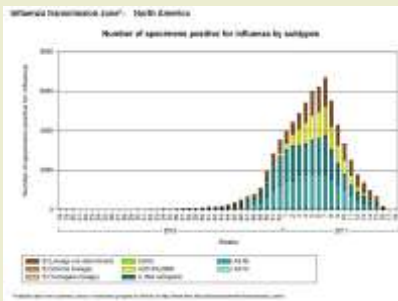




Introduction

In March 2009 there was an outbreak of a strain of influenza in Mexico that was later found in other countries, including the United States. By June, 2009 the WHO announced a phase 6 (the highest level) pandemic alert. While the pandemic was officially proclaimed over in August 2010, there continued to be cases reported. The cases had another recurrent spike in early 2011 seen predominantly in the Latin Americas, but also in North America as seen in the figure below. The CDC estimated that between April 2009 and April 2010, there were 12,470 fatal cases in the US (however, this is less than has been caused by the seasonal influenza in non pandemic years). Between February 2010 and March 2011, Harborview Medical Center (HMC) has seen 71 cases of H1N1 Influenza A, 27 resulting in ICU stays and 8 deaths.



H1N1 Background

The viral strain is a combination of two swine, one human and one avian strain of influenza. The concerning factor of the 2009-2010 pandemic was the high infection rate for people under 24 years old. In addition, while many cases included people with some underlying and/or pre-existing health conditions, a third of hospitalized patients had no pre-existing chronic illness. However, common risk factors for complications from the H1N1 virus include chronic lung disease, immunosuppressive conditions, pregnancy and asthma to name a few.

Signs and Symptoms

Mild/Uncomplicated Disease: fever, cough, sore throat, rhinorrhea (runny nose), muscle pain, headache, chills, malaise, and sometimes diarrhea and vomiting but **no shortness of breath (SOB) or development of chronic health conditions.**

Progressive Illness: Includes the symptoms above in addition to chest pain, poor oxygenation, cardiopulmonary insufficiency, central nervous system (CNS) impairment (confusion), severe dehydration, exacerbation of chronic conditions (i.e. asthma, COPD, CKF, DM etc.).

Severe/Complicated Illness: signs of lower respiratory disease (hypoxia or intubation), CNS findings, complications of hypotension (organ failure), myocarditis, & secondary bacterial infection (i.e. persistent high fever)

Meet the Patient

- 32 yo Female from southwestern Washington
- Owns a car repair shop with husband
- Pets: Parrot and dog
- Smokes 1 ppd x "years"
- Drinks 1-2 drinks per day (h/o heavy drinking)
- Per parents, patient focuses on being healthy and active

Admit Information

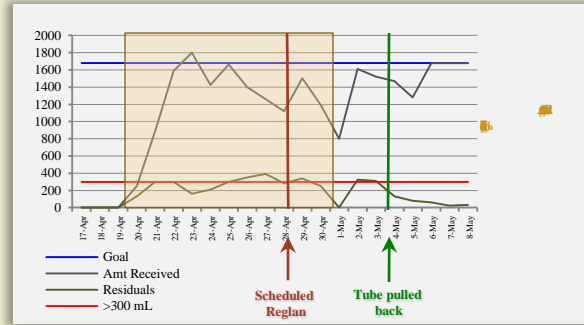
- Presented at OSH after 1 week of fatigue, malaise, nausea, poor intake
- Transferred to HMC on 4/17 w/ suspected pneumonia (PNA) and hypoxia. Etiology unknown: exposures include working as mechanic & recently nursed dying bird 1 week prior to admit
- PMH: 3 episodes of bronchitis before 2001 (1 accompanied by pleurisy)

Initial Assessment

PES: Inadequate intake from enteral nutrition related to high residuals and multiple interrupted infusions as evidenced by patient consistently receiving <75% of estimated energy needs

Admit Weight	73 kg
Usual Body Weight	65-68 kg
Height	5'5" (166 cm)
BMI (Admit BW)	26.5 kg/m ²
Estimated Energy Needs (BEE x 1.2-1.4)	1785 – 2100 kcal/d (24-28 kcal/kg)
Estimated Protein Needs (1.3-1.5 g/kg)	95-110 g/d
Prescribed Formula	Jevity 1.2 @ 70 mL/hr
TF provided	2015 kcal & 95g protein

COURSE OF NUTRITIONAL SUPPORT

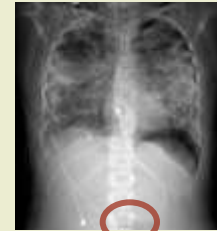


4/28

5/4



Tip of the tube is facing up, likely contributing to increased residuals



Tip of tube after nurses pulled it back by accident, residuals then decreased

Timeline of Events



- Intubated and Sedated -decreased blood pressure – pressors started
- Paralytics started
- Infectious Disease consult for possible PNA
- Takotsubo heart failure, ARDS, AKI
- First discussion of Nutrition
- plan to stop paralytics
- NG tube feedings start
- TF held for "high residuals" (210 mL)
- Reglan added PRN
- Residuals > 300 mL – TF held
- Discussion of post-pyloric feeding
- Reglan scheduled

Barriers to Nutrition

- Controversy around pressors and feeding – when on multiple pressors, enteral feeding is generally avoided
- Desire to start feeding <48hours
- Controversy around effective tube placement and feeding w/ paralytics
- Determining adequate nutrition – patient had multiple chest tubes placed (seen in second X-ray above) with consistent air leaks making indirect calorimetry impossible
- Nurse knowledge deficit for when to hold residuals
- High risk patient that cannot be moved without dropping blood pressure so she cannot be taken to IR for NJ tube placement

Paralytics and Feeding

- Insufficient research for long term (>6 days) use of paralytics – the majority of studies look at use over 2 days
- Some dietitians feel that in practice there is little success with maintaining low residuals and placing a tube post-pyloric with paralytics despite research denying effects on smooth muscle
- Overall, minimal studies looking at nutrition support on paralytics:
 - "Critically ill patients who deteriorate and need [a] ...therapeutic neuromuscular blockade should probably have their enteral nutrition held until they have been stabilized." Spain, DA.2002
 - Post-pyloric may be beneficial - possible that gastric motility is impaired more than intestinal motility Heuschkel, R & Duggan 2011
- One study relevant to this patient:

ORIGINAL

Gastric emptying in mechanically ventilated critically ill patients: effect of neuromuscular blocking agent

n = 20 mechanically ventilated patients

- Majority with AKI and ARDS
- On pressors
- Mean age 57±13

	Fentanyl & midazolam	Fentanyl & midazolam + cisatracurium
Residual Vol. 1 hr (mL)	110 ± 65	125 ± 85
Residual Vol. 2 hr (mL)	95 ± 76	105 ± 90

*cisatracurium (NIMBEX) is the paralytic used in this study and for the patient in this case study

- **Key finding:** gut absorption capacity is maintained when neuromuscular blocking agent is administered in sedated critically ill patients.
- This suggests that the mechanisms required for enteral absorption are maintained despite presence of paralytics.

Outcomes

- 1 month after admit she received a trach and a week later she was tolerating a regular diet – she was very motivated and was an active participant in learning about healthy protein rich foods for healing
- 6/6 she transferred to the floor and on 6/16, after 2 months in the hospital, she was discharged home!

REFERENCES

1. Heuschkel, R & Duggan, C. *Enteral feeding: Gastric vs. post-pyloric.* UpToDate, Jan 2011
2. Spain, DA. *JPEN* 26:S62-S68 2002
3. Thorner, AR, Hirsch, MS, McGovern, BH. Epidemiology of pandemic H1N1 influenza (swine influenza). *UpToDate.* May 2011.
4. Thorner, AR, Hirsch, MS, McGovern, BH. Clinical manifestations and diagnosis of pandemic H1N1 influenza (swine influenza). *UpToDate.* May 2011.