

## Health status and the return to work after traffic accidents

*Estado de saúde e retorno ao trabalho após os acidentes de trânsito*  
*Estado de salud y retorno al trabajo después de accidentes de tránsito*

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### ABSTRACT

**Objective:** to compare the health status of traffic accident victims, at hospital discharge and after six months, and to analyze the predictive variables of their health status and return to work. **Method:** observational, longitudinal study. Data were collected through interviews and medical records of 102 patients with a mean age of 33 years; with the majority being men and victims of motorcycle accidents. The variables were analyzed by means of validated tools, student's t-test, multiple linear regression, and logistic regression. **Results:** there was an improvement of perception in the patients' health status six months after hospital discharge and functional capacity. The individuals who returned to work showed better health-related quality of life evaluation. **Conclusion:** improvement of the perceived health status six months after hospital discharge was found. Factors that influenced the patients' return to work were not identified.

**Descriptors:** Traffic Accidents; Quality of Life; Rehabilitation; Work; Trauma.

### RESUMO

**Objetivo:** comparar o estado de saúde de vítimas de acidente de trânsito, na alta hospitalar e após 6 meses, bem como analisar as variáveis preditoras do estado de saúde e retorno ao trabalho. **Método:** estudo observacional, longitudinal. Dados coletados por entrevistas e consulta aos prontuários, com 102 pacientes com média de idade de 33 anos; a maioria, homens e vítimas de acidente motociclístico. As variáveis foram avaliadas por instrumentos validados, analisadas por teste "t" de Student, regressão linear múltipla e regressão logística. **Resultados:** houve melhora da percepção do estado de saúde 6 meses após alta associada à idade, medida geral do estado de saúde imediatamente após a alta e capacidade funcional. Os indivíduos que retornaram ao trabalho apresentaram melhor avaliação da qualidade de vida relacionada à saúde. **Conclusão:** constatou-se melhora da percepção do estado de saúde 6 meses após a alta. Não foram identificados fatores que influenciaram o retorno ao trabalho.

**Descritores:** Acidentes de Trânsito; Qualidade de Vida; Reabilitação; Trabalho; Trauma.

### RESUMEN

**Objetivo:** comparar el estado de salud de víctimas de accidentes de tránsito al alta hospitalaria y seis meses después, y analizar las variables predictoras del estado de salud y de retorno al trabajo. **Método:** estudio observacional, longitudinal. Datos recolectados por entrevistas y consulta de historias clínicas, con 102 pacientes, media etaria de 33 años, mayoritariamente hombres, víctimas de accidente motociclístico. Variables evaluadas por instrumentos validados, analizadas por test "t" de Student, regresión lineal

múltiple y regresión logística. **Resultados:** Hubo mejora de la percepción del estado de salud 6 meses después del alta, asociada a edad, medida general del estado de salud, inmediatamente después del alta y capacidad funcional. Los individuos que retornaron al trabajo presentaron mejor evaluación de calidad de vida relacionada a la salud. **Conclusión:** se constató mejora de percepción del estado de salud 6 meses después del alta. No fueron identificados factores que influyeron en el regreso laboral.

**Descriptores:** Accidentes de Tránsito; Calidad de Vida; Rehabilitación; Trabajo; Heridas y Traumatismos.

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## INTRODUCTION

Traffic accidents represent a serious and complex public health problem in Brazil. They have been on the rise with economic and technological development of modern societies and can have social and economic implications, since they predominate in young and economically active populations<sup>(1)</sup>.

The increasing number of accidents places a tremendous burden on the health system in all assistance sectors, since costly and long hospitalization periods are part of the rehabilitation of traffic accident victims who suffered injuries in several body regions. The sequelae of the injuries can affect quality of life and the return to work after the trauma, characterized as a chronic condition.

Over the last decades, Health-Related Quality of Life (HRQoL) has been used as a synonym of health status perceived by the individual and could be defined as related to how much the emotional, social, and physical well-being is affected by an illness and subsequent treatments<sup>(2)</sup>.

The sequelae resulting from traffic accidents cause a negative impact on the individual's life and can lead to a decrease in functional capability and work capacity<sup>(3)</sup>; therefore, HRQoL can be used as an indicator of the post-trauma recovery process. In a previous study, associations were found among individuals' capacity to return to previous activities, including age, severity of the trauma, level of education and type of job, social support, and participation in rehabilitation programs. With an aim at comparing the health status of traffic accident victims at hospital discharge and after 6 months, as well as analyzing the predictive factors of the health status and the return to work, a connection was found between risk factors described in the literature and the return to work. The authors also investigated whether the trauma mechanism, functional capacity, anxiety, and depression at hospital discharge played a key role in the general health status of traffic accident victims, and their return to work six months after hospital discharge.

## METHOD

A longitudinal cohort study was carried out in a General Hospital of Minas Gerais, Brazil, and concluded in July 2014, after approval of the institution's Ethics Committee. The research objectives were presented to possible participants, guaranteeing the confidential nature of their information. All individuals that agreed to participate in the study signed a free and informed consent form.

## Sample: inclusion and exclusion criteria

The sample size was limited to the period of data collection, based on human resources and time available for conducting the study. It included individuals over 18 years of age, victims of moderate or serious trauma by traffic accidents (with New Injury Severity Score  $\geq 15$ ) and with cognitive conditions that would allow them to participate in the study.

## Tools used for collecting data

Clinical and sociodemographic data questionnaire to evaluate the following information: demographics (date of birth for subsequent calculation of age, gender, marital status, education, and activity); hospitalization (date of admission and discharge, and complications); trauma characteristics (date and time of the accident, type of accident [pedestrian, bicycle, motorcycle, car, truck, bus]; body regions struck [head and neck, face, chest, abdomen, extremities or pelvic waist, and external surface]; and data on return to work [unaffected or affected activities due to the trauma and those who did not return to work activities])<sup>(4)</sup>.

- Abbreviated Injury Scale (AIS): All injuries described in the participants' medical records were entered into a coding system, according to the AIS. This code identifies the body region, the anatomical structures and the specific natures of the injury, and the injury level and severity<sup>(5)</sup>.
- New Injury Severity Score (NISS): This scoring system was used to determine the severity of the trauma. It was calculated by summing the squares of the AIS values assigned to the three most serious injuries, regardless of the body segment. The NISS value varies from 0 to 75, with scores higher or equal to 15, including moderate and minor traumas<sup>(5)</sup>.
- Perceived Health Status (PHS): The PHS score was carried out by a numeric visual analog scale. Patients answered the following question: "If you were to give a grade to your health status today, what grade would you give?" The answer was assigned in a horizontal analog scale of 100 millimeters, with zero placed at the left end (worst possible health status).
- Hospital Anxiety and Depression Scale – HADS: This scale evaluated the symptoms of anxiety and depression in patients with physical illnesses. It has 14 items, whereas seven assess symptoms of anxiety (HADS-A sub-scale) and seven evaluates symptoms of depression (HADS-D). Each item can be measured from zero to

three, with maximum score of 21 for each scale. Higher values indicate higher presence of symptoms in the specified sub-scale<sup>(6)</sup>.

- Katz Index: This tool evaluated functional capacity. The scale consists of six items that measures individuals' performance in self-care activities: eating, sphincter control, shifts, personal hygiene, capacity to get dressed, and to take a shower. Each item receives score zero (independent) or one (dependent), and the sum of the items adds to a maximum of 6 points. Participants with total score between zero and two were classified as independent, and those with higher or equal to three points were considered dependent<sup>(7)</sup>.
- Medical Outcome Survey 36-item short (SF-36): The assessment of HRQoL six months after hospital discharge was conducted applying the SF-36 tool version adapted and validated for the Portuguese language<sup>(8)</sup>. The SF-36 consists of 36 items, whereas one item assesses health changes over time and 35 evaluate distinct health aspects arranged into eight dimensions. For each dimension, the SF-36 items are coded, grouped, and transformed into a score of zero (worst health status) to 100 (highest health status)<sup>(8)</sup>.

### Procedures

The medical records of individuals hospitalized due to a traffic accident were evaluated by one of the researchers for the characterization of the severity of the trauma using the NISS tool. After agreeing to participate in the research, an individual interview was conducted in the care unit at the time of discharge from hospital. The tools were applied always following the same order: clinical and sociodemographic data questionnaire, PHS, HADS, and Katz Index. Six months after discharge, the same tools and the SF-36 were applied in the participants' residences. Data were collected by a single researcher.

### Statistics and result analysis

Basic descriptive frequency analysis for categorical and nominal variables and central tendency and dispersion for numerical variables were carried out. Considering the reduced number of traumas classified as "pedestrians" and "bikers", these categories were grouped for analysis. To compare the general health status at the time of hospital discharge and six months later, Student's t-test was used in paired samples and the mean was estimated, adopting a confidence interval of 95% for the difference of the general health status between the two periods. In order to evaluate the associations between the general health status six months post-discharge and the "trauma mechanism and general health status", "functional capacity", "anxiety and depression assessed at the time of hospital discharge" variables, multiple linear regression was applied, using as reference the trauma mechanism by motorcycle accident, for being considered as the most frequent occurrence. The proportion (and 95% confidence interval) of victims that returned to work six months after hospital discharge was estimated.

In order to study the associations between return to work six months post-discharge and the trauma mechanism and the general health status, functional capacity, anxiety and depression variables, measured at the time of hospital discharge, logistic regression was applied to calculate the gross odds ratio between response variable and each explanatory variable, having the odds ratio adjusted by the equation model of logistic regression. Significance was established at 0.05. All analyses were conducted using IBM SPSS Statistics, version 21.0 for Mac.

## RESULTS

From October 2011 to October 2012, 102 patients were recruited within the inclusion criteria of the study. The studied group had a mean age of 33 years (SD = 12.7), with prevalence of male individuals (78.4%), with poor education (mean of 8.4 years of study [SD = 3.4]), with partners (58.9%), and mean household income of 3.8 (SD = 3.2) minimum wages, and with a mean loss of 1.2 minimum wage in the household income after the traffic accident.

In the classification of traumas as moderate and serious, the mean NISS was 18.5 (variation from 16 to 43). In relation to trauma mechanism, the most common vehicle involved in the accidents was motorcycles (60.8%). Crashes involving cars and heavy vehicles (trucks and buses) represented 26.5% of the accidents, and 12.7% involved bikers and pedestrians.

From the 102 patients, most (69.6%) had injury in a single body region, with 37.2% on the external surface (abrasions, bruises, and skin lacerations). Lower extremities were the most traumatized body regions (86.3%), followed by the upper extremities (12.7%), chest (9.8%), head (7.8%), and face (4.9%).

Length of hospital stay varied from 2 to 59 days, with a mean of 11 days (SD = 10.7%). During hospital stay, the most common complications were nosocomial infections (11.7%), with surgical site infections being the most prevalent.

Mean perceived health status for the traffic accident victims was 69.1% (SD = 22.9) at the time of hospital discharge, and 76.6 (SD = 19.2) six months after discharge, with a statistically significant difference ( $p = 0.01$ ).

Individuals showed low values for anxiety six months after hospital discharge when compared to the moment of discharge, with means of 5.1 (SD = 3.2) and 6 (SD = 3.7), respectively. The participants presented higher scores with symptoms of depression six months after discharge, with a mean of 4.0 (SD = 3.8), when compared to the moment of hospital discharge, when the mean was 2.4 (SD = 2.9).

Multiple linear regression analysis was applied for the general health status model at six months, with the following explanatory measures at hospital discharge: gender, age, trauma mechanism (using dummy variables for the three categories), general health status (continuous), functional capacity (binary: independent or dependent), and symptoms of anxiety and depression (continuous). The results are shown in Table 1.

Six months after hospital discharge, the variation of the general health status was explained with a statistically significant difference by the variables age ( $p < 0.001$ ), general health status score ( $p < 0.001$ ), and functional capacity ( $p = 0.05$ ).

**Table 1** – Analysis of the multiple linear regression having as response variable the score of general health status six months after hospital discharge, and explanatory variables measured at hospital discharge, Uberaba, Minas Gerais, Brazil, October 2011 to October 2012

Explanatory variable	Coefficient estimate	Standard error	P value
Interceptions	82.33	9.09	<0.001
Age	-0.53	0.14	<0.001
Gender (Reference: female)	-7.07	4.24	0.10
General health status*	0.32	0.08	<0.001
Trauma mechanism (Reference: motorcycle)			
Automotive vehicle	3.39	3.91	0.38
Pedestrian/biker	0.61	5.22	0.90
Anxiety symptoms (HADS-A)*	-0.05	0.48	0.92
Depression symptoms (HADS-D)*	-1.02	0.62	0.10
Functional capacity (Reference: independent)*	-6.66	3.28	0.05

Note: \* Variables measured at the time of hospital discharge. Hospital Anxiety and Depression Sub-scale (HADS – A and HADS-D).

Multiple linear regression indicated that age ( $p < 0.001$ ), general health status score ( $p < 0.001$ ), and functional capacity ( $p = \text{HADS-D } 0.05$ ) were statistically significant to explain the variation in general health status six months after hospital discharge. The regression model shows that an increase in the measuring unit of the general health status at hospital discharge increases on average 0.3 points in the general health status score six months after the first evaluation (with all the remaining variables being equal). Furthermore, according to the model, an individual classified as dependent had, on average, a general health status of 6.7 points lower than the individuals classified as independent. The remaining variables inserted in the model (gender, trauma mechanism, anxiety and depression measured

during hospital discharge) were not statistically significant. The tested model explained about 33% of the measured variance of general health status six months after hospital discharge.

Of the 102 participants of this study, 53 had returned to work six months after hospital discharge and, therefore, the estimate for returning to work in the population of victims of traffic accident in Triângulo Sul was 52% (CI 95%: 42.3% - 61.7%). As for the patients who returned to work, five (4.9%) underwent jobs changes because of post-traumatic conditions.

Multiple logistic regression was applied to evaluate the factors that could influence return to work. No single factor included in the model showed association with return to work (Table 2).

**Table 2** – Results from the logistic analysis (in terms of adjusted odds ratios) using return to work within six months (yes/no) as response variable and variables measured at hospital discharge as explanatory variables, Uberaba, Minas Gerais, Brazil, October 2011 to October 2012

Variables measured at hospital discharge	Odds ratio	Confidence limits at 95%		P value
		Lower	Higher	
Age	0.97	0.94	1.01	0.12
Gender (Reference: female)	2.02	0.67	6.08	0.21
Anxiety symptoms (HADS- A)	0.95	0.84	1.08	0.44
Depression symptoms (HADS-D)	0.99	0.84	1.16	0.87
Functional capacity				
(Reference: Independent)				
Dependent	1.61	0.69	3.77	0.27
High trauma mechanism				
(Reference: Motorcycle)				
Automotive vehicle	1.52	0.35	6.64	0.57
Biker/pedestrian	0.60	0.16	2.28	0.44

Note: No variable included in the model showed association with return to work. Hospital Anxiety and Depression Sub-scale (HADS – A and HADS-D).

The results obtained in the evaluation of health-related quality of life, six months after traffic accident victims were discharged from hospital, showed that individuals who returned to work presented better evaluation in all domains, according to return to work.

The domains perceived as the most affected for the individuals who returned to work were vitality, mental health, and general health, with mean scores of 68.9 (SD = 14.9), 71.6 (SD = 13.7), and 79.6 (SD = 16.1), respectively (Table 3). For the victims who did not return to work, the most affected domains were physical functioning, role-physical, and role-emotional, with mean scores of 34.0 (SD = 27.8), 44.9 (SD = 50.2), and 45.5 (SD = 49.8), respectively. Comparing the group of patients according to the means observed in each domain of the tool, the group that returned to work presented higher values for all the domains and vitality only was not statistically significant ( $p = 0.19$ ) (Table 3).

**Table 3 –** Comparison of the SF-36 domains six months after hospital discharge in relation to returning to work, Uberaba, Minas Gerais, Brazil, October 2011 to October 2012

SF-36 six months after hospital discharge	Test of difference among groups			
	Mean (SD) *		Difference among means (CI 95%)	P value
	No*	Yes*		
<b>Domains</b>				
Physical functioning	34.0 (27.8)	93.5 (14.6)	58.6 (49.9; 67.3)	< 0.001
Role-physical	44.9 (50.2)	82.5 (37.2)	37.6 (20.4; 54.9)	< 0.001
Role-emotional	45.5 (49.8)	93.1 (21.0)	47.5 (32.6; 62.3)	< 0.001
Bodily pain	57.8 (29.1)	82.1 (22.3)	24.3 (14.2; 34.4)	0.01
Social functioning	58.2 (26.7)	88.7 (17.5)	30.5 (21.7; 39.3)	< 0.001
Mental health	61.1 (23.9)	71.6 (13.7)	10.5 (2.9; 18.1)	0.01
Vitality	63.6 (23.1)	68.9 (14.9)	5.2 (92.4; 12.8)	0.19
General health	65.7 (24.7)	79.6 (16.1)	13.9 (5.7; 22.0)	0.001

Notes: \* No = did not return to work six months post-discharge; Yes = returned to work six months post-discharge. SD - standard deviation.

Evaluating the health-related quality of life six months after discharge, the group of patients that returned to work presented higher values for all the domains, and the statistically significant domains were: physical functioning ( $p < 0.001$ ), role-physical ( $p < 0.001$ ), role-emotional ( $p < 0.001$ ), bodily pain ( $p = 0.01$ ), social functioning ( $p < 0.001$ ), mental health ( $p = 0.01$ ), general health ( $p = 0.001$ ).

**DISCUSSION**

Young adults, men, and an economically active population were predominant in this study. The data confirm the studies developed by other authors<sup>(1,9-10)</sup>. The predominance of this population is due to greater exposure of young adult men to

risks of accidents, probably because they drive mostly in urban areas and show social and cultural behaviors that predispose them to risks of injuries and deaths, such as driving at high speeds and consuming alcoholic beverages<sup>(9)</sup>.

In the last few years, a noticeable increase in risk of death by accident involving motorcycles was observed<sup>(11)</sup>. Urbanization process has led to an exponential growth in the number of motorcycles used as means of transportation, since it provides speed (although not always within the legal speed limits), mobility, low cost, and can be used as a working tool, such as the case of “motoboy” and “mototaxi”<sup>(12)</sup>. In this study, motorcycles were the most common vehicle involved in accidents (60.8%), which probably contributed to an increased incidence of trauma in lower and upper limbs. The number of assistances provided to motorcyclists with skin injuries and bone fractures, especially in the lower and upper limbs, is on the rise<sup>(10-11)</sup>.

The nature of the injuries and the severity of the trauma can influence the length of hospital stay, type of treatment, and the conditions for hospital discharge<sup>(13)</sup>. In this study, most of the victims remained hospitalized between 2 and 10 days (65.7%), similar to what has been observed in the literature as well<sup>(14)</sup>.

The most common complications were nosocomial infections (11.7%). The presence of this complication influence the morbimortality of patients who remain hospitalized, and it can be related to the period of hospital stay, disease severity, nutritional conditions, and the nature of the diagnosis and/or therapeutic procedures<sup>(15)</sup>.

The fact that participants evaluated the perceived health status as better six months after hospital discharge can be related to their access to rehabilitation. Most of the trauma victims might have recovered their health status six months after the trauma, or this period could have been sufficient for adapting to the post-trauma conditions, as others authors found<sup>(16)</sup>.

Trauma reduces health-related quality of life in the medium and long term<sup>(17)</sup>. This fact can be associated with anatomical and physiological changes at the time of the trauma, and psychological and social aspects involved in the initial assistance provided to the trauma and to rehabilitation. Some variables may influence quality of life after the trauma, such as: extent of the sequelae, pain, access to rehabilitation, and social-economic condition<sup>(17)</sup>.

In relation to the analysis of explanatory variables of the health status perceived six months after hospital discharge, age, general health status score, and functional capacity at discharge were statistically significant, with a positive association.

In other studies on quality of life of victims of traffic accidents in general, the utmost severity of the trauma was predictive of worst quality of life, presence of symptoms of anxiety and depression, and decrease in social and family interaction with difficulty to returning to work<sup>(3)</sup>.

In this study, 53 victims of traffic accidents (52%) returned to work six months after hospital discharge. Studies show that multiple trauma victims returned to work activities and the return to work rates vary between 60% and 90%, in the first and second year after the trauma, respectively<sup>(18)</sup>. The percentage in this study was low and could be attributed to the follow-up period of just six months after hospital discharge, when maybe most individuals were still undergoing rehabilitation.

There was a mean decrease of 1.2 minimum wages in household income in the first six months after the accident. This reduction may be related to work leave without pay, in case of individuals who did not have an employment contract or received lower illness benefit, if compared to the minimum wage. The traumatic injuries resulting from accidents require, in many cases, prolonged sick leave during rehabilitation, which could lead to significant consequences related to socio-professional marginalization<sup>(19)</sup>. In these authors' view, returning to work is a complex problem that interferes in quality of life; it depends on the individual, pathology, rehabilitation, and social-economic environment. In addition, it represents a serious social cost, in terms of health care provision, medical leaves, and absenteeism.

In a longitudinal cohort study conducted in Australia, traffic accident victims, who were evaluated between two and eight months after the trauma and showed injuries in the lower limbs, returned to work on average 12 weeks after hospital discharge (CI 95%: 5.7 - 18.3). In the same study, the victims that presented injuries in other body regions, except for the extremities, returned to work three weeks after hospital discharge (CI 95%: 2 - 4)<sup>(20)</sup>.

In a meta-analysis on orthopedic injuries, there was moderate evidence related to age, gender, and severity effects of the injury for returning to work, whereas level of education and job type were important factors that influenced productivity<sup>(21)</sup>.

Several factors related to trauma may interfere in return to work, among them: type of initial injury and severity and presence of head trauma. In addition, there are more predictive factors for returning to work six months after the accident, among them: presence of physical or neuro-psychological impairments and persistent pain<sup>(19)</sup>. The present study did not find associations between age, gender, symptoms of anxiety, symptoms of depression, functional capacity and trauma mechanism changes, and return to work.

In this study, six months after hospital discharge, individuals who returned to work showed better evaluation in all SF-36 domains. On the other hand, the most affected domains, in the case of the victims that did not return to work, were physical functioning, role-physical, and role-emotional. In addition, a statistically significant difference was also observed in the evaluation of the perceived health status of

traffic accident victims six months after hospital discharge, according to return to work, related to bodily pain, physical functioning, role-physical, general health, social functioning, role-emotional, and mental health. Only vitality was not statistically significant.

There are few studies showing a relationship between return to work of traffic accident victims and quality of life. The most common situation has been to evaluate the results related to the SF-36 domains of victims in general. In a study conducted with multiple trauma victims, one year after the trauma, the domains that showed lower mean scores were role-physical, bodily pain, and vitality. The domains that received higher mean scores were social functioning, role-emotional, and general health<sup>(22)</sup>. In a study carried out with traumatic spinal cord injury resulting from traffic accidents, the domains "role-emotional" and "mental health" were affected, demonstrating unbalance between mind and body, leading to decreased quality of life reflected in all domains, especially social functioning<sup>(16)</sup>.

In a study conducted with a general population sample in Brazil, individuals who indicated some chronic health problem showed worst health status when compared to healthy individuals, and the means in the eight domains were statistically significant<sup>(2)</sup>.

This study shows as limitation the follow-up period of just six months. Other follow-up studies for a longer period are necessary for evaluating the final functional result of rehabilitation. In addition, the sample size was limited to time restriction for conducting the study.

The evaluation of the health status perception during hospital discharge can provide subsidies for the multi-professional team to organize the health care process, thus allowing the identification of patients who could face greater adaptation difficulty. The results of this study exposed the great challenges that nurses face dealing with decreasing in-hospital infection rates, which contribute to the severity of trauma and rehabilitation, especially promoting self-care to older patients with increased functional capacity limitations. New studies are necessary for allowing further research on the relationships between perceived health status and return to work, for the identification of factors that could be potentially revised.

## CONCLUSION

The current study indicated better health status perception for victims of traffic accidents six months after hospital discharge associated with lower age, better general health status, and improved functional capacity at the time of hospital discharge. Factors that facilitated or interfered in return to work were not identified. The most affected health-related quality of life domains for the victims that did not return to work were physical functioning, role-physical, and role-emotional. The role played by nurses during rehabilitation of traffic accident victims stands to focus on the educational process and individual assessment, aiming at the patient's functional independency, improvement of general health status, and, consequently, recovery and future quality of life.

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