Health-related quality of life predictors during medical residency in a random, stratified sample of residents

Preditores de qualidade de vida relacionada à saúde durante a residência médica em uma amostra randomizada e estratificada de médicos residentes

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Abstract

Objective: To evaluate the quality of life during the first three years of training and identify its association with sociodemographic-occupational characteristics, leisure time and health habits. *Method:* A cross-sectional study with a random sample of 128 residents stratified by year of training was conducted. The Medical Outcome Study - short form 36 was administered. Mann-Whitney tests were carried out to compare percentile distributions of the eight quality of life domains, according to sociodemographic variables, and a multiple linear regression analysis was performed, followed by a validity checking for the resulting models. *Results:* The physical component presented higher quality of life medians than the mental component. Comparisons between the three years showed that in almost all domains the quality of life scores of the second year residents were higher than the first year residents ($p < 0.01$). The mental component scores remained high for third year residents ($p < 0.01$). Predictors of higher quality of life were: second or third year of residency, satisfaction with the training program, sufficient time for leisure, and care of critical patients for less than 30 hours per week. *Conclusion:* The mental component of quality of life was the most impaired component, indicating the importance of caring for residents' mental health, especially during their first year and when they are overloaded with critical patients.

Descriptors: Education, medical; Internship and residency; Quality of life; Stratified sampling; Mental health

Resumo

Objetivo: Avaliar a qualidade de vida do médico residente durante os três anos do treinamento e identificar sua associação com as características sociodemográficas-ocupacionais, tempo de lazer e hábitos de saúde. *Método:* Foi realizado um estudo transversal com amostra randomizada de 128 residentes, estratificada por ano de residência. O Medical Outcome Study-Short Form 36 foi aplicado; as distribuições percentis dos domínios de qualidade de vida de acordo com variáveis sociodemográficas foram analisadas pelo teste de Mann-Whitney e regressão linear múltipla, bem como estudo de validação pós-regressão. *Resultados:* O componente físico da qualidade de vida apresentou medianas mais altas do que o mental. Comparações entre os três anos mostraram que quase todos os domínios de qualidade de vida tiveram escores maiores no segundo do que no primeiro ano ($p < 0,01$); em relação ao componente mental observamos maiores escores no terceiro ano do que nos demais ($p < 0,01$). Preditores de maior qualidade de vida foram: estar no segundo ou terceiro ano, satisfeito com o treinamento, ter tempo suficiente para lazer e atender paciente crítico por menos do que 30 horas semanais. *Conclusão:* O componente mental da qualidade de vida foi o mais prejudicado, indicando a importância do cuidado da saúde mental, especialmente durante o primeiro ano do treinamento, e quando eles estão sobrecarregados por pacientes críticos.

Descritores: Educação médica; Residência médica; Qualidade de vida; Amostragem estratificada; Saúde mental

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Introduction

Medical residency has been considered the best form of professional training for doctors and, at the same time, a highly stressful period during their education. Depression and sleep deprivation have been pointed out, respectively, as the main psychological reactions to training and are among the most important stress factors.[1] A high prevalence of burnout has been described, and studies have attempted to measure its impact on the quality of care provided to patients.[2,3] Some studies have evaluated the effects of working hours and workload on the quality of patient care, the development of competence and professional abilities, and the well-being and quality of life of the trainees.[4,5] As defined by Diener,[6] happiness is a general positive mood, a global evaluation of life satisfaction, living a good life, or the causes that make people happy, with the interpretation depending on the context. Although it is a distinct concept, quality of life is closely related to happiness and refers to the degree to which a person's life is desirable versus undesirable.[7] Quality of life can be defined as an individual's level of satisfaction with his or her life and with the degree of control that she or he can exercise over it.[8] There is consensus that health-related quality-of-life (HRQOL) is a concept that includes physical, emotional and social functioning, as well as an overall evaluation of one's quality of life.[7] Happiness, as a global evaluation of life satisfaction and overall quality of life, can therefore be seen as an important aspect of emotional well-being and, thus, is relevant to a key dimension of HRQOL. There is evidence that some aspects of life can change HRQOL, but others are unchangeable probably due to a genetic influence.[7] Therefore, it is important to know the context in which the person is living to understand HRQOL.

In a recent qualitative study, medical residents defined well-being as a balance of multiple domains: professional, family, social, physical, mental, spiritual, and financial.[9] Only a few studies have investigated the quality of life of medical residents[10,11] with specific evaluation instruments for HRQOL.[12] There is no evidence about which occupational characteristics can predict low HRQOL, and if these occupational characteristics have the same impact on all years of residency. Therefore, the objective of this study is to evaluate the HRQOL of medical residents during the first three years of training and to identify the sociodemographic-occupational characteristics, leisure time and health habits associated with a higher HRQOL. We hypothesized that a medical resident who was satisfied with the training and spent less time with critical patients would present higher HRQOL than others, mainly in the first year of residency.

Method

This cross-sectional study included a stratified, randomly selected sample of 128 from a total of 426 medical residents at Universidade Federal de São Paulo (Unifesp). Randomization was carried out for each year of residency to guarantee representation over all years and maintain the total population proportions of medical residents. Sample sizes were calculated based on the formula of Kelsey et al.: $n = [(z\,\alpha/2 + z\beta)2 * \sigma2 *(r+1)]/[(d*)2*r]$; where n = exposed individuals; r = ratio of unexposed to exposed individuals; d = mean difference and σ = standard deviation, with a 95% degree of statistical power (1-β) and 1% significance (α).[13] We proposed a mean difference of 13, based on the fact that the general population in Brazil presented with a score of 73.0 on the mental component, whereas depressed individuals showed 46.2 (Medical Outcome Study). The idea was that medical residents would score halfway between those two scores. Therefore, considering a mean difference score of 13 on the mental component of the Medical Outcome Study

- Short Form 36 (SF-36) between first year residents and second/third year residents, with a standard deviation of 15, and a 1.5 ratio between second/third year residents and first year residents, at least 40 first year residents and 60 second/third year residents, amounting to 100 residents in total, would be needed. Our sample was slightly larger than that, because we wanted a stratified sample according to year of residency and for these stratified samples to be representative of the target population (30% of every year). Therefore, we enrolled 51 medical residents in their first year (R1), 49 in their second year (R2), and 28 in their third year (R3). Data collection occurred from September to December (the end of the academic year in Brazil) of 2005.

The study was approved by Unifesp Research Ethics Committee (process number 0401/02). After signing consent forms, participants were asked to complete two questionnaires. The instruments were self-completed and there were no dropouts.

A questionnaire was administered in order to collect: sociodemographic data (gender, age, marital status); academic data (year of residency, medical school, specialty, the most difficult and stressful stage of training, number of hours per week providing care to critical patients during the current training stage); satisfaction with the residency program (yes/no); professional activity other than medical residency (yes/no); regular practice of physical activity (yes/no), and whether there was sufficient leisure time (yes/no). The last four items featured as dichotomous variables; the other ones were ordinal or continuous variables.

A Brazilian validated version of the SF-36[14] was used to evaluate HRQOL. The SF-36 is a multi-dimensional instrument that evaluates the last 4 weeks in terms of both negative (disease or illness) and positive (well-being) aspects of health. It does not yield a single, overall value, but it provides scores in eight domains, which are distributed in two components. The physical component consists of the domains physical functioning, role-physical, bodily pain, and general health; the mental component consists of the domains vitality, social functioning, role-emotional, and mental health. The results of each domain are transformed into continuous variables from 0 (worst health status) to 100 (best health status), making it possible to meaningfully compare scores for the eight-scale profile.

Special attention was given to the fact that the SF-36 domains measure mainly difficulties in performing daily life activities due to physical and emotional problems, whereas the sociodemographic variables framework measured leisure and physical activities performed by the medical residents, such as possibilities of a better life, within their tight schedules. These activities may alter perceptions and feelings towards quality of life; therefore, the associations between these factors were tested.

Because the values of the SF-36 domains are not symmetrically distributed, the Mann-Whitney test was used to compare each domain according to residency year and gender. There were no significant departures from normality, and the SF-36 scores are quantitative measures, so eight multiple linear regression models were developed. For each model, the dependent variable was one of the domains of the SF-36 and the independent variables were gender, year of residency, medical specialty, satisfaction with the residency training program, hours per week providing care to critical patients, most difficult and stressful training stage, professional activities other than medical residency, sufficient leisure time, and regular physical activity. The independent variables were those with $p < 0.10$ in the preliminary univariate analysis. Statistically significant values were defined as $p < 0.05$.

Table 1 - Distribution of median values of eight domains of SF-36 by gender, specialty, professional activity besides medical residency, time with critical patients, residency program satisfaction, regular physical activity and leisure time, analyzed by way of the Mann-Whitney test

		Domains of the SF-36							
		Physical functioning	Role-physical	Bodily pain	General health	Vitality	Social functioning	Role-emotional	Mental health
Gender	Female (n = 59)	90.0	75.0	72.0	72.0	45.0	50.0	66.7	60.0
	Male (n = 69)	90.0	50.0	62.0	72.0	40.0	62.5	33.3	52.0
	p	0.19 NS	0.01**	0.76 NS	0.15 NS	0.50 NS	0,93 NS	0,04**	0,06 NS
Specialty	Clinical (n = 78)	90.0	62.5	62.0	72.0	37.5	50,0	33.3	56.0
	Surgical (n = 50)	90.0	75.0	73.0	72.0	50.0	62.5	33.3	62.0
	p	0.91 NS	0.65 NS	0.20 NS	0.82 NS	0.84 NS	0.002**	0.25 NS	0.03**
Professional activity besides medical residency	No (n = 37)	90.0	75.0	78.0	72.0	50.0	75.0	66.7	68.0
	Yes (n = 91)	90.0	75.0	62.0	72.0	40.0	50.0	33.3	56.0
	p	0.45 NS	0.39 NS	0.32 NS	0.63 NS	0.65 NS	0.07 NS	0.001*	0.07 NS
Weekly time providing care to critical patients	≤ 30 hours (n = 75)	90.0	75.0	84.0	72.0	55.0	62.5	33.3	60.0
	> 30 hours (n = 53)	85.0	50.0	62.0	70.0	30.0	50.0	33.3	48.0
	p	0.004**	0.01**	0.001*	0.09 NS	0.001*	0.001*	0.05**	0.003*
Satisfaction with the residency program	No (n = 41)	85.0	25.0	62.0	67.0	30.0	50.0	33.3	40.0
	Yes (n = 87)	90.0	75.0	74.0	72.0	50.0	62.5	66.7	64.0
	p	0.001*	0.001*	0.02*	0.001*	0.001*	0.01*	0.001*	0.001*
Regular physical activity	No (n = 87)	85.0	50.0	62.0	72.0	35.0	50.0	33.3	56.0
	Yes (n = 41)	100.0	100.0	74.0	82.0	60.0	62.5	33.3	64.0
	p	0.001*	0.014**	0.093 NS	0.001*	0.002**	0.047**	0.398 NS	0.065 NS
Sufficient leisure time	No (n = 107)	90.0	50.0	62.0	72.0	35.0	50.0	33.3	52.0
	Yes (n = 21)	95.0	100.0	84.0	87.0	65.0	75.0	66.7	76.0
	p	0.001*	0.001*	0.001*	0.003**	0.001*	0.001*	0.001*	0.001*

*$p < 0.001$; **$p < 0.05$; ^{NS}: not significant

Validation of the multiple regression models was carried out in order to check for homoscedasticity (Pearson's correlation coefficient between studentized residuals and the regression adjusted predicted values of the dependent variable and respective scatter plots); multicollinearity (Variance Inflation Factor – VIF – and its tolerance.); autocorrelation (Durbin-Watson test); influence factors (Cook's distance and Centered Leverage values); and the assumption of normality for the residuals (normal probability plots).

Results

Of the 128 medical residents, 53.9% were male; mean age was 26 years (SD = 3); 89.8% were unmarried; 53.1% lived with other residents in university dormitories; 52% had graduated in medicine at the same university in which they were undertaking the residency; 71% were training in clinical specialties and 39% in surgical specialties; 71% engaged in some professional activity other than medical residency (mainly duty shifts); 41% spent more than 30 hours per week providing care to critical patients; 47.7% of all medical residents considered the Emergency Room the most difficult and stressful stage of residency; 68% were satisfied with their training program; and 83.6% said they did not have sufficient time for leisure activities, although 32% engaged in regular physical activities.

The median values of the SF-36 domains were higher in the physical component (physical functioning = 90, role-physical = 75, bodily pain = 72, general health = 72) than the mental component

(vitality = 40, social functioning = 62, role-emotional = 33, mental health = 56). Male medical residents had lower role-physical and role-emotional scores; medical residents in clinical specialties had lower social functioning and mental health scores; medical residents engaged in professional activity other than medical residency had lower role-emotional scores; medical residents who provided care to critical patients for more than 30 hours per week had lower scores, except for general health; medical residents not satisfied with the training or who had insufficient leisure time had lower scores than the satisfied ones; and medical residents who did not do physical activity had lower physical functioning, role-physical, general health, vitality, and social functioning scores ($p < 0.05$) (Table 1).

In all domains, except for role-emotional, the scores of the second year medical residents were higher than those of first year residents ($p < 0.01$). Scores for the role-physical, bodily pain, vitality, social functioning, and mental health domains remained high for third year residents ($p < 0.01$) (Table 2). Only the role-emotional domain was not significantly different over the three years.

In the multiple variable analyses, the following results were found (Table 3): the mental component presented higher R^2 values (except for role-emotional) than the physical component, meaning that the models were more thoroughly explained by the variables under investigation. In fact, most of the dimensions in the physical component were more indirect and complex measures due to the interaction of pain and daily life activities performance or personal appraisal of general health state, including present

Table 2 - Distribution of median values of the eight domains of the SF-36 by year of medical residency, analyzed by way of the Mann-Whitney test

Domains of SF-36	R1 (n = 51)	R2 (n = 49)	R3 (n = 28)	p		
				R1 x R2	R1 x R3	R2 x R3
Physical functioning	80.0	90.0	90.0	<0.001*	0.47	0.01*
Role-physical	25.0	75.0	75.0	<0.001*	0.06	0.23
Bodily pain	51.0	72.0	74.0	<0.001*	0.001*	0.79
General health	72.0	72.0	72.0	0.07**	0.42	0.92
Vitality	30.0	50.0	60.0	0.01*	<0.001*	0.52
Social functioning	50.0	62.5	62.5	<0.001*	0.002*	0.73
Role-emotional	33.3	33.3	67.7	0.89	0.95	1.00
Mental health	48.0	68.0	60.0	<0.001*	0.001*	0.73

*$p < 0.05$; **$p < 0.001$; NS: not significant*
R1-first year; R2-second year; R3-third year

situation and future perspectives, as well as preventing disease. In the mental component, role-emotional played a similar role as to the interaction between emotional problems and work or daily activities.

Leisure and satisfaction played an important role in the mental domains, followed by exercise, surgical specialty and year of residency (mental health and social functioning). The negative impacts were caused by the long time spent with critical patients and the need to work in other activities other than residency (mainly on role-emotional). Emergency room stage had a negative impact on social functioning. Year of residency was relevant to determine vitality, social functioning and mental health.

The physical component was highly influenced by regular exercise, satisfaction, leisure time and gender (male gender determined better general health and female gender, better role-physical). Year of residency and surgical specialty were also important determinants for bodily pain, as well as the time spent with critical patients. Age above 26 had a negative impact on physical functioning.

Discussion

The significant relations found between the sociodemographic and occupational factors and the HRQOL mental component were determinant to the understanding of the detrimental effects on the medical residents' quality of life. On the other hand, the physical component needs yet to test its relation to other factors, herein not inserted in order to gain a better understanding, since the proposed models of analysis were not sufficiently explicative. The analysis pointed out that fewer hours spent providing care to critical patients, not engaging in professional activities apart from residency, having sufficient time for leisure activities, being regularly physically active, and feeling satisfied with the training predicted a higher HRQOL.

The quality of life is higher when ambitions and hopes correspond to personal experience and the individual's perceptions of his or her position in life, taking into consideration the cultural context and local value systems.[8] In Brazil, there are usually five or six times as many candidates applying for medical residency programs than the number of vacancies.[15] In this highly competitive situation, training tends to be more valued and idealized; consequently, it is common to find feelings of deception and frustration when expectations are not met. Dissatisfaction with the program can affect the medical residents' perceptions of their quality of life by jeopardizing the degree of control they feel they can exercise over their lives.[8] The degree of satisfaction with which professionals carry out their daily activities and the manner in which they deal with the difficulties

at work are important elements that affect the balance of quality of life. This study verified that dissatisfaction affected emotional aspects of HRQOL. We can, therefore, conclude that satisfaction with training program is a crucial aspect to be considered when coordinating medical residency programs.

We found that the medical resident who engaged in professional activities other than their training program had a poorer quality of life than the residents who did not do so. This finding is pertinent to the debate on the influence of the number of working hours upon the residents' well-being and learning and the quality of care they provide. Working outside the training program is common in Brazil, where residents' remuneration is low. Typically, these extra activities involve night duty shifts of 12 hours during the week and shifts lasting 24 to 36 hours at weekends.[15] Shifts are often worked in outlying city districts, under precarious conditions, and very often without the necessary backup and supervision of more experienced professionals. They tend to generate additional tensions that can have a cumulative effect on the residents' emotional states.

Providing care to critically ill patients for more than 30 hours per week had a negative influence on the emotional aspects of HRQOL. The responsibility involved in the care of critical patients is large and involves decisions that may lead to adverse outcomes, including death. Additionally, medical residents, particularly those in clinical specialties,[16] come in contact with doctor-patient-family relationships that are, from a psychological point of view, extremely complex and for which residents consider they have not been adequately prepared by their undergraduate course.[17] Dealing with difficult situations, such as angry patients, can lead to discouragement, fatigue, pessimism, skepticism, loss of ability to feel pleasure, social withdrawal, irritability, and failure to look after oneself.[9,18]

First year residents had a poorer HRQOL in all domains (with the exception of the role-emotional domain, which remained low through all years) compared to second year residents; compared to third year residents, they had a poorer HRQOL in five domains (role-physical, bodily pain, vitality, social functioning and mental health). This finding agrees with previous reports on the levels of stress experienced by residents during their first year.[1] First year residents are less competent at dealing with occupational stress because, given their professional inexperience, they have a smaller repertoire of resources at their disposal.[1,19] It is known that during the interaction between the variables "occupational stress", "personal wear and tear", and "coping with resources", there is often increase in the first two as a function of the lack or the incipient development of the last one.[15,20]

Table 3 - Multiple linear regression models of SF-36 domains

SF-36 domains	□ coefficients and intercepts	R^2	F	d.f.	p
Physical functioning	7.839 (regular exercise) -5.261 (age > 26) 4.578 (satisfaction) 3.635 (year of residency) 3.406 (male gender) Intercept = 71.559	0.261	8.6	5	< 0.001
Role-physical	24.371 (satisfaction) -14.183 (male gender) 11.406 (regular exercise) -12.671 (critical patients time > 30 hs) Intercept = 65.646	0.240	9.7	4	< 0.001
Bodily pain	-12.098 (critical patients time > 30 hs) 8.182 (year of residency) 7.325 (surgical specialty) Intercept = 58.016	0.197	9.9	3	< 0.001
General health	8.392 (regular exercise) 7.494 (satisfaction) 6.945 (leisure time) 5.839 (male gender) Intercept = 56.952	0.227	9.1	4	< 0.001
Vitality	12.545 (leisure time) 11.122 (satisfaction) -10.118 (critical patients time > 30 hs) 8.214 (regular exercise) 4.045 (year of residency) Intercept = 28.601	0.436	18.9	5	< 0.001
Social functioning	17.356 (leisure time) -11.690 (other activities) -11.470 (critical patients time > 30 hs) -10.273 (emergency room stage) 9.778 (regular exercise) 8.865 (year of residency) 7.813 (surgical specialty) Intercept = 50.796	0.466	14.9	7	< 0.001
Role-emotional	-23.953 (other activities) 23.828 (leisure time) 19.175 (satisfaction) Intercept = 45.982	0.232	12.4	3	< 0.001
Mental health	13.657 (leisure time) 9.798 (satisfaction) -7.213 (other activities) 5.560 (surgical specialty) -4.891 (critical patients time > 30 hs) 4.074 (year of residency) Intercept = 46.540	0.431	15.3	6	< 0.001

*Comparison between observed and expected values by way of the respective models of multiple linear regression (p < 0.001)

Whether it is due to dissatisfaction with the residency program, excessive time spent with critical patients or performing shift work at other institutions, the fact is that the first year residents had a low HRQOL that was equivalent to that described in patients with chronic diseases such as idiopathic pulmonary fibrosis[21] and chronic renal insufficiency.[22] It is important to identify the factors that affect doctors' quality of live so that strategies to enhance it can be developed: being a medical resident should not lead to serious emotional damage. However, the gradual improvements in the mental component of HRQOL we identified in the later years of training are reassuring. It means that, no matter how difficult this period of medical training might be, shared experiences and discussions with more experienced professionals allow for emotional maturing, and residents gradually develop the ability to deal with the ups and downs of their profession.

Our results must be interpreted cautiously, given that the study involved residents from only one institution. On the other hand, to our knowledge, this is the first study to use the SF-36 to evaluate HRQOL in a random sample of medical residents from a variety of clinical and surgical specialties. Multicenter, prospective studies using the same methodology would clarify whether residency affects the physical component of HRQOL and determine the extent of the impairment of the mental component. As described above, some aspects of the SF-36 domains can be conceptually the same described on the sociodemographic questionnaire (i.e. physical functioning and regular exercise; social functioning and leisure time), being necessary to develop a better way to explore these domains in further studies.

In spite of the limitations of this study, we believe our data can be useful to help develop measures for improving medical residency, such as implementing mental health assistance programs for residents. Since 2003 in the USA, the Accreditation Council for Graduate Medical Education (ACGME) has required that all postgraduate medical training programs make assistance services available to their residents.[19] Based on our findings and the cumulative experience of the authors in providing psychological and psychiatric assistance to residents,[20,23,24] we believe the major challenge lies in forming technically competent, ethical residents who are socially responsible, are able to establish empathetic relationships, and have a good quality of life.

Disclosures

Writting group member	Employment	Research grant[1]	Other research grant or medical continuous education[2]	Speaker's honoraria	Ownership interest	Consultant/ Advisory board	Other[3]
Paula Costa Mosca Macedo	UNIFESP	-	-	-	-	-	-
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Simone Schenkman	ANS	-	-	-	-	-	-
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Mauro Batista Morais	UNIFESP	-	-	-	-	-	-
Luiz Antonio Nogueira-Martins	UNIFESP	-	-	-	-	-	-

Modest
** Significant*
*** Significant. Amounts given to the author's institution or to a colleague for research in which the author has participation, not directly to the author.*
Note: UNIFESP = Universidade Federal de São Paulo. ANS = Agência Nacional de Saúde.
For more information, see Instructions for authors.

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