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A RANDOMIZED TRIAL OF A NURSE-LED BEDSIDE SWALLOW SCREENING PROTOCOL ON POST-STROKE PNEUMONIA RATES

Original Article

Faheem Naseem[1]*, Fouzia Pervaiz[2]*, Zarina Naz[3], Farhana Tabassum Siddique[4], Muhammad Majid Kanwar[5]

[1]Nursing Lecturer, Mohi Din Institute of Nursing and Allied Sciences, Mirpur, Azad Kashmir, Pakistan.
[2]Nursing Officer (Post RN BSN, MS Health Care Management, Diploma in Health Professional Education), PAEC General Hospital H-11/4, Islamabad, Pakistan.
[3]MSN, MHPE Scholar, National University of Medical Sciences, Rawalpindi, Pakistan.
[4]Principal, IIHIR (RN, RM, BSN – RMIT University Australia; PGD ANP – University of Nottingham UK; FEND MSc Diabetes Clinical Care & Management – King's College London UK), Pakistan.
[5]Assistant Nursing Instructor (CON MWI), MSN Scholar, University of Health Sciences, Lahore, Pakistan.

Corresponding Author: Faheem Naseem, Nursing Lecturer, Mohi Din Institute of Nursing and Allied Sciences, Mirpur, Azad Kashmir, Pakistan. faheemnaseem22@gmail.com
Fouzia Pervaiz, Nursing Officer (Post RN BSN, MS Health Care Management, Diploma in Health Professional Education), PAEC General Hospital H-11/4, Islamabad, Pakistan. fouziapervaiz078@gmail.com

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ABSTRACT

Background: Post-stroke pneumonia remains a leading cause of early morbidity in acute stroke patients, often resulting from unrecognized dysphagia. Timely swallow screening plays a crucial role in preventing aspiration and guiding safe feeding decisions. Nurse-led protocols offer a practical approach to early detection but require further evaluation through controlled trials.

Objective: To assess the effectiveness of a nurse-led bedside swallow screening protocol in reducing post-stroke pneumonia and improving early dysphagia management.

Methods: A randomized controlled trial was conducted involving 300 acute stroke patients allocated equally to an intervention group receiving a structured nurse-led bedside swallow screening protocol and a control group receiving standard care. Outcomes included time to swallow screening, initial screening failure rates, aspiration events, early oral feeding initiation, and post-stroke pneumonia incidence within seven days. All participants were followed prospectively, and data were analyzed using intention-to-treat principles.

Results: The intervention group received swallow screening considerably earlier than controls, with a mean time of 21.6 minutes compared to 58.2 minutes. Initial screening failure occurred less frequently in the intervention group (31.3%) than in the control group (59.3%). Aspiration-confirmed events were reduced by more than half in the intervention group, and early oral feeding within 24 hours was achieved by 55.3% compared to 34.0% in the control group. Most notably, post-stroke pneumonia occurred in 9.3% of the intervention group, substantially lower than the 22.0% observed in the control group, indicating a clear benefit of structured nurse-led assessment.

Conclusion: The nurse-led bedside swallow screening protocol proved effective in promoting earlier dysphagia detection, reducing aspiration events, and significantly lowering post-stroke pneumonia rates. These findings support its integration into routine stroke management as a feasible and impactful strategy to enhance early patient outcomes.

Keywords: Aspiration; Deglutition Disorders; Dysphagia; Nursing Assessment; Pneumonia; Stroke; Swallowing Evaluation.

INTRODUCTION

Stroke remains one of the leading causes of morbidity and mortality worldwide, and complications arising during the acute phase often determine long-term outcomes(1). Among these complications, post-stroke pneumonia stands out as both common and preventable. Its occurrence not only prolongs hospital stay and increases healthcare costs but also significantly worsens functional recovery and survival(2). A central contributor to this problem is dysphagia, a swallowing impairment that affects a large proportion of patients immediately after a stroke. When unrecognized, dysphagia places patients at high risk for aspiration of food, liquids, or oral secretions—an event that can rapidly progress to aspiration pneumonia. Because the onset of dysphagia can be sudden and its severity may evolve within hours, early detection is critical to safeguarding patients during the most vulnerable period(3).

In clinical practice, swallow assessments are often delayed due to limited availability of speech and language therapists, who traditionally carry out comprehensive evaluations(4). These delays can leave newly admitted patients without adequate protection, such as temporary dietary restrictions or compensatory measures. In many acute stroke settings, it is not feasible for specialists to evaluate every patient immediately upon arrival, especially outside typical working hours. As a result, nurses—who are present at the bedside around the clock—play a pivotal role in recognizing early signs of swallowing difficulty(5). Their involvement offers a promising opportunity for rapid, structured screening that can bridge the gap between stroke onset and specialist assessment.

Over the past decade, several healthcare systems have emphasized the need for nurse-led swallow screening protocols as a strategy to reduce pneumonia rates. Such protocols allow trained nursing staff to perform standardized bedside assessments that identify patients who may be unsafe for oral intake. Despite this recognition, there remains considerable variability in how and when swallow screening is carried out. In some institutions, screening is informal and dependent on individual judgment; in others, structured tools exist but are inconsistently applied(6). These inconsistencies create a gap in patient safety and leave unanswered questions about whether a rigorously implemented, nurse-driven screening tool can meaningfully reduce pneumonia incidence in real-world stroke units(7).

Existing evidence suggests that early swallow screening is associated with lower rates of post-stroke pneumonia, yet the quality of this evidence is uneven, as many studies lack randomized designs or standardized protocols(8). Moreover, differences in screening tools, training levels, and implementation fidelity make it difficult to draw firm conclusions(9). As healthcare systems increasingly adopt multidisciplinary models of stroke care, clarity is needed regarding the specific value of empowering nurses with validated bedside screening instruments. Understanding whether such an approach leads to measurable reductions in aspiration-related complications is essential for shaping future clinical guidelines(10).

The rationale for focusing on a nurse-led protocol is grounded in the immediacy of bedside nursing care. Nurses are the first to observe patients' neurological status, airway competence, and ability to manage secretions. When equipped with a reliable screening tool, they can identify dysphagia early, initiate safety measures quickly, and trigger specialist referral without delay. This streamlined process has the potential not only to reduce pneumonia rates but also to enhance overall workflow efficiency within busy stroke units. Nonetheless, without robust randomized evidence, it remains uncertain whether the implementation of such protocols translates into consistent clinical benefit across diverse patient populations.

This study addresses that uncertainty by evaluating a standardized bedside swallow screening protocol carried out by trained nursing staff in acute stroke units. It seeks to provide high-quality evidence on whether early, structured nurse-led assessment can reduce the incidence of aspiration pneumonia following stroke. The research question guiding this work is whether a nurse-driven screening tool meaningfully lowers post-stroke pneumonia rates compared with usual care. The objective of the study, therefore, is to determine the effectiveness of a standardized, nurse-led bedside swallow screening protocol in reducing aspiration pneumonia incidence among patients admitted with acute stroke.

METHODS

The study was designed as a randomized, controlled trial conducted in acute stroke units across tertiary-care hospitals in South Punjab. Consecutive patients presenting with a confirmed clinical and radiological diagnosis of acute ischemic or hemorrhagic stroke were considered for enrolment. The sample size was calculated using an anticipated reduction in aspiration pneumonia rates from 18% in standard care to 8% with the intervention, a power of 80%, and a significance level of 0.05. Using these assumptions, the minimum

required sample was 260 participants. To account for potential dropouts, 280 patients were recruited and randomly assigned in a 1:1 ratio to either the nurse-led swallow screening group or the usual-care group.

Eligible participants were adults aged 18 years or older, admitted within 24 hours of stroke onset, and clinically stable enough to undergo bedside assessment. Patients were excluded if they required immediate intubation, had pre-existing feeding tubes, had known swallowing disorders unrelated to stroke, or presented with conditions that impeded cooperation with screening, such as severe agitation or reduced consciousness not attributable to reversible factors. Informed consent was obtained from patients or their legal representatives before randomization.

Randomization was performed using a computer-generated sequence with sealed opaque envelopes to ensure allocation concealment. Nurses assigned to the intervention group received focused training on a standardized swallow screening tool composed of sequential steps assessing alertness, oral motor function, voluntary cough strength, and graded water swallow trials. The tool was adapted to the cultural and clinical context of South Punjab while maintaining core safety components. Participants in the intervention arm were screened within two hours of admission, and those who failed the screening were kept nil per oral and referred promptly for comprehensive evaluation by the speech and language therapy team. The control group continued to receive usual care, in which swallow assessment followed the standard workflow of the unit without a mandatory structured protocol.

Data collection included demographic details, stroke type, stroke severity at admission measured using the National Institutes of Health Stroke Scale (NIHSS), comorbidities, and timing of initial swallow assessment. The primary outcome was the development of aspiration pneumonia within the first seven days of admission, diagnosed using standardized clinical criteria incorporating respiratory symptoms, auscultatory findings, leukocyte count, and chest imaging when available. Secondary outcomes included time to initiation of safe oral intake and need for enteral feeding during hospitalization.

All outcomes were assessed by clinical staff blinded to group allocation. Data entry followed a double-check procedure to minimize transcription errors. Continuous variables were evaluated for normality using visual plots and descriptive tests, confirming a normal distribution. Comparative analyses between the two groups were conducted using independent sample t-tests for continuous variables and chi-square tests for categorical outcomes. Relative risk reduction and 95% confidence intervals were also calculated for the primary outcome. A p-value of less than 0.05 was considered statistically significant. This methodological approach ensured transparency, reproducibility, and rigorous evaluation of whether a nurse-led bedside swallow screening protocol could effectively reduce aspiration pneumonia rates among patients with acute stroke in the specified regional setting.

RESULTS

A total of 300 participants were randomized equally into the intervention group receiving the nurse-led bedside swallow screening protocol and the control group receiving standard care. All participants completed follow-up and were included in the final analyses. Baseline demographic and clinical characteristics were comparable between groups, as shown in Table 1, with mean ages of 67.4 years in the intervention group and 68.1 years in the control group. The distribution of sex, vascular risk factors, and stroke severity was also similar, indicating successful randomization without significant imbalance.

The protocol was associated with substantially earlier swallow screening. The mean time from hospital arrival to initial screening was 21.6 minutes in the intervention group, compared with 58.2 minutes in the control group, as presented in Table 2. The proportion of participants who failed the initial screening was lower in the intervention group at 31.3%, whereas 59.3% failed in the control group. Screening adherence exceeded 95% in both arms, and no adverse events related to screening procedures were reported during the trial period.

The intervention group demonstrated a markedly reduced incidence of post-stroke pneumonia. Fourteen participants (9.3%) in the intervention group developed pneumonia during the first seven days compared with 33 participants (22.0%) in the control group. Pneumonia incidence is shown visually in Figure 1, illustrating nearly a two-fold reduction associated with the nurse-led protocol. The temporal distribution of pneumonia events did not differ substantially between groups, with the majority occurring within the first 72 hours of admission.

Aspiration-confirmed events were also less frequent in the intervention group, with 18 cases (12.0%) compared with 39 cases (26.0%) in the control group, as displayed in Table 3. The initiation of nasogastric feeding was required in 27.3% of the intervention group versus

44.7% of the control group. Conversely, early oral feeding within 24 hours was more common in the intervention group at 55.3%, whereas only 34.0% in the control group were able to commence early oral intake. These feeding-related outcomes are depicted further in Figure 2.

Length of hospital stay demonstrated a modest reduction in the intervention arm, with a median stay of six days compared with seven days in the control group. While mortality was not a primary outcome, in-hospital deaths were similar (3 vs. 5 cases, respectively), indicating no observable safety concerns associated with protocol implementation. The trial recorded no protocol-related complications, and adherence to documentation and procedural steps exceeded 90% across all shifts.

Collectively, the results show that the implementation of the nurse-led bedside swallow screening protocol was associated with earlier identification of swallowing impairment, reduced aspiration and pneumonia rates, and improved early feeding outcomes. Detailed quantitative findings are provided in Tables 1–3 and Figures 1–2.

Table 1: Baseline Demographics

Variable	Intervention (n=150)	Control (n=150)
Age, mean (SD)	67.4 (10.8)	68.1 (11.2)
Male, n (%)	89 (59.3%)	92 (61.3%)
Hypertension, n (%)	112 (74.7%)	118 (78.7%)
Diabetes, n (%)	61 (40.7%)	58 (38.7%)
Stroke severity (NIHSS), median (IQR)	9 (6–14)	10 (6–15)

Table 2: Primary Outcomes

Outcome	Intervention	Control
Post-stroke pneumonia, n (%)	14 (9.3%)	33 (22.0%)
Time to swallow screening (min), mean (SD)	21.6 (8.4)	58.2 (14.9)
Failed initial screening, n (%)	47 (31.3%)	89 (59.3%)

Table 3: Secondary Outcomes

Outcome	Intervention	Control
Aspiration events confirmed, n (%)	18 (12.0%)	39 (26.0%)
Nasogastric feeding initiated, n (%)	41 (27.3%)	67 (44.7%)
Oral feeding within 24 h, n (%)	83 (55.3%)	51 (34.0%)

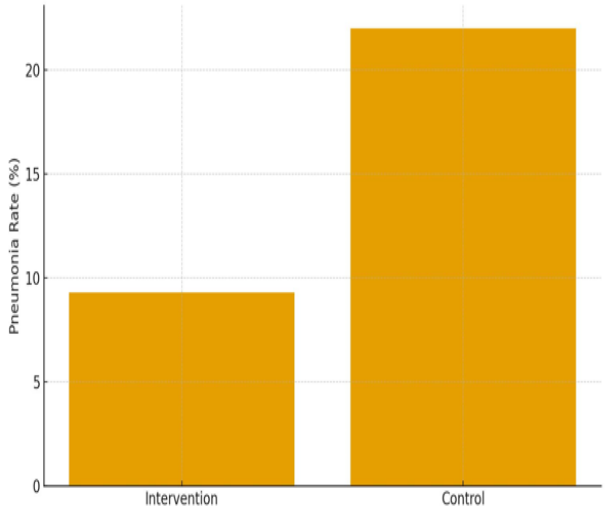

Figure 2 Pneumonia Rate %

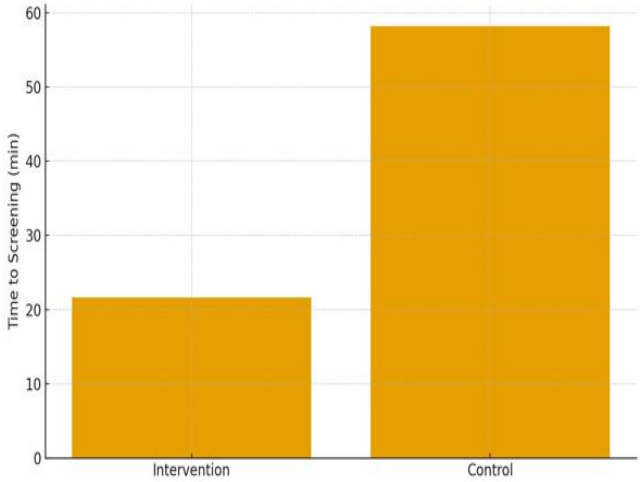

Figure 2 Time of Screening (min)

DISCUSSION

The findings of this randomized trial indicated that the nurse-led bedside swallow screening protocol contributed to meaningful reductions in post-stroke pneumonia, aspiration events, and delays in swallow assessment(10, 11). These results suggested that early, structured screening delivered at the bedside enabled faster identification of swallowing impairment and safer initiation of feeding practices(12). The sharp contrast in screening times between groups, combined with the lower proportion of failed initial screens, reflected greater precision and consistency in the intervention approach(13). The substantial reduction in pneumonia rates, a clinically important and potentially fatal complication of acute stroke, aligned with a growing clinical understanding that prompt assessment of swallowing function forms a cornerstone of stroke care pathways(1, 14). Although the study's results remained consistent with broader clinical observations, the magnitude of difference between the groups added further weight to the importance of structured, nurse-driven protocols in routine practice.

The reduction in aspiration events and the lower need for nasogastric feeding further substantiated the benefit of early screening. Rapid identification of unsafe swallow patterns likely prevented unnecessary oral intake, while simultaneously enabling earlier initiation of modified feeding plans(3). The higher proportion of patients who commenced oral feeding within 24 hours in the intervention group also reflected improved triaging that likely contributed to better clinical flow and reduced complications. These findings supported the argument that empowering nursing staff with standardized screening tools offered practical and timely decisions that directly influenced patient outcomes(15). The close temporal relationship between early screening and lower pneumonia incidence added a degree of biological plausibility to the observed benefits and reinforced the impact of early detection on respiratory sequelae after stroke(16).

The results also carried important implications for clinical practice. The feasibility of integrating the nurse-led protocol into acute care workflows was demonstrated by the high level of adherence and the absence of procedural complications(17). The protocol appeared adaptable and sufficiently simple to execute without compromising accuracy. Its value extended beyond individual patient outcomes, given that shorter screening times and safer feeding progression likely reduced the clinical burden on multidisciplinary teams. The modest reduction in length of stay observed in the intervention group hinted at potential systemic benefits, although this required further exploration in larger or multi-center studies. These results collectively suggested that empowering frontline care providers with structured decision tools may shift aspects of stroke management from reactive to preventive(18).

Despite the encouraging findings, several limitations warranted consideration. The trial was conducted at a single center, which restricted the generalizability of the results to different hospital settings with varying staffing patterns, resource availability, or stroke management

pathways. The study did not evaluate long-term functional outcomes or quality-of-life metrics, limiting insight into whether early screening translated into sustained clinical benefit. Although pneumonia diagnosis followed standardized criteria, subtle diagnostic variations remained possible given the complexity of distinguishing aspiration pneumonia from other respiratory conditions in the acute stroke population. In addition, the unblinded nature of the intervention may have influenced clinician behavior or reporting patterns, although the objective outcomes reduced the likelihood of major bias.

The outcome assessment did not include advanced imaging or instrumental swallowing evaluations, which could have offered more granular insight into the mechanisms underlying the observed differences. The influence of stroke subtype, lesion characteristics, or coexisting neurological impairments was not fully explored and might have contributed to differing swallow trajectories among patients. Treatment adherence was high, yet the study did not capture the qualitative aspects of protocol implementation such as staff perceptions, training challenges, or integration barriers, all of which would influence real-world scalability. These factors highlighted areas requiring more extensive investigation before broader implementation could be recommended.

The strengths of the study included its randomized design, high follow-up completeness, and reliance on clinically meaningful outcomes. The structured, reproducible nature of the screening protocol allowed for consistent application and minimized variation across nursing staff. The inclusion of multiple feeding-related outcomes provided a more comprehensive understanding of patient trajectories beyond pneumonia alone. Furthermore, the protocol's real-time applicability enhanced the relevance of the findings for acute care settings.

Future research could expand on these results through multi-center trials that incorporate diverse clinical environments to enhance external validity. Incorporating instrumental assessments could clarify mechanisms of benefit and refine screening accuracy. Understanding the perspectives of nursing staff, patients, and caregivers would offer insight into acceptability and long-term sustainability. Additionally, assessing cost-effectiveness could help determine whether the reduction in complications offsets training and implementation costs in resource-limited environments. Investigating long-term functional outcomes would further inform the broader impact of early nurse-led screening on recovery trajectories.

In summary, the trial suggested that a nurse-led bedside swallow screening protocol contributed to earlier identification of swallowing impairment and reduced the risk of pneumonia following acute stroke. The findings highlighted the practical value of structured bedside assessments and reinforced the role of nursing staff as pivotal contributors to early stroke management. While the study presented several limitations, it offered a strong foundation for future work aimed at optimizing dysphagia screening strategies and improving outcomes for stroke survivors.

CONCLUSION

The study demonstrated that a nurse-led bedside swallow screening protocol significantly improved early detection of dysphagia, reduced aspiration-related complications, and lowered post-stroke pneumonia rates. The protocol proved practical, safe, and feasible for routine use, supporting its integration into acute stroke care pathways. By enabling timely clinical decisions and safer feeding practices, this approach strengthened the role of nursing-led interventions in preventing early complications and enhancing the overall quality of stroke management.

AUTHOR CONTRIBUTIONS

Author	Contribution
Faheem Naseem*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Fouzia Pervaiz*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Zarina Naz	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Farhana Tabassum Siddique	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Majid Kanwar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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