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Conley Scale: assessment of a fall risk prevention tool in a General Hospital

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Key words

Conley Scale • Fall prevention • Clinical risk management

Summary

Introduction. *"Umberto I" Teaching Hospital adopted 'Conley scale' as internal procedure for fall risk assessment, with the aim of strengthening surveillance and improving prevention and management of impatient falls.*
Materials and methods. *Case-control study was performed. Fall events from 1st March 2012 to 30th September 2013 were considered. Cases have been matched for gender, department and period of hospitalization with two or three controls when it is possible. A table including intrinsic and extrinsic 'fall risk' factors, not foreseen by Conley Scale, and setted up after a literature overview was built. Univariate analysis and conditional logistic regression model have been performed.*
Results. *50 cases and 102 controls were included. Adverse event 'fall' were associated with filled Conley scale at the admission to care unit (OR = 4.92, 95%CI = 2.34-10.37). Univariate analysis identified intrinsic factors increasing risk of falls: dizziness (OR = 3.22; 95%CI = 1.34-7.75), psychomotor agitation (OR = 2.61; 95%CI = 1.06-6.43); and use of means of restraint (OR = 5.05 95%CI = 1.77-14.43). Conditional logistic regression model revealed a significant association with the following variables: use of instruments of restraint (HR = 5.54, 95%CI = 1.2-23.80), dizziness (OR = 3.97, 95%CI = 1.22-12.89).*
Discussion. *Conley Scale must be filled at the access of patient to care unit. There were no significant differences between cases and controls with regard to risk factors provided by Conley, except for the use of means of restraint. Empowerment strategies for Conley compilation are needed.*

Introduction

Patient falls are one of the most common adverse events and one of the most important issue in the context of risk management, both for the frequency with which they occur, and for the consequences that may ensue. Some studies show that falls represent up to 70% of hospital accidents, entailing a direct physical and psychological impact [1, 2]. Hospital falls, that involve death or serious harm for the patient, are treated, in Italy, as a *sentinel event* by Ministerial Protocol [3].
Falls have a multifactorial etiology and more than 400 risk factors have been described.
The incidence of this phenomenon is prevalent in the elderly population, but the event can also occur in younger subjects; the causes may be attributable to diseases or physiological situations, fall is an event that, for frequency and consequences entailed, requires a multidisciplinary approach, articulated at different levels, aimed at the prevention and containment of risk, especially among older people [4].
Some studies [5, 6] classify falls as:

- *predictable*: they occur in individuals exposed to identifiable risk factors (disorientation, difficulty in walking, gait changes caused by neurological diseases, etc.);
- *unpredictable:* determined by physiological conditions unpredictable until the fall, falls that cannot be predicted 'a priori' (presence of seizures, dizziness, drug reactions, syncope);
- *accidental:* falls attributable to environmental factors or fatality: when the person falls unintentionally (eg slipping on the wet floor).

14% of falls in hospital are classified as accidental, 8% as unpredictable, while the remaining 78% are included between predictable falls.
Risk of falling cannot be completely eliminated by care settings, but the early identification of patients at higher risk, allows us to identify and focus prevention, on a population that really needs [7]. In order to reduce the incidence of this adverse event, some risk assessment instruments are used to identify patients at risk.
According to WHO, risk factors can be divided in two categories:

a. *intrinsic factors,* which concern to patient health condition, they include data on reason of health care admission, co-morbidities and drug therapies;
b. *extrinsic factors*, related to the organizational aspects of the hospital structure, environmental features and ergonomic resources, or health facilities employed [8].

Outcomes related to the adverse event 'fall' are a cause of costs increasing, due to prolonged hospitalization and further diagnostic and therapeutic procedures needed [9]. Moreover, in terms of quality of care, this kind of event can take on a negative ethical and legal features, for operators involved.
The rating scales for risk of falls can be used both at the entrance of the patient in the hospital and for subsequent

monitoring during hospitalization. Different scales have been constructed and applied during the last 20 years, eg. Conley, Morse, Tinetti, Stratify [10-17].
However, a critical review of the literature published in 2003 emphasizes that none of these scales seems to have been sufficiently studied in terms of validity and reliability [18]. A problem of particular importance is the poor reproducibility on populations different from the experimental ones, that can result in an excessive expenditure of resources in front of a little benefit in terms of prevention [18]. Examining the different risk factors included in the risk assessment scales, it is easy to argue that some items are detected in two or more of them, even if with different formulations. Moreover, the most recent critical review of literature made possible to select and confirm a set of risk factors most important in terms of predictability, in particular: history of falls, balance and gait problems, impaired mobility, vision, orthostatic hypotension, use of different drugs, psychomotor status [19]. Latest trends consider risk assessment not based on the use of items and scores 'preformed', but rather on a detected *core* of individual variables.
Conley Scale [10] was developed by D. Conley in the United States during a study conducted within medical and surgical Units, in 1999. An article regarding Conley scale, has established values of sensitivity around 69%, and specificity between 41% and 61%, therefore, the use of this clinical tool is justified by the good margin of accuracy and predictability in identifying true positives patients truly exposed to the risk of fall [20].
The main objective of this study was to identify factors that can significantly influence the phenomenon 'patient falls' in the hospital, and to describe conditions in which the event 'fall' occurs through monitoring application of Conley Scale, in different hospital departments. A case - control study was performed in the Teaching Hospital "Umberto I" in Rome.

Methods

Sample detection

In the present study cases have been defined as "patients who have had an accidental fall during their hospitalization", from March 1st 2012 to September 30th 2013. Setting of research was Umberto I General Hospital in Rome. Data were collected through the analysis of medical records which contains, among other information, the "SHEET OF FALL DESCRIPTION"; sent to the Risk Manager of the Hospital at the moment of adverse event occurred.
Cases have been excluded from analysis for the following reasons:

- "SHEET OF FALL DESCRIPTION" not properly filled in, so that was not possible to trace the number SDO (Hospital Discharge Data) of the medical record (N = 2);
- regime of hospitalizations different from the *ordinary* one.

Moreover the cases included were paired with two (N = 48 cases) or three controls (N = 2 cases).
The selection criteria for controls were:

- ordinary regime of hospitalization;
- hospitalization during the day of the event fall of case;
- no falls during hospitalization;
- hospitalization in the same care unit of the respective case;
- pairing by gender.

Exclusion criteria for controls was:

- discharge before case fall.

The computerized system GIPSE (Management Information First Aid and Emergency) has been used for detection of controls, it is a technical tool for the computerization of Emergency Services, and disclosures discharge required by SIES (Emergency Medical Information System).
The search criteria considered to determine the controls have been the department, the event date fall (admissions have been considered starting from the four days before case fall) and gender. Medical folders have been identified by SDO codes that stemmed entering this information into GIPSE program.

Description of measuring tool

A table built ad hoc has been used to extract data (Appendix 1). The framework has been divided into three sections: the first two had to being filled in for cases and controls, and the third part was dedicated to cases data collection.
The first section refers to socio-demographic data, related to hospitalization and conditions of the patient at admission: date of birth, age, gender, residence, nationality, SDO code of medical records, admission date, discharge date, department of hospitalization, type (ordinary, day hospital), type of admission (emergency, programmed, transferred), principal diagnosis and secondary diagnoses coded ICD9-CM possible critical condition / instability of the patient at the time of admission and the four risk factors of WHO (Patient ≥ 65 years; taking > 4 drugs; weakness in the hips; unstable equilibrium).
The second section examines some of the information contained in the medical record relatively: data of admission day, presence or not of fall, filled or not filled Conley scale (at admission and any subsequent updates: the scale should be completed within 24 hours of admission or, after clinical stabilization if the admission occurred in emergency departments). Subsequent assessment should be repeated: whenever a change is detected in patient's clinical condition, eg. after surgery, changes in therapeutic, addition or replacement of sleep-inducing drugs, anti-anxiety drugs, psychotropic drugs, benzodiazepines, diuretics etc.; after 72 hours from the first assessment; every 5 days after the second evaluation until discharge; after a fall, at the time of discharge / transfer [20]); bodily functions on the date of case fall; intrinsic and extrinsic risk factors present at time of case fall.
The third section reports the same data present in the fall report form.

Data collection

Hospital records have been formally requested through a letter submitted to the Health Management Department of Teaching Hospital Umberto I.
Folders have been divided between cases and controls and controls hospitalization period has been assessed to include the day of the respective fall case.

Each folder has been analyzed independently by two reviewers using the data extracting form preformed. Medical records evaluations were compared and any disagreement has been resolved with the help of a third reviewer. Finally, data collected by extraction form have been inserted in an Excel file.

In the statistical analysis, possible associations between patient falls and variables have been evaluated using Chi-square test, Fisher's exact test, Student's t, Mann-Whitney and odds ratio (OR), with confidence intervals (CI) at 95%. The level of significance for all analyzes has been setted at $p < 0.05$.

A conditional logistic regression was used to investigate the relationship between the outcome of being a case or a control and the set of prognostic factors (intrinsic and estrinsic). Parameters were estimated using conditional method for matched data [21]. The model fitted only included covariates resulted significant at univariate analysis. The likelihood-ratio test has been applied to evaluate the goodness of model. Data were analyzed using SPSS 19.0.

RESULTS

Descriptive analysis of the sample

50 cases and 102 controls have been identified (Tab. I). The 71.7% of the sample were male, 62.3% was 64 years old and 91.3% had Italian nationality.

66% (33/50) of fall cases occurred in Neurology and Psychiatry Department, 8% (4/50) in Infectious Diseases Department and 4% (2/50) in Orthopedics Units, 4% (2/50) in Emergency Department.

With regard to Conley scale criteria, established by WHO, the present data confirmed that: the average age of cases was 69 years, while 64 years among controls. The difference was statistically significant ($p = 0.001$). 54% of the sample took more than 4 drugs, 31% had critical clinical conditions at the admission, 37.8% showed hips weakness and 45.6% had unstable balance. 46% of hospitalizations featured a filled Conley scale at the admission to care unit. In addition to the main diagnosis, comorbidities informations have been selected among anamnesis data, and thereafter collected and compared between cases and controls. The most part of cases presented one comorbidity

Tab. I. Description of sample.

Variables		N (%)	Missing
Gender	M	109 (71.7)	0
	F	43 (28.3)	
Nationality	Foreign	13 (8.7)	0
	Italian	137 (91.3)	
Age > 64 years	Yes	94 (62.3)	1
	No	57 (37.7)	
The number of drugs taken > 4	Yes	79 (54)	1
	No	67 (45.9)	
Critical conditions	Yes	47 (31)	1
	No	104 (68.9)	
Hips weakness	Yes	56 (37.8)	4
	No	92 (62.2)	
Unstable balance	Yes	67 (45.6)	5
	No	80 (54.4)	
Conley filled in at the admission into Care Unit	Yes	69 (46)	2
	No	81 (54)	

Tab. II a. Univariate analysis between cases and controls.

Variables		Controls (not fallen) N (%)	Cases (fallen) N (%)	P	OR (95%CI)
Gender	M	75 (73.5)	34 (68.0)	0.48[a]	1.3 (0.62 – 2.73)
	F	27 (26.5)	16 (32.0)		
Nation	Italian	91 (91.0)	46 (92.0)	0.99[b]	1.13 (0.33 – 3.9)
	Foreign	9 (9.0)	4 (8.0)		
Pt > 64 years	Yes	58 (57.4)	36 (72.0)	0.08[a]	1.91 (0.92 – 3.96)
	No	43 (42.6)	14 (28.0)		
Pt > 4 drugs	Yes	53 (54.6)	26 (53.1)	0.86[a]	0.94 (0.47 – 1.87)
	No	44 (45.4)	23 (46.9)		
Critical clinical conditions	Yes	27 (26.7)	40 (40.0)	0.1[a]	1.83 (0.89 – 3.74)
	No	74 (73.3)	30 (60.0)		
Hips weakness	Yes	37 (37.4)	19 (38.8)	0.86[a]	1.06 (0.52 - 2.15)
	No	62 (62.6)	30 (61.2)		
Unstable balance	Yes	42 (42.9)	25 (51.0)	0.35[a]	1.39 (0.70 - 2.76)
	No	56 (57.1)	24 (49.0)		
Conley filled at admission	Yes	42 (42.9)	25 (51.0)	< 0.001	4.92 (2.34 – 10.37)
	No	56 (57.1)	24 (49.0)		
		Average (SD)	Average (SD)	p	95%CI
Age		63 (21)	69 (12)	0.53[c]	(-10.89- 0.065)
		Average (SD)/ median (min;max)	Average (SD)/ median (min;max)	p	95%CI
Conley Score		2,9 (± 1.97) / 3 (0;5)	3,27 (± 2.66) / 2 (0;9)	0.96[d]	(-1.89- 1.17)

pt : patient

[a] p-value chi-square[2] test

[b] p-value Fisher exact test

[c] p-value t-student test for independent samples with unequal variances

[d] p-value Mann-Whitney Test

Tab. II b. Univariate analysis between cases and controls.

Variables		Controls (not fallen) N (%)	Cases (fallen) N (%)	P	OR (95%CI)
Hypotension: Systolic BP ≤ 90	Yes	2	2	0.61[b]	1.95 (0.26 – 14.34)
	No	90	46		
Hypertension: Systolic BP ≥ 180	Yes	2	2	0.61[b]	1.93 (0.26 – 14.18)
	No	89	46		
Fever≥ 38°	Yes	4	2	0.99[b]	1.08 (0.19 – 6.15)
	No	91	42		
Not integrity of consciousness state	Yes	7	3	0.99[b]	0.80 (0.19 – 3.29)
	No	77	41		
Disoriented	Yes	13	8	0.58[a]	1.30 (0.50 – 3.39)
	No	89	42		
Dizziness	Yes	11	14	**0.007[a]**	3.22 (1.34 – 7.75)
	No	91	36		
Impaired driving, creeping step, broad base of support, unstable march	Yes	45	25	0.494[a]	1.27 (0.64- 2.50)
	No	57	25		
Agitated	Yes	11	12	0.033[a]	2.61 (1.06 – 6.43)
	No	91	38		
Impairment of judgment / lack of the sense of danger	Yes	12	12	0.05[a]	2.37 (0.98 – 5.74)
	No	90	38		
Reduced muscle strength	Yes	45	20	0.59[a]	0.83 (0.42 – 1.65)
	No	56	30		
Patient with impaired vision	Yes	13	5	0.62[a]	0.76 (0.25 – 2.27)
	No	89	45		
Incontinence (fecal / urine)	Yes	9	6	0.57[b]	1.41 (0.47- 4.21)
	No	93	44		
Sleeplessness	Yes	17	6	0.45[a]	0.68 (0.25- 1.85)
	No	85	44		
Depression	Yes	9	3	0.75[b]	0.66 (0.17 – 2.55)
	No	93	47		
Language comprehension deficits (aphasia, foreigner)	Yes	23	8	0.35[a]	0.65 (0.27- 1.59)
	No	79	42		
Memory impairment	Yes	6	1	0.43[b]	0.33 (0.04 – 2.79)
	No	96	49		
Dressings (sutures, decubitus wounds, etc.)	Yes	8	6	0.39[b]	1.60 (0.52 – 4.90)
	No	94	44		
Drainage	Yes	1	1	0.55[b]	2.06 (0.12- 33.65)
	No	101	49		
Urinary catheter	Yes	23	12	0.84[a]	1.08 (0.49- 2.41)
	No	79	38		
Therapy i.v. (peripheral or central venous access)	Yes	70	34	0.94[a]	0.97 (0.47- 2.01)
	No	32	16		
Therapy with sedatives	Yes	35	17	0.97[a]	0.99 (0.48 – 2.01)
	No	67	33		
Treatment with laxatives	Yes	11	8	0.36[a]	1.58 (0.59 – 4.20)
	No	91	42		
Diuretic therapy	Yes	30	13	0.63[a]	0.83 (0.39 – 1.78)
	No	71	37		
Antihypertensive therapy	Yes	60	32	0.58[a]	1.21 (0.60 – 2.45)
	No	41	18		
Substances Abuse (alcohol and drugs)	Yes	8	4	0.99[b]	1.02 (0.29- 3.57)
	No	94	46		
Patient in postoperative / anesthesia	Yes	2	1	0.99[b]	1.02(0.09 – 11.53)
	No	100	49		
Use of restraint means	Yes	6	12	**0.001[a]**	5.05 (1.77 – 14.43)
	No	96	38		

Bold: $p < 0.05$

BP: blood pressure

i.v therapy: intravenous therapy

(11, 22%), and the most part of controls showed 3 (28, 27.5%). In 4 cases (8%) and 5 controls (4.9%) were found 6 comorbidities in addition to principal diagnosis. The differences were not statistically significant (p= 0.334).

The two groups, cases and controls, were homogeneous for gender, age, citizenship, while, with respect to the parameters WHO, the adverse event *fall*, seemed to be associated with compiling Conley scale at the admission to care unit (OR = 4.92, 95%CI: 2.34 - 10.37) (Tab. II a, b).

Univariate analysis showed (Tab. IIa-IIb) that intrinsic factors that increase the risk of falling out are: presence of dizziness (OR = 3.22; 95%CI = 1.34 to 7.75), and psychomotor agitation (OR = 2.61; 95%CI = 1.06 to 6.43); among extrinsic risk factors the use of means of containment is associated with risk of adverse event (OR = 5.05 95%CI = 1.77 to 14.43).

Conditional logistic regression included '*risk of being a case*' as dependent variable, and the following covari-

Tab. III. Conditional logistic regression model of the association between event fall and covariates: psychomotor agitation, dizziness and means of restraint.

Covariates	HR	95%CI	
		Lower	Upper
Psychomotor agitation	1.085	0.282	4.169
Dizziness	3.966	**1.221**	**12.886**
Means of restraint	5.537	**1.288**	**23.798**
Model -2 Log likelihood: 79.33 Initial Log Likelihood function: -2 Log likelihood: 95.55 Likelihood ratio test: chi-square=16.220, df=3, **p=0.001**			

Bold: $p < 0.05$.

ates as independent: gender, age, dizziness, psychomotor agitation and use of means of restraint.
The fitted model (Tab. III) to analyze association between intrinsic and extrinsic factors and risk of falls, revealed a statistically significant association with the following outcome variables, in order: use of means of restraint (HR = 5.54, 95%CI = 1.29 to 23.80) and dizziness (HR = 3.97, 95%CI = 1.22 to 12.89). The variable psychomotor agitation is not significantly associated with the outcome fall (HR = 1.08, 95%CI = 0.28 to 4.17). The comparison of null model to the full model which includes the predictors shows a significant difference: the Likelihood Ratio Test is: $\chi^2 = 16.220$ with $p = 0.001$.

Descriptive analysis of falls dynamic

Fall events occur mostly during evening and night hours, tending to double in specific time range (2:00-2.30; 4:00-4:30; 6:00-7:00; 21:30-22:00) up to three times between 1:30-2:00 a.m. Other patients were present in 76% of cases (32/42), when event fall occurred, in 7.1% (3/42) of cases health personnel and in 2.3% (1/42) family members.
Modality of falling were, in order: from standing position in 42% of cases (18/43), from bed in 37% (16/43) of cases, by sitting in 14% (6/43) and from wheelchair in 2% (2/43).
With regard to reason of fall, 37% of falls (11/30) occurred as a result of loss of balance and sliding on dry pavement; while 13% (4/30) was due to loss of strength and 7% (2/30) was related to slipping on wet floor and stumbling.
Analysis of the fall place revealed that 82% (37/45) of falls occurred in the hospital room, 15% (7/45) in the bathroom and 2% (1/45) in the hallway.
The type of shoe worn at the moment of fall was, in 45% (16/36) of the cases 'an open type', in 14% (5/36) closed or socks, and in 28% (10/36) patient was barefoot.
Means of protection were not in use in 36% of cases (16/44), instead they were present in 64% of cases (28/44).
57% (24/42) of patients fallen had been allowed to get up out of bed, while 43% (18/42) had been forbidden.
Drugs that lower blood pressure, as antihypertensive (22/43, 51%) and diuretics (11/43, 25%), have been confirmed as the most frequently used among cases, followed by benzodiazepines or CNS sedative (10/43, 23%), laxatives (3/43, 7%) and other drugs (20/43, 46.6%).
Falls had serious damage as outcome in 80% of cases (35/43), while 20% (9/43) hesitated in minor damage. Considering the total cases, the most part of them did not require further investigation than the clinical visit, after the event, though in 22% of cases (11/50) and in 11% (9/50) more detailed radiological diagnostic exams, CT/MRI and RX respectively, have been necessary. Other tests have been conducted in 14% of cases (7/50).

Discussion

Falls are common among hospital inpatients. Rates from 2.9-13 falls per 1,000 bed days have been reported [5]. Up to 30% of reported falls [23] may result in injury, including fracture, head and soft tissue trauma, all of which may in turn lead to impaired rehabilitation and co-morbidity [15, 24].
In the present study, despite the heterogeneity of settings, populations and risk factors, a small number of items, provided by Conley Scale, emerged as significant in relation to risk falling: psychomotor agitation and dizziness, among intrinsic risk factors, already provided by Conley Scale, and use of restraints. The first two items increase the risk of falling , once and three times, respectively, the use of instruments of restraint, considered as extrinsic risk factor, increases the risk of falls over 4 times. The absence of filling in Conley Scale, at the entrance to care unit, predisposes to the event.
The intake of more than four drugs, the critical clinical conditions, the weakness in the hips and the unstable equilibrium, have been confirmed as characteristics that increase the risk of falling. On the other hand, the presence of co-morbidities in addition to the main diagnosis, does not appear to increase the risk significantly.
With regard to the category of drugs, antihypertensive and benzodiazepines are the most widely used among cases.
There is small but a consistent association between the use of most classes of psychotropic drugs and falls; specifically, odds ratio for sedative/hypnotic use was 1.54 (95%CI, 1.40-1.70) Further adjustment for confounders, dosage, or duration of therapy are necessary [25]. In addition, a metanalysis that studied the relationships of falls and medications which included studies that examined both multiple and single risk factors found a significantly increased risk from psychotropic medications (OR = 1.7), Class 1a antiarrhythmic medications (OR = 1.6), digoxin (OR = 1.2) and diuretics (OR = 1.1) [26]. As regards the description of the fall, most of them occurs during night hours, inside the inpatient room, and they are due to loss of balance or force. In the 80% of cases no outcomes of damage were reported, such as to require further diagnostic tests, such as x-rays or tc.
Interaction and probable synergism between multiple risk factors, is probably important such as identifying risk factors. Several studies have shown that the risk of falling increases dramatically as the number of risk factors increases. Tinetti et al. reported that percentages of persons falling increased from 27% for those with no or one risk factors, to 78% for those with four or more risk factors [27].

Newitt et al. reported that the percentage of community living persons with recurrent falls increased from 10% to 69% as the number of risk factors increased from one to four or more [28].
As emerged from other study, profile of patient at risk of falling, is a person with mental status and mobility impairments [29]. Intrinsic risk factors were identified by Rawsky's review [30]: cognitive impairment/psychological status, acute/chronic illness and mobility, sensory deficits, fall history, and elimination, recent syncope episode and cognitive status [31, 32]. Rubenstein et al. [7] analyzed 16 studies and reported the following risk factors, in order: muscle weakness, history of falls, gait deficits, balance deficits, use of assistive devices, visual deficits, arthritis, impaired activities of daily living, depression, cognitive impairments, and age 80 years. In general, factors related to cognitive impairment, functional decline, and chronic disorders result in a higher risk of falls [33].
Extrinsic factors (e.g., environmental hazards or hazardous activities) are described as primary causes for approximately half of all falls [34]. In a review of 20 articles, Connell [35] found that environmental hazards (e.g., walking on slippery/rough surfaces, obstacles, inadequate light, or loose carpets) create conditions for trips or slips in elderly people who may already have multiple intrinsic risk factors for falls. Additionally, the risk from hazardous activities can be increased by behaviors (e.g., faller was hurried or inattentive, difficulty or discomfort during a task, or moving beyond limits of stability). Within inpatient facilities, commonly reported extrinsic factors are related use of bedrails, height and stability of seating (low toilets, wheelchair braking problems, "gerichairs," or portable commodes), and obstacles created by mobility aids (e.g., wheelchairs and walkers;). Finally, common locations for inpatient falls are resident rooms or bathrooms, with the falls often involving problems with ambulation and transfers [35-37].
Falls occurred most often in the patient's room when they were alone and unassisted while trying to get to the bathroom [37].
An effective and efficient fall prevention program should require quick, reliable, and valid fall risk screens to identify high-risk patients. In general, recommend criteria for choosing the most appropriate assessment tool for a specific setting should be: high sensitivity, specificity, and reliability [36]. Despite this, the specific instrument chosen might vary, depending on the setting and professionals engaged for filling. Nursing assessment scales seem the most appropriate approach for Acute Care Settings and extended care setting, where the majority of patients may be at high risk. A substantial number of fall risk assessment tools are readily available, most with evidence supporting their reliability and validity [36].
Frequent monitoring of drugs effects on patients is crucial, according to the most part of guidelines. Drugs with an increased need for monitoring, due to their important impact on the risk of fall are: antihypertensive and diuretics as it can cause hypotension and incontinence of urgency; hypnotics; hypoglycemic; neuroleptics because they can induce extrapyramidal disorders. The infusion therapy would take a break during the night rest, when possible.
For prevention, containment and risk of falls multifactorial interventions are required in hospital , which ensure evaluative information essential for all types of patients, and educational interventions should be tailored to the risk emerged. A particular attention should be paid to periodic environmental assessment targeted on possible risk factors assessed.
Needs of mobilization and ambulation requires special attention by the medical staff, it's important to educate patient and caregivers about the correct methods for handling and having a safe ambulation (eg. How to perform postural changes or movements from bed to chair, pass from sitting to standing without loss of balance).
Patients and caregivers should be trained about aids and facilities, in order to avoid their misuse: encouraging the use of shoes with not slippery soles; instructing patients to get up slowly; assisting patients during high risk transfers (eg. from ambulatory to corridor once or vice versa).
There is no scientific evidence in literature, that use of physical or pharmacological restraint protect patients from falls. Means of mechanical restraint can result psychological and physical adverse effects, direct and indirect. Restraint should be applied only when strictly necessary, supported by prescription or documented evaluations by the nursing care staff, after understanding causes and after taking all possible alternative care strategies, including relational interventions.
Pharmacological restraints (sedation) is acceptable when it represents an integral intervention to the therapy. Alternatively to restraint, following initiatives can be undertaken: increasing surveillance, modifying treatments, preferring oral feeding to parenteral or nasogastric tube, removing catheters and drains.
Further environmental changes could be: to increase the light in the room; to place a disoriented patient near a gatehouse; do not place bed rails; to create a peaceful environment; to keep the alarm-bell close to patient and answer immediately to calls; to use reality-orienting therapy (ROT) or other psychosocial interventions for involving patient in the conversation; to provide reference points (calendar, television, radio, clock); to use listening activities; to promote cognitive recreational and physical activities.
Finally, as Tinetti et al. argued in a previous study [37], all prevention interventions are aimed at increasing nursing awareness of patient risk and involving patient and caregivers: teaching them; promoting patient independence and decreasing use of restraints; and, finally, paying attention to patients with impairments or altered elimination patterns (incontinence, frequency, nicturia).
Our results bear out the evidence of scientific literature about Conley employment in assessing *fall risk*. Lovallo et al. comparing Conley Scale and Hendrich Risk Model [37], stated that Conley Scale gave sensitivity and specificity values of 69-49% and 61% respectively. The Hendrich Model [37] gave a sensitivity value of 45-76% and a specificity value of 71%. Conley Scale is more indicated for use in medical and surgical sectors on the strength of its high sensitivity and specificity, since its

specificity is very low it is deemed useful to submit individual patients giving positive results to more in-depth clinical evaluation [22]. Conley Scale doesn't investigate some important clinical characteristics of patient that can represent a risk, like: visual impairment [14] and sensor-motor functions, incontinence, asthenia, cognitive impairments or sedation [14, 27], and depression; likewise it is important to assess environmental conditions and the use of assistive devices, as well [22].

Conclusions

It has been shown that in acute care settings, falls during hospitalization are more common in confused patients and those with greater comorbidity [24]; but the present study doesn't support this evidence, maybe comorbidities should be stratified for disease severity.
Risk factors should be stratified for specific unit care departments, this population was heterogeneous for diagnosis and sample size was small. The most part of cases have been recorded in Neurology Department, and it is already acknowledged that several diseases have been shown to increase the risk of fall such as Alzheimer's disease [39], Parkinson's disease [28], and stroke [40].
According to the literature further studies need to be carried out in order to:

- test Conley Scale on a larger sample and stratify risk for unit department or comorbidities [41, 42];
- empower the role of nurses in fall prevention: encouraging the account of risk factors not provided by Conley, intrinsic and extrinsic; carrying out a comprehensive patient evaluation of motor cognitive functionality and psychological status [43];
- involve and inform patient and caregivers about fall risk.

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Appendix 1

DATA COLLECTION FORM HOSPITAL ACCIDENTAL FALLS

N…….

0.MEDICAL RECORD CODE …….

1. Is this patient fallen? ☐ yes (CASE) ☐ no (CONTROL)

2. Patient data:
2.a Birth date (dd/mm/yyyy)…… (age…… with respect to year of hospitalization)
2.b Gender: M ☐ F ☐
2.c City of residence……2.d County/district…….
2.e Nationality: ☐ Italian ☐ foreigner

3. Hospitalization data
3.a Date of admission: dd/mm/ yyyy:……../……./……..….
3.b Date of discharge: dd/mm/ yyyy:…..…../…..…./…….
3.c Department of Hospitalization:……..……..(see DB)
3.d Inpatient: < > ordinary < > day hospital
3.e Inpatient type: < > urgent < > planned admission (RRR into TRIAGE form)
< > transferred (see Fax from other hospital)
3.f Primary diagnosis code (ICD9-CM) : ……
3.g Secondary diagnosis codes : I …….II……..…III……..…IV……V……..……

4. Patient at admission
4.a Unstable/critical patient: yes ☐ no ☐
If not, answer to following 4 questions (**OMS factors**):
4.b .> = 65 years yes ☐ no ☐
4.c More than four drugs in assumption:yes ☐ no ☐ ß (see ED form or anamnesis)
4.d Hips weakness: yes ☐ no ☐
4.e. Unstable balance: yes ☐ no ☐
4.f Conley filled in at admission: yes ☐ no ☐
4.g. If CASE: Conley Scale filled in available before fal: yes ☐ no ☐
4.h Data. Date of the last available CONLEY Scale (FOR CASES: Conley <u>before the fall</u>):
……/……./…….(dd/mm/aaaa)

Insert Data of CONLEY mentioned above:

C0. Questions to :	Patient ☐	Caregiver ☐	Familiy ☐
Previous Falls			
	yes	no	missing
C1. Have you fallen in the last three months?			
C2. Have you never had vertigo and dizziness? (In the last 3 months)			
C3. Have you ever lose urine or feces while going to the bathroom? (In the last 3 months)			
Cognitive impairment (Nurses' Observation)			
C4. Impaired walking, creeping step, broad base of support, unstable march			
C5. Agitated (definition: excessive motor activity, usually no purposeful and associated with internal tension. Ex. Inability to sit still, moving restlessly, pulling clothes, etc.)			
C6. Impairment of judgment / lack of a sense of safety awareness			

CONLEY INDEX ≥ 2 Nursing diagnosis: patient at risk of falling

5. Factors present in the day of case fall:
Fill in with 'x' for cases and for controls, referring to the day of fall event:
YES, if the features are explicitly mentioned in the medical record.
NO, if the features are explicitly mentioned in the medical record.
NOT PRESENT, if they are not reported in the medical record.

Body Functions	yes	no	NOT PRESENT
F1) Hypotension: PA systolic <= 90			
F2) Hypertension: PA systolic> = 180			
F3) Fever >=38° (vedi diario)			
F4) unhealthy state of consciousness			

Fill in for cases and controls referring to the day of the fall of the case.
Mark with a "x" in case of presence inside medical record or in case of element otherwise deductible for clinical condition.

INTRINSIC FACTORS	✓
FI1) Disoriented	
FI2) Presence of Dizziness	
FI3) (alias C4) Impaired walking, creeping step, broad base of support, unstable march	
FI4) (alias C5) Agitated (definition: excessive motor activity, usually not finalized and associated with inner turmoil. Ex. Inability to sit still, moving restlessly, pulling clothes, etc.)	
FI5) (alias C6) Impairment of judgment / lack of a sense of danger	
FI6) Reduced muscle strength	
FI7) Patient with impaired vision	
FI8) Incontinence (fecal / urine)	
FI9) Insomnia (see Drugs Benzodiazepines / Diary)	
FI10) DEPRESSION	
FI11) DEFICIT UNDERSTANDING LINGUSITCA only if explicitly stated (aphasia, stranger)	
FI12) Memory impairment only if explicitly stated	
Extrinsic factors	
FA1) Dressings (sutures, decubitus wounds, etc.) (see Diary / Register operative)	
FA2) Drainage (see Diary and kind intervention)	
FA3) Catetere urinario (vedi Diario)	
FA4) Therapy i.v. (peripheral or central venous access) (see chart therapy)	
FA5) Therapy with sedatives (see data falls for cases)	
FA6) Laxative therapy (see data falls for cases)	
FA7) Diuretic therapy (see data falls for cases)	
FA8) Antihypertensive therapy (see data falls for cases)	
FA9) Substance Abuse (alcohol and drugs) (see Diary)	
FA10) Postoperative patient / anesthesia	
FA11) Use of instruments of restraint	

Fill in Only for Cases Module: Fall Form

6. Index of risk fall at admission (Conley: last value calculated before the fall)…….

7. DAI…….8.UO(Operative Unit)……

Nursing Section

9. Date of the event ……... 10. **Time**……(hh:mm)

11. WHO WAS PRESENT:
☐ alone ☐ other patients ☐ family ☐ health staff ☐ else……

12. MODE OF FALL:
☐ from a standing position ☐ by sitting ☐ from bed ☐ from wheelchair
☐ during transfer ☐ else ☐……..

13. REASON:
☐ loss of strength ☐ loss of balance ☐ loss of consciousness ☐ stumbled ☐ slipped, dry floor ☐ slipped, wet floor ☐ unknown ☐ else
……..…..

14. PLACE:
☐ room ☐ aisle ☐ bathroom ☐ stairs ☐ surgery ☐ outside ☐ else …….

15. WHAT WAS THE PATIENT DOING WHEN FALLEN? .....

16. TYPE OF SHOE: ☐ open ☐ closed ☐ barefoot ☐ socks

17. PROTECTIVE EQUIPMENT IN USE: no ☐ yes ☐ **Specify**…….

Medical Section

18. DIAGNOSIS AT THE ENTRANCE …….

19. PATIENT ALLOWED TO GET UP: ☐ No ☐ Yes

20. FALL Results:
☐ absence of apparent damage ☐ minor injury: bruising or abrasion
☐ moderate damage ☐ major damage ☐ death

21. P. A. in supine…….. **and orthostatic**……**(if possible)**

22. DIAGNOSTIC TESTS REQUIRED:
☐ none ☐ TC/RMN…… ☐ RX…… ☐ else……..

23. THERAPY IN ACT: ☐ CNS sedative ☐ laxatives ☐ diuretics ☐ antihypertensive ☐ else……

24. Prognosis: ☐ none ☐ sligh ☐ moderate ☐ severe ☐ serious ☐ death