Medications

Name	Class: Pharmacologic (P) and Therapeutic (T)	Dose	Route	Frequency	Reason	Nursing Assessments
Acetaminophen	**P:** Nonsalicylate, para-aminophenol derivative **T:** Antipyretic, nonopioid analgesic	490 mg	G-tube	PRN q4h	Analgesia, antipyresis	Monitor for liver dysfunction (bleeding/bruising). Hold if in active respiratory distress (may depress respiratory drive)
Albuterol sulfate	**P:** Adrenergic **T:** Bronchodilator	2.5 mg	Nebulizer	q4h	Re-open occluded airways	Monitor for hypokalemia. Monitor for tachycardia
Cefepime	**P:** Fourth-generation cephalosporin **T:** Antibiotic	1500 mg	IV	q8h	Treatment of pneumonia	Monitor for signs of extravasation, Monitor for superinfection (worsened secretions, other signs/symptoms of increased illness)
Famotidine	**P:** Histamine-2 blocker **T:** Antiulcer agent	16.24 mg	G-tube	BID	Gastric ulcer prophylaxis (immobility, stress)	Monitor for bloody/black stools, Avoid concurrent use of other antiulcer agents. Ensure drugs utilizing the acidic pH of the stomach are not administered within two hours after this drug
Gabapentin	**P:** 1-amino-methyl cyclohexaneacetic acid **T:** Anticonvulsant	150 mg	G-tube	Nightly	Dysautonomia symptom alleviation	Ensure use of gabapentin is gradually (rather than suddenly) discontinued if indicated. Do not administer within two hours after an antacid/antiulcer agent
Ibuprofen	**P:** NSAID **T:** Analgesic, anti-inflammatory, antipyretic	326 mg	G-tube	PRN q6h	Analgesia, antipyresis	Monitor for hypokalemia. Monitor for gastric upset
Levocarnitine	**P:** Ammonium compound **T:** Carnitine replacement	300 mg	G-tube	BID	Metabolic deficiency (aids in fat metabolism)	Monitor for edema in lower extremities (**PRESENT IN THIS PATIENT**). Monitor for nausea/vomiting
Scopolamine	**P:** Belladonna alkaloid **T:** Antiemetic	1 mg	Transdermal	q3d	Prevent nausea and suppress the vomiting reflex (this patient had a gastric fundoplication)	Monitor for anticholinergic effects (dry eyes are acceptable, but discontinue in presence of blurred vision), Discontinue gradually if history of withdrawal from patches

All information pertaining to pharmacologic/therapeutic classes and pertinent nursing assessments obtained from Jones & Bartlett Learning (2023). This list is comprehensive of the patient's current meds at the time of the clinical visit. Yellow highlight indicates considerable pertinence to this patient. Cyan highlight indicates corresponding adverse effects. Lime highlight indicates possible interactions. Magenta highlight indicates potential relationship in prescriptions.

Demographic Data

Admitting diagnosis: Acute on chronic respiratory failure (related to left lower lobe atelectasis and pneumonia)

Age of client: 9 years

Sex: Female

Weight in kgs: 32.5 kg

Allergies: Cefdinir (rash), Silicone-based dressings/adhesives (sloughing and ripping of the skin)

Date of admission: 06/11/2023

Psychosocial Developmental Stage: Industry vs. Inferiority (Trust vs. Mistrust) (Taylor et al, 2019)

Cognitive Development Stage: Concrete Operational (Preoperational) (Taylor et al, 2019)

Admission History

Patient admitted to Carle Foundation Hospital after being brought to Convenient Care on 06/11/2023 by her mother. Patient's mother shared concerns for pneumonia as a result of noticing an increase in the patient's tracheostomy secretions, accompanied by a change in appearance. These secretions were thick/mucousy, yellow, and blood-tinged, and the patient was also experiencing a low-grade fever for one week prior to the visit. The provider overseeing the clinic visit advised the patient's mother to go to the emergency room due to the patient's history of pneumonia and sepsis as well as the patient exhibiting tachycardia (130 bpm), hyperventilation (34 rr), hypoxia (88%), and diminished breath sounds in the lower left lobe (LLL) with crackles all throughout the rest of the lobes in both lungs. Prior to admission, this patient was administered breathing treatments (albuterol) and oxygen therapy via mechanical ventilation. These orders remain current.

Pathophysiology

Disease process: Atelectasis

Atelectasis occurs when a small number of alveoli collapse. This may be the result of a mass in the lungs, but it most often occurs when pulmonary secretions accumulate and cannot be cleared. This obstructs the bronchioles and increases the pressure on the alveoli until they can no longer fully expand, leading to eventual collapse as the pressure increases. These secretions often accumulate in bedridden or immobile patients—which is the case for this patient—thus reducing gas exchange in the affected portion of the lung. Most patients with atelectasis develop some form of pneumonia because the lack of air movement and increased volume of secretions create a more ideal environment for pathogens to grow and multiply. The presence of pneumonia increases secretions and only worsens the patient's condition in a positive feedback loop. If the conditions leading to atelectasis do not subside or worsen, the collapse of alveoli will continue and progress into a larger collapse and fluid surrounding the lung within the pleural cavity. This is known as pleural effusion and has a greater negative effect on oxygenation. Poor oxygenation can impair perfusion in tissues throughout the body, leading to multi-system dysfunction and possible ischemia. The reduced gas exchange may also lead to an acid-base balance of respiratory acidosis due to carbon dioxide retention (Capriotti, 2020).

S/S of disease:

Atelectasis presents as shortness of breath that is agitated further by shallow breathing. Patients will have lower oxygen saturation, and the affected region of the lung will exhibit crackles or diminished/absent breath sounds on auscultation. Additionally, patients with low oxygenation may exhibit altered mental status due to poor perfusion of the brain (Capriotti, 2020).

Method of Diagnosis:

Atelectasis is diagnosed by radiography, such as a chest x-ray or CT scan. Either of these images would show a more opaque region of the lungs due to the increased fluid and partial collapse/adhesion of tissues (Van Leeuwen & Bladh, 2021).

Treatment of disease:

Atelectasis is treated by suctioning, chest physiotherapy, and postural drainage to mobilize and expel the accumulated secretions. Patients who have expected motor control are encouraged to use an incentive spirometer, though this patient would not benefit from this therapy due to her immobility status. In cases of pneumonia, the appropriate antibiotics would be prescribed depending on the pathogen responsible for the disease. If atelectasis progresses into pleural effusion, the affected pleural cavity is drained of fluid by thoracentesis, encouraging the lung to reinflate and allowing for restored oxygenation (Capriotti, 2020).

Relevant Lab Values/Diagnostics

Lab/Test (unit)	Expected Range	Today's Value
RBC ($x10^6/\mu L$)	3.9 – 4.96	5.35 RBC count is elevated in patients with respiratory failure as attempted compensation for hypoxia (Capriotti, 2020)
Hgb (g/dL)	10.6 – 13.2	13.8 RBCs are elevated, so—although MCHC is decreased—there is more total hemoglobin to measure (Capriotti, 2020)
Hct (%)	32.4 – 39.5	44.2 Hematocrit is elevated in the presence of elevated RBCs (Capriotti, 2020)
MCHC (g/dL)	31.8 – 34.6	31.2 This patient is failing to intake sufficient oxygen, so the concentration of hemoglobin on individual RBCs is decreased (Capriotti, 2020)
RDW (%)	12.2 –14.4	14.5 This indicates RBCs have greater than expected variation in size between cells, indicating significant differences in age. This occurs in patients with hypoxia due to not meeting oxygen needs and the body compensating (Capriotti, 2020)
WBC ($x10^3/\mu L$)	4.27 – 11.40	9.57
Neutrophils (%)	40 – 80	62.7
Lymphocytes (%)	20 – 40	26.0
Monocytes (%)	2 – 10	7.8
Eosinophils (%)	1 – 7	3.0
Bands (%)	0 - 10	0.5
BUN (mg/dL)	7 – 17	<3 BUN is decreased in patients on chronic enteral feedings due to significantly decreased presence (in this patient, essential absence) of protein in the diet. Also a general marker for malnutrition (Capriotti, 2020)
Creatinine (mg/dL)	0.55 – 1.02	0.34 Creatinine is decreased in patients on chronic enteral feedings due to significantly decreased presence (in this patient, essential absence) of protein in the diet. Also a general marker for malnutrition (Capriotti, 2020)
Albumin (g/dL)	3.8 – 5.4	2.7 Albumin is decreased in patients on chronic enteral feedings due to significantly decreased presence (in this patient, essential absence) of protein in the diet. Also a general marker for malnutrition (Capriotti, 2020)
Bilirubin (mg/dL)	0.2 – 1.2	0.3
AST	5 – 34	86 An AST that is at least twice as high as an ALT—particularly when an ALT is normal—is indicative of progressing liver dysfunction, especially in patients with chronic illness who are on multiple medications for extensive periods of time (Capriotti, 2020)
ALT	0 – 55	43
CXR (Chest X-ray)	N/A *interpreted per case	Gastric tube in place, Tracheostomy cannula in place, LLL atelectasis. The visualization of atelectasis aided the patient's provider in diagnosing an acute episode on chronic respiratory failure (Van Leeuwen & Bladh, 2021)
Blood Culture	Negative	Negative
Sputum Culture	Negative	Gram-positive cocci This is indicative of an infection (Capriotti, 2020), though the provider noted this was likely a contaminated sample containing microbes from the oral cavity
Lower Respiratory Culture	Negative	Gram-negative bacilli This would be the pathogen responsible for the patient's pneumonia, which progressed to LLL atelectasis (Capriotti, 2020)

Normal ranges obtained from Carle Foundation Hospital (2023). This list is not comprehensive of all labs/diagnostics; omitted values were within expected ranges.

Medical History

Previous Medical History: Atelectasis, Respiratory failure (with tracheostomy), Decreased bone density, Dysautonomia, Gastric fundoplication (with gastric tube), Hypothermia (poor thermoregulation), Multiple urinary tract infections, Optic nerve hypoplasia, *Pseudomonas* infection, Respiratory acidosis, Sepsis, Spinal muscular atrophy (SMA)

Prior Hospitalizations: 01/31/2023 (Hypothermia, sepsis), 02/09/2023 (Left lower lobe atelectasis, respiratory acidosis)

Chronic Medical Issues: Respiratory failure (with tracheostomy), Decreased bone density, Dysautonomia, Need for gastric tube feedings, Optic nerve hypoplasia, Poor thermoregulation, SMA

Social needs: Lives at home with parents and two siblings; Enjoys being around people, having someone pick clothes/accessories, watching TV/YouTube

Active Orders

- Chest physiotherapy (provided by patient's mother with equipment from home) to mobilize secretions
- Continuous enteral nutrition (formulated by patient's mother at home) to compensate for chronic NPO status
- Mechanical ventilation: 21% FiO_2
- Oral/tracheostomy care/suctioning q4h (provided by patient's mother)
- Physical therapy & occupational therapy to compensate for immobility and aid mother in providing care
- Postural drainage (provided by patient's mother) to eliminate secretions
- Vital signs q15min to monitor for rapid change in status, particularly related to respiratory function

Assessment										
General	**Integument**	**HEENT**	**Cardiovascular**	**Respiratory**	**Genitourinary**	**Gastrointestinal**	**Musculoskeletal**	**Neurological**	**Most recent VS (highlight if abnormal)**	**Pain and Pain Scale Used**
Patient responds to her name by moving her fingers and making eye contact though is unable to verbally communicate, **this is her baseline**; Neat appearance as maintained by patient's mother; Initially in respiratory distress upon waking but responded well to breathing treatments and physical interventions, returning to baseline. No other acute distresses.	Skin is overall pink, smooth, dry, warm, elastic with no tenting at clavicle. Hair evenly distributed about scalp, eyebrows, eyelashes. Macular rash on face. Skin tear on left middle chest caused by agitation of telemetry wires on patient during chest physiotherapy. Wound bed is red with no drainage or signs of spreading infection. No signs of bruising throughout. Evidence of skin breakdown (redness, flaking) on ventral surfaces of upper extremities and dorsal surfaces of lower extremities (related to how the patient's extremities are positioned). Fingernails and toenails are pink and painted with silver glitter, no clubbing/cyanosis. Braden score 10, high risk.	**Head/Neck**: Cranium is symmetric, normocephalic. Facial edema present on forehead, eyes, cheeks, and chin. Carotid 2+. Unable to assess thyroid due to presence of tracheostomy. Lymph nodes nonpalpable, elicited no change in pain assessment. **Ears**: Free of wounds, lumps, lesions, cerumen. **Eyes**: PERRLA, bilateral EOMs (slow response), eyelids free of lumps/lesions, sclerae white, conjunctivae pink/moist/no drainage, unable to assess visual acuity due to lack of available chart and communication barrier with patient related to nonverbal and immobile status. **Nose**: Externally free of lumps/lesions, septum midline, unable to assess internally due to decreased size, nonpalpable maxillary/frontal sinuses, palpation elicited no change in pain assessment. **Throat**: Did not assess oral-pharyngeal cavities per patient's mother's request with concern for pain, though oral mucosae are visibly pink/moist/free of drainage.	S_1 and S_2 auscultated at APETM (Aortic, Pulmonic, Erb's Point, Tricuspid, Mitral); No murmurs, gallops, rubs; Sinus tachycardia (VR 130) on telemetry monitor; No neck vein distension; 4+ pitting edema in bilateral lower extremities; Bilateral 2+ radial, ulnar, popliteal, posterior tibial pulses; No bruits; Capillary refill 2 seconds in all fingers and toes.	Patient uses mechanical ventilator (21% FiO_2 set to 24 rr) via tracheostomy. Patient typically breathes 28 respirations/minute per patient's mother and RN. **Initial assessment (0800) before breathing treatment and interventions**: Diminished breath sounds in LLL, crackles in all other lobes bilaterally. 38 respirations/minute. Equal rise and fall of left and right chest. No accessory muscle use. **Follow-up after breathing treatment and interventions**: Crackles in LLL, clear in all other lobes bilaterally. 28 respirations/minute (**patient's baseline**). Equal rise and fall of left and right chest. No accessory muscle use.	Urine yellow, clear; ~350 mL output in 4 hours (0730-1130). Did not assess genitals. Patient has incontinence and uses bed pads. This is followed by perineal care by her mother.	Patient is NPO, history of gastric fundoplication, utilizes continuous enteral feedings via gastric tube (dressing intact, dry, free of drainage); Feedings are formulated by her mother at home. Normoactive bowel sounds in all four quadrants. No distension, incisions, scars. Abdomen soft to palpation with no masses or organomegaly. Loose, brown BM x1 in 4 hours (0730-1130), **considered patient's baseline**.	Passive range of motion. Carried by her parents at home. 0/5 strength/resistance in bilateral UE and LE; Patient's voluntary movements consist of moving her eyes, contorting her face, and wiggling/tapping her fingers.	Sensorium appears intact, as patient responds to touch on locations throughout her body. Her LOC cannot be assessed with the traditional four criteria because of nonverbal status, though she responds to her name. **She remained at her baseline** of optical/facial/digital responses to physical stimuli and the speech of others. Johns Hopkins fall score of 0, no risk.	**Time:** 1130 **Temperature:** 36.4ºC **Route:** Axillary **RR:** 28 (considered this patient's baseline) **HR:** 130 (elevated since just prior to admission) **BP:** 116/68 **MAP:** 87 RUE **Oxygen saturation:** 99% **Oxygen needs:** Mechanical ventilation; 21% FiO_2	Assessed pain with rFLACC; Pain = 0 @ 0800, 0845, 0930, 1000, 1045, 1130

Nursing Diagnosis 1	Nursing Diagnosis 2	Nursing Diagnosis 3
Ineffective airway clearance related to neuromuscular impairment and the presence of an artificial airway as evidenced by hypoxia, excessive mucus, retained secretions, and the continuous need for tracheostomy suctioning to clear secretions.	Ineffective thermoregulation related to alteration in metabolism as evidenced by proclivity to hypothermia and need for multiple layers in a warmer environment/season to maintain normal body temperature.	Impaired skin integrity related to imbalanced nutritional state, alteration in metabolism, and neuromuscular impairment as evidenced by skin breakdown on surfaces making contact with the bed and the presence of a skin tear.
Rationale Patient is immobile, has a trach in place, and is exhibiting thickened secretions that are difficult to clear, which are audible as crackles that go away after chest physiotherapy, postural drainage, and suctioning.	**Rationale** Patient was hypothermic upon initial presentation to the hospital, and she recently developed sepsis as a result of this. During this specific visit, she required multiple layers of clothing/blankets to maintain a body temperature close to 37.0ºC.	**Rationale** Patient's albumin (a marker for nutrition) is decreased at 2.7, and skin breakdown was visible even with proactive skin-protective measures by the patient's mother and nurses.
Interventions **Intervention 1:** Assess respiratory status at least every hour. **Intervention 2:** Continue suctioning as ordered to help clear the airway.	**Interventions** **Intervention 1:** Monitor all vital signs at least every 30 minutes. **Intervention 2:** Ensure warm environment and clean/dry/warm linens/blankets are provided.	**Interventions** **Intervention 1:** Adopt more effective padding and support devices. **Intervention 2:** Protect areas of fragile/broken skin (i.e. joints) and continue monitoring these areas.
Evaluation of Interventions Changes in respiratory status are perceived more quickly, and future treatments can be anticipated before status declines further. Suctioning provides relief from retained secretions.	**Evaluation of Interventions** Patient exhibits signs of contentment and remains within normal body temperature parameters.	**Evaluation of Interventions** Erythema on the ventral surfaces of the patient's upper extremities and the dorsal surfaces of the patient's lower extremities subsides with repositioning and padding of these areas.

Diagnosis and intervention components answered with information presented by Phelps (2020).

References

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