Using Data Analytics to Identify Risk Factors for Aspiration Pneumonitis

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Background and Description

Aspiration pneumonitis (AP) is a common complication for hospitalized patients. AP results in a mortality rate between 15-56%.

Numerous patient-level factors have been related to AP, but their relative contribution to development of the condition is unknown. Furthermore, their relevance in a general medical-surgical population has not been confirmed.

An interprofessional research team appraised the literature to determine common predictors of AP. Nine predictor variables were identified.

Purpose

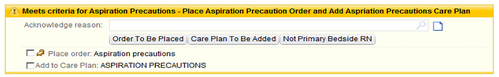
Research question: Do the following risk factors predict AP in adult medical-surgical patients?

- Advanced age
- Impaired consciousness
- Altered oral integrity
- Malnutrition
- COPD diagnosis
- Respiratory compromise
- Dysphagia
- Dependent feeding
- Gastric tube feeding

Goal: Clinical Decision Support

Create a best practice alert, to be triggered by interprofessional documentation of risk factors. The EMR will alert nurses to risks, allowing them to:

1. Order aspiration precautions (a banner placed on report views)
2. Place a care plan with interventions aimed at reducing the incidence of AP



Methods

- A retrospective case control study was performed using EMR review of adult medical surgical patients with and without a diagnosis of aspiration pneumonitis. Details include:
  - Query for N=90 with AP diagnosis
- Using binomial logistic regression, the dependent variable of AP was compared to nine patient level risk factors to determine if the variables predict AP.

VARIABLES

		Operational definitions	Electronic medical record data fields
INDEPENDENT VARIABLES	70+ years of age	Patient was at least 70 years old on admission	EPT 110
	Impaired consciousness	Patient had a total GCS score ≤ 12 any time during admission	FLO 401001 FLO 20185
	Altered oral integrity	Patient had oral lesions, poor dentition, OR oral ulcerations/lesions anytime during admission	FLO 2116 FLO 2117 FLO 305690
	Malnutrition	During admission, patient had a medical diagnosis of malnutrition, OR dietician diagnosed severe malnutrition, OR nurse documented patient had unplanned weight loss (non-fluid) >10% in the past 6 months	FLO 18096: (ICD-9 codes 262, 263.0, 263.1, 263.8, 263.9) FLO 13920
	COPD diagnosis	Patient had a medical diagnosis of COPD anytime during admission	Diagnosis Grouper 1600000002
	Respiratory compromise	Patient's respiratory function was supported by BiPAP, CPAP, ventilator, non-re-breather mask or high flow nasal cannula, OR used supplemental oxygen at FiO2 ≥ 50% anytime during admission	FLO 301030 FLO 301550
	Dysphagia	Patient had facial, tongue or palatal asymmetry/weakness, OR had documented signs of aspiration during a 3-ounce water test, OR had a diagnosis of dysphagia, OR had a dysphagia diet ordered during admission	FLO 20186 FLO 20187 FLO 20188 FLO 20190 FLO 9140 FLO 10275 Diagnosis Grouper 100809 EAP DIET15
	Dependent feeding	Patient required total assistance in feeding at any time during admission	FLO 700380 Feeding
	Tube feeding	Patient had a gastric tube to provide nutritional requirements during admission	FLO 7085770 FLO 3040102843 FLO 7085560 FLO 3040102795
DEPENDENT VARIABLES	Aspiration pneumonitis diagnosis	Participant had a medical diagnosis of aspiration pneumonitis anytime during admission	Problem List (ICD-10 code J69.0)

Results

Number of times observations appear

	Age greater than 70	Impaired consciousness	Altered oral integrity	Malnutrition	COPD diagnosis	Respiratory compromise	Dysphagia	Dependent feeding	Tube feeding
Non-aspiration 0	38	2	1	8	4	8	5	0	1
Aspiration 1	52	33	4	21	3	33	57	18	25

Model Summary

Step	-2 log likelihood	Cox & Snell R square	Nagelkerke R square
1	121.477[a]	.509	.679

Logistic Regression Table

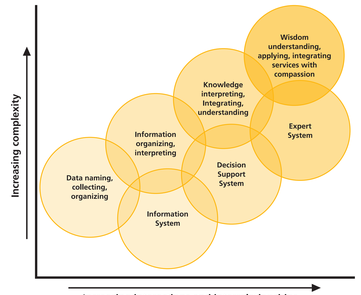
	B	S.E.	Wald	df	Sig.	Odds ratio - Exp. (B)
Age greater than 70	-.516	.496	1.082	1	.298	.597
Impaired consciousness	1.988	.888	5.013	1	.025	7.299
Altered oral integrity	-1.132	3.086	.135	1	.714	.322
Malnutrition	.336	.749	.201	1	.654	1.400
COPD diagnosis	-.910	1.405	.419	1	.517	.402
Respiratory compromise	1.723	.573	9.054	1	.003	5.604
Dysphagia	2.847	.606	22.080	1	.000	17.231
Dependent feeding	20.464	8061.854	.000	1	.998	7.716E8
Tube feeding	3.434	1.141	9.063	1	.003	30.986
Constant	-1.665	.345	23.297	1	.000	.189

a. Variable(s) entered on step 1: Age Greater Than 70, Impaired Consciousness, Altered Oral Integrity, Malnutrition, COPD Diagnosis, Respiratory Compromise, Dysphagia, Dependent Feeding, Tube Feeding.

Discussion: Next Steps

- **Impaired consciousness, respiratory compromise, dysphagia and tube feeding** are shown to be predictors of AP in this sample. Persons with impaired consciousness were seven times more likely to have AP than those without.
- The risk-factors can be further studied and incorporated into an automated predictive scale. This could help nurses identify patients at risk for AP based on existing clinical documentation.
- Predictive model research facilitates progression from data to wisdom, integrating nursing informatics metastructures into practice. This project is innovative to the nursing field, leveraging evidence based practice and data analytics to identify what is known and unknown about AP, and designing an automated system solution that can improve health outcomes.

The Relationship of Data, Information, Knowledge, and Wisdom and Automated Systems: version 2



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