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Dysphagia screening among patients with Intracerebral Hemorrhage

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Dysphagia screening after intracerebral hemorrhage

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Abstract

Background: Dysphagia screening is recommended after acute stroke to identify patients at risk of aspiration and implement appropriate care. However, little is known about the frequency and outcomes of patients undergoing dysphagia screening after intracerebral hemorrhage (ICH).

Methods: We used the Ontario Stroke Registry from 1 April 2010 to 31 March 2013 to identify patients hospitalized with acute stroke and to compare dysphagia screening rates in those with ICH and ischemic stroke. In patients with ICH we assessed predictors of receiving dysphagia screening, predictors of failing screening, and outcomes after failing screening.

Results: Among 1091 eligible patients with ICH, 354 (32.4%) patients did not have documented dysphagia screening. Patients with mild ICH were less likely to receive screening (40.4% of patients were omitted, adjusted odds ratio (aOR) 0.40, 95% confidence interval (CI) 0.26–0.63). Older age, greater stroke severity, speech deficits, lower initial level of consciousness, and admission to intensive care unit were predictive of failing the screening test. Failing screening was associated with poor outcomes, including pneumonia (aOR 5.3, 95% CI 2.36–11.88), severe disability (aOR 4.78, 95% CI 3.08–7.41), and 1-year mortality (adjusted hazard ratio 2.1, 95% CI 1.38–3.17). When compared to patients with ischemic stroke, patients with ICH were less likely to receive dysphagia screening (aOR 0.64, 95% CI 0.54–0.76) and more likely to fail screening (aOR 1.98, 95% 1.62–2.42).

Conclusion: One-third of patients with ICH did not have documented dysphagia screening, increasing to 40% in patients with mild clinical severity. Failing screening was associated with poor outcomes. Patients with ICH were less like to receive screening and twice as likely to fail compared to patients with ischemic stroke, and thus efforts should be made to include ICH patients in dysphagia screening protocols whenever possible.

Introduction

Dysphagia is a common complication of acute stroke, identified in roughly half of patients admitted to hospital post-stroke.[1] Dysphagia is known to increase the risk of pneumonia, but is also associated with a variety of other medical complications, poor neurological outcome, and death.[2–4] Screening protocols have been developed to identify patients at risk of dysphagia, and earlier screening has been shown to prevent pneumonia.[5] Simply failing a dysphagia screening test has been shown to independently predict poor outcomes after acute ischemic stroke.[6]

Despite guidelines advocating dysphagia screening of all patients with acute stroke,[7–9] little is known about dysphagia screening practices after intracerebral hemorrhage

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(ICH), and how they compare to ischemic stroke. In two studies, roughly one-quarter to one-third of patients with ICH were not screened.[4,10] Rates of dysphagia screen failure also differ among studies, from 43% in unselected ICH,[4] to 55% in thalamic hemorrhage[11] and 77% in striatocapsular hemorrhage.[12] Predictors of receiving or failing dysphagia screening after ICH have not been studied. Patients with ICH who fail dysphagia screening have a higher odds of developing pneumonia,[13] and gastrostomy tube placement occurs in 25–30%.[14,15] However, there is a lack of data regarding the effect of dysphagia on other in-hospital outcomes, discharge disability, and mortality in patients with ICH.

We used the Ontario Stroke Registry to identify the frequency of dysphagia screening and screen failure, predictors of receiving and predictors of failing dysphagia screening, and outcomes associated with failing screening in patients with ICH.

Methods

Data sources and patient sample

The Ontario Stroke Registry includes detailed clinical information on all consecutive patients with acute stroke or transient ischemic attack (TIA) seen at any of 11 Regional Stroke Centers in the province of Ontario, Canada. The registry is housed at the Institute for Clinical Evaluative Sciences where it is linked to population-based administrative databases using unique, encoded identifiers. We used the Ontario Registered Persons Database to identify deaths. We used the Canada Census to provide information on median neighborhood income.

For this study, we included those who were hospitalized with acute ischemic stroke or ICH between 1 April 2010 and 31 March 2013. We excluded patients with in-hospital stroke, age under 18, TIA, subarachnoid hemorrhage, isolated intraventricular hemorrhage, and time from symptom onset to hospital arrival over 72 h. Only patients with spontaneous, not traumatic ICH were included. Patients with hemorrhagic transformation of an infarct remained in the ischemic stroke subgroup.

Exposures

Data related to dysphagia screening were extracted from the registry database, in which chart abstractors identified whether the patient had documented dysphagia screening within 72 h of arrival at the hospital. Patients who had either no neurological deficit or were intubated were deemed ineligible for dysphagia screening and were excluded. Screening could include informal bedside testing by health care providers or formal/standardized dysphagia screening tests (e.g.

TOR-BSST; Toronto Bedside Swallowing Screening Test;[16] see Supplemental Table I for dysphagia screening tests used at each site). If dysphagia screening was documented, patients were categorized into those who failed and passed the test. Only results from formal/standardized dysphagia screening tests were included in this pass/fail analysis.

Baseline/confounding variables

The registry provided information on patient age, sex, stroke severity based on the Canadian Neurological Scale (CNS)[17,18] and the National Institutes of Health Stroke Scale (NIHSS), pre-event independence (documented as being fully independent for activities of daily living and instrumental activities of daily living prior to index event), comorbid conditions (also summarized using the Charlson co-morbidity index),[19] presenting symptoms, residence prior to admission, palliative status on admission (documentation of decision to provide only palliative or comfort care rather than active medical management; "do not resuscitate" orders alone do not suffice), and weekend or evening arrival. Higher scores on the CNS indicate lower clinical severity. We categorized clinical severity of ICH as mild (CNS > 7, equivalent to NIHSS ≤ 8), moderate (CNS > 4 to ≤ 7, equivalent to NIHSS 9 to 13), or severe (CNS ≤ 4, equivalent to NIHSS ≥ 14).

Outcomes

The primary outcome was in-hospital all-cause pneumonia, radiographically confirmed within 30 days of hospitalization. Secondary outcomes were:

1. severe disability at discharge (modified Rankin scale score 4–5);
2. placement of a percutaneous feeding tube during the index hospitalization (underwent procedure for insertion of gastrostomy or jejunostomy); and
3. all-cause mortality at 30 days and 1 year following the index event.

All-cause pneumonia, discharge disability, and percutaneous feeding tube placement were identified from the registry.

Analysis

SAS Enterprise Guide 6.1 (Cary, NS, USA) was used to conduct all analyses. For the analysis of predictors of dysphagia screening, we excluded all patients who died before 72 h, to eliminate the effect of early death on omission of screening. We first identified those patients with ICH. We compared baseline characteristics in

Figure 1. Predictors of documented dysphagia screening (a) and failing dysphagia screening (b) in patients with ICH. Not included in the figure for predictors of failing: Unconscious vs. alert (aOR 14.87, 95% CI 3.27–67.6, $p < 0.001$). Odds ratios for predictors adjusted for age, sex, income quintile, long-term care residence, arrival by ambulance, admission location, comorbid conditions, pre-event independence, presenting symptoms, stroke severity (of ICH), level of consciousness on arrival, treatment with weekend or evening arrival, palliative status on admission. Odds ratios for predictors of failing adjusted for: age, sex, stroke severity, pre-event independence, prior stroke, hypertension, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease or asthma, diabetes, atrial fibrillation, dementia, current smoking, Charlson co-morbidity index score, level of consciousness on arrival, arrival from long-term care facility, presentation with weakness, speech deficits, sensory symptoms or seizure, side of motor signs, and admission location. Admission location is compared to ward, and stroke severity is compared to moderate stroke.
ICH: intracerebral hemorrhage; ICU: intensive care unit; LOC: level of consciousness.
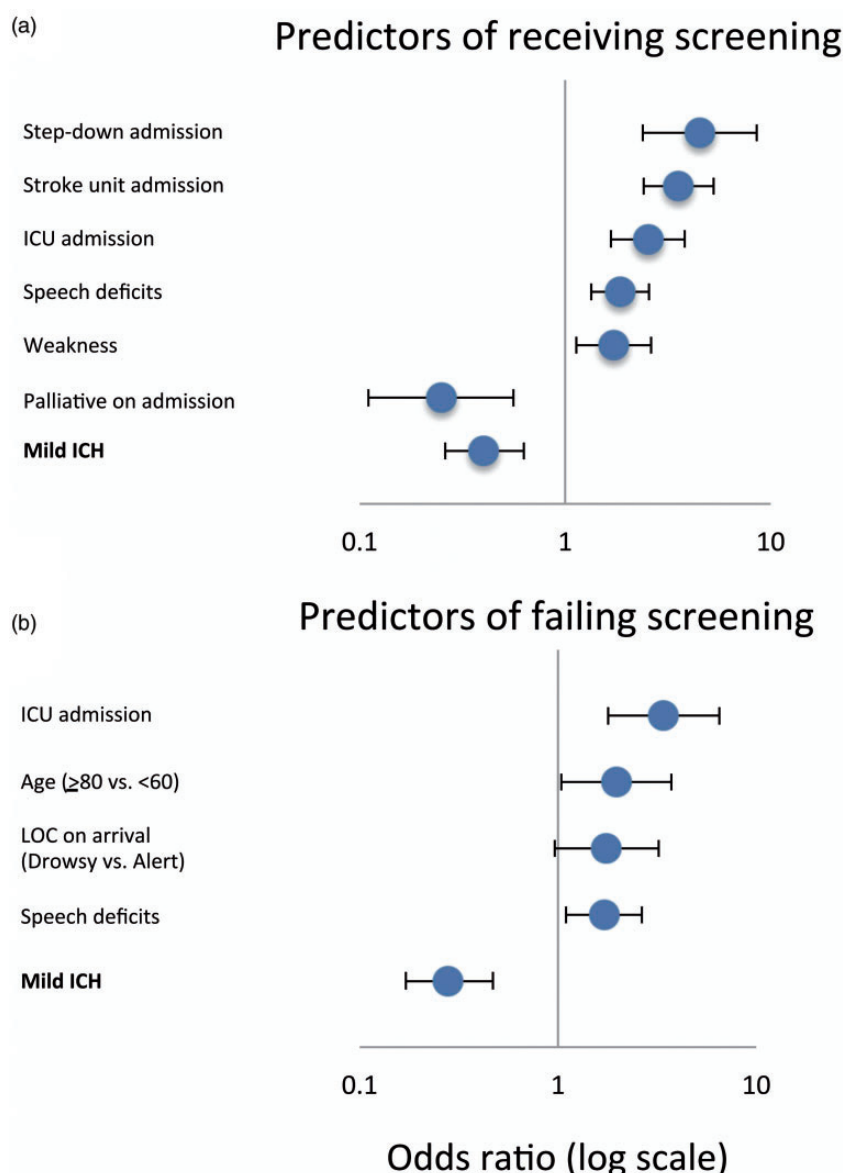
patients with ICH with and without documented screening using Chi-squared tests for categorical variables and *t*-tests or Kruskal–Wallis tests for continuous variables.

In the cohort with ICH we then used multivariable logistic regression models to determine predictors of receiving screening and, in those who received screening, predictors of failing dysphagia screening. Both

models included the following predictor variables based on potential clinical relevance: Age, sex, prior stroke (ischemic or hemorrhagic), pre-event independence, arrival from long-term care facility, stroke severity category (mild, moderate, or severe), level of consciousness on arrival (alert, drowsy, or unconscious), dementia, atrial fibrillation, Charlson co-morbidity index score, presentation with weakness, speech deficits, sensory symptoms, or seizure, side of motor signs (right, left, bilateral), and admission location (intensive care unit (ICU), step-down unit, stroke unit, ward). For predictors of screening we included the following additional variables that might have impacted likelihood of screening: income (quintile based on median neighborhood income), arrival by ambulance, weekend or evening arrival, cancer, or palliative status on admission. For predictors of failing dysphagia screening, we also included the following co-morbid conditions: hypertension, diabetes mellitus, current smoking, coronary artery disease, congestive heart disease, chronic pulmonary obstructive disease or asthma. In secondary analyses, we repeated the above analyses using the combined cohort of patients with ischemic stroke and ICH, with the addition of stroke type (ICH vs. ischemic stroke) as a separate variable in the models. Results from the ischemic stroke cohort have been published previously.[6]

We then calculated the proportion of patients with ICH who failed screening, overall and stratified by ICH severity. We estimated the effect of failing screening on the odds of the following outcomes: all-cause pneumonia, severe disability at discharge, placement of a percutaneous feeding tube, and 30-day mortality. We used Cox proportional hazard models to estimate the effect of failing dysphagia screening after ICH on the hazard of death at 1 year. We adjusted for the same variables as those included in the above analysis of predictors of failing dysphagia screening, with the addition of renal failure.

Standard protocol approvals, registrations, and patient consents

Data collection for the registry is done without patient consent, since the Institute for Clinical Evaluative Sciences is named as a prescribed entity under provincial privacy legislation. The study was approved by the Sunnybrook Health Sciences Centre Research Ethics Board.

Results

The study sample included 6677 patients with acute ischemic stroke and 1091 with ICH.

Figure 2. Independent effect of ICH on screening parameters. Odds ratios with confidence intervals are shown for ICH versus ischemic stroke, in predicting receipt of dysphagia screening and failing screening if tested.
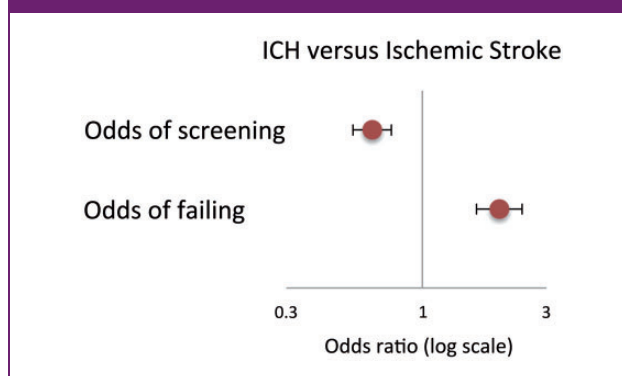
Dysphagia screening frequency after ICH

In patients with ICH, 737 (67.6%) received documented dysphagia screening within 72 h, and 354 (32.4%) did not. Documented screening was omitted in 16.2% of patients with severe ICH, 18.4% of patients with moderate ICH, and 40.4% of patients with mild ICH.

Predictors of dysphagia screening after ICH

Baseline characteristics of patients with ICH who had or did not have documented screening are shown in Supplemental Table II. In the multivariable analysis, factors associated with receiving documented dysphagia screening were: admission to an ICU (adjusted odds ratio (aOR) 2.53, 95% confidence interval (CI) 1.67 to 3.82), step-down unit (aOR 4.51, 95% CI 2.38 to 8.56), or stroke unit (aOR 3.57, 95% CI 2.42–5.28), compared to a regular ward (all $p < 0.001$), and presenting with weakness (aOR 1.72, 95% CI 1.13–2.62; $p = 0.01$) or speech deficits (aOR 1.85, 95% CI 1.34–2.56; $p < 0.001$). Having a palliative care plan on admission resulted in lower odds of having documented screening (aOR 0.25, 95% CI 0.11–0.56; $p < 0.001$). Patients with mild ICH severity were less than half as likely to receive documented dysphagia screening compared to patients with moderate ICH (aOR 0.40, 95% CI 0.26–0.63; $p < 0.001$) (Figure 1(a)). In secondary analyses using the combined ischemic and ICH cohort, ICH was associated with reduced odds of receiving documented dysphagia screening compared to ischemic stroke (aOR 0.64, 95% CI 0.54–0.76; $p < 0.001$; Figure 2).

Table 1. Complications, disability, and mortality of patients hospitalized with ICH who failed and passed the dysphagia screen

	Dysphagia screen result		
Variable	Fail, n (%)	Pass, n (%)	P-value
Total	460 (67.6%)	220 (32.4%)	
All-cause pneumonia	95 (20.7%)	8 (3.6%)	<0.001
Neurological worsening[b]	170 (37.0%)	32 (14.5%)	<0.001
Seizure	39 (8.5%)	6 (2.7%)	<0.01
Cardiac arrest	27 (5.9%)	0	<0.001
Decubitus ulcer	17 (3.7%)	<6 (<2.7%)[a]	>0.05
Depression	28 (6.1%)	<6 (<2.7%)[a]	<0.05
Deep vein thrombosis	10 (2.2%)	<6 (<2.7%)[a]	>0.05
Myocardial infarction	9 (2.0%)	0	0.04
Gastrointestinal hemorrhage	7 (2.4%)	<6 (<2.7%)[a]	>0.05
Length of stay (mean days)	22.1	13.6	<0.001
Nasogastric tube	276 (60.0%)	13 (5.9%)	<0.001
Percutaneous feeding tube	70 (15.2%)	0	<0.001
Disability at discharge – Modified Rankin score			<0.001
0–1	14/452 (3.1%)	26/219 (11.9%)	
2–3	65/452 (14.4%)	113/219 (51.6%)	
4–5	296/452 (65.5%)	73/219 (33.3%)	
Discharge location			<0.001
Home	37 (8.0%)	65 (29.5%)	
In-patient rehabilitation	168 (36.5%)	105 (47.7%)	
Long-term care	62 (13.5%)	21 (9.5%)	
30-day mortality	88 (19.1%)	11 (5.0%)	<0.001
1-year mortality	156 (33.9%)	31 (14.1%)	<0.001

[a]Cells with <6 patients suppressed to maintain confidentiality as per institutional policy.
[b]Neurological worsening = neurological deterioration requiring a physician's assessment.

Predictors of failing dysphagia screening after ICH

Of the 737 patients with ICH who underwent dysphagia screening, 680 had the results of screening documented. Of these, 460 failed (67.7%) and 220 passed (32.4%). Among patients with severe ICH, 87.5% failed, compared to 76.6% of those with moderate ICH and 46.4% of those with mild ICH. Baseline factors in patients who failed and passed dysphagia screening are shown in Supplemental Table III.

In the multivariable analysis, factors associated with failing dysphagia screening after ICH were: age (≥80 years vs. <60 aOR 1.97, 95% CI 1.04–3.73, $p = 0.04$), speech deficits (aOR 1.71, 95% CI 1.1–2.65, $p = 0.02$), initial level of consciousness (unconscious vs. alert aOR 14.87, 95% CI 3.27–67.6, $p < 0.001$; drowsy vs. alert

aOR 1.76, 95% CI 0.96–3.22, $p = 0.07$), and admission to ICU (aOR 3.41, 95% CI 1.79–6.51, $p < 0.001$). Mild ICH was associated with reduced odds of failing (mild vs. moderate aOR 0.28, 95% CI 0.17–0.47, $p < 0.001$) (Figure 1(b)). In secondary analyses using the combined ischemic and ICH cohort, ICH was associated with increased odds of failing dysphagia screening (aOR 1.98, 95% CI 1.62–2.42; $p < 0.001$; Figure 2).

Outcomes

Table 1 lists outcomes for patients with ICH who failed or passed the dysphagia screening test. Compared to those who passed, patients who failed dysphagia screening were more likely to develop pneumonia (20.7% vs. 3.6%; aOR 5.3, 95% CI 2.36–11.88; $p < 0.001$), to have severe disability on discharge (65.5% vs. 33.3%; aOR 4.78, 95% CI 3.08–7.41; $p < 0.001$) and require placement of a percutaneous feeding tube (15.2% vs. 0%). 30-day mortality was higher in patients who failed (19.1% vs. 5.0%; aOR 3.45, 95% CI 1.67–7.12; $p < 0.001$). Survival curves are shown in Figure 3, and demonstrate substantially higher 1-year all-cause mortality for patients who failed screening (33.9% vs. 14.1%; adjusted hazard ratio 2.1; 95% CI 1.38–3.17, $p < 0.001$).

Discussion

We found that one-third of patients with ICH do not receive documented screening for dysphagia, with an omission rate of 40% among patients with mild ICH

Figure 3. Mortality after failing dysphagia screening in patients with ICH. One-year adjusted survival curves showing patients with ICH who passed (blue, top curve), and failed (red, bottom curve) dysphagia screening. Adjusted hazard ratio for mortality at 1 year was 2.1 (95% CI 1.38–3.17).

severity. Furthermore, patients with ICH had a high rate of dysphagia screen failure, which was associated with poor outcomes in different domains. Compared to those with ischemic stroke, patients with ICH had lower odds of receiving dysphagia screening, and twice the odds of failing. Our results emphasize the importance of screening patients with ICH for dysphagia.

Our finding of lower odds of dysphagia screening in those with ICH compared to ischemic stroke differs from that observed in the Get With the Guidelines – Stroke database, where dysphagia screening omission was similar in those with ICH (23.8%) and ischemic stroke (25%).[4] However, our study included a 72-hour limit to receiving dysphagia screening, so it is possible that more ICH patients are screened later in the admission as level of consciousness recovers. Our finding also differs from a previous publication showing the odds of receiving dysphagia screening was higher for ICH compared to ischemic stroke/TIA (odds ratio 1.15),[20] but TIA patients are not typically included in dysphagia screening protocols, and may have lowered the screening rates in the latter cohort.

The lower screening rates in patients with ICH compared with patients with ischemic stroke may reflect the differing processes of care. Patients with ischemic stroke are more likely to be directed along a streamlined care pathway, often within a stroke unit, whereas patients with ICH more often require neurosurgery and ICU care. Indeed, in our datasets patients with ICH had greater clinical severity than those with ischemic stroke (mean CNS 7.6 vs. 8.2), were less likely to be admitted to a stroke unit (20.4% vs. 60.2%), and more often admitted to the ICU (35.3% vs. 13.5%). Patients with ICH benefit from stroke units at least as much, if not more than patients with ischemic stroke.[21,22] Although we adjusted for admission location, stroke severity, and initial level of consciousness, it is not possible to adjust for specific nursing and medical care practices related to the two disease states and locations of admission. It may be that dysphagia is less often considered in patients with ICH, or screening is performed later in the admission after stabilization. Importantly, and in line with our ischemic stroke cohort,[6] patients with mild ICH severity were the most likely to be omitted from screening.

Although dysphagia screening rates were low, screening failure rates were high (68%), and may be higher than documented as clinical bedside assessment of dysphagia underestimates the real incidence when compared to instrumental evaluation.[23] Similar to previous studies patients with ICH had twice the odds of screening failure compared to patients with ischemic stroke.[4,24] It is unclear whether this association is due to the nature of brain injury in ICH versus ischemic
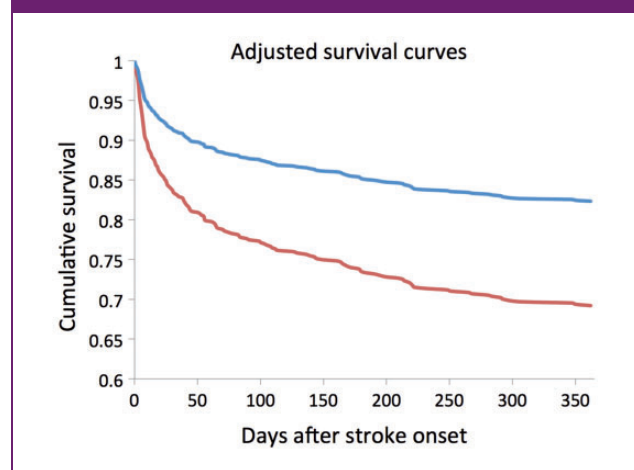
stroke, or residual clinical confounders. Dysphagia screen failure was associated with a high risk of poor outcomes in patients with ICH, including pneumonia, percutaneous feeding tube placement, disability, and death, arguing for early and comprehensive dysphagia care after ICH.

Our study has some limitations. We did not have information on confirmatory videofluoroscopic examination of swallowing, and the dysphagia screening protocol differed according to site. However, the study was designed to address the utility of simple and readily available bedside dysphagia screening. We did not have information on ICH volume or etiology, although these variables may in large part be reflected through clinical severity. Finally, we cannot rule out the possibility of residual confounding given the design of our study. Despite these limitations, our study provides a comprehensive characterization of dysphagia screening in a large ICH cohort.

Summary

The results of this study demonstrate that patients with ICH are at high risk of not receiving timely dysphagia screening, and failing dysphagia screening if tested, exposing patients to associated complications and mortality. These data emphasize that patients with ICH should be included in comprehensive dysphagia screening protocols and receive prompt screening when clinically appropriate.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Disclosures

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