

Effect of a KPI-360 °Multidimensional Nursing Performance Management Model on Patient-Reported Outcomes and Functional Independence Among Stroke Inpatients: A Randomized Controlled Study

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Abstract: Nursing shortages and increasing care complexity in neurological wards highlight the need for performance systems that can reliably translate nursing standards into patient-centered outcomes. To evaluate whether a KPI-360 °-integrated multidimensional nursing performance management model improves patient-reported outcomes and functional independence in stroke inpatients. Single-center, parallel-group randomized controlled study. From January 2022 to June 2023, 201 non-critical stroke inpatients were randomly allocated to routine inpatient nursing (control, n=100) or to a KPI-360 ° performance management model embedded in daily nursing practice (intervention, n=101). Outcomes were assessed at baseline (day 1–2) and follow-up (day 5) using the Connor-Davidson Resilience Scale (CD-RISC), Fatigue Severity Scale (FSS), Self-Efficacy for Managing Chronic Disease 6-item Scale (SEMCD-6), and Modified Barthel Index (MBI). Length of stay was recorded. Independent-samples t-tests and chi-square tests were used (two-sided P<0.05). At follow-up, the intervention group showed higher CD-RISC (mean difference [MD] 26.89, 95% CI 23.95–29.83; P<0.001), higher SEMCD-6 (MD 11.11, 95% CI 8.58–13.64; P<0.001), higher MBI (MD 7.16, 95% CI 2.00–12.32; P=0.007), and lower FSS (MD –20.47, 95% CI –22.28 to –18.66; P<0.001) than the control group. Length of stay was shorter in the intervention group (MD –1.21 days, 95% CI –2.30 to –0.12; P=0.030). Embedding a KPI-360 ° multidimensional performance management model into neurology nursing practice was associated with improved patient-reported outcomes and shorter length of stay in stroke inpatients. Multicenter, cluster-randomized studies with nurse-level outcomes are warranted. Performance management can be framed as a nursing quality-improvement intervention when it is explicitly linked to care processes (education, safety, communication) and to patient-centered outcomes.

1. Introduction

Nursing services in neurological wards are characterized by high care intensity, rapid changes in patient status, and substantial demands for safety monitoring and patient education. At the same time, health systems face persistent nursing workforce shortages and increasing expectations for measurable quality and efficiency [1].

Key performance indicators (KPIs) translate organizational and clinical goals into measurable indicators and can support standardized nursing processes. However, nursing care is inherently multidimensional, and relying on a single-source appraisal may underestimate important domains such as communication, education, and safety behaviours.

360-degree (multisource) feedback integrates perspectives from supervisors, peers, multidisciplinary colleagues, and patients/families. Evidence suggests that multisource feedback can support professional development and behaviour change, although effectiveness varies and implementation factors are important [2-4].

To support nursing quality improvement in a neurology setting, we embedded a KPI-based indicator system within a 360-degree feedback framework and examined whether this multidimensional model is associated with improvements in patient-reported outcomes (resilience, fatigue, self-efficacy) and functional independence among stroke inpatients. The conceptual pathway of the intervention is summarized in Figure 1.

The study hypothesis was that the KPI-360° model, when operationalized through standardized nursing processes and feedback loops, would improve patient-reported outcomes and reduce length of stay compared with routine inpatient nursing.

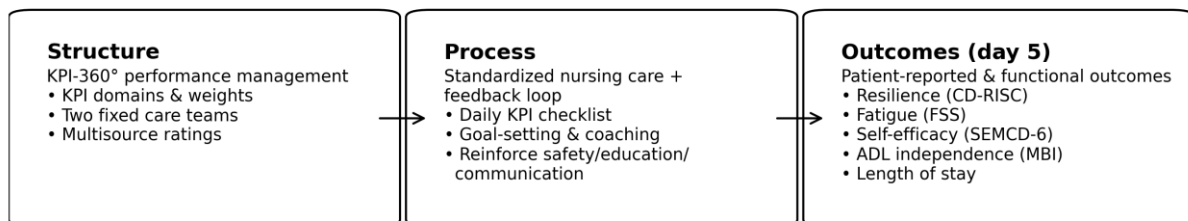


Figure 1. Conceptual framework of the KPI-360° multidimensional nursing performance management model.

2. Methods

2.1 Design and setting

This was a single-center, parallel-group randomized controlled study conducted in the neurology department of a tertiary hospital in China.

2.2 Participants

Stroke inpatients admitted between January 2022 and June 2023 were screened. Inclusion criteria were: (1) diagnosis of stroke according to standard neurology criteria; (2) clear consciousness and ability to communicate; (3) no diagnosed mental disorders; (4) age ≥ 45 years; and (5) Modified Barthel Index (MBI) ≥ 60 at admission. Exclusion criteria were: (1) participation in other

interventional studies during hospitalization; or (2) critical illness precluding assessment.

2.3 Randomization and allocation

Participants were randomly allocated (1:1) to control or intervention groups using a random-number table. To minimize contamination, nursing staff were organized into two fixed care teams during the study period, each primarily responsible for one study group, and cross-coverage was minimized when feasible.

2.4 Interventions

Both the control group (routine inpatient nursing) and the Intervention group (KPI-360^o multidimensional model) underwent demographic analysis (Table 1).

Table 1. Baseline characteristics of participants.

Characteristic	Control (n=100)	Intervention (n=101)	t/ χ^2	P value
Age, years (mean \pm SD)	71.35 \pm 11.00	71.21 \pm 10.24	0.093	0.926
Sex, n (%)			0.408	0.523
Male	55 (55.0)	50 (49.5)		
Female	45 (45.0)	51 (50.5)		

Baseline patient-reported outcomes and functional status did not differ significantly between groups (all P>0.05).

Control group (routine inpatient nursing): Patients received systematic nursing care in accordance with the neurology department's standardized inpatient procedures, including admission assessment, medication administration, safety monitoring, basic health education, and routine communication.

Intervention group (KPI-360^o multidimensional model): In addition to routine care, nursing care delivery was guided by a KPI-360^o evaluation index system and a structured feedback loop. The model included six first-level domains (admission and reception, assistance with diagnostic procedures, therapeutic nursing, patient education, safety nursing, and communication nursing). Each domain comprised operationalized second-level indicators with predefined weights (Table 2).

Table 2. KPI-360^o evaluation index system for neurology inpatient nursing (first- and second-level indicators).

First-level domain	Weight (%)	Second-level indicators (weight)
Admission and reception nursing	10	Courtesy (2); Responsible reception (2); Bed arrangement & physician notification (1); Initial vital signs & risk screening (4); Medical-nursing handover (1)
Assistance with diagnostic procedures	10	Scheduling (1); Pre-test precautions (2); Safe transport tools (2); Procedure explanation (2); Special examination support (3)
Therapeutic nursing	20	Treatment plan explanation (3); Medication purpose (4); Medication precautions/side effects (4); Administration verification & clarity (4); Neurological observation (consciousness/pupil/motor) (5)

Patient education	20	Clarity (5); Scientific accuracy (5); Relevance/individualization (5); Teach-back & engagement (5)
Safety nursing	30	Fall prevention (10); Aspiration/choking prevention (10); Escort for high-risk patients (2); Monitoring & early warning (5); Ward rounds (3)
Communication nursing	10	Active listening (2); Verbal communication (2); Respectful attitude (2); Tone (2); Interaction and timely response (2)

The 360-degree feedback component incorporated ratings from multiple sources (self, peers, nurse managers, physicians, and patients/families) to generate individualized feedback for nurses. Feedback was used to reinforce adherence to key nursing processes (e.g., safety checks, timely education, and communication behaviours) and to support continuous improvement during hospitalization.

2.5 Outcome measures

Outcomes were assessed at baseline (within 1–2 days of admission) and follow-up (day 5 of hospitalization). The outcome measures were:

Psychological resilience: Connor-Davidson Resilience Scale (CD-RISC; 25 items; total score 0–100; higher scores indicate greater resilience) ^[5].

Fatigue severity: Fatigue Severity Scale (FSS; 9 items; average score 1–7 or total 9–63; higher scores indicate greater fatigue) ^[6].

Self-efficacy: Self-Efficacy for Managing Chronic Disease 6-item Scale (SEMCD-6; items rated 1–10; summed score 6–60; higher scores indicate greater self-efficacy) ^[7].

Functional independence: Modified Barthel Index (MBI; total score 0–100; higher scores indicate greater independence) ^[8-9].

Length of hospital stay: days from admission to discharge recorded from the medical record.

2.6 Statistical analysis

Analyses were performed using SPSS (version 22.0). Continuous variables are presented as mean ± standard deviation (SD) and categorical variables as n (%). Normality was assessed using probability plots. Between-group comparisons used independent-samples t-tests (Welch correction when appropriate) for continuous variables and chi-square tests for categorical variables. Two-sided P<0.05 was considered statistically significant.

2.7 Ethical considerations

The study protocol was reviewed and approved by the hospital ethics committee. Written informed consent was obtained from all participants or their legal representatives. All procedures were conducted in accordance with relevant ethical standards.

3. Results

A total of 201 eligible stroke inpatients were enrolled and included in the analysis (control n=100; intervention n=101). Baseline demographic characteristics were comparable between groups

Table 3. Outcomes at baseline and follow-up (day 5) and between-group differences at follow-up.

Outcome	Baseline Control (mean ± SD)	Baseline Intervention (mean ± SD)	Day 5 Control (mean ± SD)	Day 5 Intervention (mean ± SD)	MD (Int-Control) (95% CI)	P value
Resilience (CD-RISC, 0-100)	31.02 ± 9.55	33.18 ± 10.75	38.86 ± 10.94	65.75 ± 10.19	26.89 (23.95 to 29.83)	<0.001
Fatigue severity (FSS, 9-63)	44.53 ± 7.15	46.41 ± 6.50	39.46 ± 7.46	18.99 ± 5.33	-20.47 (-22.28 to -18.66)	<0.001
Self-efficacy (SEMCD-6, 0-60)	30.88 ± 7.17	29.38 ± 7.17	36.45 ± 6.97	47.56 ± 10.81	11.11 (8.58 to 13.64)	<0.001
Functional independence (MBI, 0-100)	62.60 ± 18.11	60.40 ± 18.13	76.70 ± 20.96	83.86 ± 15.76	7.16 (2.00 to 12.32)	0.007
Length of hospital stay (days)	—	—	9.63 ± 4.43	8.42 ± 3.34	-1.21 (-2.30 to -0.12)	0.030

At follow-up, the intervention group demonstrated significantly higher resilience and self-efficacy scores, lower fatigue, better functional independence, and a shorter length of stay compared with the control group (Table 3).

4. Discussion

This study evaluated a KPI-360° multidimensional nursing performance management model embedded in neurology inpatient care. Compared with routine nursing, the intervention group showed better patient-reported outcomes (higher resilience and self-efficacy and lower fatigue), improved functional independence, and a modestly shorter length of stay.

From a nursing management perspective, KPI-based indicators can function as a transparent care-process framework that clarifies expectations and supports consistent delivery of key nursing tasks. The indicator system emphasized admission assessment, diagnostic support, therapeutic nursing, education, safety, and communication—domains aligned with established nursing quality concepts that prioritize prevention of adverse events and patient experience^[10].

The 360-degree component extends beyond supervisor-only appraisal by incorporating perspectives from peers and patients, which may increase perceived fairness and salience of feedback. A systematic review suggests that multisource feedback can support behaviour change, particularly when feedback is credible, specific, and paired with goal-setting and follow-up coaching^[2]. Training interventions using 360-degree feedback have been reported in healthcare settings^[3], and nurse-focused models have been proposed^[4].

In stroke nursing, patient education and supportive communication are key levers for improving self-management confidence and engagement in rehabilitation. The observed improvements in SEMCD-6 and MBI in the intervention group may reflect more consistent education delivery and closer monitoring of functional needs, supported by the KPI-360° process and feedback loop.

Interpretation should consider several limitations. First, this was a single-center study with a short follow-up window (day 5), so longer-term outcomes after discharge were not evaluated. Second, blinding was not feasible and contamination between groups cannot be fully excluded,

although fixed care teams were used to minimize it. Third, nurse-level outcomes (e.g., job satisfaction, burnout, adherence to safety checks, and patient satisfaction) were not directly measured, limiting the ability to identify which mechanisms drove improvements. Finally, analyses compared follow-up means between groups; future studies should consider baseline-adjusted models (e.g., ANCOVA) and cluster-randomized designs at the unit or team level.

Despite these limitations, the findings support framing performance management as a nursing quality-improvement intervention when KPIs are operationalized as observable care processes and when multisource feedback is used to reinforce patient-centered behaviours. Future multicenter studies should evaluate implementation fidelity, nurse outcomes, and sustainability, and should incorporate commonly reported nursing quality indicators (e.g., falls and pressure injuries) alongside patient-reported outcomes ^[10-11].

5. Conclusions

In a neurology ward setting, a KPI-360° multidimensional nursing performance management model embedded into routine care was associated with improved resilience, reduced fatigue, higher self-efficacy, better functional independence, and shorter length of stay among stroke inpatients. The model may be a feasible approach to strengthen nursing process standardization and patient-centered care in resource-constrained settings.

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Author contributions: JT: study design, data collection, analysis, manuscript drafting. XL: supervision, interpretation, critical revision. All authors read and approved the final manuscript.

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