



# Development and implementation of an assessment tool to ascertain the risk of choking among patients admitted to an acute hospital: a prospective cohort study

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## Introduction

Assessing patients' risk of choking is essential during an acute episode of hospitalization.<sup>1</sup> However, a quick and reliable choking risk assessment tool is lacking in the acute care setting that nurses can use. In response to an increasing number of elderly patients being admitted, a choking risk assessment (CRA) algorithm was developed to facilitate the assessment at the bedside upon patient's admission. It is designed to be efficient and provide recommendations for safe and appropriate diet textures and minimize unnecessary Nil-by-mouth (NBM) periods.

## Study Aims

This study aims to determine the accuracy of the CRA algorithm, and (2) to examine the feasibility and usability of the algorithm in identifying the high risk for choking among hospitalized adults.

## Methodology

**Study design:** Retrospective audit medical record review study  
**Setting:** 5 Acute Medical wards in Singapore General Hospital  
**Study period:** September 2019 to January 2020

- Patients that underwent the choking risk assessment (Figure 1) from the 5 acute medical wards were identified from the documentation by the nurses in the patients' medical records.
- The assessment results in two cohorts of patients- high-risk patients kept by nil-by mouth, and low-risk patients were allowed diet of choice.
- The assessment outcome will be matched against speech and language therapist's documentation to determine the sensitivity of the algorithm.

### Data collected:

- Patient's risk assessment outcome
- Patient's sociodemographic information
- Feedback from ward nurses.

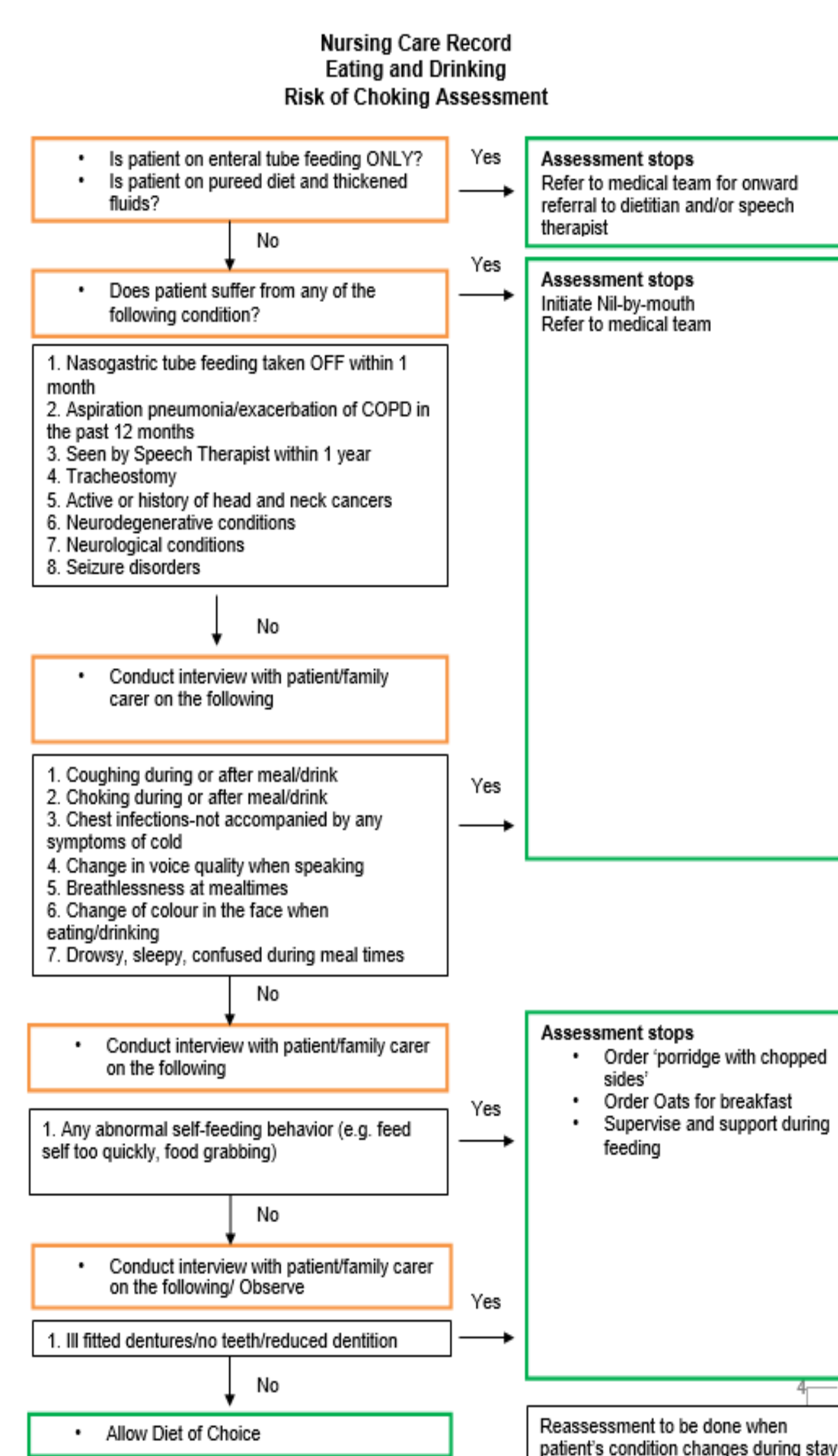


Figure 1. Choking Risk Assessment

## Results

A total of 400 medical records were reviewed, 314 patients were classified as high risk of choking and kept nil-by-mouth (NBM), while low-risk cohort consisted of 86 patients and was allowed diet of choice (DOC) (Table 1).

Variables	High risk and placed on 'NBM' (n=314)	Low risk and placed on 'DOC' (n=86)
Age, Mean (SD)	67.2 (16.9)	64.4 (16.5)
Gender, n (%)		
Male	134 (42.7)	38 (44.2)
Female	180 (57.3)	48 (55.8)
Ethnic group, n (%)		
Chinese	240 (76.4)	59 (68.6)
Malay	26 (8.3)	13 (15.1)
Indian	37 (11.8)	9 (10.5)
Others	11 (3.5)	5 (5.8)
Algorithm Assessment, n (%)		
Impaired cognition	143 (45.5)	-
Unconscious	85 (27.1)	-
On enteral feeding	36 (11.5)	-
On pureed diet and thickened feeding	25 (8.0)	-
Showed signs of Dysphagia	25(8.0)	-

Table 1. Demographics characteristics of patients

The sensitivity of the CRA algorithm was determined by the true positive cases and specificity was determined by the true negative cases. True positive referred to patients who had been assessed by the nurses to be at risk of choking on the CRA algorithm and subsequently diagnosed by an SLT. False negative referred to patients who had been assessed not to be at risk of choking but were diagnosed by an SLT.

## Results

Nil by mouth patients, n (%) (n=314)	Seen by ST (No)	Seen by ST (Yes)	True Positive	False Positive			
Unconscious	72 (84.7)	13 (15.3)	13 (100)	0 (0.0)			
Impaired cognition	118 (83)	25 (17.5)	19 (76)	6 (24)			
On enteral feeding	-	7 (19.4)	29 (80.6)	-			
On puree diet and thickened fluid	-	17 (68)	8 (32)	-			
Showed signs of Dysphagia	19 (76)	6 (24)	5 (83.3)	1 (16.6)			
Patient diet, n (%), (n=86)	Seen by ST (No)	Seen by ST (Yes)	As part of care pathway	Previously seen by ST	Requested by medical team	True Negative	False Negative
Diet of Choice	80 (68.8)	6 (5.1)	2 (1.7)	2 (1.7)	2 (1.7)	2 (33)	4 (67)

Table 2. Algorithm assessment and assessment done by the Speech and Language Therapist (ST)

A total of 21% (n=68) of patients in the high-risk cohort were referred for a SLT assessment. Upon review by the SLT, patients who were deemed true positive include those who were unconscious (100%, n=13), impaired cognition (76%, n=19) and showed signs of dysphagia (83.3%, n=5) (Table 2). Seven patients were deemed to have a false positive assessment result. A total of six patients in the low-risk cohort were subsequently referred to SLT by the medical team for further evaluation. Out of these 6 patients, 33% (n=2) had no dysphagia and were true negatives. Four patients were diagnosed by the SLT to have dysphagia, which was found to have false-negative (Table 2). Overall, the CRA showed a sensitivity of 90.2% and specificity of 22.2%

Likert survey response	Strongly Agree	Agree	Disagree	Strongly disagree
1. The assessment tool is relevant to the patients I cared for.	27.8%	64.7%	7.2%	0.3%
2. It is important to assess for risk of choking.	44.4%	53.4%	2.2%	0%
3. The assessment questions are easy to understand.	20.6%	74.7%	4.1%	0.6%
4. The assessment questions are easy to execute.	20.9%	72.8%	5.6%	0.6%
5. I can complete the assessment in time (before ordering diet in e-menu).	16.9%	72.2%	10.3%	0.6%
6. The recommendations are easy to execute.	17.2%	76.6%	5.9%	0.3%
7. Using the tool, I am able to communicate patient's risk of choking to the medical team.	20.9%	72.2%	6.6%	0.3%
8. I feel assessment outcomes (of choking risk) were taken into consideration for patient's management.	22.8%	70.9%	5.6%	0.6%

Table 3. Survey response on the feasibility and usability of CRA (n=320)

A total of 320 nurses responded to the survey. Overall, the response reported high feasibility and the usability of the algorithm levels ranging from 89.1% to 97.8% (Table 3). Most of the respondents agreed that "It is important to assess the risk of choking" (97.8%).

## Discussion

Overall, the CRA has demonstrated high sensitivity, allowing nurses to assess the appropriate patients who were to be placed on NBM. Nevertheless, low levels of consciousness increase the risk of choking. Therefore, withholding any form of feeding will be the right course of action.

The study's findings highlight the challenge of identifying accurately those who were cognitively impaired and required to be placed on NBM for further assessment by the SLT. Patients who had true positive results were accurately assessed using the CRA, and placed patients with cognitive impairment on NBM were 76%. Whereas 24% of the patients were unnecessarily placed on NBM after review by the SLT.

The evaluation of patients using the CRA algorithm showed low specificity in this study, as 67% of those allowed to have a regular diet had choking risk detected after being reviewed by the SLT. The CRA demonstrated an overall specificity of 22.2%. It is vital to reinforce the reassessment of admitted patients with the CRA algorithm as part of the routine nursing practice. This will enable the nurses to be able to carry out accurate and timely screening for any risk of choking in patients when their condition changes during the hospitalization.

## Conclusion

The CRA is potentially valuable to aid nurses in identifying and preventing adverse outcomes for patients at risk of choking during their hospitalization. Early risk identification will allow for prompt interventions and detailed evaluation of high-risk patients.

## Acknowledgement

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### References:

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