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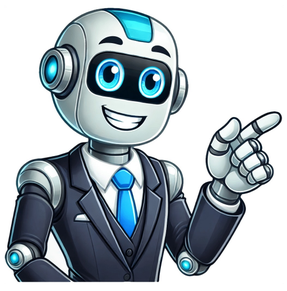

DiagnosisRule OutPrognosisFormulaTreatmentAlgorithm Keeping track of a patient's fluid intake and output is one of those fundamental practices that truly makes a difference in their care. As nurses, we know how quickly a fluid imbalance—too much or too little—can throw off a patient's stability especially for critical patients. By carefully recording every bit of fluid a patient takes in or excretes, we get a clearer picture of their health, allowing us to catch any issues early and adjust their treatment as needed. It's all about using those details to support our patients and help them on their path to recovery. Fluid intake and output (I&O) refers to the careful tracking of the amount of fluids a patient consumes and excretes. This process helps healthcare professionals monitor a patient's fluid balance, ensuring that the body is maintaining proper hydration and electrolyte levels. Fluid intake includes all liquids that enter the body, which may come from various sources: Oral fluids. Water, juice, milk, soups, and other beverages. Intravenous (IV) fluids. Fluids administered through an IV line, such as saline or medications diluted in fluids. Enteral fluids. Fluids given through a feeding tube directly into the stomach or intestines. Medications. Liquid medications or medications dissolved in fluids. Fluid output refers to all fluids that leave the body, which may include: Urine. The most common form of output. Feces. Especially if the patient has diarrhea. Vomitus. Fluid loss through vomiting. Wound drainage. Fluid exuding from surgical or wound drains. Sweat. Though difficult to measure, sweat can contribute to fluid loss, particularly in febrile patients. Breathing. Minimal fluid loss through respiration (called insensible loss), though typically not directly measured. The primary purpose of monitoring fluid intake and output is to assess and maintain the patient's fluid balance, prevent complications associated with imbalances, and aid in diagnosing underlying medical conditions. This is particularly important in patients who are critically ill, those with renal or cardiac issues, and those on intravenous (IV) therapy. Understanding the patient's fluid status allows nurses and the broader healthcare team to: Monitoring fluid intake and output (I&O) is an important part of nursing care that helps ensure proper fluid balance in patients, prevent complications, and guide treatment decisions. Below is a comprehensive step-by-step nursing assessment of fluid I&O, including rationales for each step. 1. Review the patient's medical history. Obtain a detailed medical history focusing on conditions that may affect fluid balance, such as kidney disease, heart failure, liver disease, diabetes, and endocrine disorders.Pre-existing conditions can predispose patients to fluid imbalances. For example, heart failure can cause fluid retention, while kidney disease may impair fluid excretion. Understanding the patient's medical history provides context for interpreting fluid intake and output. 2. Assess current medications. Review all medications the patient is taking, paying special attention to those that can affect fluid balance, such as diuretics, antihypertensives, steroids, and laxatives.Many medications directly influence fluid status. Diuretics, for instance, promote fluid loss, while corticosteroids can lead to fluid retention. Understanding how medications affect the patient's fluid balance helps predict and manage potential imbalances. 3. Conduct a physical examination. Perform a thorough physical assessment, focusing on signs of dehydration or fluid overload.Physical signs provide immediate, observable evidence of fluid imbalances. For example, poor skin turgor or dry mucous membranes suggests dehydration, while edema or crackles in the lungs may indicate fluid overload. Skin turgor. Pinch the skin and observe how quickly it returns to its normal position. Mucous membranes. Inspect the mouth for moisture and color. Edema. Assess for swelling, particularly in the extremities, which indicates fluid retention. Lung sounds. Auscultate for crackles, which may suggest fluid in the lungs. 4. Measure and record vital signs. Obtain baseline vital signs, including blood pressure, heart rate, respiratory rate, and temperature.Vital signs can give clues about fluid status. For instance, hypotension (low blood pressure) and tachycardia (rapid heart rate) can indicate dehydration or hypovolemia, while hypertension (high blood pressure) may suggest fluid overload. 5. Monitor daily weight. Weigh the patient daily at the same time, preferably in the morning, and record the weight.Daily weight is a highly reliable indicator of fluid balance. A rapid increase in weight (e.g., 1-2 kg in a day) often indicates fluid retention, while a sudden decrease may indicate fluid loss. Even small changes in weight can represent significant fluid shifts. 6. Assess fluid intake. Document all sources of fluid intake.Accurate documentation of fluid intake ensures that healthcare providers have a complete picture of how much fluid the patient is receiving. This is essential for comparing intake against output to assess fluid balance. Oral fluids (water, juice, milk, etc.) IV fluids Enteral feeds (via a feeding tube) Blood products Medications administered in liquid form To calculate the total fluid intake for a patient, the basic formula is: Total Fluid Intake = Sum of all intake sources (in mL) This includes all forms of fluid that the patient consumes or receives over a given period (typically measured over 24 hours). For each of these sources, measure the volume in milliliters (mL) and sum them to get the total fluid intake for the designated time period. The sources of fluid intake are: Oral intake. All fluids consumed by mouth, such as water, juice, tea, coffee, and soup. IV fluids. The amount of intravenous fluids administered (e.g., normal saline, dextrose). Enteral feeds. Nutritional fluids given via a feeding tube. Medications. Any medications administered in liquid form. Blood products. If blood transfusions are given, the volume of blood products is included in intake. The recommended daily fluid intake varies based on individual factors such as age, weight, activity level, and medical conditions. However, in general nursing practice, the usual fluid intake recommendations for an average adult are: Oral fluids. Adult male. 2,500 to 3,000 mL/day (approximately 8 to 12 cups). Adult female. 2,000 to 2,500 mL/day (approximately 8 to 10 cups). IV fluids. This varies depending on the clinical condition of the patient (e.g., dehydration, surgery, etc.). Common IV fluid rates range from 75 to 150 mL/hour, which totals 1,800 to 3,600 mL/day. Enteral feeds. This depends on the patient's nutritional needs and the formula used, but a typical enteral feeding may provide 1,000 to 2,000 mL/day. Medications and blood products. The volume here depends on what is administered, but this usually contributes smaller amounts to the total intake. By recording all fluid sources, nurses can track the total fluid intake and assess the patient's hydration status or adjust therapy as necessary. Fluid SourceExampleVolume (mL)Oral IntakeGlass of water240 mLCup of coffee or tea240 mLBowl of soup300 mLJuice200 mLIV FluidsNormal saline (over specified time)1,000 mL (1 liter)Enteral FeedsFormula administered every 4 hours250 mL (total: 1,500 mL/day)MedicationsLiquid medication (e.g., oral antibiotics)20 mL 7. Assess Fluid Output. Measure and record all sources of fluid output.Accurate measurement of fluid output is critical for assessing the patient's fluid balance. Changes in urine output, for example, can indicate kidney function or response to fluid therapy. Excessive vomiting or diarrhea can lead to significant fluid losses and dehydration. Urine (using a graduated container or catheter drainage bag) Vomitus Diarrhea Wound drainage (from drains or dressings) Other excretions (e.g., sweat, though typically estimated as insensible losses) To calculate the total fluid output for a patient, the basic formula is: Total Fluid Output=Sum of all fluid losses (in mL) This includes all measurable fluids excreted or lost by the patient over a given period (usually measured over 24 hours). The sources of fluid output include: Urine output. Measured in milliliters (mL) using a urinary catheter or a graduated container for patients using a bedpan or urinal. Vomitus (emesis). Measured in mL, if the patient vomits. Diarrhea. Measured by collecting and estimating the volume of stool if it's liquid. Wound drainage. Fluids collected from surgical drains or wound dressings are measured. Chest tube drainage. If present, drainage from a chest tube is measured. Other measurable outputs. Any other fluids that can be collected, such as from nasogastric (NG) tube suction. The usual fluid output varies depending on the individual's health status, hydration level, and medical condition. However, for a healthy adult, the typical daily fluid output includes: Urine Output. Normal adult urine output is typically 800 to 2,000 mL/day when consuming about 2,000 mL of fluid per day. Average hourly urine output. 30 to 50 mL/hour (for adults), which helps to assess kidney function. Oliguria. Less than 400 mL/day (could indicate dehydration, kidney failure, etc.). Polyuria. More than 2,500 to 3,000 mL/day (can occur with diabetes, diuretic use). Vomitus (Emesis). The amount varies based on the condition. For example, vomiting could range from small amounts (50-100 mL) to large volumes (300-500 mL or more in severe cases). Diarrhea. Varies greatly depending on the underlying cause. A single episode of diarrhea could be 100-200 mL, but severe diarrhea can lead to output of over 1,000 mL/day. Wound Drainage. Depends on the type of wound or surgery. Surgical drains can produce anywhere from 50 mL to 200 mL/day, but can exceed 500 mL/day in some cases (e.g., large wounds or severe infections). Chest Tube Drainage. The expected output is less than 100 mL/hour, with total amounts varying depending on the condition (e.g., after chest surgery or trauma). Other Sources. Nasogastric (NG) suction. Varies based on the amount of gastric contents being drained; can be around 200-300 mL/day or more. Insensible losses (sweating, breathing). These are not easily measurable and are generally estimated to account for around 600-900 mL/day. They are not typically included in fluid output calculations unless the patient has a condition (e.g., fever or burns) that dramatically increases these losses. Urine. 1,500 mL/day (normal output for an adult). Vomitus. 100 mL (mild vomiting episode). Diarrhea. 200 mL (single episode). Wound drainage. 50 mL from a surgical drain in 24 hours. Chest tube drainage. 80 mL/hour post-surgery 8. Calculate fluid balance. At the end of each shift or 24-hour period, calculate the fluid balance by subtracting total output from total intake.Calculating fluid balance helps to detect trends in fluid status. A positive balance may indicate fluid overload, which can exacerbate conditions like heart failure, while a negative balance may point to dehydration or hypovolemia. Positive balance. More intake than output, suggesting fluid retention. Negative balance. More output than intake, suggesting fluid loss. 9. Evaluate laboratory results. Review relevant lab values.Lab results provide objective data on the patient's fluid and electrolyte status. Abnormal electrolyte levels may indicate fluid imbalances (e.g., hypernatremia in dehydration), while changes in BUN and creatinine may suggest kidney dysfunction. Electrolytes (e.g., sodium, potassium) Blood urea nitrogen (BUN) and creatinine for kidney function Serum osmolality Urine specific gravity to assess urine concentration 10. Assess the patient's mental status. Monitor for any changes in mental status, such as confusion, restlessness, or lethargy.Altered mental status can be an early sign of severe fluid imbalance, such as dehydration, electrolyte disturbances, or fluid overload, particularly in older adults or patients with chronic conditions. 11. Evaluate urine output patterns. Assess the frequency, volume, and characteristics of urine output.The volume and characteristics of urine provide vital information about the patient's fluid status and kidney function. Abnormal patterns may warrant further investigation or changes in treatment. Oliguria. Low urine output (less than 400 mL/day), possibly indicating kidney dysfunction or dehydration. Polyuria. Excessive urine output, which may occur with certain conditions like diabetes or during diuretic therapy. Concentrated urine. Dark urine suggests dehydration. 12. Communicate findings with the healthcare team. Report any significant deviations in fluid intake and output, abnormal physical findings, or changes in weight or vital signs to the healthcare provider.Prompt communication ensures that healthcare providers can make timely adjustments to the care plan, such as initiating or adjusting IV fluids, administering diuretics, or ordering further diagnostic tests. 13. Monitor patient response to interventions. After initiating fluid therapy or medication (e.g., diuretics), closely monitor the patient's response, including changes in I&O, vital signs, and physical assessment.Monitoring the patient's response to interventions allows for timely adjustments to therapy and prevents complications such as overcorrection, dehydration, or worsening fluid overload. This guide outlines the step-by-step nursing interventions and provides rationales to ensure accurate monitoring and effective management of fluid balance. 1. Educate the patient and family. Explain the importance of monitoring fluid intake and output to the patient and their family. Teach them how to report oral intake, measure urine, and report any unusual fluid losses (e.g., vomiting, diarrhea).Patient and family education promotes cooperation and ensures accurate recording of fluid intake and output, leading to better overall care. 2. Maintain accurate measurement tools. Ensure that appropriate tools (e.g., calibrated containers, urine collection devices) are readily available for measuring intake and output. Ensure that measuring devices are placed near the bedside and are clean and labeled.Readily available and calibrated tools allow for accurate and consistent measurement of fluids, ensuring the accuracy of I&O records. 3. Measure and record all fluid intake. Record all fluid intake.Documenting all sources of fluid intake provides a complete picture of the patient's hydration status. Missed fluid intake, such as unrecorded IV fluids, can skew assessments and lead to incorrect conclusions about fluid balance. 4. Measure and record all fluid output. Accurately measure and document fluid output.Accurately documenting fluid output allows for the calculation of fluid balance and detection of conditions such as dehydration, overhydration, or impaired kidney function. Failure to record all output can lead to incorrect assessments of the patient's fluid status. 5. Calculate and evaluate fluid balance. At the end of each shift, calculate fluid balance by subtracting total output from total intake. Track any trends over time.Calculating fluid balance helps to identify changes in the patient's condition early. A positive balance (more intake than output) may indicate fluid retention or overload, while a negative balance (more output than intake) may indicate dehydration or fluid loss. 6. Collaborate with the healthcare team. Communicate any abnormal findings or significant deviations in fluid balance with the healthcare provider. Adjust IV fluids, diuretics, or other interventions as ordered.Timely communication and collaboration with the healthcare team allow for appropriate and rapid adjustments to the patient's care plan, improving outcomes and preventing complications like electrolyte imbalances or organ dysfunction. 7. Monitor and adjust IV fluids as ordered. Administer IV fluids as prescribed and adjust the rate or type of fluids according to the patient's condition and physician orders. Ensure accurate infusion rates.Correct administration of IV fluids helps restore or maintain fluid balance. Monitoring the rate ensures that the patient receives the correct amount of fluids to avoid overhydration or underhydration. 8. Monitor electrolyte and laboratory values. Regularly review lab values such as serum electrolytes (sodium, potassium), BUN, creatinine, and urine specific gravity. Electrolyte imbalances can accompany fluid imbalances. Abnormal sodium or potassium levels may indicate the need for adjustments in fluid therapy, while elevated BUN or creatinine levels can suggest kidney impairment. 9. Adjust fluid restrictions or encouragement based on assessment. If fluid restrictions are ordered, monitor the patient's intake closely to ensure compliance, and provide patient education to prevent overconsumption of fluids. Encourage fluid intake if the patient is dehydrated or has low intake.Fluid restrictions are often necessary for conditions like heart failure or kidney disease to prevent fluid overload. Conversely, encouraging fluid intake helps in preventing dehydration, particularly in patients with inadequate oral intake. 10. Encourage the patient to self-report intake and output. Encourage the patient, if able, to record their own intake and report the amount of fluid consumed and urine output.Involving the patient in tracking their I&O promotes accountability and ensures that intake and output are accurately recorded, especially in a home or outpatient setting. 11. Reassess fluid balance and make adjustments. Regularly reassess the patient's fluid balance, clinical status, and lab results, and make adjustments to the care plan as needed based on their evolving condition.Continuous reassessment allows for early detection of changes in fluid balance and ensures that interventions are appropriate, reducing the risk of complications such as electrolyte disturbances, kidney failure, or heart failure. A comprehensive evaluation of fluid intake and output monitoring allows nurses to ensure that fluid balance is being effectively maintained, detect potential complications early, and adjust interventions as necessary. Through systematic evaluation of I&O records, clinical signs, laboratory data, and patient education, nurses can significantly impact patient outcomes by promoting appropriate hydration and preventing fluid-related complications. 1. Assessment of fluid balance (intake vs. output). Review the total fluid intake and output over a set period (typically 24 hours) to calculate the patient's fluid balance.A balanced fluid status helps ensure adequate hydration and prevent complications like dehydration or fluid overload. A positive or negative balance can indicate underlying issues such as fluid retention or excessive fluid loss. Intake and output should be roughly equal for a healthy patient, unless specified otherwise (e.g., intentional fluid restriction or diuresis). 2. Observation of physical signs of hydration. Monitor for physical signs of hydration and fluid imbalance, such as skin turgor, mucous membranes, urine color, edema, and lung sounds.Physical symptoms provide immediate and observable evidence of the patient's hydration status. Changes like dry mucous membranes, edema, or lung crackles may indicate dehydration or fluid overload. The patient should exhibit normal skin turgor, moist mucous membranes, and clear lung sounds, with no signs of edema or dehydration. 3. Monitoring of vital signs. Regularly monitor blood pressure, heart rate, and respiratory rate to identify changes that may be related to fluid imbalance.Vital signs can fluctuate in response to fluid status. For instance, dehydration may cause hypotension and tachycardia, while fluid overload can result in hypertension and respiratory distress. Vital signs should remain stable and within normal ranges, with no significant deviations indicating fluid imbalance. 4. Daily weight monitoring. Weigh the patient daily, preferably at the same time each day, to detect rapid changes in body weight related to fluid retention or loss.Sudden weight gain or loss can indicate fluid shifts, such as retention from heart or kidney failure, or dehydration from excess fluid loss. The patient's weight should remain stable, with minor fluctuations (1-2 pounds) depending on their condition. 5. Review of laboratory values. Check laboratory values like serum electrolytes (sodium, potassium), blood urea nitrogen (BUN), creatinine, and urine specific gravity.Lab values offer objective data on the patient's fluid and electrolyte status. For example, elevated BUN and creatinine may suggest dehydration, while low sodium might indicate fluid overload. Lab values should remain within normal limits, indicating that the patient's fluid and electrolyte balance is well-managed. Cohen, R., Fernie, G., & Roshan Fekr, A. (2021). Fluid intake monitoring systems for the elderly: A review of the literature. Nutrients, 13(6), 2092. Fraser, C. (2009). Monitoring hydration status in our clients. Wound Care Canada, 7(1), 18. Lim, S. H., Lim, M. L., Aloweni, F. A. B., & Ang, S. Y. (2021). Audit of the appropriateness and accuracy of fluid intake and output monitoring: Experience in a tertiary hospital. British Journal of Nursing, 30(11), 660–664. FacebookEmailPrintBufferPinterestShare During a 12-hour shift from 0600H to 1800H, the client had 40 mL/h of IV infused starting from 0600H. At 1200H, the IV rate was increased to 55 mL/h, and IV infusions were stopped at 1500H. TPN was started at 1500H at 25 mL/h. The client drank 120 mL of water at 0700H along with 3 cookies weighing 15 g. At 0900H, the client had 200 mL of liquid feces. At 1230H, the client consumed 20 mL of ice chips and 5 mL of ice pop. At 1400H, the client ate a sandwich and had 100 mL of juice, 20 mL of ice cream, and one cup (240 mL) of water. At 1600H, the client voided 150 mL of urine and had 40 mL of emesis. Finally, at the end of the shift, 80 mL was emptied from the client's surgical drain. Fill in the I&O table and find the fluid balance. During a 12-hour shift from 0600H to 1800H, the client had 40 mL/h of IV infused starting from 0600H. At 1200H, the IV rate was increased to 55 mL/h, and IV infusions were stopped at 1500H. TPN was started at 1500H at 25 mL/h. The client drank 120 mL of water at 0700H along with 3 cookies weighing 15 g. At 0900H, the client had 200 mL of liquid feces. The client had 20 mL of ice chips and 5 mL of ice pop at 1230H. The client ate at 1400H and had a sandwich, 100 mL of juice, 20 mL of ice cream and one cup of water. At 1600H the client went to the bathroom to void 150 mL of urine and 40 mL of emesis. Finally, at the end of the shift, 80 mL was emptied from the client's surgical drain. IV 40 mL/h from 0600H to 1200H 55 mL/h from 1200H to 1500H Oral (note: solid foods are not accounted for) 120 mL of water at 0700H 10 mL of ice chips (half volume) at 1230H 5 mL of ice pop at 1230H 100 mL of juice at 1400H 20 mL of ice cream at 1400H 240 mL (converted one cup) of water at 1400H TPN 25 mL/h from 1500H to 1800H During a 12-hour shift from 0600H to 1800H, the client had 40 mL/h of IV infused starting from 0600H. At 1200H, the IV rate was increased to 55 mL/h, and IV infusions were stopped at 1500H. TPN was started at 1500H at 25 mL/h. The client drank 120 mL of water at 0700H along with 3 cookies weighing 15 g. At 0900H, the client had 200 mL of liquid feces. The client had 20 mL of ice chips and 5 mL of ice pop at 1230H. The client ate at 1400H and had a sandwich, 100 mL of juice, 20 mL of ice cream and one cup of water. At 1600H the client went to the bathroom to void 150 mL of urine and 40 mL of emesis. Finally, at the end of the shift, 80 mL was emptied from the client's surgical drain. Stool Urine Emesis Drain Intake 0600H-0700H 0700H-0800H 0800H-0900H 0900H-1000H 1000H-1100H 1100H-1200H 1200H-1300H 1300H-1400H 1400H-1500H 1500H-1600H 1600H-1700H 1700H-1800H Total IV 40 40 40 40 40 40 55 55 55 405 Oral 120 15 360 495 TPN 25 25 25 75 Shift Total 40 160 40 40 40 40 70 55 415 25 25 25 975 Output 0600H-0700H 0700H-0800H 0800H-0900H 0900H-1000H 1000H-1100H 1100H-1200H 1200H-1300H 1300H-1400H 1400H-1500H 1500H-1600H 1600H-1700H 1700H-1800H Total Stool 200 200 Urine 150 150 Emesis 40 40 Drain 80 80 Shift Total 200 190 80 470 Solution: The fluid balance would be total intake (975 mL) minus total output (470 mL) 975 − 470 = +505 (positive since total intake > total output) Chest tubes NCLEX review on how to care for a patient with chest tube drainage systems. The nurse is responsible for monitoring the patient and chest tube drainage system while maintaining the chest tube system. Therefore, the nurse must know for the NCLEX exam how a chest tube system works, what to do in you note bubbling, what to do if something goes wrong, and the nurse's role during chest tube removal. After you watch the lecture below and review the NCLEX notes, be sure to take the chest tube care NCLEX quiz. This material details the following: Purpose of chest tubes Reasons for chest tube insertions Difference between a wet suction and dry suction drainage system Information about the drainage collection chamber, water seal chamber, and suction control chamber Normal versus abnormal findings while monitoring a chest tube drainage system Nursing interventions for chest tube care Nurse's role during chest tube removal Lecture on Nursing Chest Tube Care for NCLEX NCLEX Review for Chest Tubes Purpose of Chest Tubes: a tube inserted into the pleural space of the lungs to remove air or fluid and to help the lung re-expand OR it is a tube placed in the mediastinum space to help drain blood or fluid from around the heart after cardiac surgery. Mediastinal chest tubes are usually placed after cardiac surgery to help drain blood from the pericardial space (placed under the sternum) which prevents fluid from compressing the heart which can lead to cardiac tamponade. Pleural space: a small space that surrounds the lungs that contains a small amount of serous fluid. This small space is surrounded by the parietal and visceral pleurae. These two layers glide over each other which creates a negative pressure. Therefore, if air or extra fluid enters into the pleural space the lungs are severely affected and can collapse. Reasons for a chest tube: Cardiovascular surgery Pneumothorax: air enters into the pleural space and causes the lung to collapse (trauma to the chest or spontaneous) Pleural Effusion: fluid in the pleural space Types of Pleural Effusions: Hemothorax: blood enters in the pleural space and causes lung to collapse (trauma to the chest, disease TB, blood clotting issue) Empyema (infection in the pleural space) Chylothorax (lymphatic fluid in pleural space), Type of Chest Tubes Drainage Systems *Always familiarize yourself with what your facility uses and be sure to receive the proper training because each hospital uses different drainage systems. Wet Suction (water seal suction) or Dry Suction Wet: suction regulated by the height of water in the suction control chamber when connected to wall suction…some have stop-cocks to help regulate to amount of bubbling (you will hear bubbling while it's working….water evaporates overtime so you will have to re-add it)…physician determines the suction level (usually -20cmH2O). Dry Suction: This chest drainage system has no water column to control suction but uses a suction monitor bellow (looks like an orange accordion) that balances the wall suction and you can adjust water suction pressure using the rotary suction dial on the side of the system. It allows for higher suction pressure levels, has no bubbling sounds, and water does not evaporate from it as with other systems. Nursing Management of a Chest Tube: Drainage system itself: keep system below patient's chest Tubing: Keep it free from kinks and make sure it is draining freely (not clots or stagnate fluid) and that all connections are sealed Drainage Collection Chamber: Monitor drainage (color, amount…..should drain no more than 100 cc/hr and record routinely) Water Seal Chamber: performs an underwater seal on the tube to allow air to be removed from pleural space while preventing outside air from entering lungs NCLEX: Water in the water seal chamber fluctuates as the patient breathes in and out. If the patient is breathing on their own the water will increase during inspiration and decrease during expiration (it will be the opposite if the patient is on positive pressure mechanical ventilation). There may be intermittent bubbling, which is expected as air is drained from the pleural space, especially for treatment of a pneumothorax. Remember that a pneumothorax is an AIR leak between the lung and chest wall….therefore air can escape into the water seal chamber causing intermittent bubbles. What if it doesn't fluctuate at all? The lung could have re-expanded or there is a kink somewhere. Excessive bubbling? There is an air leak somewhere. Suction Control Chamber: Dry: suction controlled by a dial on the side and is regulated by suction monitor bellow (orange accordion). There is no water column. Wet: remember watch the amount of water because it evaporates over time and it should gently bubble due to the suction working. *Water in the water seal and suction control can evaporate over time so watch the water and add as needed. Patient Assessment: Note lung sounds, rate, any dyspnea? Worsening pneumothorax or hemothorax Note skin around insertion site for any subcutaneous crepitus (crackling sensation felt on palpitation) that is due to carbon dioxide escaping into the tissues. Keep patient moving by turning frequently, coughing, and deep breathing…helps move fluid and improve lung function Mishaps with a Chest Tube and What to Do? What to do if chest tube becomes dislodged? Cover the site with a sterile dressing, and tape on three sides (this allows air to escape and prevent tension pneumothorax) and notify physician immediately. System breaks? Insert the tube 1 inch into a bottle of sterile water or sterile normal saline and obtain a new system. Milking or stripping tubing? Not recommended anymore because it creates too much negative pressure (always follow hospital policies) Clamping tubing? Increase risk of patient developing a tension pneumothorax. Never do it without an order and follow hospital policies. Chest tube removal: Nurse's role: assisting physician (done at beside)…some facilities allow nurses to do this if they've completed proper training and competencies. Gather supplies: sterile gloves, dressing supplies (occlusive, petroleum gauze, Telfa….every physician varies on their preference), mask, goggles, suture removal kit, tape, rubber tipped hemostats) Educate patient prior to remove and how to do the Valsalva's maneuver. This is performed by having the patient take a deep breath, exhale, and bear down (prevents air for going back into pleural space). This will be performed by the patient when tube is removed. Pre-medicate for pain if ordered by physician. Position patient in Semi-Fowler's for removal. Monitor respiratory status, lung sounds, drainage, assess chest for unequal chest rising, and dyspnea. Note: the patient will have chest x-ray (ordered by the physician) to assess lung expansion after removal. You may be interested in more NCLEX Reviews. Just released is "ABG Interpretation Notes, Mnemonics, and Workbook by Nurse Sarah". These notes contain 64 pages of Nurse Sarah's illustrated, fun notes with mnemonics, and worksheets that include over 90 ABG practice problems and 60 test review questions covering ABG concepts. You can get an eBook version here or a physical copy of the book here. References: "How Are Pleurisy And Other Pleural Disorders Treated? – NHLBI, NIH". Nhlbi.nih.gov. N.p., 2011. Web. 2 Aug. 2016. "The Respiratory System – NHLBI, NIH". Nhlbi.nih.gov. N.p., 2012. Web. 1 Aug. 2016. Intake and output calculation NCLEX review for nurses. This quick review will highlight how to calculate intake and output because these type of questions may be on your NCLEX exam or (definitely) on a nursing lecture exam. It seems like calculating I and O's is self-explanatory, right?! Well, it can be tricky, especially calculating intake because many students get confused on what to include, how to convert from ounces to milliliters, and how to interpret the calculation. Don't forget to take the intake and output practice calculation quiz after reviewing the material below. So let's break it down! Nurse Sarah's Notes and Merch Just released is "Fluid and Electrolytes Notes, Mnemonics, and Quizzes by Nurse Sarah". These notes contain 84 pages of Nurse Sarah's illustrated, fun notes with mnemonics, worksheets, and 130 test questions with rationales. You can get an eBook version here or a physical copy of the book here. Lecture on I and O's Intake What is intake? These are fluids taken IN the body. It can be via various routes like the mouth, a tube, or intravenous (IV). What do you include for the liquids that are consumed? This includes anything that is liquid at room temperature like: Juice Water Ice chips (NOTE: this melts to half its volume….if you give the patient 8 oz of ice chips RECORD 4 oz) Drinks (coffee, soft drinks, tea etc.) Milk Gelatin (Jell-O ®) Broths Ice cream Frozen treats: popsicles, sorbet Nutrition supplements like Ensure® or Boost ® How about pudding or items similar to it? NO…most NCLEX review guides (example: Kaplan) specify NOT to include pudding etc. in the calculation since it is a semi-liquid (Irwin, Yock & Burckhardt, 2015). However, some sources say to include it (Carter, 2007), but with that being said, ask your professor what they want you to do. However, for this review we will NOT include pudding or products similar to it. Many times test questions will give you the amount in ounces (oz), but we record intake and output in milliliters (mL). To convert oz to mL, simply multiply the amount of oz by 30. Example: 67 oz = 2010 mL Miscellaneous: Tube feedings (include free water) IV and central line fluids (TPN, lipids, blood products, medication infusion) IV and central line flushes Irrigants (example: irrigating a catheter….calculate the amount of irrigate delivered and subtract it from the total urine output…which will equal the urine output) Output What is output? These are fluids that LEAVE the body. It can be via various routes as well. What's included: Urine output (most of the output calculation) Emesis Liquid stool (ostomy or diarrhea) Wound draining (drains, tubes…example: chest tubes etc.) Suction (gastric, respiratory) Not included but needs to be considered is: insensible loss This is from the skin and respiratory system. It can't be measured. According the Mosby's Medical Dictionary, insensible loss is estimated to be 600 mL/day ("insensible water loss", 2018). This varies depending on the patient's activity level, temperature etc. Therefore, you want to take that in account when assessing if the patient is at risk for fluid volume deficient OR fluid volume overload. Interpreting Intake and Output If the intake is less than output or if the output is MORE than the intake….think DEHYDRATION! The patient is losing too much fluids compared to what they are taking in. If the intake is more than output or if the output is LESS than the intake….think that the patient may be retaining fluid and is in FLUID OVERLOAD! Example: Intake 4250 mL and Output 1210 mL…..patient is at risk for fluid volume overload. Intake and Output Quiz References: Carter, P. (2007). Lippincott's Textbook for Nursing Assistants (2nd ed., p. 403). Lippincott Williams & Wilkins. insensible water loss. (2018) Mosby's Medical Dictionary, 8th edition. (2009). Retrieved February 8 2018 from water+loss Irwin, B., Yock, P., & Burckhardt, J. (2015). NCLEX-PN 2015-2016 Strategies, Practice, and Review with Practice Test (p. 127). Simon and Schuster. Overview . When the amount of fluid lost from the body is equal to the amount of fluid taken in, the body is in fluid balance. Fluid in our body is found within the body cells (intracellular), surrounding the cells (interstitial) and within the blood vessels (intravascular). It is our bodies' principal chemical component, comprising, on average, 60 percent of our weight. In obese individuals and the elderly, total body fluid can be significantly lower. Fluid is constantly being lost by the body through perspiration, expired air (as water vapour), urine, feaces, and negligible amounts in tears and saliva. It is replaced in our daily basic intake of food and drink. There is no easy answers as to how much water a person is required to drink each day. Studies have produced varying recommendations over the years, but in truth, each individual water requirements depend on many factors, including his health and how active he is. Monitoring of fluid balance is required for people with renal failure, electrolyte imbalance, or severe vomiting and diarrhea. It is also necessary for people with nasogastric tubes and drainage collection devices. In addition, those receiving intravenous therapy and those taking medicines such as diuretics and corticosteroids also need to have their fluid balance monitored. These measurements are important to help evaluate a persont fluid and electrolyte balance, to suggest various diagnosis, and allows for prompt intervention to correct the imbalance. Records of all intake and output must be kept meticulously in an Intake and Output Chart (I/O Chart). All amounts must be measured and record in milliliters. Do not estimate the amount. If the person is able to cooperate, he should be encouraged to help in keeping an accurate record of his daily fluid intake and output. At the end of a 24-hours period, add up the total intake and output. Evaluate the person's fluid status in relation to the disease process, medication regimen, diet, and activity ordered by your healthcare professionals. The person is said to be in negative fluid balance if his output is greater than his intake. Conversely, a positive fluid balance occurs when intake is greater than output. If the difference is alarming, consult your doctor. Keep the chart to show to the doctor, and start a fresh one for the next 24-hours. Items Required for Measuring Intake and Output ► Two jugs marked in milliliters, one for intake and the other for output. You can also work out the capacity of any container and mark it. ► Gloves (for handling excretions such as urine and vomitus) ► Intake and output chart to record all measurements and remarks. Reference Chart for Measuring Utensils Utensil & Measurement Quantity in Milliliter 1 cup *150 ml 1 large glass *240 ml 1 ounce 30 ml 1 tablespoon 15 ml 1 teaspoon 5 ml 1 soup bowl *180 ml *Quantity may varies with different utensils. Return to Top Measuring Intake ► Fluid intake refers to all fluid entering the person's body. It also includes foods that are liquid at room temperature, such as ice chips, ice-cream, and certain beverages. ► Measure any fluids offered to the person and make a note of how much the person drinks and the time of the day at which it is drunk. ► If the person is drinking from a jug, obtain the total intake by subtracting the fluid remaining in the jug at the end of the day plus any fluid added. ► You can also pre-measure the drinking glasses or bowls most commonly used by the person. So when the person tell you that he had "one glass of water," you will know the amount. ► Measure ice chips by multiplying the volume by 0.5; when melted, the volume of ice is approximately half its previous volume. ► For yogurt, ice cream, gelatin, packet or canned drinks, measure the amount printed on the labels. ► Measure the amount of feeds through nasogastric tube by noting the volume of the bag at the beginning of the feeding and then subtracting he amount left at the end of the feeding. Remember to include any feeding that is added during the day. ► Intravenous intake (drips) can also be measure using the above method. ► If water is used to flush the nasogastric tube, record the amount used for irrigation in the intake and output chart. Measuring Output ► Fluid output refers to all fluid that leaves the person's body. This includes urine, loose stools, vomitus, aspirated fluid, excessive perspiration, and drainage from surgical drains, nasogastric tubes, and chest tubes. ► Use a container marked with milliliters to collect fluid output. Be sure to label the container "FOR MEASURING OUTPUT ONLY" to prevent confusion with intake container. ► Always wear gloves when handling body fluids. ► Any amount not measured due to any reasons such as the person passed urine while in the toilet should be documented, otherwise the chart becomes inaccurate and misleading. ► In cases such as vomits or diarrhoea, record the number of time it was passed. For such cases, check with your doctor in advance if it is necessary to measure the exact amount. ► It is also important to make a note of the fact if the person is sweating. ► If the person has drainage, record the amount of the drainage. It is important to document the source of the drainage especially if he has more than one drainage site. ► If the person is on intermittent or continuous irrigation, calculate the true output by measuring the total output and subtracting the total irrigation infused. Return to Top Dehydration Dehydration can be defined as "the excessive loss of water from the body". It can be caused by losing too much fluid (as in vomiting and diarrhea), not drinking enough water, or both. The best way to treat dehydration is to prevent it from occurring. Always encourage the person to drink during an illness, and remember that his fluid needs is greater when he has fever, vomiting, or diarrhea. If you suspect excessive fluid loss during an illness, inform your doctor immediately. DO NOT wait for signs of dehydration. Signs of dehydration include: ► ► ► ► ► ► Concentrated urine appears dark yellow ► ► Sunken fontanelles (the soft spot on the top of the head) in an infant ► Increase breathing and heart rate ► Low blood pressure causing light headedness (worsening on standing) ► Delayed capillary refill*2 ► ► ► Delirium or unconsciousness in most serious cases *1 Dry skin in an elderly is not a reliable indication of dehydration as skin automatically loses moisture and elasticity with age. A better barometer is the color of urine: clear or light-colored urine means well hydrated, whereas a dark concentrated color usually signals dehydration. *2 A capillary nail refill test can be done by pressing firmly on a fingernail bed for 5 seconds and measure the speed at which blood returns after the pressure is released. In normal person, capillary refilling should take less than 3 seconds. *3 You can test the hydration state of the person by simply pinching up the skin on his hand into a fold. If dehydrated, the skin may lack its normal elasticity and sag back into position slowly. Normally, skin springs right back into position. Return to Top Intake and output calculation NCLEX review for nurses. This quick review will highlight how to calculate intake and output because these type of questions may be on your NCLEX exam or (definitely) on a nursing lecture exam. It seems like calculating I and O's is self-explanatory, right?! Well, it can be tricky, especially calculating intake because many students get confused on what to include, how to convert from ounces to milliliters, and how to interpret the calculation. Don't forget to take the intake and output practice calculation quiz after reviewing the material below. So let's break it down! Nurse Sarah's Notes and Merch Just released is "Fluid and Electrolytes Notes, Mnemonics, and Quizzes by Nurse Sarah". These notes contain 84 pages of Nurse Sarah's illustrated, fun notes with mnemonics, worksheets, and 130 test questions with rationales. You can get an eBook version here or a physical copy of the book here. Lecture on I and O's Intake What is intake? These are fluids taken IN the body. It can be via various routes like the mouth, a tube, or intravenous (IV). What do you include for the liquids that are consumed? This includes anything that is liquid at room temperature like: Juice Water Ice chips (NOTE: this melts to half its volume….if you give the patient 8 oz of ice chips RECORD 4 oz) Drinks (coffee, soft drinks, tea etc.) Milk Gelatin (Jell-O ®) Broths Ice cream Frozen treats: popsicles, sorbet Nutrition supplements like Ensure® or Boost ® How about pudding or items similar to it? NO…most NCLEX review guides (example: Kaplan) specify NOT to include pudding etc. in the calculation since it is a semi-liquid (Irwin, Yock & Burckhardt, 2015). However, some sources say to include it (Carter, 2007), but with that being said, ask your professor what they want you to do. However, for this review we will NOT include pudding or products similar to it. Many times test questions will give you the amount in ounces (oz), but we record intake and output in milliliters (mL). To convert oz to mL, simply multiply the amount of oz by 30. Example: 67 oz = 2010 mL Miscellaneous: Tube feedings (include free water) IV and central line fluids (TPN, lipids, blood products, medication infusion) IV and central line flushes Irrigants (example: irrigating a catheter….calculate the amount of irrigate delivered and subtract it from the total urine output…which will equal the urine output) Output What is output? These are fluids that LEAVE the body. It can be via various routes as well. What's included: Urine output (most of the output calculation) Emesis Liquid stool (ostomy or diarrhea) Wound draining (drains, tubes…example: chest tubes etc.) Suction (gastric, respiratory) Not included but needs to be considered is: insensible loss This is from the skin and respiratory system. It can't be measured. According the Mosby's Medical Dictionary, insensible loss is estimated to be 600 mL/day ("insensible water loss", 2018). This varies depending on the patient's activity level, temperature etc. Therefore, you want to take that in account when assessing if the patient is at risk for fluid volume deficient OR fluid volume overload. Interpreting Intake and Output If the intake is less than output or if the output is MORE than the intake….think DEHYDRATION! The patient is losing too much fluids compared to what they are taking in. If the intake is more than output or if the output is LESS than the intake….think that the patient may be retaining fluid and is in FLUID OVERLOAD! Example: Intake 4250 mL and Output 1210 mL…..patient is at risk for fluid volume overload. Intake and Output Quiz References: Carter, P. (2007). Lippincott's Textbook for Nursing Assistants (2nd ed., p. 403). Lippincott Williams & Wilkins. insensible water loss. (2018) Mosby's Medical Dictionary, 8th edition. (2009). Retrieved February 8 2018 from water+loss Irwin, B., Yock, P., & Burckhardt, J. (2015). NCLEX-PN 2015-2016 Strategies, Practice, and Review with Practice Test (p. 127). Simon and Schuster. Monitoring is an important clinical care process that provides the means to determine the progress of the disease and the beneficial as well as detrimental effects of treatment. Monitoring of intake help care givers ensure that the patient has proper intake of fluid and other nutrients. Monitoring of output helps determine whether there is adequate output of urine as well as normal defecation. The intake and output chart is a tool used for the purpose of documenting and sharing information regarding the following: Whatever is taken by the patient especially fluids either via the gastrointestinal tract (entrally) or through the intravenous route (parenterally) Whatever is excreted or removed from the patient Sometimes it is known as the Fluid-Balance Chart. Because the amount is measured in standard measuring units (usually in ml), some calculation such as addition, subtraction and totaling can be done. Indirectly, the chart gives an idea of the status of the patient's physiology including: Gastro-intestinal function (ability to eat or drink, absorb food and defecate) Fluid balance and the renal function (ability to pass urine in adequate amounts) Occurrence of any abnormal losses Bowel movement The amount of fluid required by a person and the urine output varies with age, weight, activity and physical surrounding. The water intake of a 50-90 kg adult person is about 2500 to 3000 ml per day or 2 ml/kg/hour. Normally, this is accomplished by: Water consumed as drinks (usually about 2000 ml) Water that is part of solid food Water produced in the body as a product of metabolism The greater part of this water is re-excreted as urine, the amount of which can be measured by various means. Urine output in an adult is between 1000 to 1500 ml per day.Another normal means of output of water is through evaporation of water from the skin and mucous membranes (mouth, throat, respiratory tract) and also through sweating. The amount contributed by these two mechanisms is about 800-1200 ml (dependent on climate and environment). In clinical practice, this amount is not measurable and is called the insensible loss (actually it is the loss not measured). The amount excreted as urine and that by insensible loss added together balances with the normal intake. If there is more loss, due to either higher temperature of the environment or the person's body, then the amount of urine output is expected to be less. Some 300 ml of water is also excreted together with faeces and is also not usually measured. In cases of diarrhea, significant amount of fluid may be lost with the stool. The frequency of defecation also can provide an indication of bowel movement. When providing and monitoring fluid intake and output, clinical care providers use two types of forms/charts, one for purposes of planning and the other for recording findings. Each type consists of different components as shown below: The Plan (the intended amount to be given as ordered) Type of fluid The amount intended for a given period Other electrolyte or drug to be added The Record or result Intake – actual amount administered or taken Output – amount of output that can be measured Fluid Balance Sometimes the nature of the fluid output (colour, turbidity etc.) and the occurrence the passage of stool by the patient may be noted. The nature of the stool (consistency, colour) may also be indicated. The order itself is often written in the continuation sheet of the Medical Record as part of the treatment plan. Normally, nurses copy the orders into another sheet and converts it into a plan used as a guide to administer the infusion. For intravenous (IV) fluid therapy, it would be better if the doctor him/herself can write the plan and brief the nurse regarding the plans rather than just placing an order. For enteral feeds, because of the methods involved, it is easier for the doctor or dietitian to just order and for the nurse to plan the route, intervals, frequency and rate. The plan is often attached to the I-O chart both of which are placed together with the nursing observation chart usually clipped on to a clip-board or a file separate from the medical record. The information is then recopied into the I-O chart. The beauty of the paper-based I-O chart is that it is very concise, providing a lot of required information on a single chart. How the data is transferred from the order to the plan and then onto the chart will be discussed later. When IV fluid is to be given, the recommended fluid intake is usually ordered by doctors. The order for the type and amount of fluid to be infused is called the Fluid Regime. It is routine for doctors to order IV fluids to meet the needs of a 24 hour period. Strictly, doctors should order IV fluids for the duration that they are required. When fluid is ordered for resuscitation, it is ordered only for the period required to achieve stabilization. The regime is then reviewed taking into consideration the change in the patient's condition. Also, a review is done if there is an order for the transfusion of blood or an order for administering drugs diluted in a considerable amount of IV fluid. The doctor is often guided by normal daily (24 hour) requirements and the estimated fluid deficit. This period varies with the time of admission of the patient. Therefore, IV infusion can be started at any time of the day and may be extended beyond the 24 hour nursing shift. This does not matter because IV infusion is meant to be continuous. The nurse, may write a plan that extends to the next working day but it is probably better to write a separate plan for the shifts of current nursing work day and another for the shifts that follows. Periods for Planning and Measurement of Intake and Output There is a need for greater clarity in ordering the fluid therapy regimen. Some methods that is still in practice can lead to confusion. Intake-Output Plan Writing an order in this way is not advisable because it relies too much on nurses to: Understand the order, Arrange the sequence of the type of fluids and Calculate the amount to administer for a given period The nurse would probably calculate the rate as 2500 divided by 24 hours (one bottle or pack taken to be 500 ml). She would most likely give all 1500 ml of Dextrose 5% first before giving the 1000 ml of Normal saline. On the contrary, the doctor probably hoped that she will start with Normal saline and the alternate with Dextrose 5%. The assumption is also made that the nurse knows she should add only 1 gm of KCL per 500 ml of fluid. A better but still incorrect way is to order is as below. Better but Still Incorrect Way of Ordering IV Fluid with Addition of KCl Ordering Addition of KCl A proper IV fluid order would indicate the type of fluid to be given, the starting time, the period it is to be administered. When properly written it also acts as the plan. It is important that the doctor prescribes the type of fluid to be given, the amount of each type, the total amount for period and the route / site planned. It would mean that the order and plan is written on the same form. The nurse needs only to calculate the rate. This arrangement is subject to policies of the hospital concerned. Frequently, fluid is given via one infusion set into a single peripheral or central vein. For providing the normal requirements for water, it is common practice to order 1/5 Normal saline in Dextrose 5 % at a rate that will provide the volume and sodium required (in both adults and children). For total parenteral nutrition, fluid containing all the necessary nutrients including electrolytes may be given from one bag. The total volume to be given is determined and the rate calculated. While the doctor may order the total volume for a 24 hour period, the nurse need to take into consideration how the fluid is to be provided. She/he will need to plan the amount, duration and when the bottles/bags needs to be changed. Then, she/he needs to calculate the rate of infusion in ml/min and the equivalent drops per minute if a gravity driven drip set is used rather than an IV infusion pump. Plan for Infusion of One type of Fluid(click on image to enlarge) However, if additions are to made then the amount to be added and to which bottle/bag needs to be indicated. The period of infusion can be extended to the next day i.e. beyond 24 hours but when the intake is measured and totaled it would be for the three nursing shifts. Often, different types of fluids are ordered to be given sequentially, through a single vein. These may include blood, plasma, plasma substitutes, albumin etc. The doctor needs to indicate clearly the sequence and duration of infusion of each pack/bottle of fluid as well as any additions to be made to each of them. In effect the doctor writes the plan. The rate may be calculated by the nurse. IV Fluid Plan for Infusion of More than One Type of Fluid(click on image to enlarge) In this example, the doctor intends to give the patient 2500 ml of fluid (the normal daily requirement) in 24 hours. He/she would like ensure that the patient is given 154 meq of Na and 39 meq of K+. Therefore, he/she has ordered 1000 ml of 0.9% Sodium Chloride in 5% Dextrose. He/she has also indicated that 1 gm of KCl is to be added to three (3) of the solution bags ordered. In practice, KCl may be supplied by the pharmacy in gm per vial (usually 1 gm per vial equivalent to 13 mEq) or in meq per vial (usually 10 mEq per vial). KCl is a dangerous drug and should be ordered with care. If fluid is to be given using more than one method or via more than one site then the order should be documented on a slightly different type of form. There are instances when more than one IV infusion site is used i.e. either: A peripheral vein plus a central vein More than one peripheral vein The circumstance is also similar when two IV infusion sets/line are set up to run through one vein (piggy-backed) to give a different type of fluid e.g. diluted medication. The orders should be made on a chart specially designed for the purpose. Piggy Backed IV line Additional line (Piggy Back) Attached to the Primary Line For this purpose, the type of chart used has separate sections for different sites so that the specific site (vein) the fluid is to be infused is specified. Fluid may be given also via an arterial line to keep it patent. In children, this amount is significant enough to be recorded.If there are more than one line, attached to a vein then the line need to be named.In the example below, the doctor provides a total of 3000 ml of IV fluid consisting of 2000 ml of Total Parenteral Nutrition Solution (in one bag) via the Central venous line and 1000 ml (in two 500 ml bags) of Normal saline with 2 gm of potassium added in each bag to offset for dehydration, hyponatraemia and hypokalaemia in the patient. IV Fluid Plan for Infusion at More than One Site(click on image to enlarge) The above form may be used for ordering and planning for infusion via a different set piggy-backed to the first set. There are instances when fluid is given via more than one mode i.e. via the intravenous route and also one of the enteral routes. The same form for ordering and planning as shown above may be used. The type and amount of fluid to be given using the different method at the different the site is written on the separate section. Data from the plan is need to be accurately transferred to the chart by handwriting. It is a good practice to have the plan and chart together in one place e.g. on a clip-board or in a file. Transfer of Data from Plan to Intake Chart(to enlarge, click on image) In the clinical setting, the type and amount of fluid whether given parenterally or enterally, needs to be measured. The type of fluid is copied from the plan.When fluid is given via intravenous (IV) infusion, the amount of intake is taken as the amount put up minus the amount left over. When an infusion pump is used, the volume is calculated by the machine based on the flow rate set by the nurse.How fluid is measured, when given through the enteral route, depends on whether it is given by intermittent bolus feeding or continuous infusion driven by either gravity drip or by the use of an infusion pump (will be discussed later). The Intake-Output chart is so named because on one side is the Intake and the other the Output. Measurements of volume are in ml. The chart is for a 24 hour period but, for practical reasons, it does not follow the calendar day (i.e. is not from 12 Midnight to 12 Midnight of the next day). Rather, it follows the nursing shift i.e. usually from 7 a.m. on the starting day to 7 a.m. the next day. While the order or plan may extend into the nursing morning shift of the next day, the intake and output measurements end with the night shift. Charting is then started on a new form.A common Intake-Output Chart is used for when fluid is given intravenously as well as by the enteral routes. Also, the same chart is used to enter data and to view what has been recorded.The chart is a table where the rows divide the chart into time intervals. The columns indicate: the type and amount of the fluid that has been given and the mode and site of administration the fluid output including urine, discharges or drainage. (The structure of the Electronic order form and Intake Output Chart for a computerized Clinical Information System is discussed in another paper yet to be written). Normally the empty chart is pre-printed and the data is entered in ink. Charts are usually single sheets of standard A4 paper and are often separated from the main medical record e.g. placed on a clip board. There is a danger of losing the identity of the patient whose I-O is being charted. It is important to document the Name of the Patient, the Registration number / Medical record number and the (starting) date for which the chart is used. At the end of the patient's stay, the charts should be reincorporated as part of the Medical record.All relevant particulars of the input and output data are charted in the appropriate time-interval (period) on the chart under the relevant the chart headings (column and row titles). The amount of both the input and the output is totalled for every shift (sub-total) and for the 24 hr period (grand total) starting at 7.00 a.m. and ending at 6.59 a.m. the next day. The chart is designed to follow the process of giving intravenous infusion. After receiving orders from the doctor on the regimen to be followed, the nurse obtains the first IV Fluid pack/bottle of the specified type from the pharmacy or floor stock. Where the fluid solution is sourced or kept from depends on policy. It is very convenient for IV drip solutions to be kept as part of the ward stock, because large amounts are used especially in acute care wards. However, issues arise when additions like electrolyte such as Potassium or drugs such as inotropes (dopamine, dobutamine), heparin and antibiotics need to be added. Hence, the admixture may be done by the nurse in the ward or by pharmacists.Currently, many hospitals give to nurses the responsibility of mixing common substances to fluids in packs/bottles. The nurses are trained on how to ensure that the right concentration is given and the aseptic technique is followed.The need for mixing to the correct concentration and asepsis is also applicable if pharmacists are to make the additions. The advantage is less people need to be trained. The trade-off is that the supply may be delayed. The workload of the pharmacy will be increased and the staff available may not be able to cope. However, most hospitals make it a rule that only pharmacists are allowed to mix items such as parenteral nutrition and cytotoxic drugs.The workflow for starting and recording IV infusion is as shown below:Workflow Chart for Starting and Recording IV Infusion by Nurse Using Ward Stock IV Infusion Workflow The instances when the nurse needs to enter (write down) data into the chart include: At the beginning of putting up an IV infusion At the beginning of a shift Whenever a pack is finished and another is put up Whenever the regime is changed The nurse enters the actual time that she starts the infusion rather than the time planned. The time is recorded on rows within the column on the extreme left. The same column is use for all activities and happenings including for the output (e.g. the time when the urine is collected). The time fluid is put up need to be recorded. However, the finish time need not be recorded; assuming that in a continuous infusion, after the last pack/bottle finishes. the next one is put up immediately. At the beginning, the nurse records the following data in the Intake Chart: The time the infusion is started The type of fluid being set up The amount set up The nurse needs to ensure that the type of fluid being infused is the same as the one ordered. This is done by confirming with the particulars on the label of the pack/bottle. The type of fluid being set up (e.g. Normal saline, Dextrose 5%, Normal Saline in Dextrose 5% or parenteral nutrition solution) is then recorded. Because the columns may not be wide enough, it may be necessary to use abbreviations.The amount of fluid put up is the amount in the pack/bottle or the chamber if a set with a chamber is used (as in paediatric cases). The chamber usually contains the maximum of 100 ml. If a syringe is used with a pump, then the amount set up would be the amount drawn into the syringe (usually 50 or 100 ml).If additions are made then she/he needs to make a note on the existing label or by sticking another label on the pack/bottle. The rate of infusion may be decided in the fluid intake / infusion plan. A good method is to indicate the additions, the rate and period it is to be completed on an extra label stuck to the pack/bottle. In the example below, instruction is given at rate of 100 ml/hr. to finish the 500 ml bottle at 12 noon. Instruction on Extra Label Where IV infusion has been started on a previous shift, the nurse would record the amount of fluid left in the pack/bottle as the amount carried over. If the pack is finished in the middle of the shift, the volume in the replacement pack is recorded as the amount set up. If the fluid flow is by gravity and the flow rate is controlled by a flow regulator (in drops/min), then the amount infused is calculated as amount set up minus the amount left in the pack. The amount that has gone in need to be recorded at these instances: When the pack/bottle is finished in the middle of the shift, At the end of the shift The amount gone in at the end of the shift is calculated by subtracting the remainder from the amount set up or remaining in the bag/bottle at the beginning of the shift. The amount of the remainder fluid is noted in the chart for the benefit of the nurse of the next shift.If an infusion pump is used, the amount given as indicated on the machine is read from it. Even though it is not necessary to know the amount left behind for purpose of calculation, it is good practice to make a note of the remainder left in the pack/bottle. Also, if a change is made, the new type of fluid and the amount put up must be recorded Since the amount that has gone in is for a period, the data must be written at the time it is calculated or read i.e. on another row on the Intake Chart and not on the same row as the time it is put up. It is quite common for patients to be given intravenous fluid therapy. Frequently, IV fluids are given via a single vein using a single set. The chart used for this purpose is as shown below:Paper-based IV Fluid Intake Chart for Single IV Site Intake Chart for IV Infusion at Single Site(click on image to enlarge ) When a certain amount is planned for a period, e.g. 24 hours, the nurse must ensure that the rate of flow is set so that the intended amount will be infused. If the infusion time is delayed or brought forward for any reason, then the rate need to be increased or decreased accordingly so as to ensure the necessary amount is in fact transfused. Therefore, the nurse needs to observe (by counting or otherwise) the rate of flow and the remainder amount in the pack. Often, the right amount is not given if the line is obstructed or the rate becomes too fast.In emergency situations when fluid is given rapidly, the nurse ensures that the actual amount required as ordered is given at the speed required. It may be beneficial to record the amount every hour in the amount "gone in" column. Since, traditionally, the recording the intake and output is the duty of nurses, it is logical that the chart is segmented into sections according to nursing shifts. Morning shift: 7.00 a.m. to 2.00 p.m Afternoon shift: 2.00 p.m. to 9.00 p.m. Night shift: 9.00 p.m. to 7.00 a.m. next day The nurse on duty calculates the cumulative total at the end of the shift. The remainder or amount left-over of any IV fluid or enteral fluid in the container is noted to be carried forward to the next shift in the "remainder" column.The remainder will be recorded again by the nurse in charge at the next shift as the starting amount. She/he notes this as being "carried over". Cumulative Total (Each Shift)(to enlarge click on image) Two alternative approaches can be taken in this situation: Use two charts Use chart with two sections To record the intake two separate charts may be used for the each of the line. The shift total is made up by adding the total for each line. However to avoid confusion, for recording of the Output only on one of the charts should be used (preferably the second one). A different Intake Chart with two sections can be used when two sets of infusion system are used for e.g.: to infuse fluids into two separate veins, or a second set is piggy backed to a line on the same vein, It caters for the different site of administration by having two sections for intake as shown below:Chart with Sections for Two Sites of Administration (for one shift) Intake Chart for IV Infusion at Two Sites(click on image to enlarge) In this chart, the width of the column is compromised and abbreviations may be used. It is quite impossible to have charts with columns for more than two sites or routes. In this situation, it is better to use more than one chart. When two separate charts or a chart with two sections are used, the total for each section is added to give the shift total. This is recorded at a supplementary section at the bottom of one of the charts preferably the one that comes later. Shift Total For Fluid Given via Peripheral and Central Vein The doctor or nurse may order and plan the feeding regime or a dietitian is consulted. The dietitian may recommend the type and amount of liquid food formulation to use based on fluid and calorie requirements. Usually, the nurse will plan the frequency of feeds and the amount for each feed.Enteral tube feeds may be given in two ways: Intermittent bolus feeding Continuous Infusion via an infusion set attached to the tube with the flow determined by

gravity or using an infusion machine For patients taking well orally and on a normal diet, an Intake-Output Chart is quite unnecessary. It is only in situations where there is clear indication that the patient's oral intake needs to be monitored and controlled that an I-O chart is indicated. Indications include: When there is doubt regarding ability of the patient to take adequate amounts of fluid Whenever the patient is given fluids orally in addition to IV fluids For oral feeds, depending on circumstances, the doctor or nurse may decides on how much fluid to be given and how frequently. The nurse provides the desired amount to the patient in a container (e.g. cup, glass or bowl) and record this as 'amount supplied'. She/he then records the amount that the patient actually takes.Situations where the amount needs to be controlled and measured carefully are: Patients on trial of oral feeding after prolonged period of IV Therapy (e.g. after aesophageal, gastric and intestinal surgery) Patients reluctant to take orally (due to anorexia etc.) Patients where intake needs to be limited (e.g. renal failure) Enteral feeds may be given in two ways: Intermittent bolus feeding Continuous Infusion via tube with the flow determined by gravity or using an infusion machine Intermittent bolus feeding is suitable mainly for feeds via nasogastric tube or gastrostomy, even though it is also practiced for feeding via nasoduodenal or nasojejunal tubes. The nurse introduces the amount planned but it is recommended that she/he aspirates the stomach contents, before the next feed, to determine if the feeds has been passed on and not retained. If some amount is retained, she would then have to subtract this from the amount introduced and record the resultant amount as 'amount given'. If all or most of the feed is not passed on or retained, this will indicate that there is problem with gut motility or absorption. The route of administration may be reduced in amount, a different type of formula or feeding by this route is abandoned, Bolus feeding may give rise to the problems of inadequate digestion and diarrhea. By giving feeds in small amounts there is a better chance of absorption and less chance of food left undigested. The incidence of diarrhea is also reduced. The setting up, calculation of rate of infusion and recording amount gone in and left over is similar to that of IV infusion. Feeding can be given via a nasogastric tube as a temporary measure in the situation where a patient cannot swallow. For feeding for longer periods, creating a gastrostomy for the purpose is better. Usually, the intermittent bolus feeding method is used for this route. A gastrostomy is done to bypass the mouth and esophagus in cases of inability to swallow, obstruction or injury to the aesophagus. If the rest of the gastrointestinal tract is healthy, blended or homogenized food of any type can be given. Where the rest of the bowel has limitations in motility or absorption, then milk and other formulas may be given. The intermittent bolus feeding method usually works well for gastrostomy feeding. Gastrostomy Tube Gastrostomy Tube A fine (small diameter) feeding tube can be placed so that it ends in the duodenum or jejunum using endoscopy or radiology imaging. It is indicated when there is gastric stasis or risk of aspiration as well as for acute pancreatitis and hyperemesis. Feeds via these routes are administered continuously by infusion pump. The initial rate of administration is increased gradually and is combined initially with parenteral nutrition achieve the necessary caloric intake. The type of feed is similar to that of jejunostomy feeding. Depending on the ability of the jejunum and ileum to pass on and absorb liquid food , three types of liquid formulations may be given: Standard Formula i.e. Liquid formulations of protein, sugar and fat usually milk-based Elemental Formula these are usually proprietary formulas where food substances supplied are those that are broken down into simple elements which are easily absorbed (protein in the form of amino acids, , sugar as glucose or dextrose and fat as fatty acids). Special formulas that are elemental formulas with some elements increased or added or reduced or removed. The content of the formulations depends on the types of disease. Jejunostomy feeds are best given by continuous infusion either via: Gravity driven drips via closed administration sets Enteral feeding pumps The doctor or dietitian needs to specify the type and amount of feed for the day. The frequency of feeding is best left to the discretion of the nurse These feeds need to be given via continuous infusion. The order should specify the amount and type of feed. The frequency, periods of delivery and rest are usually planned by nurses. Orders Jejunostomy Feeds by Doctor or Dietitian Jejunostomy Feed Order(click on image to enlarge) This order can easily be written as: "to give 2400 ml of enteral feeding formula via jejunostomy in 24 hours using infusion pump". Feeds via gastrostomy and nasogastric tubes are usually given by intermittent bolus method. For nasogastric feeding it is better to use only milk formulas. For gastrostomy, as the tubes are much bigger, blended or liquid mixtures such porridge or soups can be given. The time of feed is indicated but since it is to be given as a bolus it is not necessary to indicate the period. In between feeds, the tube is closed with a spigot and patients can move about if they are able to. The plan also acts as an order to the unit supplying the feeds (e.g. the kitchen).Plan for Gastrostomy Feeds (example) Plan for Gastrostomy Bolus Feeding(click on image to enlarge) In order to avoid physiological complications, Nasoduodenal, Nasojejunal and Jejunostomy feeds are best given via continuous infusion using infusion pumps. It is also good to have a break and stop infusion for a short period to give the intestine some rest. It is also good practice to clear the tubes with water or saline from time to time. The tube has a side connection for this purpose. Feeding via Jejunostomy (based on Fig. from CC BY-NC-ND 3.0) The plan can be written by doctors or dietitians. However, it may be better to leave it to nurses because they have better knowledge and skills on the techniques. They would also prefer to determine the periods of feeding rest and clearance of the tubes. Enteral feed formulas used for continuous infusion usually comes as sterile solutions in 1000 ml bottles. To meet the daily fluid and calorie requirements of adults 2500 ml (two and a half bottles may be required). Hence, the plan may be extended to the next working day to finish the third bottle (unless a 500 ml bottle is available). In this way the remainder in the bottle/container is used for the next shift and not wasted.Plan for Continuous Jejunostomy Tube Feeding (example) Plan for Jejunostomy Feeding by Continuous Infusion(click on image to enlarge) It is best that the same Intake-Output Chart is used for when fluid is given either via the intravenous or enteral route. Since the feed is given bolus only the time rather than the period need to be recorded.Recording Intake of Fluid Given via Gastrostomy Intake Chart for Gastrostomy Feed(click on image to enlarge) The charting of intake of fluid given by continuous enteral feeding (i.e. via naso-dudenal, nasojejunal, jejuostomy tubes) is quite similar to that of intravenous infusion. Recording Intake of Fluid Given by Continuous Feeding via Entrostomy Jejunostomy Intake(click on image to enlarge) There are instances when fluid is given by both IV and enteral route. Two approaches can be taken in this siuation (just as for when fluid is given via two IV sites) Use two charts Use chart with two sections Two separate charts may be used one for each of the route/mode. The shift total is made up by adding the total for each route/mode. However to avoid confusion, for recording of the Output only on one of the charts should be used (preferably the second one). The Intake Chart with two sections can be used when two routes/modes are used. An example is when starting a trial of enteral feeding, the enteral feed is given at a slow rate e.g. 30 ml/hour while the rest of the fluid is given by the intravenous route.Charting Intake when Fluid Is Given by Both IV and also Enteral Route Charting Intake when Two Routes are Used(click on image to enlarge) When two main sections are used, the total for each section is added to give the shift total. This is recorded at a supplementary section at the bottom of the chart. Shift Total When More than One Route is Used Shift Total Combined In the clinical setting, the normal output can be measured only partially. It is mainly a measure of the urine output. This amounts to 1000-1500 ml per day in a normal adult. Sometimes, especially in children the amount of loss due to diarrhoea is estimated. The loss from sweating and evaporation (insensible loss) is not measured. This is around 1000 ml. Hence, in a normal person the measured input is more than the measured output by around 1000 ml. This is not a deficit because it is not an abnormal loss.Abnormal losses occur in situations where the patient has: A fistula originating from the jejunum or ileum An ileostomy A draining tube inserted into a body cavity containing fluid When there is a necessity to chart the patient's fluid balance, the urine is collected and measured. In a patient who is alert and not on a urinary drainage catheter, the patient or care giver collects the urine in a urinal or bottle each time urine is passed. The amount is usually measured by a nurse or nursing aid using a measuring jug and recorded on the chart. Dependable patients may also be allowed to measure the urine and record them on a slip of paper before recording them. The nurse copies the amount onto the I-O chart.Urine output may need to be measured at the end of a shift or more often (e.g. hourly). Currently, the urinary catheter is attached through into a collapsible plastic with markings. The amount can be read from these markings or by emptying the entire content of the bag into a measuring jug when it is full or at the end of the shift or day. If it is desirable to let the urine accumulate for the whole day, the nurse reads off the amount from markings (level in ml) on the bag and record this and the time in the I-O chart. To enable her to make the next reading, she may indicate the level at which last measurement was made – on the bag with a marker or tape. Otherwise, she can also subtract the reading of the previous level from the level at the time of the current reading. This gives the amount passed between the times of the two readings. If the urine bag is full, the urine is discarded and the amount recorded.If urine output is to be measured hourly, then the use of the standard I-O chart may not be suitable (too many rows required). The output may be recorded on a separate chart and then the total for a shift inserted into the main (standard) chart. Patient who has a collection of fluid in a body cavity (like in pleural effusion or ascites) may have a drainage tube inserted into the cavity to drain the fluid. After surgical operations, drains may be inserted into abdominal or thoracic cavity and abscess or cyst cavities to facilitate drainage of secretions or discharges such as blood, serum or pus.To measure the loss, one method is to read from markings on drainage bags / bottles. After reading the loss for the current period, she may use an ink marker or tape to indicate on the bag or bottle the level when it was last read. The amount at the end of a shift is calculated by subtracting the amount of the previous reading from the accumulated amount. Making Markings on Drainage Bottle Marking the Level of Drainage In the second method, reading is done and then the whole bag or bottle is emptied. In a closed drainage system changing the whole drainage bag/bottle at every shift is not done. But it is indicated if the bag or bottle is full. Emptying a Drainage Bottle Drainage Bottle that Can Be Emptied Other forms of fluid or semi-fluid may be discharged by the body. These include Intestinal contents Gastric juice from a nasogastric tube Urine from a nephrostomy tube If the patient has a fistula originating from the jejunum or ileum, the intestinal contents are collected into a jejunostomy or ileostomy bags. Measurement of the output is made by transferring the content into a measuring–container or aspirated with a syringe. The type of fluid that is excreted or drained out is indicated by the headings on separate columns. These include: Urine Nasogastric aspirate Drainage from drainage tubes, stomas etc. Stool/faeces (only the occurrence of passage of stool is recorded. In children with diarrhoea the loss may be measured) The time of measurement for each output is written on a separate row unless it coincides with the time when the input was recorded. There should be enough rows on the chart to record the time of intake as well as output.Each type of output has its own column title. As space is limited, total volume of all types of output of each shift needs to be added and written at the bottom of the chart (see below).Entering Data for Output (Morning Shift) Entering Data for Output(click on image to enlarge) Total Output at the End of the Shift Shift Total of Output Urine, though an output, is not normally considered as a loss because urine production is a normal mechanism for the excretion of products of metabolism. In normal circumstances, if too much urine is produced the commonest reason is that more fluid than what is required has been given to the patient. The intake therefore needs to be reduced. A common mistake is to increase the intake to catch up with the urine output.However, the clinician needs to be aware of circumstances where an abnormal amount of urine is excreted because of complications of disease for example osmotic diuresis diabetes insipidus high output renal failure The doctor need to determine whether the drainage constitutes an active loss or drainage of accumulated fluid for which the body has been compensated. Fluid in ascites or pleural effusion usually had accumulated for some time and it is wise not to replace it volume for volume. However if there is re-accumulation after the initial drainage, it may have to be replaced. In intestinal obstruction fluid may well up into the stomach and the volume Nasogastric aspirate will rise. It is quite common practice to replace it volume for volume with IV Normal-saline. However, it must be remembered that most of the accumulation is in the small intestine. Therefore just replacing the Nasogastric aspirate is not enough. Judgment on the fluid need must be based on the diminishing urine output, increased pulse rate and drop in blood pressure. In the monitoring of Intake and output the following need to be taken into consideration: There should be an order, a plan besides the recording of fluid intake and output. Sometimes it is best to combine the order with the plan Orders and plans must be for a defined period The measurement and charting of Intake and Output follows the Nursing shift. Mode/route and site of administration should be indicated. Measurements should be as accurate as possible. A good part of losses are not measured. Therefore the amount of intake compared to the output as per the I-O chart is not supposed to be balanced. Besides the I-O chart, other clinical factors should be considered when fluid therapy is planned. Entire Completed Intake–Output Chart Entire Completed Chart Entire Blank Intake–Output Chart Entire Empty Chart(to enlarge click on image) Link to MSWord version of Chart INTAKE-OUTPUT CHART MS Word Version References: Intake and output (I&O) are crucial aspects of patient care in nursing. Monitoring these parameters involves tracking all the fluids a patient consumes and excretes. Proper documentation of I&O helps healthcare providers assess the patient's fluid balance, which is essential for maintaining optimal physiological function.Monitoring intake and output is critical for several reasons. It helps in:1. Assessing Fluid Balance: Ensuring proper hydration and identifying imbalances that could lead to conditions like dehydration or overhydration.2. Evaluating Kidney Function: Adequate urine output is an indicator of kidney function, which is vital for excreting waste products.3. Guiding Treatment Plans: Helps in tailoring fluid therapy and medication dosages, especially in patients with conditions like heart failure, renal disease, or those undergoing surgery.4. Detecting Complications Early: Early signs of fluid imbalance can be detected through meticulous I&O monitoring, preventing severe complications.Components of IntakeIntake includes all fluids consumed by the patient, such as:1. Oral Fluids: Water, juices, soups, and other beverages.2. IV Fluids: Intravenous infusions, including medications administered through IV.3. Enteral Feedings: Tube feedings given through nasogastric, gastrostomy, or jejunostomy tubes.4. Parenteral Nutrition: Total parenteral nutrition (TPN) administered intravenously.5. Medications: Liquid medications consumed orally or via IV.Components of OutputOutput includes all fluids excreted by the patient, such as:1. Urine: Major component of fluid output, measured in milliliters.2. Emesis: Vomitus, which should be quantified.3. Stool: Diarrhea or liquid stool should be measured. Solid stool is typically noted but not quantified.4. Drainage: Fluids from surgical drains, chest tubes, or wound drains.5. Sweat and Insensible Losses: Although not easily quantifiable, these are considered in overall fluid balance, especially in febrile states or excessive sweating.Accurate measurement of I&O is vital. Here's how nurses can ensure precise documentation:1. Measuring Devices: Use calibrated measuring devices like graduated cylinders, urinals, and collection bags.2. Documentation: Record every input and output immediately to avoid errors. Use standardized forms or electronic health records (EHR) for consistency.3. Patient Education: Educate patients and families on the importance of reporting fluid intake and output, especially in home care settings.Challenges in Measuring Intake and OutputSome common challenges include:1. Patient Non-Compliance: Patients may forget to report or inaccurately report intake and output.2. Inaccurate Measurements: Estimations instead of precise measurements can lead to errors.3. Overlapping Responsibilities: Multiple caregivers might lead to inconsistent documentation.4. Insensible Losses: Difficult to measure, requiring clinical judgment to estimate.Best Practices for Accurate I&O MonitoringTo ensure accuracy in I&O monitoring, consider the following best practices:1. Routine Checks: Conduct regular checks and recalibrate measuring instruments as needed.2. Team Communication: Maintain clear communication among the healthcare team regarding I&O status.3. Patient Involvement: Engage patients in their care by explaining the importance of accurate I&O tracking.4. Use Technology: Leverage EHR systems to streamline documentation and reduce errors.ConclusionIntake and output monitoring is a fundamental aspect of nursing care that plays a vital role in maintaining patient health and preventing complications. By understanding the components, challenges, and best practices, nurses can effectively manage and document I&O, ensuring optimal patient outcomes. Intake and output calculation NCLEX review for nurses. This quick review will highlight how to calculate intake and output because these type of questions may be on your NCLEX exam or (definitely) on a nursing lecture exam. It seems like calculating I and O's is self-explanatory, right?! Well, it can be tricky, especially calculating intake because many students get confused on what to include, how to convert from ounces to milliliters, and how to interpret the calculation. Don't forget to take the intake and output practice calculation quiz after reviewing the material below. So let's break it down! Nurse Sarah's Notes and Merch Just released is "Fluid and Electrolytes Notes, Mnemonics, and Quizzes by Nurse Sarah". These notes contain 84 pages of Nurse Sarah's illustrated, fun notes with mnemonics, worksheets, and 130 test questions with rationales. You can get an eBook version here or a physical copy of the book here. Lecture on I and O's Intake What is intake? These are fluids taken IN the body. It can be via various routes like the mouth, a tube, or intravenous (IV). What do you include for the liquids that are consumed? This includes anything that is liquid at room temperature like: Juice Water Ice chips (NOTE: this melts to half its volume….if you give the patient 8 oz of ice chips RECORD 4 oz) Drinks (coffee, soft drinks, tea etc.) Milk Gelatin (Jell-O ®) Broths Ice cream Frozen treats: popsicles, sorbet Nutrition supplements like Ensure® or Boost ® How about pudding or items similar to it? NO…most NCLEX review guides (example: Kaplan) specify NOT to include pudding etc. in the calculation since it is a semi-liquid (Irwin, Yock & Burckhardt, 2015). However, some sources say to include it (Carter, 2007), but with that being said, ask your professor what they want you to do. However, for this review we will NOT include pudding or products similar to it. Many times test questions will give you the amount in ounces (oz), but we record intake and output in milliliters (mL). To convert oz to mL, simply multiply the amount of oz by 30. Example: 67 oz = 2010 mL Miscellaneous: Tube feedings (include free water) IV and central line fluids (TPN, lipids, blood products, medication infusion) IV and central line flushes Irrigants (example: irrigating a catheter….calculate the amount of irrigate delivered and subtract it from the total urine output…which will equal the urine output) Output What is output? These are fluids that LEAVE the body. It can be via various routes as well. What's included: Urine output (most of the output calculation) Emesis Liquid stool (ostomy or diarrhea) Wound draining (drains, tubes…example: chest tubes etc.) Suction (gastric, respiratory) Not included but needs to be considered is: insensible loss This is from the skin and respiratory system. It can't be measured. According the Mosby's Medical Dictionary, insensible loss is estimated to be 600 mL/day ("insensible water loss", 2018). This varies depending on the patient's activity level, temperature etc. Therefore, you want to take that in account when assessing if the patient is at risk for fluid volume deficient OR fluid volume overload. Interpreting Intake and Output If the intake is less than output or if the output is MORE than the intake….think DEHYDRATION! The patient is losing too much fluids compared to what they are taking in. If the intake is more than output or if the output is LESS than the intake….think that the patient may be retaining fluid and is in FLUID OVERLOAD! Example: Intake 4250 mL and Output 1210 mL…..patient is at risk for fluid volume overload. Intake and Output Quiz References: Carter, P. (2007). Lippincott's Textbook for Nursing Assistants (2nd ed., p. 403). Lippincott Williams & Wilkins. insensible water loss. (2018) Mosby's Medical Dictionary, 8th edition. (2009). Retrieved February 8 2018 from water+loss Irwin, B., Yock, P., & Burckhardt, J. (2015). NCLEX-PN 2015-2016 Strategies, Practice, and Review with Practice Test (p. 127). Simon and Schuster. Hi, I'm Meris. And in this video, we're going to be talking about fluid balance, osmolarity, calculating intake and output, and also talking about fluid volume excess and fluid volume deficit. Very important stuff to know for nursing school. I'm going to be following along using our Nursing Fundamentals flashcards. These are available on our website, levelupRN.com, if you want to get your own set. And if you already have a set, you want to follow along with me starting on card number 90. Let's get started. So on card number 90, we are starting by talking about solution osmolarity. And if you see on this card, we've got three different types. We have hypertonic, isotonic, and hypotonic. So hyper means a higher tonicity of the fluid than the body. So that is going to be something that is going to cause fluid to move out of our cells, shriveling them. Then isotonic, iso means the same, so same tonicity as our body's fluid. The big one here is going to be normal saline. Lactated Ringer's is also an isotonic fluid. So that's not going to change the intracellular volume there. Nothing is going to change in that regard. And then hypotonic. Hypo means low, so lower tonicity than the fluid that's in our body already. This means that fluid is going to move from the outside into the cells causing them to swell and possibly burst or lyse. So I remember this. This is not on the cards, but this is how I remember it. Hypertonic, the E after the P is what I'm looking at. The E looks spiky, hypertonic. It's got points, right? So that means that that's what the cell is going to look like too. Hypotonic, the letter after the P, it's an O. It looks swollen and big, right? Fluid has moved into the cell, and it has swollen. Let's talk really quickly. Some examples of hypertonic fluid would be D10W, dextrose 10% in water, 3% sodium chloride - so that's more than is in normal saline - and 5% sodium chloride, even more. Hypotonic, less than that of our body, we're talking about half-normal saline, 0.45%, or quarter-normal saline, 0.225%, okay? Those are some examples there. Now, I want to show you this illustration. I think this illustration is beautiful. It's available on the cards. And it shows what happens to the cells when fluid moves in and out of them based on what type of solution they are in. Love this illustration, I think it is absolutely beautiful. Moving on to card number 92. Let's talk about calculating the intake and output for your patients. I have had a lot of questions about this in nursing school and even on the NCLEX. You need to understand what counts for intake and output. Intake is any fluid put into the body. So that's not just like the fluids that they drink. That's IV fluids. That's going to be IV flushes, medications if they're liquid, gastric lavage, right? All of those things, continuous bladder irrigation, all of that counts. So you need to calculate everything that goes into the body as part of your intake. And output is any fluid that comes out of the body. That's going to be urine, primarily. But it could also be emesis, right, vomit. It could be blood if I'm having a hemorrhage or surgery, even wound drainage, chest tube drainage. All of these things count for the output. We have sensible losses, which are those which can be measured, like urine or blood. And insensible losses are things like the water lost through respiration and the sweat that comes out of my skin. I can't really measure it, but I am losing fluid that way. You'll see her that we have some examples of how to calculate I and O's. Remember that everything should be done in milliliters, so we give you the conversions here. The big one here in red is 1 ounce is 30 mls. 1 fluid ounce is 30 mls. You've got to know that. A lot of things will be in ounces on fluid containers, like juices, right? One big key point here, I would really, really know this, is that ice chips are recorded at half of their volume. So if I have 100 mls of ice chips, I have 50 mls of water. Okay. Up next, we are talking about two crucial concepts to understand for nursing school, fluid volume deficit, not enough fluid, and fluid volume excess, too much fluid. So let's start talking about deficit first. If you see here on card 93, that is a lot of red, bold text. That sure does mean you need to know it. Very, very, very important. So signs and symptoms, the two big ones I want to call your attention to, hypotension, meaning low blood pressure, but tachycardia. Remember, I don't have enough fluid, so my vascular volume has dropped, meaning the resistance against my vessels has dropped, meaning that my blood pressure has fallen. So what does my body do? It tries to compensate for that with tachycardia. It's trying to meet that cardiac output, which is heart rate times stroke volume. So if my stroke volume has gone down because I have less fluid, then my heart rate is going to go up, compensatory tachycardia. Now, when you feel their pulse, right, it's going to be fast but weak and thready. Think of water just trickling through a garden hose. It's not putting forth very much pressure, so you'll feel it going fast, but it's going to be weak. Very important to understand that. Now, in terms of labs and diagnostics, your patients are going to have an elevated hematocrit, an elevated blood osmolality, elevated BUN, elevated urine-specific gravity, and elevated urine osmolality. So all of these numbers are going up. Why? Because the fluid volume is going down. So if I have five particles in a solution, that's my normal lab, and then as the solution volume drops, it seems like there's more of that, right? Proportionately there's more, so as the volume of the plasma drops, these labs are going to go up. Very important to understand that, as well. So we're going to treat this with IV fluids, usually isotonic, and we're going to notify the provider if the urine output drops to less than 30 mls per hour. We've already reached a decreased urine output if we get to that point, but when we fall below 30 mls per hour, this should be a big red flag in your mind that we have a serious problem. So that is fluid volume deficit. Okay. Let's move on to fluid volume excess. Now, this one you're going to see a lot because you're going to have patients with fluid volume overload. Big one would be a patient in heart failure, right? This patient's going to have a heart that is big but weak. It is not meeting that cardiac output very well, so it's causing a traffic jam, and now we have fluid volume excess somewhere. So in general, signs and symptoms of fluid volume excess of any ideology, of any cause, we could see weight gain, right? Fluid has weight, so if I have more fluid than usual, weight gain, and edema, swelling, that's a big one. Now remember, I'm going to have tachycardia still, right? I'm going to have tachycardia because my blood flow is not moving appropriately, so I have compensatory tachycardia. But I'm not going to have hypotension. I'm going to have hypertension. More fluid means more vascular resistance means higher BP. Now, I can have other things like dyspnea, shortness of breath, crackles in the lungs on auscultation, jugular vein distension, fatigue, bounding pulses. So when I feel it, it's going to be very strong. Think of fluid, of water gushing through a garden hose, right? Very strong, I can feel it from the outside very well. Labs, these things are all going to go down, hematocrit, hemoglobin, serum osmolality, urine-specific gravity, right? It's diluting everything. More fluid volume means I'm diluting the particles in solution, so all of those values will fall. We can treat this with diuretics. We can also do procedures to pull off fluid, like a paracentesis. A big, big thing here in bold and red is that we need to report a weight gain of 1 to 2 pounds in 24 hours or 3 pounds in a week. That is a lot. Think of 2.2 pounds is one kilogram. 1 kilogram is 1 liter of fluid. That's a lot of fluid. So if my patient gains 2 pounds in a day, I need to tell the provider, and I need to educate my patient to do the same at home. Okay. So that is it for osmolality of solutions, talking about fluid volume balance, calculating I's and O's, and fluid volume deficit and excess. I hope that review was helpful. This is very, very, very important content for your nursing exams and for the NCLEX, so really be familiar with these concepts. You've got to know them backwards and forwards. If you have any questions or really cool ways to remember things, I would love it if you would leave me a comment. If you like this video, please like it on YouTube, and be sure you subscribe to our channel. You want to be the first to know. We have new videos coming. We've got electrolytes and electrolyte imbalances up next, plus a whole lot more content headed your way. Thanks so much, and happy studying. This NCLEX review will discuss the two types of GI ostomies: colostomies and ileostomy. As a nursing student, you must be familiar with the different types of GI ostomies, how to provide pre-opt and post-opt care to a patient with an ostomy, and patient teaching. These type of questions may be found on NCLEX and definitely on nursing lecture exams. Don't forget to take the GI ostomy quiz. You will learn the following from this NCLEX review: Definition of Colostomy and Ileostomy Reason for a GI ostomy Types of Colostomies Stools Types based on Ostomy Location Pre-opt and Post-opt Nursing Care Pouching System, Medication and Diet Teaching NCLEX Review Lecture on Colostomy and Ileostomy What is a Colostomy and Ileostomy? A surgical opening created on the surface of the abdomen to allow stool (waste) to exit the body rather than through the rectum. A GI ostomy can be created for the small (ileostomy) or large intestine (colostomy). Reasons for a GI ostomy: GI diseases: Crohn's, ulcerative colitis, diverticulosis, infection, cancer (rectum and colon), injury (trauma to the GI system), congenital defects (obstructions) *May be permanent (lifetime) or reversible (GI system just needs to heal and then it will be reversed) Colostomy vs Ileostomy Colostomy: an opening created to bring the LARGE INTESTINE to the surface of the abdomen (the large intestines are also called the colon). There are various locations for a colostomy (think back to A & P of the GI system): Remember the mnemonic: "DATS a Colostomy" Descending Colostomy Ascending Colostomy Double-barrel Ostomy Transverse Colostomy Double-barrel ostomy: type of transverse colostomy where there is the creation of two stomas which divide the bowel. One stoma is called the proximal and puts out stool while the other stoma is known as the distal and puts out mucus. It is also known as a mucus fistula. Sigmoid Colostomy Ileostomy: an opening created to bring the SMALL INTESTINE to the surface of the abdomen, specifically the ileum (which is the last part of the small intestine before it opens into the large intestine). How does food travel through the body? Need to know this so you know what type of stool to expect from various ostomies, and the potential complications. Digestion starts in the mouth….you chew the food (saliva has digestive enzymes that breaks down some of the food) -> then you swallow-> the food travels through your esophagus and this tube uses peristalsis to help the food enter your stomach -> the stomach breaks down the food with the help of gastric acid and it becomes chyme (digested food and gastric acid) -> "chyme" is released into the duodenum (which is the first part of the small intestine), then flows to jejunum and finally the ileum, which is the last part of the small intestine that enters into the large intestine (while the food flows through the small intestine enzymes and bile breakdown the food even further)-> (CONSISTENCY OF CONTENTS right now is thick liquid…therefore an ileostomy will have liquid stool…as it progresses through the GI tract and gets closer to the rectum it becomes more formed like the stool that would have left the anus ->stool goes through the large intestine (which is going to absorb the water and electrolytes left over)…so the stool starts to have more of a formed look to it) -> starts at the cecum, then up through the ascending colon to the transverse colon and then down through the descending colon and then into the sigmoid colon to the rectum and excreted. *Ostomies closer to the end of the GI tract will have similar consistency to normal stool AND the patient has a greater chance of developing bowel continence (where they will learn how to control bowel movements). Hence, patients with DESCENDING and SIGMOID colostomies have the greater chance of bowel continence. Stool types based on Ostomy Location Ileostomy: will always have liquid stool. Note there is an increased risk of dehydration and electrolyte imbalance (because the contents will NOT flow to the colon where water and electrolytes are majorly absorbed…instead it is excreted out). There is also a huge risk for skin break down around the stoma because the small intestine contains digestive and pancreatic enzymes that will break down the skin. Colostomy: Ascending: liquid stool Transverse: lose to partly formed stool Descending/Sigmoid: similar to normal consistency The stoma isn't painful to the patient (area around the stoma after surgery may be tender) therefore the patient is at risk for unknown injuries…not painful when you clean. Pre-opt Nursing Care: Educate about what to expect (many patients are scared), how the stoma will look (show them a picture), and where it will be on the abdomen. Start teaching them about the pouching system MD may prescribe oral antibiotics to reduce bacteria in the colon (which normally lives there) to prevent post-opt infection. 2 to 3 days before surgery soft or semi-liquid diet may be ordered A cleansing solution and laxative may be ordered to clean the colon and that the patient follows a clear liquid diet prior to surgery (24 hours). Patient may have to be hospitalized due to the profuse diarrhea they will be experiencing and may need an IV solution to maintain hydration. NPO day of surgery Post-opt Nursing Care: Monitor the electrolytes, sign of dehydration (urinary output) site and stoma: After surgery, stoma will be swollen and large, but after a couple months it will shrink to normal size Ostomies will SHOULD ALWAYS look: pink or red and be moist/shiny. Notify MD if stoma is: pale pink patient (may have a low hgb and hct), dark red or black could mean compromised circulation to the stoma. After Surgery Stool: Ileostomy: drainage is dark green and then turns yellow when patient starts to eat Colostomy: may pass mucous stool at first….stool will be liquid at first and then progress to what it should look like depending on its location. It can take up to 2 days before stool is produced. A petroleum gauze will be over the stoma to keep the stoma moist, and then a sterile dry dressing until pouching system in place. Skin break down around the stoma Help patient understand the pouch system: Empty pouch when 1/3 to 1/2 full Change pouch when gut less active (morning before breakfast) Change pouching system every 3-5 days Keep stoma and skin around stoma clean Watching for burning around the skin or leaking (patient needs to be taught how to perform by self and become independent with it) Be familiar with the various pouching systems: one piece (skin barrier and pouch are one unit) vs two piece (pouch and skin barrier separate). NOTE: When applying the pouching system, the skin barrier application is key in preventing skin irritation and stoma constriction. Be sure to measure the stoma and cut the opening of the skin barrier to be 1/8" LARGER than the stoma. Stoma irrigation may be ordered by the doctor. This is an enema given through the stoma. Ordered if stoma is not excreting regular amounts of stool OR to teach a patient with a descending or sigmoid colostomy bowel continence. Medications precautions for patients with an ileostomy: NO: Enteric coating medications (don't dissolve until reaching a specific part of the small intestine) OR Sustained-released medication (releases slowly over a period of time) Diet Teaching Start out slow (1st 6 weeks) with low fiber, small meals throughout the day, monitor hydration and electrolyte status, eat slowly and chew thoroughly and then advance as tolerated. Patients with an ileostomy need to stay hydrated and consume fluid and electrolyte solutions like Gatorade (remember they are losing a lot of rich fluids that cannot pass through the colon). Most patients will be able to eat a regular diet eventually, but should avoid foods that caused problem before surgery and MUST keep the following in mind: Use caution and eat small amounts or completely avoid foods that are not completely digestible: Corn, celery, peas, coleslaw, popcorn, nuts and seeds, raisins, skin of fruits, raw mushrooms and pineapple etc, Gas/Odor causing foods: Pouch will expand as gas collects in bag (teach patient this and how to "burp" the bag)…there are bags with filters that allow gas to escape while filtering the smell or drops for the bag. Foods to avoid that cause excessive gas: beans, onions, eggs, broccoli, cabbage, garlic, alcoholic beverages, fish…high fibrous foods You may be interested in more: NCLEX REVIEWS References: Ostomy Surgery of the Bowel. (2017). National institute of diabetes and digestive and kidney diseases. Retrieved 7 January 2017, from