ORIGINAL ARTICLE

Factors associated to multimorbidity in inpatient elderly according to sociodemographic characteristics, lifestyle and use of services

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ABSTRACT

Introduction: Aging is a physiological process associated to decreased functional capacity and the presence of diseases, especially chronic noncommunicable diseases. **Objective:** To analyze the prevalence and factors associated to the multimorbidity of elderly in a teaching hospital, according to sociodemographic characteristics, lifestyle and use of services in the health care network. **Methods:** Descriptive and inferential cross-sectional study, conducted with 144 hospitalized patients 60 years of age or more, from January to June 2018, in a university hospital in the state of Paraná. Data were collected 30 days after hospital discharge by telephone interview. The dependent variable was the occurrence of multimorbidity and the independent variables were: sociodemographic characteristics, lifestyle and use of hospital health services. Logistic regression analysis was performed. **Results:** It was found that 55% of the elderly had multimorbidity. The elderly who were more chances to have multimorbidity where there low education (OR=16.29; CI:2.75-96.42), non-white (OR=2.34; CI:1.00-5.50) hospitalized longer (4 to 7 days: OR=6.91; CI:2.40-19.96; more than 7 days: OR=3.03; CI:1.00-9.22), who scheduled to return to the hospital (OR=18.99; CI: 1.30-277.87), and that after discharge they needed help from someone to follow the medical recommendations (OR=3.16; CI:1.38-7.22). **Conclusion:** It was identified a high prevalence of multimorbidity, and important factors associated to multimorbidity in hospitalized elderly, with emphasis on education; color; hospitalization time; scheduling of return to hospital after discharge; need for help from someone (family member/caregiver), without post-discharge, to follow medical recommendations.

Keywords: multimorbidity; hospitalization; risk factors; aged; geriatric nursing; noncommunicable diseases.

INTRODUCTION

Aging is a physiological process associated with decreased functional capacity and the presence of diseases, especially chronic noncommunicable diseases (NCD)[1]. Hypertension, Diabetes Mellitus, chronic respiratory diseases, and neoplasms represent the main chronic NCD in the elderly population and are determined by several factors,

characterized by the gradual onset of usually uncertain prognosis, and with long duration, being the presence of two or more morbidities in an individual, being associated, or not, with the so-called multimorbidity[2].

Multimorbidity is associated with increased mortality rates, decrease or loss of functional capacity, greater demand for health care and hospital resources such as beds, materials and attention and service time of professionals[3,4]. Thus, it can be inferred that the presence of multimorbidity contributes to the complexity of care and to the increase of expenses in health services, making the appropriate management a challenge for the system[3,5].

Most non-elective hospitalizations are due to the decompensation of chronic diseases, or to acute situations that can be complicated by their multimorbidity. Avoidable hospitalizations are a warning to public health, showing the unpreparedness and lack of quality in primary health care. Thus, multimorbidity shows up as an important problem in public health, which deserves special attention, being imperative the need to identify the susceptible subject and elucidate the factors associated with the development of morbidity and multimorbidity, in order to act to prevent hospitalization by promoting a decrease in its incidence and recurrence[5,6].

In the face of this, this study aimed to analyze the prevalence and factors associated with multimorbidity in patients admitted to a teaching hospital, according to sociodemographic characteristics, lifestyle and use of hospital services.

METHODS

Study type, sample, and sampling

This is a cross-sectional, descriptive, and inferential study, developed with 144 patients aged 60 years or older hospitalized, from January to June 2018, in a university hospital in the state of Paraná, which provides medium and high complexity medical and hospital care to a population from several locations in the Campos Gerais region, with a total of 160 hospital beds and an average of 950 admissions per month.

For the sample size calculation, the monthly average of elderly inpatients (n=60) was multiplied by 6 (estimated number of months for collection) (n=1,200), with a precision of 5%, confidence interval of 95% and design effect 1, for a prevalence of 88% of inpatients satisfied with the hospital service, object of the research macro-project, which fostered this study. The prevalence was estimated by means of the average satisfaction of previous studies in hospitals[7,8]. This resulted in a total of 144 individuals. The software Epi. Info7.1.4 software was used for this estimate.

Inclusion criteria were: to be 60 years old or older; to be hospitalized during the collection period, regardless of length of stay; or to be a family member or caregiver who had fully followed the

hospitalization process (when the participant was unable to answer the questionnaire); to have been discharged from the hospital 30 days before the interview. Individuals under 60 years of age, elderly patients who died, patients who had no telephone contact in their medical records, and family members or caregivers who did not agree to participate in the study were excluded.

Data Collection

A structured questionnaire was developed, containing social characteristics and questions related to the object of study, based on an instrument proposed by the Brazilian Ministry of Health[9].

Data collection was structured in three stages: the first stage was related to the collection of information about hospitalization in the hospital's own information system. The second stage referred to the access to the patient's electronic medical records to obtain sociodemographic information and telephone contact, in order to list eligible patients. The third stage involved making phone calls to the patients to gather information about their social demographic characteristics, which were complemented by their medical records, lifestyle, and use of hospital health services. Because it was a telephone interview, consent was given verbally, after explaining the objectives, how the data would be collected and used, and reading the informed consent form.

It is worth mentioning that all steps were carried out by previously trained and calibrated researchers. The average time of the interviews was 20 minutes, focusing on the variables of interest to the study, which were sociodemographic characteristics, presence of diseases, lifestyle and use of health services during hospitalization and post-discharge and need for assistance at home. It is noteworthy that all variables refer to self-report, including those of lifestyle, how the patient perceives himself in relation to obesity and practice of physical activity.

After explaining the study objectives, all means of collection, analysis, and dissemination of results, individuals who agreed to participate in the survey were considered.

Data Analysis

Data were tabulated in Microsoft Excel 2013® and analyzed using the statistical software SPSS® (Statistical Package for the Social Sciences) 18. The occurrence (presence/absence) of multimorbidity was considered as a dependent variable. This variable was created from the analysis of the answers of the reason for hospitalization and presence of chronic diseases. Individuals with the presence of two or more chronic conditions joined the group with multimorbidity; and for the group without multimorbidity, individuals with the presence of only one or nonchronic disease; and with acute diseases or conditions.

Prior to the analysis, the independent variables were treated and reorganized, preferably in dichotomous form, especially for the variables that presented few subjects in certain categories, so

that the statistical test would be accurate. For example, variables such as smokers and alcoholics who had been and are currently alcohol and tobacco abusers were grouped into "yes" and "ex-smoker" and "yes" and "ex-alcoholic", respectively, since these conditions, even if past, have an impact on the current life condition of the individual.

Thus, the independent variables were presented as follows: Sociodemographic characteristic: gender (female, male), skin color (white, black, mixed, asian), marital status (married or stable union, widowed, other: grouped single and divorced), lives alone (no, yes), education (numeric variable categorized into: 10 or more years of completed education, 6 to 9 years of completed education, illiterate, and less than 6 years of education), monthly income (numeric variable grouped into: $2 \geq$ minimum wages, $1 > 2$ minimum wages, >1 minimum wage); Lifestyle: smoker (no, yes or former smoker), drinker (no, former drinker or drinker), self-reported sedentary (no, yes), self-reported obesity (no, yes); Intra-hospital: length of hospital stay (numeric variable categorized into: up to 3 days, 3 to 7 days, and more than 7 days), ICU stay (no, yes); length of ICU stay (numeric variable categorized into: up to 3 days, more than 3 days), previous hospital admission (no, yes), scheduling a return to the hospital, post discharge (no, yes), needing help from someone (family member/caregiver), post discharge, to follow medical recommendations (no, yes).

To investigate the association between the presence of multimorbidity and the surveyed items, the chi-square test was used initially. Next, logistic regression analysis was performed using the *stepwise* input method, based on the likelihood ratio value. The variables that presented a value of $p \leq 0.20$ in the bivariate analysis were selected to enter the multiple models, remaining in the models if they reached $p \leq 0.05$ and/or adjusted the model.

Research ethics

The research was approved by the Committee for Ethics in Research with Human Subjects (process 2,461,494/2018; CAAE 81453417.1.0000.0105), respecting the resolution 466/12 of the Brazilian Health Council and the Declaration of Helsinki.

RESULTS

It was verified that 55% of the elderly individuals investigated had multimorbidity. There was a prevalence in the sample of elderly women, white, married or in a stable union, with low education, income between 1 and 2 minimum wages and living with other people. Moreover, most of the elderly did not report being alcoholic, smoker, obese, only sedentary (Table 1).

Regarding the presence of multimorbidity, it was verified that from the total of women and men, 57.1% and 58.2%, respectively, had multimorbidity, with no significant difference between men and women ($p>0.05$). Of all individuals with income below two minimum wages, 54.0% reported having multimorbidity, also without significant difference ($p>0.05$). Also, 97.5% of the older people with multimorbidity had low education, being significantly higher in detriment of those without multimorbidity (81.2%) ($p=0.003$) (Table 1).

Table 2 shows that the time of use of hospital health services by the elderly with multimorbidity (38.7% more than 7 days) was significantly higher in detriment of those without the condition (15.6% more than 7 days) ($p<0.05$). The elderly with two or more chronic diseases needed significantly more care in the ICU setting (28.7%) ($p<0.05$) and for longer periods (47.8%) ($p<0.05$) and required help from someone (family member/caregiver), post-discharge, to follow medical recommendations ($p<0.05$). However, regarding the return to the hospital after discharge, the elderly with multimorbidity returned significantly more ($p=0.02$).

The following variables remained associated with the presence of multimorbidity in the final adjusted multiple model: education; color; length of hospitalization; need for help from someone (family/caregiver) after discharge to follow medical recommendations; and scheduling a return to the hospital after discharge (Table 3).

Older people with low education and non-white (mixed, black, asian and indigenous), presented 16.29 (CI:2.75-96.42) and 2.34 (CI:1.00-5.50), respectively, times more likely to have multimorbidity in detriment to those with high education and white. Individuals with length of stay ranging from 4 to 7 days and more than 7 days, had 6.91 (CI:2.40-19.96) and 3.03 (CI:1.00-9.22) more chances of having multimorbidity in detriment of individuals who stayed up to 3 days hospitalized. Also, elderly who needed someone's help to follow medical recommendations (OR=3.16; CI:1.30-277.87) and scheduled a return to the hospital after discharge also had higher odds of having multimorbidity (OR=18.99; CI:1.38-7.22) (Table 3).

DISCUSSION

In this study 55% of the hospitalized and evaluated patients had multimorbidity. The findings agree with the national literature[4,10-12] of older people community residents, since with the increase in the elderly population in Brazil, noncommunicable chronic diseases increase proportionally due to the high vulnerability of this population. Brazilian studies evaluating the presence of multimorbidity in the elderly individual show a prevalence above 50% for those aged 60 years or more[4,10-12]. Thus, the monitoring of multimorbidity is present in the population for the planning of public policies and preventive measures.

This condition is also found in Europe[3,4,13], conducted in 2015 in England with community residents found a prevalence of multimorbidity of 45.7% for individuals aged 65-74 years, 68.7% for

Table 1: Sociodemographic and lifestyle characteristics of elderly patients admitted to a Teaching Hospital in Paraná, according to multimorbidity. Ponta Grossa, Paraná, 2018 (n=144).

Variable and Class	With multimorbidity n (%)	No multimorbidity n (%)	Total n (%)	OR (CI[II] 95%)	p value
Presence of multimorbidity	80 (55)	64 (45)	144 (100)		-
Sex					
Female	41 (51.2)	36 (56.3)	77 (53.4)	0.8	0.55
Male	39 (48.8)	28 (43.8)	67 (46.5)	(0.4-1.6)	
Skin Color					
White	57 (71.3)	37 (57.8)	94 (65.3)	1.8	0.092*
Other	23 (28.7)	27 (42.2)	50 (34.7)	(0.9-3.6)	
Marital Status					
Married/Stable Union	44 (55.0)	38 (59.4)	82 (56.9)		
Widower	27 (33.7)	17 (26.5)	44 (30.6)	-[III]	0.623
Other	9 (11.3)	9 (14.1)	18 (12.5)		
Resides alone					
No	68 (85.0)	55 (85.9)	123 (85.4)	0.9	0.874
Yes	12 (15.0)	9 (14.1)	21 (14.6)	(0.4-2.4)	
Education					
10 or more years of completed education	2 (2.5)	12 (18.8)	14 (10.8)		
From 6 to 9 years of schooling completed	16 (20.0)	14 (21.8)	30 (20.8)	-[III]	0.003*
Illiterate and with less than 6 years of schooling	62 (77.5)	38 (59.4)	100 (69.4)		
Monthly Income					
2 or more minimum wages#	22 (27.5)	11 (17.2)	33 (22.9)		
Between 1 and 2 minimum wages#	41 (51.3)	37 (57.8)	78 (54.2)	-[III]	0.386
Up to 1 minimum wage#	14 (17.5)	10 (15.6)	24 (16.7)		
Don't know/no answer	3 (3.8)	6 (9.4)	9 (6.3)		
Smoker					
No	42 (52.5)	32 (50.0)	74 (51.4)	1.1	0.766
Yes/ Ex smoker	38 (47.5)	32 (50.0)	70 (48.6)	(0.6-2.1)	
Ethylist					
No	62 (77.5)	57 (89.1)	119 (82.6)	0.4	0.069*
Ex alcoholist/ Ethylist	18 (22.5)	7 (10.9)	25 (17.4)	(0.2-1.1)	
Sedentary					
No	26 (32.5)	27 (42.2)	53 (36.8)	0.6	0.231
Yes	54 (67.5)	37 (57.8)	91 (63.2)	(0.3-1.3)	
Obesity					
No	62 (77.5)	56 (87.5)	118 (81.9)	0.2	0.121*
Yes	18 (22.5)	8 (12.5)	26 (18.1)	(0.2-1.2)	

#Amount considered to be R$954.00, in effect during the study period.
[I] OR: Odds Ratio.
[II] CI: Confidence Interval
[III] OR e CI cannot be calculated. Only 2x2 tables can be calculated, without empty cells.
* Variables that entered the logistic regression model (p≤0.20).

those over 85 years. And it estimated that in the next 20 years there will be an expansion of morbidity with an increase in prevalence from 45.7% to 52.8%, particularly for complex multimorbidity, with the presence of 4 or more diseases, reinforcing the need to draw appropriate, timely, and efficient strategies to curb the advance of diseases in older people[4].

A systematic review found that the overall combined prevalence of multimorbidity was 33.1% (CI:30.0-36.3%), regardless of age, with studies showing high heterogeneity in prevalence, sample, associated factors, and combination of diseases[14]. This lower prevalence is due to the non-restriction of the elderly sample.

However, the study itself indicated that a large proportion (more than 50% in many cases) of individuals older than 65 years had multimorbidity. However, a similar finding was described in the study conducted in 7 Indian states, with individuals aged 60 years and older living in the community, which found a prevalence of 30.7% (CI:29.8-31.7). However, the authors themselves attribute the low prevalence to limited access and use of health services in India, especially among the elderly[15].

A study conducted in Sweden also revealed a 55% prevalence of multimorbidity in the elderly population, with cardiovascular and mental diseases being the most frequent disorders in this

Table 2: Hospital and home health services used by the elderly who were admitted to a Teaching Hospital in Paraná, according to multimorbidity. Ponta Grossa, Paraná, Brazil 2018 (n=144).

Variable and Class	With multimorbidity n (%)	No multimorbidity n (%)	Total n (%)	OR (CI[II] 95%)	p value
Hospitalization time					
up to 3 days	20 (25.0)	37 (57.8)	57 (39.6)	- [III]	<0.001*
3 to 7 days	29 (36.3)	17 (27.6)	46 (31.9)		
over 7	31 (38.7)	10 (15.6)	41 (28.5)		
ICU admission					
No	57 (71.3)	57 (89.1)	114 (79.2)	0.3 (0.1-0.8)	0.01*
Yes	23 (28.7)	7 (10.9)	30 (20.8)		
Length of stay in ICU					
Up to 3 days	12 (52.2)	7 (100.0)	19 (63.3)	- [III]	0.02*
More than 3 days	11 (47.8)	0 (0.0)	11 (36.7)		
Previous hospitalization					
No	60 (75.0)	45 (70.3)	105 (72.9)	1.3 (0.6-2.6)	0.53
Yes	20 (25.0)	19 (29.7)	39 (27.1)		
Scheduling of return to the hospital, after discharge					
No	9 (11.3)	1 (1.6)	10 (6.9)	8.0 (1-64.8)	0.02*
Yes	71(88.8)	63 (98.4)	134 (93.1)		
Need for help from someone (family member/caregiver), after discharge, to follow medical recommendations					
No	35 (43.8)	47 (73.4)	82 (56.9)	0.2 (0.1-0.6)	<0.001*
Yes	45 (56.3)	17 (26.6)	62 (43.1)		

[I] OR – Odds Ratio. [II] CI – Confidence Interval
[III]OR e CI cannot be calculated. Only 2x2 tables can be calculated, without empty cells.
*Variables in the logistic regression model (p≤0.20).

Table 3: Multiple analysis of the association between presence of multimorbidity and independent variables. Ponta Grossa, Paraná, Brazil 2018 (n=144).

Variable	OR[I] (CI[II] 95%)	p value
Education		
10 or more years of completed education	1.00	0.01
Illiterate and with less than 6 years of schooling	16.29 (2.75-96.42)	<0.001
From 6 to 9 years of schooling completed	1.67 (0.64-4.38)	0.29
Color		
White	1.00	0.05
Other	2.34(1.00-5.50)	
Hospitalization time		
Up to 3 days	1.00	<0.001
4 to 7 days	6.91 (2.40-19.96)	<0.001
More than 7 days	3.03 (1.00-9.22)	0.05
Scheduling of return to the hospital, after discharge		
No	1.00	0.03
Yes	18.99 (1.30-277.87)	
Need for help from someone (family member/caregiver), after discharge, to follow medical recommendations		
No	1.00	0.01
Yes	3.16 (1.38-7.22)	

[I] OR – Odds Ratio. [II] CI – Confidence Interval
Model: - 2 Log LR= 148,72 e R^2=0,387. Explanatory power 79,2%.

population. This study also revealed that mental illness was more present in the oldest old due to the high number of elderly women affected by dementia[13]. In those over 80 years old, multimorbidity is more common than single diseases, with more than 80% of this age group having chronic conditions and 54% of those over 85 years old having four or more chronic conditions[16].

It is worth mentioning that in hospital settings, the prevalence is also similar[3] and the higher the number of chronic diseases, the higher the probability of hospital admission[17]. A British study of hospitalized people over 65 years old found that 62.8% had 2 or more chronic diseases and 4.7% had 6 or more, only 22.2% had only one chronic condition[3]. And it found that the elderly with

3 concurrent diagnoses of major medical conditions represented 39.9% of the sample and were the ones with the worst clinical outcomes[3]. Hospital admission in older people with multimorbidity is still associated with longer length of stay, mortality, and likelihood of readmissions[18].

The development of multimorbidity is influenced by the behavior of young individuals; behaviors such as smoking, excessive alcohol consumption, unhealthy eating habits and not practicing physical exercises, which comprise the risk factors for the onset of morbidities in older people[5,19]. Added to these contexts, there are other factors from the social determinants of health (SDH), such as social, economic, cultural, ethnic/racial, psychological and behavioral determinants, which influence the occurrence of health problems and their risk factors in the population[19,20].

In this study, among the SIH analyzed, it was found that the cumulative factors: low education and color; and the consequential factors: length of stay, return to the hospital after discharge, and need for help from others to follow medical recommendations after discharge were associated with the presence of multimorbidity in older people hospitalized.

Low schooling among the older people is a reality in developing countries such as Brazil, since the current elderly lived their childhoods at a time when they began their professional lives prematurely and where education was not a priority[21]. The low provisioning of essential services, such as education, propitiates the creation of groups of subjects considered as socially disadvantaged and infers to them a higher risk of more dangerous or stressful working conditions, lower income and less access to social and health services, and consequently worse health conditions and quality of life[22].

A reflection of this context can be verified in this study by finding a relationship between low education and prevalence of multimorbidity, a condition also verified in similar studies[5,13,22,23]. In addition, people who have less education are more deprived of access to health information, in which the variable directly interferes in selfcare and self-perception about their health status and in the understanding about diseases such as risk factors, preventive measures, and means of treatment[5,23]. In this sense, low education reduces the search for health services for measures to promote and protect health, besides interfering directly in early diagnosis and proper treatment of established diseases, especially for chronic NCD[22].

Considering that education and health information touch the profile of the older people with multimorbidity, it is essential that public agencies invest in education. In this context, authors point out that investing in education reflects in direct benefits in health, since it contributes to individuals with empowerment, promoting autonomy in health, identifying diseases, seeking health services in advance, improving adherence to the treatment offered and contributing holistically to the individuals well-being[24].

The color variable was also relevant to the prevalence of multimorbidity in the older people. older people. Mixed, black, asian, or indigenous people had higher chances of having multimorbidity in detriment of whites, consistent with the literature[5,23].

A condition that follows the same ideological delineation of low education and social vulnerability. The non-white older people have a cumulative burden of lack of access to goods and services of the most diverse coming from the veiled or explicit discrimination of years in the country. The connection of these variables in a negative way often leads to a harmful lifestyle and low use of health services, especially for preventive measures, thus creating vulnerable risk groups, indicating that the distinctions in health are reflections of social inequalities in the population under study[25].

Further, verifying factors that are of consequential nature, it was observed that the older people with multimorbidity required longer hospital stays and returns to the hospital for follow-up consultations. These individuals present potential negative developments for health; high risk of mortality; more functional declines and more complex health demands, generally reflecting complications related to the aggravation of chronic NCD; and therefore, need longer therapeutic regimes and have a greater demand for care[1,3,26,27].

Furthermore, studies show that multimorbidity is also associated with increased use of emergency and outpatient services, polypharmacy, and the use of invasive devices such as probes in the post-discharge period, requiring more recurrent follow-ups to ensure the safety of these patients, which is consistent with the findings of this study[26-28].

It is worth noting that the hospitalization of an elderly person requires special attention from health professionals, thus being able to prevent injuries and greater impairment of functional capacity that can occur during this period. Thus, healthcare professionals, especially the nursing staff, play a fundamental role in preventing skin lesions acquired during hospitalization, preventing falls, aspiration pneumonias, detecting drug reactions, and other problems. Therefore, the identification of older people who are more vulnerable becomes fundamental for the proper management of care, thus reducing the length of hospitalization and the potential complications that can occur during this period[1,29-31].

It is important to emphasize that the hospital and healthcare professionals need to adapt to the needs of the elderly with multimorbidity, besides being a prerequisite for improving the quality of care during hospitalization and in the discharge process of the elderly. Even more so because it was evidenced that older people with multimorbidity require more help from third parties to follow the recommendations in the post-discharge period than the elderly without this condition.

The relationship between the presence of multimorbidity and the need for help from others to follow medical recommendations can be analyzed by the requirement for more specific care in the post-discharge period due to the complications that this condition

can cause. Depending on the health status/functionality, older people become dependent on complex, permanent and specific care; management of prescribed medications at home; and a vast list of care that the elderly alone cannot effectively perform[32,33].

Thus, for family members and/or caregivers to be able to offer this required care in a timely and effective manner, it is essential that they receive continuous, systematic, and clear information during the period in which the older people are hospitalized. When the health team and the caregiver agree about the importance, management methods, and the realization of the care that should be given to the elderly patient, it significantly reduces the chances of hospitalization recurrence, the need for early returns for outpatient care, and the reduction of functionality and independence of the senior[34].

The clinical follow-up of people with multimorbidity requires skill from health professionals, especially nursing to recognize the profile of multimorbidity can be used to identify vulnerable groups, which should be targeted for prevention and rehabilitation actions, reducing the event among the older people, in order to contribute directly to the physical and social well-being of these individuals.

Limitations of the study

The limitation of the study is its transversal design, which does not allow the verification of causal factors. Since it is a study carried out with patients who were hospitalized, its findings on the prevalence of multimorbidity may be overestimated, since hospitalization increases the chances of disease diagnosis[6]. Moreover, because it is a question of self-reports, the data may suffer from memory bias, or overestimations or underestimations, such as the self-report on lifestyle.

However, these limitations do not minimize the study, since its results are good sources for generating hypotheses, and help in the direction of health-promoting strategies. What is suggested is the development of new studies, especially with longitudinal and population-based designs, to deepen the theme.

Conclusion

The study allowed us to identify a high prevalence of multimorbidity and important factors associated with multimorbidity in older people hospitalized, such as education, color, length of hospitalization, scheduling of return to the hospital after discharge, and the need for help from someone (family/caregiver) after discharge to follow medical recommendations.

The findings contribute to the basis for the elaboration of a health policy that acts in preventive conditions against the analyzed SIH, and for health professionals to organize care strategies, considering that the study predominantly deals with factors that are subject to effective interventions, especially in the hospital setting.

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