Methods of nutritional evaluation between patients in hemodialysis

Métodos de avaliação nutricional entre pacientes em hemodiálise

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Abstract

Chronic kidney disease is a public health problem. Characterizing the nutritional profile of these patients allows early diagnosis of possible nutritional risks. The objective was to evaluate the nutritional status and dietary intake of hemodialysis patients. A cross-sectional study was performed at a hemodialysis clinic from February to April 2016. Patients 18 years of age or older who underwent treatment for at least three months and were able to perform the Bioimpedance test were included. Nutritional status was determined by Body Mass Index. The Palmar Grip Strength was measured by dynamometer and the Adductor Muscle Thickness of the Thumb was by an adipometer, food intake was analyzed through a 24-hour Food Recall. A Global Subjective Assessment was performed, adapted for kidney patients. Of the 33 patients, 66.7% were males, with a mean age of 57.6 ± 14.2 years. According to the body mass index, eutrophy was prevalent (54.5%). The thickness of the adductor muscle of the thumb showed severe depletion (66.7%). Palmar grip strength ranked 72.7% of patients as malnourished. Body Fat, obtained through Bioimpedance, was high in 57.6%. The Global Subjective Assessment ranked 87.9% of patients with mild malnutrition. According to the 24-hour food recall, the total caloric intake averaged 1493 ± 530 Kcal. The protein mean was 0.88 ± 0.4 g / kg. The study allowed to visualize nutritional alterations, food intake below the recommended amounts, and different classifications of the nutritional state depending on the method used. Thus, a comprehensive nutritional assessment becomes important.

Keywords: Renal dialysis. Chronic Renal Insufficiency. Nutrition of Risk Groups.

Resumo

A doença renal crônica constitui-se um problema de saúde pública. Caracterizar o perfil nutricional desses pacientes permite diagnosticar precocemente possíveis riscos nutricionais. O objetivo foi avaliar o estado nutricional e consumo alimentar de pacientes em hemodiálise. Estudo transversal, realizado em uma clínica de Hemodiálise, de fevereiro a abril de 2016. Foram incluídos pacientes com 18 anos ou mais, em tratamento por no mínimo três meses, capazes de responder a avaliação e que puderam realizar teste de Bioimpedância. O estado nutricional foi determinado pelo Índice de Massa Corporal. A força de Preensão Palmar foi mensurada por dinamômetro e a Espessura do Músculo Adutor do Polegar por adipômetro, ingestão alimentar foi analisada por meio de Recordatório Alimentar de 24 horas. Foi realizada Avaliação Subjetiva Global adaptada para pacientes renais. Dos 33 pacientes, 66,7% do sexo masculino, com média de idade de 57,6 ± 14,2 anos. Segundo o índice de massa corporal a eutrofia foi prevalente (54,5%). Já a espessura do musculo adutor do polegar mostrou depleção severa (66,7%). A força de preensão palmar classificou 72,7% dos pacientes como desnutridos. A Gordura Corporal, obtida por meio da bioimpedância, mostrou-se alta em 57,6%. A Avaliação Subjetiva Global classificou 87,9% dos pacientes com desnutrição leve. Segundo Recordatório Alimentar de 24 horas, o total calórico teve como média 1493 ± 530 Kcal. A média proteica foi de 0,88 ± 0,4 g/kg. O estudo permitiu visualizar alterações nutricionais, ingestão alimentar abaixo do recomendado e diferentes classificações do estado nutricional dependendo do método utilizado. Assim, torna-se importante uma avaliação nutricional ampla.

Palavras-chave: Diálise Renal. Insuficiência Renal Crônica. Nutrição de Grupos de Risco.

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INTRODUCTION

Chronic Kidney Disease has a high prevalence worldwide, ranging from 10 to 13% among adults, and it is a problem of global proportions. In Brazil, it is estimated that approximately 131,000 people are in the early stages of CKD[1]. In the census of the Brazilian Society of Nephrology from 2013, it was estimated that in Brazil there would be 112,000 patients on dialysis, 91.4% on hemodialysis (HD), and 8.6% on peritoneal dialysis. The percentages by patient age groups were 62.6% between 19 and 64 years, and 26.7% between 65 and 80 years. These data reveal that chronic kidney disease (CKD) is a growing public health problem in Brazil[2]. In hemodialysis patients, changes in nutritional status are frequent as a consequence of the metabolic and hormonal disorders resulting from the disease and its treatment[3].

The Body Mass Index (BMI) is one of the anthropometric indicators recognized as a marker of body fat in the general population, but in kidney patients these values may be distorted as a result of possible water retention. Individuals with the same BMI values may be exposed to risks in different ways because this indicator not only "masks" the results due to edema, but is also not sensitive in identifying protein depletion and/or visceral fat gain. In specific patients such as kidney patients, the gauging of anthropometric measurements should be made shortly after the hemodialysis session, reducing the risk of the results being influenced by edema; common in this group of patients[4].

Protein-Energy Malnutrition (PEM) is one of the main factors that affect this group of patients, who have a wide prevalence of 23 to 76%. However, some studies have been reporting the identification of overweight assessed by BMI. This, in turn, may be a positive point, since there is evidence that hemodialysis patients with higher BMI's have a higher survival rates[5]. Among the many causes of malnutrition are insufficient dialysis, restrictive diets, gastrointestinal and associated diseases, anemia, fluid overload, psychological and social factors, loss of nutrients in hemodialysis sessions, endocrine disorders, and acid-base balance and metabolic acidosis[6].

Currently, there is no single indicator that provides nutritional diagnosis in an unequivocal and complete way, and it is necessary to use different parameters, such as clinical, biochemical, and anthropometric methods that are analyzed together, allowing the identification of nutritional risks or disorders already in place[7]. Considering the importance of nutritional monitoring in the care and promotion of a better quality of life in hemodialysis patients, the present study aimed to evaluate the nutritional status and dietary intake of hemodialysis patients.

METHODOLOGY

A cross-sectional study was carried out, including 33 patients undergoing hemodialysis, aged 18 years or older, who were able to perform the proposed evaluations, whose sessions are four hours, every other day, three times a week, in a nephrology clinic in the city of Carajinho, Rio Grande do Sul between January and April of 2016. Among these patients, 66.7% (n = 22) were males, with a mean age of 57.6 ± 14.2 years.

Treatment time averaged 29.9 ± 26.6 months. The socio-demographic questionnaire involving income, cohabitation, schooling, level of physical activity, diuresis, medications used, Global Subjective Assessment (GSA) for patients with kidney disease[8], as well as the 24-hour Dietary Recall (R24h) were collected at the time of hemodialysis. The anthropometric measures of weight, height, skinfolds, Adductor Pollicis Muscle Thickness (APMT), Palmar Grip Strength (PGS), and Bioimpedance (BIA) were performed after hemodialysis sessions and on the arm without venous access, when measuring the limb was involved. Biochemical tests to evaluate the Metabolic Syndrome criteria were collected from patients' records.

For the classification of nutritional status, the BMI was calculated. Due to the differences in established cut-off points, for the correlations of the present study, patients who presented leanness / low weight / adequate weight were included in the low weight/adequate category; and those who were overweight / obese were in the overweight category. For the database structuring, the Excel 2007 and Epi Info ™ 3.5.1 applications were used, and R 2.10.0 for Windows was used for statistical analysis. The data were analyzed descriptively through absolute and relative frequencies. The study followed the guidelines of Resolution No. 466/12 of the National Health Council on the participation of people in research, taking into account the ethical aspects of hospital consent, privacy, and anonymity of the participants. The project was approved by the Ethics and Research Committee of the University of Passo Fundo under Proposal 1.389.674.

RESULTS

In relation to schooling, 39.4% studied until the initial grades of primary school, 39.4% completed primary school, and 21.2% of high school. The prevalent personal income was one to two minimum wages (81.8%); 93.9% live in their own homes and 45.5% have cars. The mean cohabitation was 2.48 ± 1.0 people.

Regarding nutritional status according to BMI, eutrophy was prevalent (54.5%), followed by overweight (24.2%), some degree of obesity, I, II or III (15.2%), and finally low weight (6.1%). On the other hand, APMT showed significant muscular loss, classified in three levels, with severe depletion (66.7%), moderate depletion (24.2), mild depletion (3.0%), and only 6.1% showed no degree of APMT depletion. The PGS classified 72.7% of the patients as malnourished. When PGS was analyzed in the arm with access and without access, the averages were 13.6 ± 7.8kg and 18.97 ± 10.3kg, respectively, presenting a statistically significant difference (p = 0.001) between the two. Body Fat (BF), obtained through skin folds, was adequate in 54.5%, high in 30.3%, and low in 15.2% of the patients. When it was evaluated through Bioimpedance, it was high in 57.6%, adequate in 39.4%, and low in 3% of patients.

When APMT was correlated with the other anthropometric indicators, a statistically significant correlation with dry weight (p = 0.007), BMI (p = 0.019), and lean mass (p = 0.034) can be observed.

Table 1 shows statistically significant differences found between BMI classification and gender, personal income, physical activity, APMT, body fat, and metabolic syndrome.

Regarding the Metabolic Syndrome, 15.2% of the patients presented the criteria for diagnosis (blood pressure, waist circumference, biochemical tests for glycemia, triglycerides and HDL-cholesterol). PSG adapted for kidney patients classified 87.9% with mild malnutrition, 9.1% without risk of malnutrition, and 3% with moderate malnutrition. Regarding diuresis, 81.8% of the patients had a median of 500ml |300; 1000|. When HD duration correlated with diuresis, we observed a statistically significant correlation (p = 0.009).

The usual dietary intake based on R24h is described in Table 2. There was no statistically significant difference between the R24h of the day without HD, with HD, and the weekend. Among the nutrients analyzed in R24h, the adequate distribution of carbohydrates and lipids according to the recommendation, as well as adequate intake of sodium, potassium and phosphorus nutrients, can be observed. However, by analyzing the amount of protein (g/kg), it can be seen that in none of the days the average intake investigated reached the recommended level, as well as for calcium.

When a correlation between fat and lean mass evaluated by the sum of skinfolds and protein intake (g/kg) was found, a statistically significant difference was observed with the fat mass (p = 0.020); suggesting that when less protein was ingested, the greater the fat mass was in our sample. There were no statistically significant differences when analyzing the correlation between age and nutritional indicators (APMT, PSG, GSA, BF by BIA).

The nutritional assessment by BIA is shown in Table 3. BIA identified a high percentage of fat (31.0%) and body fluid (50.5%). There was a statistically significant positive correlation between BMI and Body Fat (%), Lean Mass (%) and Water (%) evaluated by BIA; all of these parameters had a correlation of p <0.001.

HD time correlated statistically, significantly, and inversely with BIA-classified body fat (p = 0.013), showing that the longer the HD time, the lower the fat percentage.

Figure 1 allows analyzing different methods of nutritional evaluation that allow for the diagnosis of malnutrition, and consequently there was a difference between 6.1 and 93.9% in diagnosis in the same population.

Table 1– Characterization of the Body Mass Index classification of the patients. Passo Fundo, 2016.

Variable	Adequate/Low Weight		Overweight		p
	n	%	n	%	
Gender					
Male	16	72.7	6	27.3	0.440*
Female	4	36.4	7	63.6	
Personal Income					
Less than 1 Minimum Wage	2	66.7	1	33.3	
1 to 2 Minimum Wages	15	55.6	12	44.4	0.189*
3 or more Minimum Wages	3	100	-	-	
Physical Activity Frequency					
Never perform/Stopped performing	15	60.0	10	40.0	0.016**
Rarely performed	5	62.5	3	37.5	
APMT					
Non-Severe Malnutrition	4	36.4	7	63.6	0.044**
Severe Malnutrition	16	72.7	6	27.3	
PGS					
Malnourished	14	58.3	10	41.7	0.660**
Well nourished	6	66.7	3	33.3	
BF Classification					
Low/Adequate	18	78.3	5	21.7	0.001**
High	2	20.0	8	80.0	
Metabolic Syndrome					
Yes	2	40.0	3	60.0	0.205*
No	18	64.3	10	35.7	

*Teste de Qui-quadrado; **Teste de Exato de Fischer; significativo para um p ≤ 0,05.
*Chi-square test; ** Fischer's Exact Test; significant at p ≤ 0.05.

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Table 2 – Food intake based on the 24-hour Food Recall. Passo Fundo, 2016.

Nutrients	R24h day w/o HD	CI 95%	R24h day of HD	CI 95%	R24h day of the weekend	CI 95%
Total caloric (kcal)	1493.9 ±530.6	|1305.7 : 1682.0|	1382.4 ± 569.8	|1180.4 : 1584.5|	1539 ± 552	|1343.9 : 1735.5|
Protein (%)	17.3	-	17.5	-	19.8	-
Carbohydrate (%)	56.2	-	56.6	-	51.3	-
Lipids (%)	25.1	-	25.1	-	27.6	-
Protein (g/kg)	0.88 ± 0.4	|0.71 : 1.05|	0.81 ± 0.5	|0.6 : 1.0|	1.05 ± 0.5	|0.84 : 1.27|
Saturated Fat (mg)	13.5 ± 9.8	|10.0 : 17.0|	12.0 ± 7.7	|9.3 : 14.8|	17.2 ± 10.8	|13.4 : 21.1|
Polyunsaturated Fat (mg)	6.8 ± 8.6	|3.7 : 9.8|	4.9 ± 4.2	|3.4 : 6.4|	6.1 ± 4.8	|4.4 : 7.9|
Monounsaturated Fat (mg)	11.5 ± 8.2	|8.6 : 14.5|	10.3 ± 6.8	|7.9 : 12.7|	15.5 ± 11.1	|11.5 ; 19.4|
Cholesterol (mg)	189.2 ± 118.2	|147.3 : 231.1|	176.1 ± 134.9	|128.3 : 224.0|	233.1 ± 1 49.7	|179.9 : 286.2|
Phosphorus (mg)	745.5 ± 342.2	|624.1 : 866.9|	715.1 ± 422.8	|565.1 : 865.0|	858.7 ± 383.3	|722.7 : 994.6|
Calcium (mg)	382.8 ± 262.0	|289.9 : 465.7|	380.9 ± 246.7	|293.4 : 468.4|	376.5 ± 224.2	|297.0 ; 456.0|
Potassium (mg)	1243 ± 536	|1053.3 : 1434.0|	1176.8 ± 616.7	|958.1 : 1395.5|	1457.1 ± 626.7	|1234.8 : 1679.3|
Sodium (mg)	1342.0 ± 736.1	|1080.9 : 1603.0|	1454.1 ± 1077.4	|1072.1 : 1836.5	1696.8 ± 1212.2	|1267.0 : 2126.6|

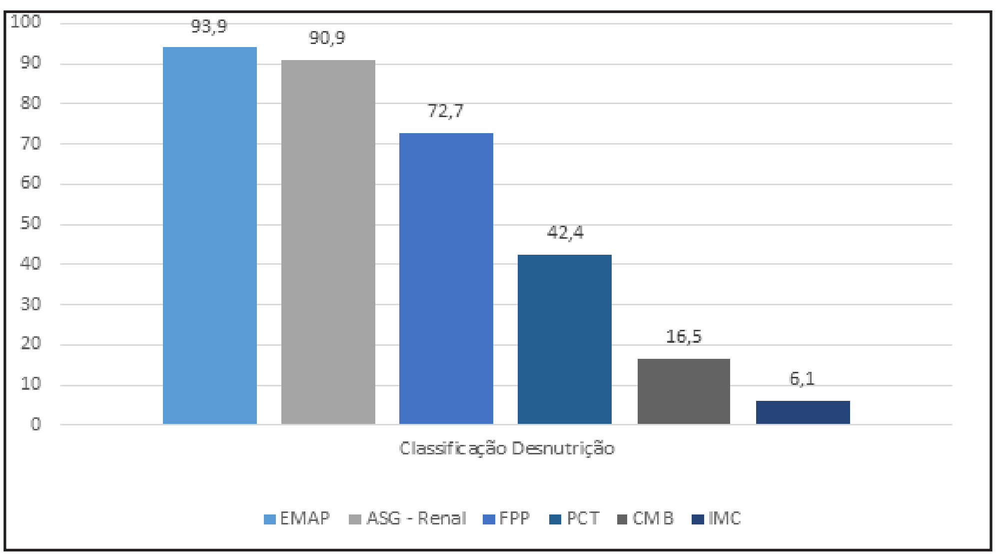

Figure 1 – Identification of malnutrition by different methods. Passo Fundo, 2016.

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DISCUSSION

The majority of the patients in this sample are male, with similar values in relation to the number of patients and gender distribution in other studies[9,10]; which may be justified by the fact that men seek preventive health services less, and by the progression of kidney disease being faster in men and in more advanced individuals[11].

Age did not present a statistically significant difference with BF, PGS, GSA, APMT, lean mass and protein intake. Studies also did not find this statistical significance, suggesting that the treatment may have greater influence on the loss of lean mass or malnutrition than age[12].

The average consumption of calcium, protein, and energy are considered inferior to the nutritional recommendations, corroborating with Machado et al. (2014) who, when analyzing the food intake of 34 individuals in HD in Guarulhos, found similar data, where the energy consumption (19.0 ± 6.2 kcal/kg), protein consumption (0.9 ± 0.4 g/kg) and phosphorus consumption (612.5 ± 212.6 mg) were lower than the recommended amounts; which may be justified by the hormonal alterations that affect patients in HD[13]. In addition, patients with greater weight had higher concentrations of acyl-ghrelin, demonstrating that it is related to appetite and weight gain[14].

Naylor et al. (2013) performed a literature review aiming to elaborate guidelines on the protein requirement of hemodialysis patients and concluded that the intake of 1.1 g/kg/day is able to meet their needs and avoid protein malnutrition. However, in this study protein intake was lower than this value, showing the need for intervention and nutritional orientation, since this intake, when insufficient, is related to higher mortality[15].

In the present study there was a statistically significant negative correlation ($p = 0.02$) between fat mass and protein intake (g/kg), indicating that the lower the protein intake, the greater the fat mass. Insufficient dietary intake of protein and energy is indicated as one of the main causes of malnutrition in dialysis treatments, and correlates with lean body mass index and adiposity. This deficient intake can be justified by several factors such as decreased taste, chronic inflammation, rigorous dietary restriction, excessive medication, worsening of quality of life, hormonal and gastrointestinal disorders, intercurrent diseases, sedentary lifestyle, uremia, loss of nutrients during dialysis treatment, insufficient or inadequate dialysis, and psycho-emotional and social factors[16]. Ribeiro et al. (2011) state that values of protein intake below the recommended values suggest a negative nitrogen balance, which would compromise the nutritional status of the hemodialysis patient[17].

The nutritional status classified by BMI in this study showed the prevalence of eutrophy, but when analyzing BF by BIA, it was identified as high and lean mass decreased, according to APMT and PGS measurements. With these data it is possible to observe the importance of body composition analysis in hemodialysis patients, and BMI alone is not a good parameter of nutritional status[18].

The mean BMI of the present study (27.2 ± 8.0 kg/m^2) indicates a lower mortality risk according to the Committee of the International Society of Renal Nutrition and Metabolism, which recommends BMI > 23 kg/m2 for hemodialysis patients[19]. These results can be explained by the considerable physical inactivity observed in this population, also taking into account the positive and statistically significant correlation between physical inactivity and increased BMI ($p = 0.016$). Many patients in dialysis therapy are physically inactive for reasons such as fatigue, anemia, skeletal-muscular diseases, difficulty in locomotion, and psychological factors[5].

The increase in overweight individuals in HD has been reported more and more. It is important to observe how obesity is being evaluated, since it is necessary to identify body composition, since excess body fat is not advantageous for survival while in HD, as opposed to the amount of muscle mass, which seems to exert a protective effect. Abnormal fat deposition may not be beneficial to HD patients because it is associated with increased inflammatory risk[20].

Dialysis time may negatively affect body weight and composition[21]. In this study, there was no association between time on dialysis and BMI, APMT, PGS, but there was a significantly positive correlation with body fat classified by BIA (p = 0.013), showing that the higher the HD time, the higher the body fat percentage; suggesting bodily redistribution. However, new studies are correlating greater adiposity with the increase of the inflammatory process in this population, and the adipose tissue, under inflammatory response, is responsible for the secretion of inflammatory mediators such as IL-6. In a study by Wing et al. (2014), a positive relationship between BMI, body fat and increased inflammatory markers was found[22].

In this study, the percentage of body fluid correlated significantly with the nutritional status classified by BMI. Fluid overload is a common feature of the progression of CKD[18]. It is necessary to evaluate the correct blood volume in HD, which must be performed by an appropriate method of evaluation of body composition, since fluid overload does not always accompany classic symptoms. The estimation of total body fluid volume performed by BIA, compared to other standard methods (such as isotopic dilution), shows that BIA is safe and effective for this measurement[23].

The relationship between nutrition and hydration was shown, illustrated by the fact that the percentage of body fluid correlated statistically and significantly according to nutritional status. Antlanger et al. (2013) also observed this association, indicating that the highest percentage of fluid was observed in individuals with less fat, and agreed with a previous study that described fluid overload in patients with low BMI and lower concentrations of albumin[24]. To justify such observations, they postulate that obese patients have a lower accumulation of fluid, due to diuretic or residual kidney function that allows for greater elimination of urine. Therefore, it is important to analyze the body composition, and not only the weight, in HD, so as not to overestimate or underestimate it. Fluid overload represents an independent risk factor for cardiovascular mortality in CKD[18].

The GSA adapted to kidney patients identified a large part of the sample as malnourished (92.9% between mild and moderate malnutrition), with no statistically significant difference in weight, BMI, skinfolds, body fat, APMT, and PGS. Similar data are found in the study by Oliveira et al. (2010) who, when using classical GSA and adapted GSA, perceived differences in the identification of malnutrition. In classical GSA, 39.7% of patients were mildly/ moderately malnourished and 60.3% were well nourished.

According to the ASG adapted to the renal patient, 94.8% of the patients were at nutritional risk / mild malnutrition, and they also did not identify a significant correlation with BMI, triceps skinfold (TSF), arm circumference (AC), arm muscle circumference (AMC), albumin, lean mass, and fat mass[16].

The GSA adapted to the kidney patients classifies the patient who is on dialysis for more than 2 years with a score of 9, even if the other indicators of their clinical history and physical examination were normal, which already qualifies them as nutritional risk/ slight malnutrition; which explains why the prevalence of malnutrition in the study population was high, since the mean time in HD was 29.9 ± 26.6 months.

The APMT correlated statistically with dry weight, BMI and lean mass, differently from the study by Pereria et al. (2013), where they analyzed APMT with GSA, laboratory tests, PGS, and BMI and found a positive correlation only with PGS[12].

Cohort study by Oliveira et al. (2012) included 143 adult and elderly patients in HD. BMI, percentage of weight loss, AC, arm muscle area (AMA), triceps skinfold, APMT, biochemical exams, and BIA were measured. APMT was well correlated with BMI, AC, AMA, percentage of weight loss, creatinine, albumin, and BIA, differently from our sample. Thus, the authors concluded that APMT may be a useful parameter for the early diagnosis of malnutrition and a mortality risk marker in this population[25.]

A study by Oliveira et al. (2010) assessed different diagnostic methods for malnutrition in chronic kidney failure, finding similar data to that of this study (94.8% of malnutrition by kidney GSA, 84.5% by TSF, 12.1% by BMI, and 43% when assessed by AMC) and found that it is difficult to assess the nutritional status of patients on dialysis since there is no single criterion that can be used for their identification, which often delays the diagnosis.

They suggest that the evaluation of

malnutrition while on dialysis should be based on multiple indicators of nutritional status[16].

The present study presents limitations, mainly in relation to the size of the sample which, in itself, conditions the reading of the results and conclusions. However, the results obtained, together with the experience and skills acquired, leave room for the feasibility of developing new research projects in this area in the near future.

CONCLUSION

The study allowed us to analyze that the patients presented a lower than expected intake for both calories and protein, and with no statistically significant difference between the days with and without HD. Regarding the nutritional status, there were different diagnoses depending on the method used.

With the present research, it can be concluded that the use of different nutritional assessment methods, with subjective and objective variables, represents an improvement in the diagnostic pattern of patients with CKD in HD. Consideration should always be given to costs, level of training of evaluators, time of execution, population receptivity, and possible health risks to define the best method. It is also imperative that the chosen method be validated for the population to be studied. Thus, it is possible to obtain the necessary support for decision-making in relation to the conduct of the dietitian, including preventive conduct, minimizing the complications inherent to the patients on HD, which can improve their quality of life.

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