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Coordination strategies of care across stroke recovery: Proposals for nursing interventions in primary care

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Abstract

Introduction: Stroke is characterized by its complexity as a result of residual deficits, dependence in basic activities of daily living, and new needs for caregivers. The purpose of this study was to propose nursing interventions in accordance with general practice to provide continuity of care of stroke patients across the stroke-recovery trajectory and support for caregivers beyond the patient's length of stay.

Methods: This is a longitudinal prospective study of a population-based cohort of all cases recorded in inpatient care of a first episode of stroke that occurred between 1 April, 2006 and 31 December, 2013.

Results: There were 1,337 cases (54.1% male) and the mean age was 73.9 ± 12.5 years. Only 24.6% were evaluated by their disability after hospital discharge. Ischemic stroke treated with thrombolysis had the best results in mortality (5.1%) and Barthel score (85.4). Mild dependence for thrombolysis was OR = 2.5 with RRR = 46%, ARR = 9.4%, and NNT = 10 to get a Barthel score > 60 at discharge. After the episode the percentage of individuals with moderate or greater dependence increased up to 19.3%, with a loss (p = .023) higher in women, halving the number of individuals with early independence. Of the stroke survivors 44.9% went directly home after acute care and needed a home caregiver. Age (p < .001) and NIHSS < 12 (p = .045) were identified as the only prognostic factors associated with mild dependence (Barthel > 60).

Conclusions: This study recommends consideration of special interests, both standardization of a discharge report as organizing an individualized primary care plan and the unification of processes for assessment of the situation of dependency among all public administrations to facilitate the necessary support planning for the stroke patient and their family in primary care.

Key Words: Stroke, Disability, Dependence, Basic daily activities, Caregiver, Primary care

1 Introduction

The reasons to justify a study about stroke are based on its increasing incidence, its consequences in the form of residual deficits, dependence in basic activities of daily living, and new needs for caregivers. In many cases integrated care is a reality that is still not formalized while in some others it is still at an embryonic stage: the comparison of different experiences becomes then necessary to define systems some characteristics that an integrated system should have.[1]

In the past two decades, the absolute number of people suffering a first episode of stroke, the number of survivors after suffering a stroke, and the number of years of life lost have increased.[2,3] Thus, a stroke is a complex condition and as a result, survivors need and use a lot of health resources in-

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cluding acute care, rehabilitation, and social and community services. With the progressive aging of the population, the problem's magnitude and its consequences are increasing.[4] However, family caregivers are often ill prepared to manage the complex problems and post-discharge care needs of stroke patients.[5–7]

Therefore, after hospital discharge one of the most important aspects of care will be controls and adjustments for the patient and caregiver in disability management with the objective of minimizing the personal and family social impact up to a level as close as possible to that prior to the stroke episode, by empowering family and social reintegration of patients; and home adaptations and social resources to ensure continuity of care and patient transition between different levels of care and specialities.

After a stroke, the availability of tools for identifying those with lower acceptance of their residual disability will be useful for both formal and informal caregivers to plan an appropriate strategy to facilitate their rehabilitation process. Furthermore, interventions that facilitate prolonged participation in physical activity not only demonstrated better results in reduced disability but in greater involvement of affected people.[8,9]

The results of numerous studies also note the high social cost caused by stroke in relation to the degree of residual functional dependence and the temporal duration of the care they receive.[10–12] In this sense, social support has been recognized as one of the most important determinants of quality of life so that the existence of social networks and family supports are considered a priority in care after an episode.[13–15] In our country,[16] the degree of dependence was based on an evaluation of their ability to perform basic activities of daily living for the loss of physical, mental, intellectual, or sensorial autonomy, but there are no specific social support organizations available for support.

In the bibliography there are many references to the adherence of professionals to clinical practice guidelines on the care of patients who have suffered an episode of stroke, with widely varying results and objectifying the need to increase the adherence of health professionals to recommendations, particularly patients on long-term care.[16–18] However, outcomes vary regionally after adjusting for demographics and clinical characteristics.[19] In our clinical reality, we do not have any form of evaluation for standard clinical care or social support program to provide a stroke care continuum.

This work is a continuation and extension of the Ebrictus study,[20,21] and discusses issues related to stroke caregiving. It proposes nursing interventions in accordance with general practice to provide continuity of care of stroke patients across the stroke-recovery trajectory and support for caregivers beyond the patient's length of hospital stay. Integrated cares is desirable and constitutes a reference model for all situation considered.

2 Methods

This research is a longitudinal study of a population-based cohort of all registered cases of a first episode of stroke that occurred between 1 April, 2006 and 31 December, 2013 in Baix Ebre and Montsia (Tarragona, Spain). Its design has taken into account the criteria of an "ideal" incidence study[22] and was adopted retrospectively. The hypothesis is that after suffering a stroke, a loss of autonomy happens, which is insufficiently described and evaluated.

2.1 Demographic patterns and epidemic characteristics

It is widely accepted the ageing populations suffer high comorbidity and multi-organ chronic diseases often worsened by their social conditions. This makes difficult the comparison between different studies,[22] without knowing demographic patterns and epidemic characteristics. Our territory is characterized by a low density of population with 53.6 inhabitants/km^2 which is significantly lower than the Catalan average of 212 inhabitants/km^2. The income per capita is significantly lower (93.7%) than the average of Catalonia. In the last two decades the area is characterized by negative growth and a higher aging factor. The population older than 80 years old has increased 66% in the period 1986-2006, comprising 3.5% to 5.9% of the overall population. Life expectancy at birth is 81.34 years globally,[23] 78.26 years for men and 84.74 years for women.

Patients were included from the automated operation of the database of patients with a diagnosis code of stroke (I60-I69). Once the inclusion criteria were confirmed, data from the clinical history of primary care (e-cap) and data from hospital records for any of the defined services (e-SAP) protocols were systematically reviewed.

2.2 Case definition

The definition of stroke corresponds to that set by the World Health Organization:[24] "clinical signs of focal disturbance of cerebral function, rapidly developing, with symptoms lasting 24 hours or longer or leading to death, with no other apparent cause a vascular origin". The acute loss of cerebral or ocular function with symptoms lasting less than 24 hours correspond to the classical definition of transient ischemic disorder, which is included in this study.[25] These concepts are included in the definition used by the Master Plan for cerebrovascular disease in Catalonia and included in the codes used. It is defined as patients diagnosed with stroke, explicitly recorded in medical history during the study period (including deaths) in any of the records of health centres specified in the map of health resources SAP Terres de l'Ebre territory, regardless of their clinical course. All primary care centres and hospitals in the area are included.

Inclusion criteria: all patients must meet all of the following criteria: (1) Patient $\geq$ 15 years old and $\leq$ 90 years old; (2) Usual residence in the territory and/or assignment to any of the participating PCs at least five years at the time of the episode of stroke; (3) Patient with a diagnosis of stroke explicitly recorded in their medical record at any of the registration systems in health centres of the territory; the deceased are included in the study period; (4) Patient with a first episode of permanent or transient stroke; (5) Availability of relevant episode information in clinical records: 1) outpatient clinic; 2) hospital clinic; or 3) access to medical/socio-sanitary reports.

2.3 Variables

The variables on which information was collected were grouped as follows:

(1) Socio-demographic.
(2) Clinics: AVC type (ischemic or hemorrhagic) and event date (day/month/year).
(3) Characteristics of hospital episode: if there was inpatient care (not registered, only emergency department, hospital admission); NIHSS score on admission; whether or not there was thrombolytic therapy; duration of hospital stay (days); and hospital discharge destination (home, higher level acute hospital, long-term care hospital, death and date thereof).
(4) Pre- and post-stroke functional autonomy: Barthel score[26–29] classified as follows: < 20 (total dependence); 20-35 (severe dependence); 40-55 (moderate dependence); $\geq$ 60 (mild dependence); or 100 (independence) registered for the pre-episode and for discharge in the medical history of the patient, hospital, or primary care.
(5) Functional status of the patient at discharge: death, home-autonomous, home-address caregiver, referral to another acute hospital, or convalescent centre (temporary or long-term stay).
(6) Patient vital status (alive/dead), specifying the date (day/month/year) of death, if any.
(7) Diagnoses-related groups (DRGs) in which the patient has suffered a first stroke episode are included. The DRGs[30] are a pooling of patient morbidity. Using a computer algorithm each patient's diagnosis is recorded in the medical record in a given time period (usually a year) and a combination of diseases are reviewed and are classified in a group of nine existing categories: 1) healthy population; 2) acute disease; 3) chronic lower; 4) multiple minor chronic diseases; 5) chronic illness; 6) chronic disease in two affected organs; 7) chronic illness in three or more organs; 8) serious tumours and/or metastases; and 9) patients with greater care needs.

2.4 Codes and classification

For classification and coding of different variables, the international database[31] consensus standards are used in the computerized clinical records of the territory that have been previously specified. ICD-10 diagnosis codes (I60–I69 Cerebrovascular diseases) grouping the episodes into two variants were used: ischemic or hemorrhagic episode, as recorded or encoded in the clinical course report issued by the neurologist or, in their absence, coded in any of the related records. Bleeding complications post-episode are excluded from this section.

2.5 Statistical analysis

Computerized statistical analysis was undertaken with the following: (1) descriptive study to characterize the sample using basic statistics and standard deviations; and (2) differences in functional outcome and its evolution before and after the episode determined the possible effects on mortality and different residual deficits categorized. Mortality should be interpreted as overall mortality and cause-specific no stroke. Patients who died during hospitalization for the initial stroke or within the first month after the same are considered "immediate death". During follow-up the deceased are described as "subsequent mortality".

The analysis and processing of data was performed using the SPSS 11.5 statistical package for Windows. For the descriptive statistical analysis, basic statistics and standard deviation of key variables stratified by age and sex were used. An accepted level of statistical significance for all hypothesis tests was 5% ($p < .05$) and/or 95% CI.

3 Results

General characteristics of the overall group are described in Table 1 and 1,678 episodes of stroke (first event) were included initially. However, from this 122 episodes were excluded (7.2%) because they were in patients older than 90 years, 145 (8.6%) did not have their usual residence in the territory, and 74 (4.4%) were excluded due to insufficient clinical data in the records of medical history. The average age of the remaining 1,337 patients was 74.06 ± 11.9 years (25-90). The percentage of men (54.1%) was significantly higher ($p = .004$), but with a significantly ($p < .001$) lower mean age (72.34 *vs.* 76.09) than women, and significantly higher ($p < .001$) than those in which fibrinolysis (68.8 ± 12.0) was performed. The average follow-up was 3.12 ± 2.51 years (see Table 2) and 8.6% of ischemic strokes were treated with fibrinolysis. The severity was greater in women and those with hemorrhagic stroke. Many (44.9%) stroke survivors go directly home after acute care and need a home caregiver and 2.8% are directly referred to long-term care. After the stroke episode the percentage of individuals in the degree of dependence at least triples. The Barthel score as an assessment of functional status for basic activities of daily living (ADL) appears recorded in only 24.6% of patients at discharge.

Table 1: General characteristics (Ebrictus 2014)

Variables	Men	Women	*p*	All
Mean age (years)	72.1±12.7	76.0±12.1	< .001	73.9±12.5
Sex	722 (54.1%)	615 (45.9%)	.004	1337
Average NIHSS score (N)	7.14±6.8 (321)	8.47±7.8 (206)	.036	7.6±7.0 (527)
Average Barthel score pre-stroke (N)	94.9±15.1 (493)	91.3±19.7 (391)	.002	93.3±17.4 (88 [65.7%])
Average hospital stay (days)	7.9±8.16	9.02±7.82	.05	8.6±8.3
Average Barthel score at discharge (N)	83.18±25.21 (182)	75.8±30.81 (149)	.019	79.8±28.0 (331 [24.62%])
Average survival (months) (95% CI)	54.1±1.6 (50.9-57.4)	51.9±1.7 (48.6-55.8)	ns*	53.8±1.2 (51.4-56.2)
Incidence rate ratio (95% CI; 1,000 people/month)	13.6 (12.2–15.1)	13.5 (12.0–15.1)	.951	13.6 (12.5–14.6)
Ischemic Stroke	602 (83.2%)	537 (87.4%)	ns*	1139 (85.2)
Mean age	71.9±12.3	76.2±11.5	< .001	74.0±12.1
Average NIHSS score	6.62±6.56	8.3±7.4	.011	7.3±6.95
Average hospital stay (days)	7.7±7.5	8.8±7.9	.03	8.2±7.7
Average Barthel score at discharge	84.2±24.9	75.1±31.2	.006	80.0±28.37
Number of deaths	275 (37.9%)	247 (39.8%)	ns*	522 (45.78%)
Average survival (months) (95% CI)				56.6±1.3 (54.1-59.2)
Incidence rate ratio (95% CI; 1,000 people/month)				12.1 (11.1-13.2)
Hemorrhagic Stroke	120 (16.6%)	78 (12.7%)	ns*	198 (14.8%)
Mean age	72.7±14.2	74.6±15.3	ns*	73.4±14.8
Average NIHSS score	10.5±7.6	10.0±7.34	ns*	10.4±7.48
Average hospital stay (days)	10.8±10.6	7.8±7.6	.04	9.6±9.7
Average Barthel score at discharge	75.0±27.0	82.7±23.7	ns*	77.4±25.8
Number of deaths	67 (55.8%)	57 (72.1%)	.020	124 (62.31%)
Average survival (months) (95% CI)				37.5±3.0 (31.5-43.4)
Incidence density rate (95% CI; 1,000 people/month)				26.7 (22.2-31.8)
Thrombolysis Treatment	50 (8.3%)	48 (8.92%)	ns*	98 (8.6%)
Mean age	68.0±11.7	69.6±12.5	ns*	68.8±12.5
Average NIHSS score	13.9±6.4	12.3±6.0	.03	13.1±6.27
Average hospital stay (days)	10.3±12.3	10.0±6.6	ns*	10.2±9.9
Average Barthel score at discharge	83.3±25.7	87.5±24.9	.01	85.4±25.2
Number of deaths	19 (38%)	9 (18.7)	.034	28 (28.57%)
Average survival (months) (95% CI)				66.1±4.1 (58.0-74.3)
Incidence rate ratio (95% CI; 1,000 people/month)				8.0 (5.3–11.5)
Vital Status at Discharge				
Death	63 (9.36%)	59 (10.26%)	ns*	122 (9.77%)
Home, Autonomous	172 (25.55%)	145 (25.21%)	ns*	317 (25.4%)
Home, caregiver	315 (46.8%)	246 (42.78%)	ns*	561 (44.95%)
Referral to acute hospital	20 (2.97%)	16 (2.78%)	ns*	36 (2.88%)
Referral to long-term hospital	103 (15.3%)	109 (18.95%)	ns*	212 (16.98%)
Subtotal	673	575		1248
Clinical Risk Groups				
1	-	-		-
2	1	1	ns*	2
3	-	-		-
4	-	-		-
5	22 (5.45%)	10 (3.31%)	ns*	32 (4.53%)
6	289 (71.71)	213 (70.52%)	ns*	502 (71.2%)
7	79 (19.6%)	74 (24.5%)	ns*	153 (21.7%)
8	9 (2.23%)	4	ns*	13 (1.84%)
9	3	0	ns*	3 (0.04%)
Subtotal	403	302		705

* $p > .05$

Regarding the clinical severity of the episode, a NIHSS score was registered in 39.4% of patients, 33.5% of women and 44.4% of men ($p = .012$), and significant differences in the average NIHSS score by gender ($p = .036$) were observed, with greater severity in women. The average NIHSS score was 7.6 ± 7.0, significantly more severe ($p < .001$) among those who received fibrinolysis (13.1 ± 6.27) and those with hemorrhagic stroke (10.4 ± 7.48) than among those with ischemic stroke without treatment with fibrinolysis (7.3 ± 6.95). The average hospital stay was 8.65 ± 8.33 days, significantly higher in women (9.05 days, $p = .05$) and in the ischemic stroke group treated with fibrinolysis (10.2 days, $p = .011$).

The NIHSS is a predictor of functional outcome and correlates with the Barthel post-episode ($p = .022$) and survival ($p < .001$). In patients where there is no registered NIHSS score at discharge, the percentage of those with a Barthel value of ≤ 60 was 39.3% and the mortality endpoint represents 55.9% of the total. The highest percentage of patients with a Barthel score of ≤ 60 (26.2%) is associated with a NIHSS score of > 12.

Table 2: Clinical profile severity according to type of stroke (Ebrictus 2014)

	All	Hemorrhagic	Ischemic without thrombolysis	Ischemic with thrombolysis
N	1337	198	1041	98
Average follow-up (years)	3.12±2.51	1.91±2.24	3.36±2.50	3.05±2.42
Mean age (years)	74.06±11.09	74.46±12.42	74.59±11.54	68.82±12.05
Overall mortality (%)	122 (9.7%)	58 (31.4%)	59 (6.1%)	5 (5.1%)
Home, Autonomous	317 (25.3%)	17 (9.2%)	271 (28.1%)	29 (29.6%)
Home, caregiver	561 (44.8%)	43 (23.2%)	478 (49.6%)	37 (37.8%)
Referral to acute hospital	36 (2.9%)	21 (11.4%)	8 (0.8%)	7 (7.1%)
Referral to chronic hospital	212 (16.9%)	46 (24.9%)	144 (14.9%)	20 (20.4%)
Average NIHSS score	7.6±7.0	10.4±7.4	7.3±6.9	13.1±6.2
P50 NIHSS score	4	9	3	12
Average Barthel score post-stroke	79.8±28.0	77.4±25.8	80.0±28.3	85.4±25.3
Percentage of patients with Barthel score < 60	11.4%	27.6%	11.8%	6.1%
Average hospital stay (days)	8.65±8.33	9.65±9.69	8.24±7.75	10.22±9.90

Hemorrhagic strokes accounted for 14.8% of all strokes and 40.2% occurred in patients ≥ 80 years of age. Of ischemic strokes, 48.4% happened in patients aged ≤ 80 years, and they were significantly more common among men (60.2%). Ischemic strokes, in spite of having the worst clinical profile (see Table 2), had the highest average Barthel score (85.4) without cases of moderate dependence or more deficits at discharge.

The Barthel score as pre-stroke assessment of functional status for basic activities of daily living (ADL) was recorded in 65.7% of the cases, but only 24.6% at discharge and for six months after. The average score before the episode (see Table 1) was close to full independence (93.3 ± 17.4) and was significantly ($p = .002$) higher in men (94.97 *vs.* 91.30) than women. According to the Barthel score, 79.1% were independent before the stroke and only 5.5% had a moderate or greater dependence prior to the stroke episode. Overall, after the stroke episode the percentage of individuals in a degree of dependence at least triples; this occurs by halving the number of individuals with early independence. The percentage of patients with moderate or greater dependence increases up to 19.3%, with a significant decrease ($p = .023$) in the Barthel score, which was higher in women than in men (83.18 *vs.* 75.8), thus increasing the previous gender difference. Of stroke survivors, 44.9% go directly home after acute care and need a home caregiver and 2.8% are directly referred to long-term care.

A Barthel score < 60 is a predictor of long-term mortality ($p < .001$). In our study, thrombolysis treatment was associated with lower mortality ($p < .001$), less referral to long-term institutionalization in chronic centres, and had a clear protective effect (OR = 2.5) for mild dependence. The relative risk reduction was 46%, the absolute risk reduction was 9.4% to get a reduction in the number of people with the outcome of a Barthel score < 60 at discharge, and the number needed to treat was 10 to get one more result with a Barthel score > 60 at discharge. Age ($p < .001$) and NIHSS score < 12 ($p = .045$) were identified as the only prognostic factors associated with a mild dependence (Barthel > 60), OR = 0.85 (95% CI: 0.81-0.90) and OR = 0.04 (95% CI: 0.01-0.94) respectively.

Finally, 92.2% of stroke patients were concentrated in groups 6 and 7 in the Diagnoses Related Groups classification. Although there were no significant differences in the total group, in groups 6 the percentage (41.1%) of men was significantly higher ($p = .002$) than women (30.0%).

4 Discussion

In relation to the first period (2006-2008) of the Ebrictus[20] study, epidemiologically and clinically the percentage of hemorrhagic stroke increased significantly ($p < .001$) from 7.9% to 14.8%; and no significant differences were detected on the average value of the severity between a NIHSS score of 12-13 and dependence results. Basically, the absolute number of people who have a stroke every year, stroke survivors, related deaths, and the overall burden of strokes are increasing. We should point out the main facts we have found in this study: the assessment of functional status for basic activities of daily living is recorded in only 24.6% of the cases at discharge and for six months after episode in the primary care database; functional status after stroke is a predictor of long-term mortality; the worse the severity of the episode, the greater the probability that no NIHSS score was registered at discharge; the classification by DRGs has little utility to provide qualitative data on functional impairment; and the evaluation tool for functional impairments resulting from stroke and their consequences used by the Social Welfare Department[16] to measure severity is different from the one used by the clinical organization at discharge.[26] We think these facts are barriers to acquiring effective implementation of stroke care pathways and stroke family support programs. It constitutes an approach based more to the characteristics of the care provider than to the patient needs.

If around 50% of stroke survivors go directly home after acute care, family caregivers play a central role in supporting them in their transition through rehabilitation and return to community living.[32] To improve the recovery of stroke survivors the first step would be to get a comprehensive pre-discharge report of the patient that included an assessment of caregivers. This would help in designing treatment plans that would meet the recovery of patients and the needs and skills of caregivers. Nurses should explore care coordination and care management acknowledging that families have limited participation in the discharge planning process. We suggest the availability of standardized hospital discharge reports that include all variables related to the episode of stroke to provide epidemiological, clinical, disability outcomes, and prognosis of stroke episode. Both in hospitals and in primary care an appropriate assessment of both the episode and its effects on ADL should be linked to objectives and clinical quality records centres. It seems to be proven1 that protected hospital discharge is, in the mid-term, more effective than hospitalization when it comes to the recovery of autonomy. We consider the following basic and necessary content in a hospital discharge report:

(1) Type of stroke.
(2) History of previous stroke and risk of relapse: Essen scale.
(3) Possible cause: aging population, increased antiplatelet and anticoagulant treatment, and episodes of stroke (traumatic) not necessarily related to traditional cardiovascular risk factors (such as falls) involving different preventive care.
(4) Episode severity: NIHSS/Rankin; clearly the Barthel scale provides more specific and detailed information on the patient's needs, while the Rankin scale is more comprehensive and useful in the decision of fibrinolytic therapy evaluation.
(5) Impact on ADL: Barthel, immediately before the post-stroke and developmental period.
(6) If it has been started, the rehabilitation process in a specific service or home and what are the functional impairments.
(7) Outcomes and quality of care expected (swallowing, SNG, depression, *etc.*). A care pathway post-stroke in the context of complex illness would be useful. This should include both pharmacological and non-pharmacological aspects to allow design of a strategic plan to follow-up in primary care.
(8) If there has been a resulting death, it has the same relationship to the episode of stroke (traumatic or intercurrent complications such as aspiration pneumonia or ischemic miocardiopathy), allowing access to information regarding quality of care and improving registration of the causes of mortality.
(9) The family and/or caregivers have been informed about social networks and stroke assistance in the territory: social work, law dependence, RHB centres, centres for cognitive activities, day hospitals, residential and day centres, home care services, *etc.*

Possibly those cases with greater clinical severity and worse prognosis have discharge reports without variables such as Barthel or NIHSS. The cases without such records are concentrated in almost 40% of the cases with a Barthel value of ≤ 60 or the mortality endpoint is 55.9%. However, this does not preclude the need for them in the planning of more complex home care. If we do not have information we cannot provide both stroke-specific information and caregiver training and counselling, or get social support. Modest differences in functional status at three months are associated with significant differences in survival and functional status over seven-year follow-up and have implications for health care planning and the health economic assessment of treatments for acute stroke.[33]

The second step would be to design comprehensive care coordination and case management that are individualized to the needs of both patients and caregivers, smoothing their transition from having intense therapy and nursing case management to having little or no assistance after hospital discharge. The needs of other chronic conditions must be included. Also, the use of a primary care patient care plan to follow and support family caregivers with daily activities should include: (1) Periodic assessment of residual disability in activities of daily living (Barthel/Rankin). (2) Quality of life (SF-36):[34] to explore the impact of stroke on patients' QoL and their caregivers and the efficacy of interventions. (3) Handling of Disability: RHB, care transitions, changes and adaptations in the home, primary care and specialist follow-up, on medication self-management, and knowledge of signs/symptoms of exacerbations. (4) Prevention of immobility complications: abnormal positions, thromboembolism prevention, and pressure sores. (5) Nutritional state; risk of aspiration. (6) Ending harmful habits. (7) Handling problems with sphincters. (8) Sexual activity. (9) Aphasia and possible consequences of communication deficit. (10) Caregiver health is closely linked to the stroke patient's physical, cognitive, and psychological recovery.

The effectiveness of advanced registered nurse practitioners compared to routine visits from a home health nurse for fewer re-hospitalizations and lower costs post-discharge has been consistently demonstrated,[35] but none of these transition interventions have been designed specifically for stroke patients and their informal caregivers. In addition, follow-up post-discharge and supportive counselling interventions individualized to the caregiver's needs should be implemented.

From our results, we specially consider the individual management of the following conditions: long-term participation in physical activity after stroke by obtaining a clinical report of patients with stroke that can be used by primary care to make a simple clinical prediction for death and functional impairments at discharge. Like our study, results of both community and hospital-based studies demonstrated that functional outcome post-stroke is a powerful predictor of long-term mortality,[9,21,36] therefore we ought to promote maximum functional independence of stroke survivors living at home through nursing interventions and supervised and tailored physical activities. Clinical trials are necessary to further address the impact of physical activity on primary and secondary stroke prevention, outcome, and cognitive function.

DRGs are increasingly being used for various purposes in many countries. However, there are no studies comparing different DRG systems in the care of stroke. Large variations in the classification of stroke patients raise concerns whether all systems rely on the most appropriate classification variables and whether the DRGs adequately reflect differences in the complexity of treating different groups of patients.[37] Actually, its utility seems relatively quite short because it is not associated with proportionately greater degrees of disability and is less discriminative of the intensity or quality of the affected functions. We need a clinical model including not only cardiovascular prediction, but also simple clinical prediction for death and disability, which may be determined by nonspecialist clinicians.[6]

The aging of our population is associated with a higher prevalence of comorbidities such as auricular[38] fibrillation treated with oral anticoagulants (OAC). The incidence of cerebral hemorrhages has doubled in the period 2009-2013 perhaps related to the increased use of OAC. Since 40% of hemorrhagic strokes occurred in patients $\geq$ 80 years in which the expected prevalence of atrial fibrillation is 24%, it is necessary to identify at discharge especially those patients susceptible to accidents, treated with OAC, polypharmacy and control problems, use and/or identification of prescribed medicines by the lack or loss of physical, mental, intellectual or sensory functions, or characteristics of their autonomous living environment.

Eventually, the records should measure the recovery of survivors over time and their needs in terms of social and medical services. Nurses must be involved in research about results in patient outcomes. Adding web-based services, leading support groups and educational resources, and managing telehealth monitoring would make the intervention more comprehensive while minimizing resource use and improving accessibility.

The main evidence from this study is the enormous impact of an episode of stroke on people's autonomy. Currently, our healthcare system has a lot of clinical and prognostic information that is stratified into different levels of care (hospital, primary care) and different providers (social assistance, dependency law, welfare department, *etc.*) which paradoxically make assessment planning and resolution of specific needs of affected patients more difficult. Family caregivers of stroke survivors who are just beginning their role must learn new skills and incorporate new knowledge into their daily activities and should get the right social support. Nursing has a very important and necessary role in making this transition easier and smoother. Lacking or inadequate legal framework on this topics cold result in a major obstacle to integration and particularly to the provision of care.

Limitations of the study include the number of cases and variables to study, and the quality of information depends on the methodology used in data collection, storage, and manipulation of the data. The cases without Barthel or NIHSS records are concentrated in almost 40% of the cases with a Barthel value of $\leq$ 60 or where the mortality endpoint is 55.9%. This reflects an information lack which is a barrier to acquiring effective implementation of stroke care pathways and stroke family support programs.

The study is designed to operate under typical day-to-day operating conditions in all participating healthcare levels. Therefore, their validity will be suitable for application in settings and populations with similar characteristics. When analysing a complex intervention, such the principal characteristics of existing practices, it is relevant to consider the management of information involved in the process as key element that should be common and shared between hospital and community to grant the continuity of care and a coordinated use of resources.

5 Conclusion

After first stroke, 44.9% of stroke survivors go directly home and the percentage of patients in each degree of dependency triples with higher lost in the previous Barthel score among women (7.3) than in men (3.6).

Regarding the average assessment of functional status (Barthel score), this variable is recorded in only 24.6% of all cases in the hospital discharge reports as specific indicators in primary care. The NIHSS score was registered in 39.4% of patients.

We consider alternatives of special interest both the standardization of hospital discharge reports that include all variables related to the episode of stroke, as well as the transfer of care from having intense therapy to having little or no assistance after hospital discharge. Nurses should explore care coordination and care management recognizing that family had limited participation in the discharge planning process.

We also propose a Care Plan with advanced registered nurse practitioners rather than routine visits from a home health nurse. Adding web-based services, and managing telehealth monitoring would make the intervention more comprehensive while minimizing resource use and improving accessibility. Nurses must be involved on research about results in patient outcomes.

The nurse leadering social support groups' information about and educational resources and identifiying at discharge especially those fragile patients often jeopardized by multifactorial risk as falls, polypharmacy, ACO, solitude, cognitive impairment, *etc.* in order to facilitate his access to the wide catalogue of services that could be provided by an integrated care system.

The simplification and standardization of all the evaluation processes of dependence is necessary by public administration to avoid repetitions with different instruments and routes from different sources.

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Conflicts of Interest Disclosure

The authors declare that they have no competing interests.

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