● **Original article**

CHARACTERISTICS OF ELDERLY SUBMITTED TO DRIVER LICENSE TESTS

Maria Helena Lenardt[1], Nathalia Hammerschmidt Kolb Carneiro[2], Maria Angélica Binotto[3], Clovis Cechinel[4], Tânia Maria Lourenço[5], Letícia Marie Sakai[6]

ABSTRACT: A quantitative, descriptive and retrospective study was undertaken to screen for the characteristics of elderly people who took the physical and mental aptitude test to get the Brazilian driver license. Data were collected from 1023 forms of elderly aged ≥ 60 years at a clinic for traffic medicine in Curitiba-PR. The predominant characteristics were men (n=713; 69.7%), between 60 and 64.9 years of age (n=418; 40.9%), medicine use (n=621; 60.7%), overweight (n=419; 41%) and reduced visual acuity (n=573; 56%). As regards the aptitude to drive, 216 (21.1%) were considered apt; 803 (78.5%) apt with restriction and four (0.4%) temporarily inapt. Most elderly drivers are young elderly, male with restriction to drive due to the use of corrective lenses. The results offer support to advance on the theme in studies intended to improve the elderly's assessments and, consequently, contribute to safer traffic.
DESCRIPTORS: Aged; Automobile Driver Examination; Automobile Driving; Geriatric Nursing.

CARACTERÍSTICAS DOS IDOSOS SUBMETIDOS AOS EXAMES PARA A CARTEIRA DE HABILITAÇÃO VEICULAR

RESUMO: Trata-se de estudo quantitativo descritivo retrospectivo, cujo objetivo foi rastrear as características dos idosos que realizam o exame de aptidão física e mental para a carteira nacional de habilitação veicular. Coletaram-se dados em 1023 formulários de idosos com idade ≥ 60 anos em uma clínica de medicina do tráfego na cidade de Curitiba-PR. Houve predomínio de homens (n=713; 69,7%), idade entre 60 e 64,9 anos (n=418; 40,9%), uso de medicamentos (n=621; 60,7%), sobrepeso (n=419; 41%) e acuidade visual diminuída (n=573; 56%). Quanto à aptidão para dirigir, 216 (21,1%) foram considerados aptos; 803 (78,5%) aptos com restrição e quatro (0,4%) inaptos temporários. A maioria dos idosos motoristas é idoso-jovem, do sexo masculino e que possui restrição para dirigir pelo uso de lentes oculares. Os resultados fornecem subsídios para o avanço da temática em estudos que têm por objetivo aprimorar as avaliações dos idosos e, consequentemente, contribuir para um trânsito mais seguro.
DESCRITORES: Idoso; Exame para Habilitação de Motoristas; Condução de Veículo; Enfermagem Geriátrica.

CARACTERÍSTICAS DOS IDOSOS SUBMETIDOS AOS EXAMES PARA A CARTEIRA DE HABILITAÇÃO VEICULAR

RESUMEN: Se trata de estudio cuantitativa descriptivo retrospectivo con objeto de rastrear las características de los ancianos que realizan el examen de aptitud física y mental para la conducción de vehículos. Fueron recolectados datos en 1023 formularios de ancianos con edad ≥ 60 años en una clínica de medicina del tránsito en la ciudad de Curitiba-PR. Predominaron hombres (n=713; 69,7%), edad entre 60 y 64,9 años (n=418; 40,9%), uso de medicamentos (n=621; 60,7%), sobrepeso (n=419; 41%) y acuidad visual disminuida (n=573; 56%). Respecto a la aptitud para dirigir, 216 (21,1%) fueron considerados aptos; 803 (78,5%) aptos con restricción y cuatro (0,4%) inaptos temporarios. La mayoría de los ancianos motoristas es anciano-joven, del sexo masculino y con restricción para dirigir debido al uso de lentes oculares. Los resultados fornecen subsidios para el avance del tema en estudios con objeto de perfeccionar las evaluaciones de los ancianos y, consecuentemente, contribuir hacia un tránsito más seguro.
DESCRIPTORES: Anciano; Examen de Aptitud para la Conducción de Vehículos; Conducción de Automóvil; Enfermería Geriátrica.

[1]RN. Ph.D. in Nursing Philosophy. Professor, Graduate Nursing Program at Universidade Federal do Paraná. Curitiba, PR, Brazil.
[2]RN. Ph.D. candidate in Nursing. Universidade Federal do Paraná. Curitiba, PR, Brazil.
[3]Physical Educator. Ph.D. candidate in Nursing. Universidade Federal do Paraná. Curitiba, PR, Brazil.
[4]MD. M.Sc. in Nursing. Geriatric physician at Hospital Zilda Arns. Curitiba, PR, Brazil.
[5]RN. Ph.D. candidate in Nursing. Universidade Federal do Paraná. Curitiba, PR, Brazil.
[6]Nursing Undergraduate. Universidade Federal do Paraná. Curitiba, PR, Brazil.

Corresponding author:
Nathalia Hammerschmidt Kolb Carneiro
Universidade Federal do Paraná
R. Lothario Meissner, 632 - 80210-170 - Curitiba, PR, Brasil
E-mail: nathalia.kolb@gmail.com

Received: 23/08/2016
Finalized: 07/02/2017

● INTRODUCTION

When considering aging and longevity, there are many concerns with these changes and their impact on people's quality of life. Although this represents a conquest, it entails different challenges for the aging subject and for society in general.

For aging to be a positive experience, a longer life should be accompanied by continuing opportunities for health, participation and safety[1]. Under these circumstances, the need for good mobility conditions can be highlighted, which remits to transport and elderly people's driving of motor vehicles.

According to data from the UK National Travel Survey, the percentage of people aged 70 years or older holding a driver license increased from 38% in 1995-1997 to 58% in 2012. This finding is even clear among women aged 70 years or older, where the number of licenses doubled from 21% in 1995-1997 to 42% in 2012. In the same period, in the elderly between 60 and 69 years of age, an increase from 63% to 79% was observed in men and from 45% to 70% in women[2].

A survey by the Traffic Department in the State of Paraná revealed that 219,439 drivers over 65 years of age are active and driving in the state. They represent 4.7% of the 4.5 million drivers registered in the state, with an upward trend in the next years[3].

The concept of traffic safety and its implications to maintain the mobility of elderly people are emerging themes. Nevertheless, their effectiveness is urgent, due to the significant increase in the fleet of cars and motorcycles and in traffic violence. For elderly people, keeping on driving is equivalent to independence and freedom, besides access to social life and leisure activities, which represent important factors that prevent the elderly's social isolation. In addition, it reduces the chance of institutionalization and depression in these individuals[4]. Driving is a complex function though, which requires the integration of the sensory organs, the cognitive function and the psychomotor activity. The drivers should continuously perceive the changes around them, make decisions based on these perceptions and execute the appropriate responses[5].

Some factors can contribute for the elderly to become incapable of driving, such as the loss of sight, hearing, muscle strength, flexibility, too many fines and difficulty to pass the assessment tests[6].

Medicine use, signs of illness and physical weakness contribute to a greater exposure trend to the risk of traffic accidents in elderly drivers[7]. Some medicines they use, such analgesics, anxiolytics or anti-depressive agents entail adverse effects for driving, as they act direct or indirectly on the central nervous system, affecting the psychomotor function and/or balance[8]. The physical frailty takes the form of changes related to aging, such as neuromuscular alterations, deregulation of the neuroendocrine system and dysfunction of the immunological system. Similarly, it is associated with a physical cycle of exacerbated decline of multiple systems, resulting in reduced muscle strength and tolerance to effort, energy deficit and sarcopenia, causing a state of vulnerability in the elderly[9-10].

The content of this article results from the first phase of a large research project entitled "Frailty in elderly and the driver license", which shows significant results from further research, mainly due to the gap found in the literature on the theme. This is an original study in gerontology and outlines a new context for gerontological nursing care.

In view of the above, this study aimed to screen for the characteristics of the elderly people who took the physical and mental aptitude test to get the Brazilian driver license (CNH).

● METHOD

A quantitative, descriptive and retrospective study was undertaken, based on secondary data obtained from the registers on the standard form of the agency responsible for the driver license. The study was undertaken at an accredited clinic to organize the physical and mental aptitude test for driving, located in the city of Curitiba-Paraná. There are 54 accredited clinics in the city of Curitiba (when the research was undertaken). The clinic was selected through a simple random draft from the

list of clinics provided by the accrediting agency.

The distribution of the elderly across the clinics is in accordance with the Resolution of the Federal Council of Medicine (CFM) 1636/2002[11], which establishes the impartial distribution of all tests through the compulsory, random and impersonal division among the accredited entities and physicians. The tests are distributed by the Traffic Department. The subjects are never allowed to choose among the accredited clinics in the city.

The study was developed based on data registered in the standard form for elderly aged 60 years or older who took the physical and mental aptitude test and/or the psychological assessment to obtain, renew, add or change the category to driver motor vehicles. The sample period went from December 2012 to December 2014 and the sample consisted of 1023 forms. The following criteria were established to include the elderly in the study: take the physical and mental aptitude test at the clinic; and be 60 full years old or more by the test date. No exclusion criteria were established.

The data collection started in October 2014 and was concluded in March 2015 through a form based on the variables in the National Register of Qualified Drivers (RENACH), including the following variables of interest: sex, age, occupation, drugs, physical impairment, (psychiatric, cardiac, ophthalmological, motion organ, auditory, upper limb, neurological and postural balance) illnesses), anthropometric data, dynamometry, illegal drugs, traffic accidents and aptitude to drive.

The data were organized in the software Excel® 2007 and analyzed in Statistical Package for the Social Sciences version 21.0. The data were treated through descriptive statistics, with absolute and relative frequency distribution, means and standard deviation.

The research project obtained a favorable opinion under number 833.460. The access to the accredited clinic and to the National Register of Qualified Drivers was achieved through authorization and partnership with the clinics and the agency responsible for the driver license.

● **RESULTS**

In Table 1, the predominance of male elderly (n=713; 69.7%), between 60 and 64.9 years of age (n=418; 40.9%) is shown. The elderly's mean age was 67±6.1 years, being 67.4±6.3 years for the male sex and 66±5.6 years for the female. Concerning the clinical variables, most elderly reported taking one or more medications (n=621; 60.7%), but did not declare health problems (n=861; 84.2%). Similarly, the majority denies physical impairment (n=990; 96.8%), episodes of dizziness (n=1009; 98.6%) and traffic accidents (n=878; 85.8%). According to the categories of BMI values(12),the registers appointed 419 elderly (41%) with overweight and 195 (19%) with obesity.

Table 1 – Sociodemographic and clinical characteristics of elderly submitted to the physical and mental aptitude test to get the Brazilian driver license. Curitiba, PR, Brazil, 2015 (continues)

CHARACTERISTICS	CLASSIFICATION	n (%)
Sex	Female	310 (30.3)
	Male	713 (69.7)
Age	60-64.9 years	418 (40.9)
	65-69.9 years	329 (32.2)
	70-74.9 years	137 (13.4)
	75-79.9 years	91 (8.9)
	80 years or older	48 (4.7)
Profession/ Sector	Primary†	6 (0.6)
	Secondary±	63 (6.2)
	Tertiary§	624 (60.9)
	Retired	330 (32.3)

Medication use	Yes	621 (60.7)
	No	402 (39.3)
Dizziness	Yes	14 (1.4)
	No	1009 (98.6)
Illnesses	Yes	162 (15.8)
	No	861 (84.2)
Traffic accident	Yes	145 (14.2)
	No	878 (85.8)
Body Mass Index (BMI)	Low weight	22 (2.2)
	Eutrophic	248 (24.2)
	Overweight	419 (41)
	Obesity	195 (19.1)
	Did not answer	139 (13.5)

Source: The authors (2015)
†Primary sector = agriculture and mining. ±Secondary sector = transformation industry and civil construction. § Tertiary sector = general services and trade[13].

Concerning the visual acuity variable, 573 (56%) elderly used assistive technologies for visual correction. The remaining variables in the physical and mental aptitude test (auditory acuity, cardiac auscultation, assessment of upper and lower limbs) presented no significant changes. Elderly with right and left dynamometric results of 30-40 Kgf (n=975; 95.3% and n=971; 94.9%, respectively) were prevalent (Table 2).

Table 2 – Results of elderly submitted to the physical and mental aptitude test to get the Brazilian driver license. Curitiba, PR, Brazil, 2015

CHARACTERISTICS	CLASSIFICATION	n (%)
Visual acuity	With correction	573 (56)
	Without correction	444 (43.4)
	Did not answer	6 (0.6)
Auditory acuity	Altered	0 (0)
	Normal	1021 (99.8)
	Did not answer	2 (0.2)
Cardiac auscultation	Altered	48 (4.7)
	Normal	970 (94.8)
	Did not answer	5 (0.5%)
Upper limbs	Altered	16 (1.6)
	Normal	1005 (98.2)
	Did not answer	2 (0.2%)
Right dynamometry	10 - 20 kgf	42 (4.1%)
	30 – 40 kgf	975 (95.3)
	Did not answer	6 (0.6%)
Left dynamometry	10 – 20 kgf	44 (4.3%)
	30 – 40 kgf	971 (94.9)
	Did not answer	8 (0.8%)
Lower limbs	Altered	18 (1.8)
	Normal	1001 (97.8)
	Did not answer	4 (0.4%)

Source: The authors (2015)

In the end result of the elderly's physical and mental aptitude test (Graph 1), 216 (21.1%) were considered apt, 803 (78.5%) apt with one or more restrictions to drive and four (0.4%) temporarily inapt.
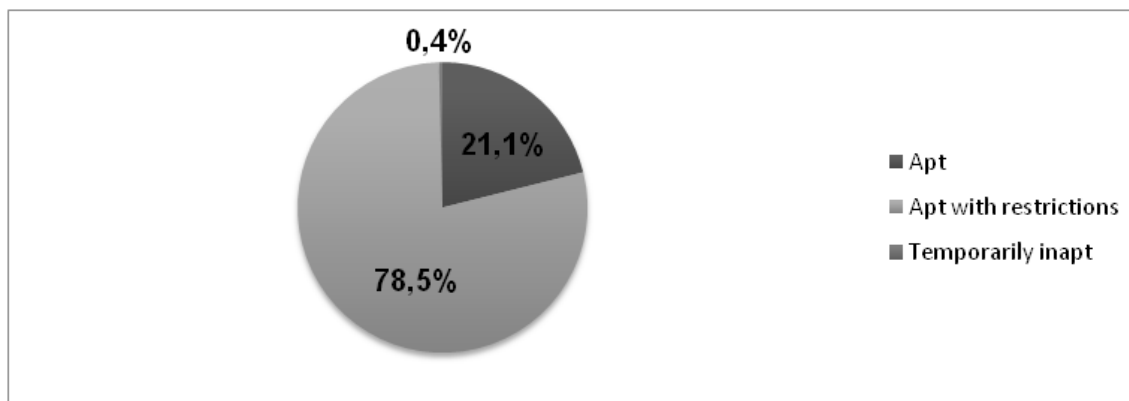
Graph 1 – End results of elderly on the physical and mental aptitude test for the driver license. Curitiba, PR, Brazil, 2015

Among the 803 elderly declared apt with restrictions, the main part was due to the use of corrective lenses (n=560; 54.7%), followed by the category not authorized C (n=374; 36.6%) (Table 3).

Table 3 – Restrictions of elderly on the physical and mental aptitude test for the driver license. Curitiba, PR, Brazil, 2015

CHARACTERISTICS†	CLASSIFICATION	n (%)
Use of corrective lenses	Yes	560 (54.7)
Category not authorized	Only C	374 (36.6)
	A and C	17 (1.7)
Use of auditory prosthesis	Yes	18 (1.8)
Monocular sight	Yes	10 (1)
Prohibited to drive on highways and major roads	Yes	6 (0.6)
Prohibited to drive after sundown	Yes	2 (0.2)
Deaf driver	Yes	0 (0)

†Each elderly can present one or more restrictions to drive.
Source: The authors (2015)

● DISCUSSION

Male elderly were predominant in the age range between 60 and 64.9 years, service professionals, followed by retired individuals and pensioners. Although studies appoint the feminization of old age[14-15], the number of male elderly drivers is twice as high as that of female elderly drivers. This result is in accordance with the statistics of the State of Paraná Traffic Department[16], which revealed a larger number of male elderly drivers in Curitiba (n=108,519) when compared to female drivers (n= 49,037).

The number of men qualified to drive predominates in all age ranges[16]. This result is related to the greater insertion of men in the job market and the professions in which men are predominant, such as driver. The women who are elderly nowadays were frequently victims of discrimination in the access to education, wages, food, significant work and political power[17]. These cumulative disadvantages may also have influenced the elderly women's lesser access to the driver license.

In this study, the young elderly individuals were active, with preserved functional capacities and lower physical frailty rates, which justifies their greater presence at the driver license sector. According to an international study[18], health problems are the most common reasons for elderly people to quit driving, followed by doctor's advice, traffic accidents, family interventions or influence of some variables, such as age.

Elderly individuals predominated who referred medication use and no health problems. It is known that medication use increases with age, in line with findings in the international literature. In the USA, elderly over 65 years of age consume more than 30% of annual medicine prescriptions(8). The fact that elderly people drive vehicles at increasingly advanced ages when compared to previous generations arouses the need for more in-depth research on how medicines affect the elderly's driving capacity[19]. While alcohol is known to be a contributing factor to car crashes, the contribution of medicines in traffic accidents has not been well explained yet[19].

Continuing medication use to treat some illnesses, and consequently control their symptoms, makes some elderly not notice the presence of the disease in their daily life, which can partially justify the result found.

A minority of the elderly indicated the symptom dizziness. In Natal-RN, a study was developed that assessed the presence of dizziness in 50 elderly between 60 and 88 years of age, who participated in a community group in the Unified Health System (SUS). The results show that 17 (35.1%) elderly presented vertigo, six (13.5%) vertigo associated with another type of dizziness, 12 (24.3%) disequilibrium, four (8.1%) buoyancy, eight (16.2%) presyncope and one (2.8%) buoyancy and presyncope[20].

The low percentage of elderly with episodes of dizziness and syncope is expected, as these elderly took the physical and mental aptitude test for the driver license and the presence of these symptoms could make it unfeasible for them to drive. According to the Brazilian Traffic Council[21], the supreme regulatory and consultation agency of the National Traffic Symptom, when the candidate for a driver license mentions the symptom dizziness, the expert physician administering the test should request an otoneurological examination to assess the safety conditions to drive – that is sufficient motive to justify the low prevalence in the study population.

Among the 1023 elderly assessed, 573 (56.0%) presented the need for visual correction. Driving requires good visual acuity from the driver, using corrective lenses or not. In a cohort involving 2520 elderly North Americans, which was intended to associate the types of visual functional loss with the changes in car driving, it was demonstrated that the visual acuity variables is significantly associated with the variables decrease in kilometers run and driving in unknown areas[22]. The decrease in the visual function indicates alterations in the way the elderly drive and assessing the visual acuity is extremely important in this age range.

Elderly people with normal visual acuity were predominant (n=1021; 99.8%), differently from the literature findings. In a study[23] developed in an Elderly College Education Program in the city of Salvador (BA), the hearing of 40 elderly between 61 and 88 years of age was assessed. Using the Hearing Inventory for the Elderly (IAPI) and an audiometric test, the study showed that 37.5% of the elderly presented normal hearing and 62.5% some hearing loss, being 30% asymmetric and 32.5% symmetric hearing loss. It is know that hearing is fundamental to good driving and, therefore, measures are needed such as the exclusion of self-reporting and more sensitive tests.

The cardiorespiratory assessment undertaken through cardiac auscultation presented changes in 48 (4.7%) elderly, including arrhythmias and hyperphonetic cardiac sounds. It is known, however, that the percentage of cardiac problems in Brazilian elderly exceeds the result found. In a survey among elderly from 16 Brazilian capitals, 12.6% suffered from ischemic heart disease associated with systemic arterial hypertension and diabetes mellitus[24].

The Consensus of the Brazilian Association of Traffic Medicine (ABRAMET) establishes that Myocardial Infarction (MI) leads to temporary inaptitude to drive for eight weeks, while Angina Pectoris victims can only drive if the symptoms are under control. In both diseases, the renewal term can be reduced at the physician's discretion. Heart failure (HF) makes the candidate temporarily inapt until the situation stabilizes[25].

As for the upper and lower limb strength, most elderly (n=1005; 98.2% and n=1001; 97.8%, respectively) were considered within normal parameters. The lower limb strength is not assessed on the physical and mental aptitude test according to the standards established in the relevant literature. Brazilian[17,26] and international[27-28] studies appoint that the increased age implies a reduction in the walking speed. That reduction influences the elderly's vitality, as their execution, movement control and support are related to the functioning of multiple organs, such as the heart and lungs, circulatory, nervous and musculoskeletal systems[27].

It is fundamental to apply simple performance tests, such as the assessment of the walking speed in driving elderly. These tests permit the identification of elderly functional decline and the screening of elderly with a loss of muscle mass and, consequently, of lower limb strength to use the pedals.

The evaluation of the manual grip force (MGF) ranged between 30kgf (n=975;95.3%) and 40kgf (n=971;94.9%) for the right and left upper limb, respectively. The MGF scores are compatible with the requirements on the driving test (20 kgf in each hand for candidates to drive motor vehicles and cars and 30 kgf in each hand for candidates to drive trucks, buses and tow trucks), with relatively high averages when compared to other community-based elderly.

The MGF results indicate that these elderly are active and robust, with muscle strength compatible with the renewal of the driver license. The type of dynamometer used for the measures should be taken into account, which is considered less precise when compared to the type used in Brazilian and international studies.

In this study, a predominance of overweight elderly was observed. This finding is a source of concern, as the excessive weight increase represents a risk factor for different diseases, mainly heart-related. According to studies[29-30], obesity increases the risk of severe injury in car accidents. Increased BMI causes anatomic and physiological changes that modify the passengers' normal response to the safety belt during an accident[29]. Thus, the increased energy transfer and impulse can replace the protective effect of the fat layer and cause more severe injuries[30].

Based on the result, further research is suggested focused on the BMI of vehicle users. These studies can contribute to the conception of new safety equipment, which adapt to the different levels of BMI and result in less severe injuries for drivers and passengers.

What the end results of the driving test are concerned, elderly people classified as apt with one or more restrictions to drive were predominant. The elderly who submit to the aptitude test for driving present a low level of failure. It is emphasized that there may be loopholes in the self-reported questions the candidates are asked, covering items related to the factors interfering in driving.

As a study limitation, it is highlighted that some variables of interest that would support further discussion were not discussed, as they were not addressed in the registers of the form analyzed. Other cross-sectional and longitudinal studies are suggested to further explore the characteristics and relations between elderly people and driving.

● **CONCLUSION**

Elderly drivers are young elderly men, who take medication, use corrective lenses, are not physically disabled and do not report dizziness, fainting, convulsion, vertigo and other illnesses. In the physical examination, they presented intact auditory acuity, normal cardiac auscultation, upper and lower limbs without alterations and dynamometry in both upper limbs compatible with normal results. As for vehicle driving, elderly people considered apt with some kind of restriction were predominant. The use of corrective lenses and the category not authorized C were the predominant restrictions.

This is an original study in gerontological nursing and is expected to arouse the nursing professionals' interest in the context of car driving. The results offer support to the advance of the theme in studies intended to improve the elderly's assessments and, consequently, to contribute to safer traffic.

● **FUNDING**

● **REFERENCES**

1. Centro Internacional de Longevidade Brasil (ILC-Brasil). Envelhecimento ativo: um marco político em resposta à evolução da longevidade. [Internet] 2015 [acesso em 23 ago 2016]. Disponível: http://ilcbrazil.org/portugues/wp-content/uploads/sites/4/2016/02/Envelhecimento-Ativo.pdf

2. Great Britain – Department For Transport (DFT). Statistical Release - National Travel Survey 2012. [Internet] 2013 [acesso em 20 fev 2016]. Disponível: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/243957/nts2012-01.pdf

3. Governo do Estado do Paraná (PR). Anuário estatístico: 2013. Curitiba: Governo do Estado do Paraná; Departamento de Trânsito do Paraná; 2014. 134p. Relatório Final.

4. Marottoli RA, de Leon CFM, Glass TA, Williams CS, Cooney Jr LM, Berkman LF. Consequences of driving cessation: Decreased out of home activity levels. J Gerontol B Psychol Sci Soc Sci. [Internet] 2000;55(6) [acesso em 22 fev 2016]. Disponível: https://www.ncbi.nlm.nih.gov/pubmed/11078110

5. Cunha UGV, Thomaz DP. Risk of dementia misdiagnosis among car drivers. Rev Med Minas Gerais. [Internet] 2011;21(2) [acesso em 22 fev 2016]. Disponível: http://pesquisa.bvsalud.org/ses/resource/pt/lil-598711

6. Lacerda LP, Carlos CMG. O idoso no trânsito. UNAR. [Internet] 2012;6(1) [acesso em 14 fev 2016]. Disponível: http://revistaunar.com.br/cientifica/documentos/vol6_n1_2012/4_o_idoso_no_transito.pdf

7. Mcgwin Jr G, Sims RV, Pulley L, Roseman JM. Relations among chronic medical conditions, medications, and automobile crashes in the Elderly: a population-based case-control study. Am J Epidemiol. [Internet] 2000;152(5) [acesso em 12 mar 2016]. Disponível: https://www.ncbi.nlm.nih.gov/pubmed/10981455

8. Rudisill TM, Zhu M, Davidov D, Leann Long D, Sambamoorthi U, Abate M, et al. Medication use and the risk of motor vehicle collision in West Virginia drivers 65 years of age and older: a case-crossover study. BMC Res Notes. [Internet] 2016;166(9) [acesso em 13 abr 2016]. Disponível: http://dx.doi.org/10.1186/s13104-016-1974-x

9. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: Evidence for a phenotype. J. Gerontol A Biol Sci Med Sci. [Internet] 2001;56(3) [acesso em 13 abr 2013]. Disponível: https://www.ncbi.nlm.nih.gov/pubmed/11253156

10. Zaslavsky O, Cochrane BB, Thompson HJ, Woods NF, Herting JR, LaCroix A. Frailty: a review of the first decade of research. Biol Res Nurs. [Internet] 2013;15(4) [acesso em 13 abr 2014]. Disponível: http://www.ncbi.nlm.nih.gov/pubmed/23086382

11. Conselho Federal de Medicina. Resolução nº 1636 de 10 de maio de 2002. Dispõe sobre o teste exame de aptidão física e mental para condutores de veículos automotores. Brasília: CFM; 2002.

12. Organización Panamericana de la Salud (OPAS). Encuesta Multicêntrica: Salud, bienestar y envejecimiento (SABE) en América Latina y el Caribe. XXXVI Reunión del Comité Asesor de Investigaciones en Salud. 2001 [acesso em 23 out 2016]. Disponível: http://envejecimiento.csic.es/documentos/documentos/paho-salud-01.pdf

13. Pochmannm M. Economia solidária no Brasil: possibilidades e limites. IPPEA [Internet] 2004;24(n esp) [acesso em 23 out 2016]. Disponível: http://repositorio.ipea.gov.br/handle/11058/5249?locale=pt_BR

14. Salgado CDS. Mulher idosa: a feminização da velhice. Estud. interdiscip. Envelhec. [Internet] 2002;4(n esp) [acesso em 16 de jul 2016]. Disponível: http://seer.ufrgs.br/index.php/RevEnvelhecer/article/view/4716/2642

15. de Lima LCV, Bueno CMLB. Envelhecimento e gênero: A vulnerabilidade de idosas no Brasil. Revista Saúde e Pesquisa. [Internet] 2009;2(2) [acesso em 04 dez 2015]. Disponível: http://periodicos.unicesumar.edu.br/index.php/saudpesq/article/view/1173

16. Governo do Estado do Paraná (BR). Anuário estatístico: 2012. Curitiba: Governo do Estado do Paraná; Departamento de Trânsito do Paraná; 2012. 134p. Relatório Final.

17. Lenardt MH, Carneiro NHK, Betiolli SE, Ribeiro DKMN, Wachholz PA. Prevalence of pre-frailty for the component of gait speed in older adults. Rev. Latino-Am. Enfermagem. [Internet] 2013;21(3) [acesso em 10 Abr 2016]. Disponível: http://dx.doi.org/10.1590/S0104-11692013000300012

18. Chihuri S, Mielenz TJ, DiMaggio CJ, Betz ME, DiGuiseppi C, Jones VC, et al. Driving Cessation and Health Outcomes in Older Adults. J Am Geriatr Soc. [Internet] 2016;64(2) [acesso em 13 abr 2016]. Disponível: https://www.ncbi.nlm.nih.gov/pubmed/26780879

19. Kelly E, Darke S, Ross J. A review of drug use and driving: epidemiology, impairment, risk factors and risk perceptions. Drug Alcohol Rev. [Internet] 2004;23(3) [acesso em 24 abr 2016]. Disponível: http://dx.doi.org/10.1080/09595230412331289482

20. Ferreira LMBM, Ribeiro KMOBF, Pestana ALS, de Lima KC. Prevalence of dizziness in older people. Rev. CEFAC. [Internet] 2014;16(3) [acesso 17 jul 2015]. Disponível: http://dx.doi.org/10.1590/1982-021620142913

21. Conselho Nacional de Trânsito. Resolução nº 425 de 27 de novembro de 2012. Dispõe sobre o exame de aptidão física e mental, a avaliação psicológica e o credenciamento das entidades públicas e privadas de que tratam o art. 147, I e §§ 1º a 4º e o art. 148 do Código de Trânsito Brasileiro. Brasília: Contran; 2012.

22. Freeman EE, Munõz B, Turano KA, West SK. Measures of Visual Function and Their Association with Driving Modification in Older Adults. IOVS. [Internet] 2006;47(2) [acesso em 26 abr 2016]. Disponível: http://dx.doi.org/10.1167/iovs.05-0934

23. de Sousa MGC, Russo ICP. Hearing and perception of hearing loss in elderly people. Rev. soc. bras. fonoaudiol. [Internet] 2009;14(2) [acesso em 15 jul 2015]. Disponível: http://dx.doi.org/10.1590/S1516-80342009000200016

24. Pereira JC, Barreto SM, Passos VMA. The profile of cardiovascular health of elderly Brazilian people needs to improve: a population-based study. Arq. Bras. Cardiol. [Internet] 2008;91(1) [acesso em 10 mai 2015]. Disponível: http://dx.doi.org/10.1590/S0066-782X2008001300001

25. Conselho Nacional de Trânsito. Resolução nº 267 de 15 de fevereiro de 2008. Dispõe sobre o exame de aptidão física e mental, a avaliação psicológica e o credenciamento das entidades públicas e privadas de que tratam o art. 147, I e §§ 1º a 4º e o art. 148 do Código de Trânsito Brasileiro. Brasília: Contran; 2008.

26. Busch TA, Duarte YA, Nunes DP, Lebrão ML, Naslavsky MS, Rodrigues AS, et al. Factors associated with lower gait speed among the elderly living in a developing country: a cross-sectional population-based study. BMC Geriatrics. [Internet] 2015;15 [acesso em 23 de out 2016] Disponível: http://dx.doi.org/10.1186/s12877-015-0031-2

27. Studenski S, Perera S, Patel K, Rosano C, Faulkner K, Inzitari M, et al. Gait speed and survival in older adults. JAMA. [Internet] 2011;305(1) [acesso em 23 mai 2014]. Disponível: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3080184/

28. Jankovik J. Gait disorders. Neurol Clin. [Internet] 2015;33(1) [acesso em 14 abr 2016]. Disponível: http://dx.doi.org/10.1016/j.ncl.2014.09.007

29. Zhu S, Kim JE, Ma X, Shih A, Laud PW, Pintar F, et al. BMI and Risk of Serious Upper Body Injury Following Motor Vehicle Crashes: Concordance of Real-World and Computer-Simulated Observations. PLoS Med. [Internet] 2010;7(3) [acesso em 13 abr 2016]. Disponível: http://dx.doi.org/10.1371/journal.pmed.1000250

30. Carter PM, Flannagan CA, Reed MP, Cunningham RM, Rupp JD. Comparing the Effects of Age, BMI and Gender on Severe Injury (AIS 3+) in Motor-Vehicle Crashes. Accid Anal Prev. [Internet] 2014;72(n esp) [acesso em 14 abr 2016]. Disponível: http://www.ncbi.nlm.nih.gov/pubmed/25061920