrates their progress in terms of actions and *thinking* ($\overline{x} = 4.4$). The following statements were assigned a mean score of 4.2: The relationships between me and my co-workers are good; My coworkers and I cooperate; We solve problems for our collective benefit; and Me and my co-workers who carry out the same or similar work tasks as me realize that supporting each other in various challenges that emerge during work strengthens the direct and indirect ties that connect us. The statement My co-workers and I trust each other scored at 4.0 and the statement My co-workers and I compete against each other was awarded a mean score of 2.7. The total mean score of all the statements pertaining to the action principle of peer coaching is 4.0.

We were also curious to determine which of the peer coaching principles they believe to be crucial for providing comprehensive and high-quality treatment to patients. Graduate nurses reported that the most important principles of peer coaching which are necessary for a comprehensive and high-quality treatment of patients are *responsibility* (\bar{x} =4.8), *focusing on solutions* (\bar{x} =4.6), *awareness* (\bar{x} =4.5) and *self-confidence* (\bar{x} =4.5). These are followed by the *action* principle with a mean score of 4.4 and the principles *free of judgement* and *challenge*, both of which scored a mean of 4.3.

We were also interested to find out the extent to which the principles of peer coaching are featured in their work setting. The respondents acknowledged that all of the principles of peer coaching are featured in their work setting, but they found that they are not equally represented. *Self-confidence* $(\bar{x} = 4.0)$ and *responsibility* $(\bar{x} = 3.9)$ seem to be the most common. They are followed by principles which scored a mean of 3.8: *awareness, focusing on solutions* and *action*. A mean score of 3.7 was awarded to *challenge*. The least common is the principle *free of judgement* which received the lowest mean score of 3.1.

98% of the surveyed graduate nurses established that their co-workers and them should know the advantages of peer coaching, 97% believe that all health care workers should follow the principles of peer coaching, and 86% of them indicated that they would attend a workshop on peer coaching.

5. Discussion

The employees of an organization do not possess merely formal knowledge that they acquired in the course of education, they also possess rich experience and a network of acquaintances. If this silent knowledge remains limited only to individual employees who possess it, the organization can have a problem, once such an individual leaves the organization and takes it with them. For such knowledge to remain within the organization there must be some sort of mechanisms in place for knowledge transfer. To this end, several methods, techniques and systems were designed attempting to distribute the benefits of an individual's knowledge to other members of the organization as well. This means that the knowledge remains within the organization, even once the respective individuals leave (Černelič, 2006, p. 87).

It is important in the process of transferring knowledge and skills that the employee possessing the desired knowledge has time for their co-workers, so they can support them in various challenges which emerge in the course of work through peer coaching. However, advice and help are usually required *ad hoc*. Problems arise when the co-worker has no time for conversation, advice, finding solutions and transferring knowledge on account of an extensive workload. It is essential for efficient implementation of knowledge that sources of knowledge are varied and contacts between co-workers frequent. In this way, issues that emerge can be illuminated from different angles and solved in different ways.

The majority of graduate nurses are not familiar with the term peer coaching, but further answers revealed that most of them implement all seven principles of peer coaching in the course of their work, which are highly important for providing comprehensive and high-quality patient treatment.

The respondents are aware of the significance of peer coaching, having awarded high mean scores to all principles of peer coaching. They believe that the most important principle in their line of work is responsibility (a mean score of 4.8), followed by focusing on solutions, self-confidence and awareness, all of which were assigned a mean score of 4.5. They believe it is important to be able to come up with a solution on their own after consulting with a colleague, thereby assuming responsibility. They have an interest in optimistically focusing on searching for solutions rather than over-analysing problems as this is often counterproductive. They know they can reach their goals and they are aware that there are certain aspects of their work they tend to neglect until they consult colleagues.

We established the following:

- In terms of the principle of *awareness* under peer coaching, the surveyed graduate nurses are aware of the importance of support provided by their colleagues in various challenges in the course of their work, they are aware that consulting colleagues can improve their job performance and help them reach completely new solutions in the course of their work;
- In terms of the principle of *responsibility* under peer coaching, the surveyed graduate nurses are aware of their competences and responsibilities, they can embrace well-founded work-related comments by their colleagues, they have a clear picture of what is expected of them at the work place, they are independent in their job performance and discuss work results with their colleagues;
- In terms of the principle of *self-confidence* under peer coaching, the surveyed graduate nurses are aware of the fact that they make

mistakes at work, but that they also learn from them, they are able to learn from examples, they are able to achieve work goals and they have the conviction, abilities and knowledge;

- In terms of the principle of *free of judgement* under peer coaching, the graduate nurses point out mistakes to their colleagues with the best intentions so they wouldn't be repeated, they have an easy time accepting differing views by their colleagues and treat every mistake as an opportunity to learn, because they are aware that they can learn much from mistakes made by them or others;
- In terms of the principle of *focusing on solutions* under peer coaching, the surveyed graduate nurses are aware that positive thinking impacts how they or their colleagues tackle problems; they find it important to reach a solution on their own, thereby assuming responsibility; they acknowledge that they are more successful in finding solutions to a problem if consulting colleagues, and that a constructive mindset yields quick and efficient solutions to reallife problems;
- In terms of the principle of challenge under peer coaching, the graduate nurses are aware of the necessity of changes, that they can learn much from older colleagues who perform the same or similar work tasks as them, that they themselves can learn much from their younger colleagues and that the total accumulated knowledge of all employees makes up a competitive advantage for their respective organizations; In terms of the principle of action under peer coaching, the graduate nurses appreciate the work of their co-workers who perform the same or similar tasks as them, they are aware of the significance of knowing the nature of the work of their colleagues and the challenges arising in its course, as this strengthens direct and indirect ties among them; they wish to highlight the positive steps that were undertaken, so each coworker can demonstrate their progress in terms of actions and thinking.

The surveyed graduate nurses believe that two principles of peer coaching are most prominently featured in their work setting – *self-confidence* and *responsibility*. In our opinion, this seems rather expected, because without self-confidence, confidence in one's own work and the sense of responsibility for one's work, one cannot provide comprehensive and high-quality treatment to patients, which would meet patient expectations. For this reason they are convinced that they themselves and their colleagues should be familiar with the advantages of peer coaching and that peer coaching principles should be applied by all health care workers.

We cannot influence the strategies and techniques that enable knowledge exchange, foster mutual trust and promote cooperation between colleagues, but we can create conditions that nurture them (Davenport and Prusak, 1998, in: Černelič, 2006, p. 84): Depth of the analysis, i.e. the level of detailed analysis in the framework of the knowledge management systems with regard to the description of knowledge; time limitations indicating the time available for solving problems; structure of methods, which may vary depending on whether we would like to activate structured quantified knowledge or archive high-quality and non-structured contents and work tasks of knowledge management seeing as the knowledge is accumulated in employees' minds. It is therefore crucial that every single employee is involved in knowledge management, and also willing to share their knowledge with others.

6. Conclusion

Peer coaching is one of the most powerful communication tools. When used efficiently and correctly, it raises our awareness. It acts like a laser that affects our thoughts and leads them to positive shifts toward solving the issues at hand.

It facilitates positive shifts in one's mindset, improves one's job performance, and brings out the best in one. It is the fastest growing significance of human development – it yields results and helps shape one's performance and productivity. Not only does it have an impact on one's output, but also on one's self-confidence and motivation, it brings about changes in one's behaviour, culture and leadership. It promotes positive changes within the organization, fosters the sense of belonging of employees, reduces costs for employee education while increasing their output, it helps to raise future leaders and supports employees to achieve better work results in a shorter time.

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A Screening Tool for a Hyperglycemic Crisis Death Scale using a colorful Wright map

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Abstract

Introduction: Hyperglycemic crises have recently become an important topic in hospital Emergency Departments (EDs).

Objective: To construct a valid and reliable Hyperglycemic Crisis Death (HCD) Scale using existing clinical data for the early detection of hyperglycemic crises and to predict mortality for each patient.

Methods: Rasch analysis was used to validate the items in the HCD scale. The setting was a 700-bed medical center in northern Taiwan. Three hundred thirty patients visiting the study hospital ED between January 2004 and December 2010 were included. Two data sets derivation and validation were used to determine a cut-off criterion for classifying patients with a high probability of mortality, and to verify the effectiveness of the HCD scale.

Results: The 12-item HCD scale can be fitted to the Rasch model's requirement. The probability of mortality for each patient can be easily and quickly computed using the Rasch probability formula. A colorful visual representation, a Rasch Wright map, can be made available to highlight the person and item relationship on the same interval scale to allow direct comparisons.

Conclusions: The HCD scale is a simple and rapid tool for predicting 30-day in-hospital mortality and suggests that ED physicians pay closer attention to patients with scores beyond the threshold criterion.

Keywords: diabetes; hyperglycemic crises, hyperosmolarity, ketoacidosis, mortality, prognosis

Introduction

Patients with hyperglycemic crises frequently present in hospital emergency departments. The basic underlying characteristic of a hyperglycemic crisis is a reduction in the net effective action of circulating insulin and is coupled with a concomitant elevation of counter-regulatory hormones, such as glucagon, catecholamines, cortisol, and growth hormone [1]. There are three kinds of hyperglycemic crises defined in clinical settings: DKA (diabetic ketoacidosis), HHS (hyperglycemic hyperosmolar state), both of which are two extremes of the same clinical syndrome, and DKA/HHS (a mixed state of acidosis and hyperosmolarity) [2-7].

The annual incidence rate for DKA has recently increased drastically in the USA [3]: It was estimated to be 4.6-8.0 episodes per 1,000 patients with diabetes in the aging population. Hospitalizations for DKA in the past two decades also consecutively increased [3]. It was reported in 2006 that DKA accounted for approximately 136,510 hospitalizations in the U. S. [8]. The average cost per patient per hospitalization has reached US\$13,000, and the total annual hospitalization cost may exceed US\$1 billion annually [3].

The incidence and expenditure for HHS are difficult to estimate in clinical practice because there are few studies based on this population, and it is difficult to count these patients because they often present with multiple comorbidities; reported that the rate of hospital admissions for HHS is about 1% of all primary admissions for diabetes [9]. The incidence of hyperglycemic crisis-caused mortality is 1-9% for DKA, 5-45% for HHS, and 5-25% for mixed DKA/HHS [1,4,5], and \sim 71% for people > 65 years old [10].

A fast screening tool needed in ED

Emergency Department (ED) treatments for the three kinds of hyperglycemic crises are the same: correcting dehydration, hyperglycemia, and electrolyte imbalances; identifying comorbid precipitating events; and above all, frequently monitoring the patient [1]. However, determining the severity of the crisis to provide other appropriate treatments is difficult. Some mortality predictors have been proposed: One hypothesis [5] was that age was the only independent mortality predictor; a second was [4] that altered mental status rather than age was an independent mortality predictor; and a third [11] was that there were six independent predictors of mortality for DKA: (i) severe comorbidity at presentation, (ii) pH < 7.0 at presentation, (iii) > 50 IU of regular insulin is required 12 h after presentation, (iv) serum glucose is > 16.7 mmol/L 12 h after presentation, (v) the patient becomes emotionally depressed 12 h after presentation, and (vi) the patient becomes febrile 24 h after presentation. The third prediction model has two major drawbacks: first, it shows results only for patients with DKA and cannot be generalized to patients with HHS or mixed DKA/HHS; second, several predictors cannot be immediately obtained in the ED.

Objectives

In the present study, we used a well-developed measurement model based on item response theory (IRT) [12,13] to construct a valid and reliable Hyperglycemic Crisis Death (HCD) Scale using existing clinical data for the early detection of hyperglycemic crises, and to predict the probability of mortality for each patient.

Methods

Study design, setting, population, and selection of participants

Participants were recruited from all adult patients (> 18 years old) presenting at the ED of a 700-bed university-affiliated medical center with in northern Taiwan between January 1, 2004, and December 31, 2010. Those that met one of the following inclusion criteria for a hyperglycemic crisis [14] were included:

- (1) DKA was defined as a casual plasma glucose > 250 mg/dL, a high anion gap metabolic acidosis (anion gap > 12, serum HCO₃ < 15 mmol/L, and pH < 7.3) and ketonuria (2+ or more ketones on a urine dipstick);
- (2) HHS was defined as a casual plasma glucose > 600 mg/dL, increased effective serum osmolality>320 mOsm/kg(calculated using the formula: 2[measured Na⁺ (mEq/L)] + [glucose (mg/dL)]/18), an anion gap < 12, no significant acidosis (HCO₃ > 15 mmol/L, pH > 7.3, or both), minimal ketonuria (1+ or less ketones on a urine dipstick), and an alteration in mental state;
- (3) Mixed DKA/HHS syndrome was defined in the patients who presented with acidosis $(pH < 7.3, HCO_3 < 15 \text{ mmol/L})$, ketonuria (2+ or more ketones on a urine dipstick), and effective serum osmolality > 320 mOsm/kg (calculated using the formula: 2[measured Na⁺ (mEq/L)] + [glucose (mg/dL)]/18).

Data Collection and Definition of Variables

From 368 patients clinically suspected of HCD infection, guided by the American Diabetes Association [1,3,14] and the literature [4,5,11], in addition to 30-day in-hospital mortality for each patient, data were selected to construct a scale to screen the HCD. Some clinical data were obtained from the patients' medical records: a personal history of type II diabetes, stroke, cancer, being bedridden, and nasogastric tube feeding; altered mental status, absent tachycardia (HR \leq 100/min), hypotension (SBP < 90 mmHg), anemia (Hb < 10 g/dL or Hct < 30%),Severe coma (GCS \leq 8); serum creatinine (> 2 mg/dL), and infection as the precipitating factor. This study protocol was approved by the hospital's Human Investigation Committee.

The dichotomously categorized clinical features used are generally acceptable in emergency and critical care, all of which were analyzed using a Rasch model [15] implemented in the Winsteps computer program [16]. Severe coma was defined as Glasgow Coma Scale (GCS) ≤ 8 [17]. Anemia was defined as hemoglobin < 10 g/dL or hematocrit < 30% [18]. Hypotension was defined as systolic blood pressure < 90 mmHg [19]. Tachycardia was defined as a heart rate >100 beats/min. Absent tachycardia was defined as a heart rate \leq 100 beats/min. We used absent tachycardia as a variable because tachycardia is a normal body response to dehydration caused by hyperglycemic crises [1]. Absent tachycardia is an abnormal response found in clinical practice and may indicate a poor prognosis. The definition of infection included lower respiratory tract infection, urinary tract infection, intra-abdominal infection, skin or soft tissue infection, and endocarditis. The clinical impression of infection was abstracted from the medical record by using criteria based on the medical decision-making section of the chart along with the diagnoses assigned by the treating physicians.

Three hundred thirty patients were finally enrolled after excluding 38 without sufficient data or those were transferred from other hospitals after having received treatment there. Patients were divided into two groups, Survival and 30-day in-hospital mortality, according to their outcome at discharge. All the variables were used for constructing a HCD Scale.

Derivation and Validation Sets

According to the ED visit time, data were separated into two sets, the derivation (from January 1, 2004, until December 31, 2008) and validation (from January 1, 2009, until December 31, 2010) used for developing the HCD Scale and inspecting its validity, respectively.

Definition of Endpoint

We used 30-day in-hospital mortality as the primary endpoint. Patients who were discharged from the hospital alive in less than 30 days or who survived for at least 30 days in the hospital were considered Survival group patients for this analysis.

Data analysis

All analyses were done using SPSS 16.0 for Windows (SPSS Inc., Chicago, IL, USA). Continuous data are presented as means \pm standard deviation (SD). Univariate comparisons between two groups were made using either an independent samples *t*-test (assuming normal distribution) or a Mann-Whitney and Wilcoxon test (assuming non-normality) for the continuous variables and either a χ^2 test or Fisher's exact tests for categorical variables. The variables with a univariate comparison p < 0.1 were then included in the item selection for constructing an HCD Scale. Statistical significance was set at p < 0.05 (two tailed).

The cutoff points of the bimodal distribution for the Survival and the 30-day in-hospital mortality groups were obtained from ROC curve analysis using MedCalc for Windows 9.5.0.0 (MedCalc Software, Mariakerke, Belgium). Additionally, we used the ROC curves to examine the effectiveness of each sample extracted from derivation and validation data sets. The area under the ROC curve and the Hosmer-Lemeshow goodness-of-fit test were reported to determine the cutoff point by variables of Rasch-transformed scores (or scale summation scores) and survival status.

Rasch analysis

When a set of items is designed to measure the same construct (e.g., HCD tendency), item scores are often summed to represent the level of the construct. This summation method assumes that all items contribute equally to the construct and that all items are substantially related to the common construct. Otherwise, the summation score is meaningless and the assumptions are problematic [20]. Rasch analysis has been increasingly used in recent years to examine whether items measure a common construct in social science [15,20], appropriately used for dichotomous responses (e.g., yes or no, present or absent, success or failure, etc.) as in this study.

Item fit

The weighted fit mean square statistic (Infit MNSQ) produced from Winsteps was used to indicate the item fit. This statistic is sensitive to nearby person estimates, and has an expected value of 1 with a range from zero to infinity. Winsteps guidelines suggested that an acceptable range for an Infit value is between 0.50 and 1.50. An Outfit value < 0.50 indicates that an item does not contribute information to the test beyond that provided by the rest of the items. A value > 1.5 indicates that an item does not define the same construct as does the rest of the items. Clearly, a larger Infit value poses a more serious threat to test validity than does a smaller value [21]. The Pearson correlation between the observations on an item and the person raw scores(PTME for short in this study)

can be as similarly as Rasch Fit statistics applied to indicate items useful for constructing a scale.

Wright map

The Wright map depicts the person-estimate distribution and the item location distribution [22,23]. A Wright map is a visual representation of the person and item relationship in which the patient HCD estimates and the item calibrations are put onto the same interval scale to allow direct comparisons. In this study, we developed a colorful Wright map rather than the traditional monochrome mode to present the person and item relationship as well as the cutoff point determination.

Results

Characteristics of two studied samples and unidimensionality checking

Three hundred thirty men in the derivation (49.4%) and validation (48.9%) samples (mean age: 59.8 ± 20.9 and 60.2 ± 22.3 years old, respectively) clinically diagnosed with hyperglycemic crises were included in this study (Table 1). The proportions of characteristics between those two samples were not significantly different (Table 1). Thirteen variables for predicting mortality were significantly different (p < 0.1) (Table 2). After doing a Rasch analysis for the derivation data set, 12 items were verified fitting a Rasch model with an Infit MNSQ range between 0.5 and 1.5 (Table 3 and Figure 1).





The most difficult item (i.e., item rarely present; the greater the number of responses to an item, the less difficult the item) was the nasogastric tube feeding history with 1.51 logits. The easiest one was the Type II diabetes history with -2.84 logits (Table 3).

Cutoff point determined to calculate the probability of mortality

The sensitivity and specificity at the cutoff point of -1.47 logit (or raw summation score > 3) for the variation set were 0.88 and 0.69, respectively (Table 3). The area under the ROC curve was 0.87 (95% confidence interval (CI): 0.82-0.91) (p < 0.0001). The Wright map in Figure 1 shows that 3 patients in the 30-day in-hospital mortality group presented false-negatives, and 64 (= 86-22, 64/210 = 21%), false-positives.

Using the cutoff point beyond the summation score of 3 to verify the validation data set, sensitivity and specificity were 1.00 and 0.83, respectively (Table 4). The area under the ROC curve was 0.92 (95% CI: 0.85-0.97) (p < 0.0001). The Wright map in Figure 2 shows that no patient in the 30-day inhospital mortality group presented a false-negative.



Figure 2. Wright map displayed by validation data (n = 95; item length = 12). Note. # represents the number of patients in the 30-day inhospital

The patients with 0 and 1.0 logits in Figure 2 had probabilities of a tendency for HCD at 0.81

$$\left(=\frac{\exp(\log odds)}{(1+\exp(\log odds))} = \frac{\exp(0-(-1.47))}{(1+\exp(0-(-1.47)))}\right)$$

and 0.92
$$\left(=\frac{\exp(1-(-1.47))}{(1+\exp(1-(-1.47)))}\right)$$
, respectively.

Detient ob exectoristics	Derivation	Validation
ratient characteristics	(n = 235)	(n = 95)
Age, mean \pm SD	59.8 ± 20.9	60.2 ± 22.3
Male sex, %	49.4	48.9
Vital signs, mean \pm SD		
Glasgow coma scale	12.9 ± 3.4	13.0 ± 3.1
Systolic blood pressure (mmHg)	137.1 ± 32.8	135.0 ± 31.0
Heart rate (1/min)	111.0 ± 23.3	112.9 ± 23.1
Respiratory rate (1/min)	20.5 ± 4.6	21.2 ± 5.8
Body temperature (°C)	36.7 ± 1.1	37.0 ± 1.1
Disease history, %		
Diabetes	73.2	79.5
Hypertension	40.4	52.3
Stroke	17.9	19.3
Cancer	8.5	8.0
Laboratory data, mean \pm SD		
Blood glucose (mg/dL)	766.9 ± 331.3	650.0 ± 237.3
White blood cell count (cells/mm ³)	12700.0 ± 5870	13400.0 ± 5936
Hemoglobin (g/dL)	13.9 ± 3.1	13.9 ± 2.8
Serum creatinine (mg/dL)	2.2 ± 1.6	1.8 ± 1.1
Effective serum osmolarity*	325.1 ± 30.2	324.2 ± 32.1
Blood pH†	7.3 ± 0.1	7.3 ± 0.1
Precipitating factors, %‡		
Poor compliance	59.6	61.4
Infection	45.1	40.9
New-onset diabetes	27.2	22.7
Subgroup diagnosis, %		
DKA	31.6	35.2
HHS	55.3	58.0
Mixed DKA/HHS syndrome	13.1	6.8
30 day in-hospital mortality rate, %	10.6	10.5

Table 1. Patient characteristics in the derivation and validation data sets

* Effective serum osmolarity: 2[measured Na⁺ (mEq/L)] + [glucose (mg/dL)]/18

† 296 (89.7%) patients had this test.

‡ Patients may have multiple precipitating factors.

SD, standard deviation; DKA, diabetic ketoacidosis; HHS, hyperosmolar hyperglycemic state.

Table 2. Univariate mortality predictors at p < 0.1

	Variable		
Variable	Yes	No	<i>p</i> -value
	n (% mortality)	n (% mortality)	
Elderly (\geq 65 years old)	114 (17.5)	121 (4.1)	0.001
1. Altered mental status	82 (23.2)	153 (3.9)	< 0.001
2. Severe coma (GCS ≤ 8)	36 (33.3)	199 (6.5)	< 0.001
3. Hypotension (SBP < 90 mmHg)	18 (38.9)	217 (8.3)	0.001
4. Absent tachycardia (HR \leq 100/min)	64 (17.2)	171 (8.2)	0.046
5. Type 2 diabetes history	148 (13.5)	87 (5.7)	0.079
6. Stroke history	42 (19)	193 (8.8)	0.092
7. Bedridden history	21 (23.8)	214 (9.3)	0.056
8. Nasogastric tube feeding history	17 (23.5)	218 (9.6)	0.091
9. Cancer history	20 (40)	215 (7.9)	< 0.001
10. Anemia (Hb < 10 g/dL or Hct < 30%)	26 (26.9)	209 (8.6)	0.011
11. Serum creatinine > 2 mg/dL	88 (17)	147 (6.8)	0.014
12. Infection as the precipitating factor	106 (22.6)	129 (0.8)	< 0.001

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Item	Rasch item	Count	Summation	Rasch item	Item	Item
No.	Difficulty‡	Number	SCORE	SE‡	IN.MSQ	PTME †
10	1.51	235	17	0.27	0.72	0.45
3	1.43	235	18	0.27	1.06	0.25
8	1.30	235	20	0.25	1.24	0.21
9	1.23	235	21	0.25	0.80	0.44
4	0.95	235	26	0.23	1.20	0.27
5	0.48	235	36	0.20	0.84	0.51
7	0.24	235	42	0.19	0.84	0.52
2	-0.49	235	64	0.17	1.35	0.33
1	-1.00	235	82	0.17	0.69	0.70
11	-1.17	235	88	0.16	1.00	0.55
12	-1.65	235	106	0.16	1.08	0.56
6	-2.84	235	148	0.18	1.06	0.59

Table 3. All items of derivation data fit the Rasch model (Infit MNSQ within 0.5 and 1.5)

† PTME: The Pearson correlation between on the observations on an item and the person raw scores or measure. ‡ In a unit of logit.

Table 4. ROC curve analysis for derivation and of validation data

DOC analysis	Derivation	Validation
	n = 235	n = 95
Sensitivity	88.00%	100.00%
Specificity	69.52%	83.53%
Area under the ROC curve (AUC)	0.87	0.92
95% Confidence interval	0.82-0.91	0.85-0.97
Z statistic	12.97	15.82
Significance level p (Area = 0.5)	< 0.0001	< 0.0001
Cutoff point in Rasch logit scores	>-1.47	
Cutoff point with summation scores	> 3	
Mortality [n (%)]	25 (10.6)	10 (10.5)

Discussion

We found that:

- (1) the 12-item HCD scale can be fitted to the Rasch model with an Infit MNSQ range within 0.5 and 1.5.
- (2) the mortality rate for each patient beyond the cutoff criterion can be easily and quickly computed using the Rasch probability formula.
- (3) a colorful visual representation of Rasch Wright map can be made available to highlight the person and item relationship on the same interval scale to allow direct comparisons.

We developed and validated a new decision rule using a cutoff criterion > 3 on the 12-item HCD

scale that uses variables readily available to the physician to predict 30-day in-hospital mortality and decide how to manage adult ED patients with hyperglycemic crises. Patients with a high risk score who are more critically ill should be considered for treatment in the ICU. Fluid resuscitation, strict intravenous insulin control, a detailed investigation and management of the precipitating factors, and careful prevention of treatment complications should be aggressively done. Patients with a low risk score (below the cutoff criterion) can be sent to a general ward or be kept in the ED for further observation.

We can see the altered mental status with highest PTME(the Pearson correlation between the observations on an item and the person raw scores) of 0.7 among items (Table 3). It agrees with Chung et al. [4] that altered mental status rather than age [5] is an independent mortality predictor.

Infection as the precipitating factor (item 12 in Table 2 and Table 3 of a hyperglycemic crisis is the 2nd most common occurrence. Infection with PTME of 0.56 was the strongest mortality predictor. Infection should always be suspected in every patient with hyperglycemic crises because missed detection would be a catastrophe [24]. More attention must be paid to evaluating elderly patients whose presentation of infection may be vague or unapparent and to patients with long-term diabetes [1]. If the existence of an infection is equivocal after evaluation in the ED, an immediate blood culture and empiric antibiotics should be considered [23]. Anemia has been used as a mortality predictor in APACHE (Acute Physiology and Chronic Health Evaluation) and ODIN (Organ Dysfunction and/or Infection) scores for critical patients [25]. In the present study, the common causes of anemia were upper gastrointestinal bleeding, cancer, chronic renal insufficiency, and iron deficiency anemia. Blood transfusion is suggested in the anemic patients; however, the threshold and timing depend on the individual condition rather than any single criterion [26]. Metastatic cancer has been used as a mortality predictor in ICU mortality scores such as MPM (Mortality Probability Model), SAPS (Simplified Acute Physiology Score), and APACHE [27]. In the present study, "cancer history" included the presence of any malignancy, whether metastatic or non-metastatic. We found that this variable predicts better than metastatic cancer.

Wright map showing more information

We developed a colorful visual representation of a Rasch Wright map that highlights the person and item relationship on the same interval scale to allow direct comparisons. In addition, some underlying messages are shown in Figure 2, especially on items 2 and 9 beyond Infit MNSQ 1.5. Because the item difficulties were anchored (i.e., set to be equal in derivation and validation sets) when compared on the two subscales, items 2 and 9 were significantly different (more common and severe in the validation set) between these two sets. Other items were randomly in difficult with a similar Infit MNSQ. Interested readers can download the Excel VBA module (Additional File 1) to plot a colorful Wright map using their own data. In addition, a Rasch KIDMAP is recommended for use in the ED for displaying more useful information about individual performance for TCD [28-30].

Limitations and suggested studies

This study has several limitations. First, some data were collected from reviewing retrospective patient records. These records may not have been completely documented. Second, this was a singlesetting study; therefore, the findings cannot necessarily be generalized to other settings. It is worth doing other studies and comparing their findings with ours. Third, the number of patients in the present study was small. Additional studies with larger study populations are encouraged and recommended. Fourth, even though we have validated our prediction results (Table 3), external validation with heterogeneous populations in different hospitals is required. Fifth, Figures 1 and 2 show many patients with a false-positive beyond the cutoff point (> summation score of 3), which means that they were well treated and discharged from the hospital.

Conclusion

The HCD scale is a simple and rapid tool for predicting 30-day in-hospital mortality and suggests physicians in the ED must be more concerned about patients with high HCD scores. The HCD scale is easy to use in clinical settings. Providing critical medical care to patients with high HCD scores will be always required in the ED.

List of abbreviations

DKA: Diabetic Ketoacidosis HHS: Hyperglycemic Hyperosmolar State IRT: Item Response Theory ED: Emergency Department HCD: Hyperglycemic Crisis Death ICU: Intensive Care Unit CR: Coefficient of Reproducibility EFA: Exploratory Factor Analysis GCS: Glasgow Coma Scale MNSQ: Mean Square Error ROC: Receiver Operating Characteristic VBA: Visual Basic for Applications

Author contributions

TWC and SCK collected all data, generated the database, designed and performed the statistical analysis, and wrote the manuscript. WCW and WSL contributed to the development of the study design and advised on the statistical analysis. The analysis and results were discussed by all authors together. TWC contributed to the Excel programming, helped interpret the results, and helped draft the manuscript. All authors read and approved the final manuscript.

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Abstract

In this paper the instructions for preparing camera ready paper for the Journal are given. The recommended, but not limited text processor is Microsoft Word. Insert an abstract of 50-100 words, giving a brief account of the most relevant aspects of the paper. It is recommended to use up to 5 key words.

Key words: Camera ready paper, Journal.

Introduction

In order to effect high quality of Papers, the authors are requested to follow instructions given in this sample paper. Regular length of the papers is 5 to 12 pages. Articles must be proofread by an expert native speaker of English language. Can't be accepted articles with grammatical and spelling errors.

Instructions for the authors

Times New Roman 12 points font should be used for normal text. Manuscript have to be prepared in a two column separated by 5 mm. The margins for A4 (210×297 mm2) paper are given in Table 1. *Table 1. Page layout description*

Paper size	A4
Top margin	20 mm
Bottom margin	20 mm
Left margin	20 mm
Right margin	18 mm
Column Spacing	5 mm

Regular paper may be divided in a number of sections. Section titles (including references and acknowledgement) should be typed using 12 pt fonts with **bold** option. For numbering use Times New Roman number. Sections can be split in subsection, which should be typed 12 pt *Italic* option. Figures

should be one column wide. If it is impossible to place figure in one column, two column wide figures is allowed. Each figure must have a caption under the figure. Figures must be a resolution of 300 DPI, saved in TIFF format, width 10 cm min. For the figure captions 12 pt *Italic* font should be used. (1)



Figure 1. Text here

Conclusion

Be brief and give most important conclusion from your paper. Do not use equations and figures here.

Acknowledgements (If any)

These and the Reference headings are in bold but have no numbers.

References

- 1. Sakane T, Takeno M, Suzuki N, Inaba G. Behcet's disease. N Engl J Med 1999; 341: 1284–1291.
- 2. Stewart SM, Lam TH, Beston CL, et al. A Prospective Analysis of Stress and Academic Performance in the first two years of Medical School. Med Educ 1999; 33(4): 243- 50.

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