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ARTICLE

Key performance indicators for stroke from the Ministry of Health of Brazil: benchmarking and indicator parameters

Indicadores de performance de AVC do Ministério da Saúde do Brasil: avaliação comparativa e parametrização dos indicadores

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ABSTRACT

The present study aimed to analyze the stroke units in two centers for the key performance indicators (KPIs) required by the Ministry of Health in Brazil. **Methods:** All 16 KPIs were analyzed, including the percentage of patients admitted to the stroke unit, venous thromboembolism prophylaxis in the first 48 hours after admission, pneumonia and hospital mortality due to stroke, and hospital discharge on antithrombotic therapy in patients without cardioembolic mechanism. **Results:** Both centers admitted over 80% of the patients in their stroke unit. The incidence of venous thromboembolism prophylaxis was > 85%, that of in-hospital pneumonia was < 13%, the hospital mortality for stroke was < 15%, and the hospital discharge on antithrombotic therapy was > 70%. **Conclusion:** Our results suggest using the parameters of all of the 16 KPIs required by the Ministry of Health of Brazil, and the present results for the two stroke units for future benchmarking.

Keywords: stroke; quality indicators, health care; delivery healthcare; outcome and process assessment; health care.

RESUMO

O objetivo do presente estudo é analisar os indicadores de qualidade (IQ) exigidos pelo Ministério da Saúde no Brasil em duas unidades de AVC. **Métodos:** Foram analisados os 16 IQ, incluindo a percentagem de pacientes internados na unidade de AVC, profilaxia de tromboembolismo venoso (TEV) nas primeiras 48 horas após a admissão; pneumonia e mortalidade hospitalar e alta hospitalar em terapia antitrombótica (TAT) em pacientes sem mecanismo cardioembólico. **Resultados:** Ambos os centros admitiram mais de 80% dos pacientes na unidade de AVC. A profilaxia do TEV foi realizada em mais de 85% dos casos; a pneumonia hospitalar foi inferior a 13%; a mortalidade hospitalar foi menor que 15% e a alta hospitalar em uso de TAT foi acima de 70%. **Conclusão:** O presente estudo sugere os parâmetros dos 16 IQ exigidos pelo Ministério da Saúde do Brasil e os resultados obtidos em duas unidades de AVC para avaliação comparativa futura

Palavras-chave: acidente vascular cerebral; indicadores de qualidade em assistência à saúde; assistência à saúde; avaliação de processos e resultados; cuidado da saúde.

Stroke is one of the leading causes of mortality and morbidity worldwide. To improve this scenario, it is crucial to evaluate reliable data to improve the standards of hospital care, since quality care is of great value in the prognosis of patients[1,2].

In 2012, the Brazilian Ministry of Health published Resolution No. 665 for implementation in stroke treatment, including the implementation of stroke units[3]. An essential aspect of this regulation was the inclusion of key performance indicators (KPIs) for monitoring disease management in all the comprehensive stroke units[3].

The present study aimed to demonstrate the analysis of the KPIs determined by the Brazilian Ministry of Health in two separate Brazilian stroke units, and to suggest parameters to consider while evaluating the different metrics.

METHODS

This was a retrospective and descriptive study performed in two public tertiary hospitals in Brazil, the Hospital das

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Clinicas from São Paulo State University in Botucatu, and the Hospital de Clinicas from the Federal University of Parana in Curitiba. The ethics committees of both hospitals approved this study.

All the patients with a confirmed stroke diagnosis admitted from January 2015 to June 2015 were included in the study. The following exclusion criteria were considered: 1) length of stay < 2 days; 2) "comfort measures only" documented on days 0 or 1; 3) enrolled in clinical trials related to stroke; 4) left against medical advice on days 0 or 1; 5) died on day 0 or 1; and 6) length of stay > 120 days.

The definition of a stroke unit used in the current study was a multidisciplinary team comprising physicians, clinical nurses, physical therapists, occupational therapists, and speech and language therapists in a specific ward providing specialized care to patients with stroke[4]. The stroke unit is characterized as a semi-intensive unit, and the only criterion to be admitted to a stroke unit was the diagnosis of stroke, independent of the severity. The criteria to not be admitted to the stroke unit were: 1) unconscious patients; 2) necessity of mechanical ventilation; 3) presence of hemodynamic instability; and 4) patients who underwent a surgical procedure (e.g., craniectomy). All the patients were admitted to the intensive care unit.

The 16 KPIs published by the Ministry were considered in four groups: the admission KPIs, the in-hospital treatment KPIs, the in-hospital complication KPIs, and the discharge KPIs. The admission KPIs considered were as follows: 1) door-to-image time < 25 minutes, 2) door-to-needle time <60 minutes, and 3) percentage of patients admitted to the stroke unit, which was the only marker considered for all the patients with stroke admitted to the hospital during the study period. The in-hospital treatment KPIs were as follows: 1) venous thromboembolism prophylaxis in the first 48 hours after admission and 2) antithrombotic therapy by the end of day 2. The in-hospital complication KPIs were: 1) deep venous thrombosis, 2) pressure ulcer, 3) pneumonia, 4) urinary tract infection, and 5) hospital mortality. The discharge KPIs were the following: 1) hospital discharge on antithrombotic therapy in patients without cardioembolic mechanism, 2) hospital discharge on anticoagulation therapy in patients with atrial fibrillation or flutter, 3) hospital discharge on statin therapy in patients with atherothrombotic mechanisms, 4) hospital discharge on rehabilitation and secondary prevention therapy in patients with ischemic stroke, 5) mean length (in days) of the hospital stay for patients with stroke, and 6) specific ICD-10 for stroke etiology at discharge. Table 1 presents the parameters for all the KPIs considered in the current study based on previous publications[5,6,7,8,9].

All the data were collected prospectively and manually at patient admission in a standard flowchart and checklist by a professional from the stroke unit. After discharge, the information was reviewed by an external professional and confirmed by checking the patient admission records. The absence of data was considered as "procedure not followed."

Descriptive analysis of the qualitative variables was performed using simple frequencies and percentages.

RESULTS

This study included 117 patients with stroke admitted to the Federal University of Paraná and 172 patients admitted to the São Paulo State University. All the patients had complete data for analyses. Ischemic stroke etiology was found in 106 (90.5%) cases at the Federal University of Parana and 149 (86.6%) cases at the São Paulo State University. The mean length (in days) of hospital stay for the patients with stroke was six and 12 days in the São Paulo State University and Federal University of Parana, respectively. Table 2 presents the proportions of patients in each center that achieved the KPIs.

DISCUSSION

The current study demonstrated the viability of collecting and analyzing KPIs in two different Brazilian stroke centers, including data ranging from admission until discharge. In addition, the parameters used were standard for both the centers, thereby allowing for national and international benchmarking.

The Ministry of Health KPI is the first Brazilian initiative to evaluate quality parameters in Brazil. They include 16 measures related to the structure, process, outcome, and efficiency of acute stroke care[7]. More than 40 measures have been previously suggested and reported, including local, national, and regional measures[2,6,7,9,10]. The importance of these measures lies in their capability to evaluate individual facilities over time, compare the qualities of different healthcare providers, and identify areas for improvement[10].

When considering the admission KPI, a recent study demonstrated that 68% of the patients achieved the door-to-image time[11]. In the present study, the door-to-image time was very different in both the centers, which could be related to the patient admission flow for early stroke management. In one of the centers (Federal University of Paraná), the patients were admitted directly in the CT room, thereby significantly reducing the door-to-image time[12]. This demonstrated the importance of identifying gaps in the timeline of acute stroke care, from symptom identification by the patient and/or relatives to discharge from hospital. Even with this discrepancy, two-thirds of the patients achieved the door-to-needle in both centers, higher than previously reported[11]. One important result is that more than 80% of patients were admitted to a stroke unit in the current study, very similar to previous studies[13,14]. The admission to a stroke unit is an important marker to evaluate the performance and outcome of hospitals. In this ward, patients are treated by

Table 1. Parameters for the key performance indicators considered in the current study.

KPI	Definition	Method	Numerator	Denominator	Important points
Venous thromboembolism (VTE) prophylaxis in the first 48 hours after admission	Percentage of patients prescribed VTE prophylaxis on hospital days 0 or 1	Based on prospective data from patient medical records	Patients with ischemic stroke prescribed VTE prophylaxis in the first 48 hours after admission or those who have documentation related to why VTE prophylaxis was not provided	All patients with ischemic stroke	Prophylaxis: medications (heparin, low-molecular-weight heparin) or intermittent pneumatic compression. Reasons not to introduce: the patient was ambulatory or undergoing full-dose anticoagulation for other reasons
Hospital discharge on antithrombotic therapy (ATT) in patients without cardioembolic (CE) mechanisms	Percentage of patients without CE mechanisms discharged on ATT	Based on prospective data from patient medical records	Patients with ischemic stroke without CE mechanisms discharged on ATT	All patients with ischemic stroke without CE mechanisms	Antiaggregation or anticoagulation medication in therapeutic dosage considered
Hospital discharge on anticoagulation therapy in patients with atrial fibrillation or flutter	Percentage of patients with atrial fibrillation or flutter discharged on anticoagulation	Based on prospective data from patient medical records	Patients with ischemic stroke with atrial fibrillation or flutter discharged on anticoagulation	All patients with ischemic stroke with atrial fibrillation or flutter	Anticoagulation medication in therapeutic dosage considered
The ATT at the end of day 2	Percentage of patients with ischemic stroke on ATT at the end of day 2	Based on prospective data from patient medical records	Patients with ischemic stroke who are prescribed ATT at the end of day 2	All patients with ischemic stroke	Antiaggregant or anticoagulation medication in therapeutic dosage considered
Hospital discharge on statin therapy in patients with atherothrombotic mechanisms	Percentage of patients with atherothrombotic mechanisms discharged on statins	Based on prospective data from patient medical records	Patients with ischemic stroke with atherothrombotic mechanisms discharged on statins	All patients with ischemic stroke with atherothrombotic mechanisms	At least 50% stenosis to considered atherothrombotic mechanisms
Hospital discharge on rehabilitation and secondary prevention therapy in patients with ischemic stroke	Percentage of patients with ischemic stroke discharged on rehabilitation and secondary prevention therapy	Based on prospective data from patient medical records	Patients with ischemic stroke discharged on rehabilitation and secondary prevention therapy	All patients with ischemic stroke	Documented in the patient's file
Percentage of patients admitted to the stroke unit	Percentage of patients with stroke admitted to the Stroke Unit	Based on prospective data from patient medical records	Patients with stroke admitted to the stroke unit	All patients with stroke	Registered in the hospital's central data
Mean time (in days) of hospital stay for patients with stroke	Mean time (in days) of hospital stay for patients with stroke	Based on prospective data from patient medical records	Mean time (in days) of hospital stay for patients with stroke	NA	
Deep venous thrombosis (DVT)	Percentage of patients with ischemic stroke with DVT at admission	Based on prospective data from patient medical records	Patients with ischemic stroke with DVT at admission	All patients with ischemic stroke	Clinical diagnosis or supported by complementary tests
Pressure ulcer (PU)	Percentage of patients with ischemic stroke with PU at admission	Based on prospective data from patient medical records	Patients with ischemic stroke with PU at admission	All patients with ischemic stroke	Clinical diagnosis or supported by complementary tests
Pneumonia	Percentage of patients with ischemic stroke with pneumonia at admission	Based on prospective data from patient medical records	Patients with ischemic stroke with pneumonia at admission	All patients with ischemic stroke	Clinical diagnosis or supported by complementary tests
Urinary tract infection (UTI)	Percentage of patients with ischemic stroke with UTI at admission	Based on prospective data from patient medical records	Patients with ischemic stroke with UTI at admission	All patients with ischemic stroke	Clinical diagnosis or supported by complementary tests
Specific ICD-10 to stroke etiology at discharge	Percentage of patients discharged with stroke admitted to the stroke unit with the specific ICD-10 to stroke etiology	Based on prospective data from patient medical records	Percentage of patients discharged with stroke admitted to the stroke unit with the specific ICD-10 to stroke etiology	All patients with stroke admitted to the SU	ICD-10 I64 was not considered appropriate
Hospital mortality due to stroke	Percentage of patients with stroke who died during hospital admission	Based on prospective data from patient medical records	Percentage of patients with stroke who died during hospital admission	All patients with stroke admitted to the hospital	
Door-to-image time <25 minutes	Percentage of patients with ischemic stroke submitted to brain CT in less than 25 minutes of admission	Based on prospective data from patient medical records	Percentage of patients with ischemic stroke submitted to brain CT in less than 25 minutes of admission	All patients with ischemic stroke admitted to the hospital within less than 24 hours of symptoms onset	
Door-to-needle time <60 minutes	Percentage of patients with ischemic stroke submitted to thrombolysis in less than 60 minutes of admission	Based on prospective data from patient medical records	Percentage of patients with ischemic stroke submitted to thrombolysis in less than 60 minutes of admission	All patients with ischemic stroke submitted to thrombolysis and admitted to the hospital	

KPI: key performance indicators; NA: not available; VTE: venous thromboembolism; ATT: antithrombotic therapy; SU: stroke unit; CE: cardioembolic; DVT: deep venous thrombosis; PU: pressure ulcer; UTI: urinary tract infection; DTI: door-to-image; DTN: door-to-needle.

Table 2. Percentage of patients in each center that achieved the key performance indicators.

Variable	SPSU (%)	FUPR (%)
DTI	27	83
DTN	75	66
DVT prophylaxis on day 2	92	88
Antiplatelet therapy on day 2	97	94
Antiplatelet therapy at discharge in non-cardioembolic IS	75	100
Anticoagulation therapy at discharge in cardioembolic (atrial fibrillation) IS	94	87
Statin at discharge in atherothrombotic IS	100	88
Plan of rehabilitation and prophylaxis at discharge	96	87
Percentage of stroke patients admitted to the stroke unit	94	84
DVT	0.6	0.0
Pneumonia	13	6
UTI	11	6
PU	0.6	1
Mortality rate	8	14
Specific ICD-10 to stroke etiology at discharge	24	64

SPSU: Sao Paulo State University; FUPR: Federal University of Paraná; DTI: door-to-image time; DTN: door-to-needle time; DVT: deep venous thrombosis; IS: ischemic stroke; UTI: urinary tract infection; PU: pressure ulcer; ICD: International code diagnosis.

a multidisciplinary team specialized in their condition, and this could reduce clinical complications during admission and improve the outcome after discharge.

For the in-hospital treatment KPIs, two important factors related to mortality and disability after stroke were evaluated, venous thromboembolism prophylaxis and antithrombotic therapy. These reached approximately 90% in both the centers, which was very similar to the previously reported national and international data[15,16].

Clinical complications are common after stroke; 16% of the patients develop urinary tract infection, 11.2% develop chest infection, 0.6% develop deep venous thrombosis, and 0.6% develop pressure ulcer[17]. In the current study, the incidence of these complications was very similar to that reported by previous studies. The mortality rate presented in our study is lower than that previously published in Brazilian epidemiological studies[18,19].

When the discharge KPIs were analyzed, the antithrombotic therapy at discharge in patients without cardioembolic mechanisms, hospital discharge on anticoagulation therapy in patients with atrial fibrillation or flutter, and hospital discharge on statin therapy in patients with antithrombotic therapy mechanisms were those prescribed in more than 75% of the patients in both the centers. Previous studies showed higher numbers, with more than 88% for these important secondary prevention parameters[10,18,19].

Usually, the set of measures does not include all the worthwhile clinical interventions; some of these are challenging to measure or to define in acute stroke settings. The refinement of measures is an ongoing process, and changes can be expected[7]. Hence, some important outcome markers should be considered while reviewing the current KPIs, such as patient education, percentage of patients submitted to thrombolysis, assessment of dysphagia, counseling for smoking cessation, outcomes, and complications after discharge[5-10,14,20].

Some important limitations of this study are as follows. The analyses were performed in only two public academic centers in south and southwest Brazil. The results could be different in other private or non-academic centers, or in other regions of the country. The data presented here, and the suggestions for parameters to use for the different metrics would help initiative new studies in this area and improve the benchmarking of stroke care in Brazil. At present, it is not possible to extrapolate the present data to private and non-academic centers. In a previous study performed in a private Brazilian center, the authors evaluated international performance indicators, some of which were similar to the KPIs reported here, which were compared with the studied centers[16].

This is the first study in Brazil to consider the KPIs proposed by the Brazilian Ministry of Health for stroke centers, thereby highlighting their practical viability. This organized recording method could be useful for all hospitals to examine their data and improve their quality of care in the future.

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