Module 3
Medication Administration and Patient Monitoring

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Pre-Assessment Exercise
Question #1

Which of the following is an example of a dry powder inhaler?
- a. Maxair Autoinhaler
- b. Pulmicort Turbohaler
- c. Tilade
- d. Vanceril

Question #2

When using metered dose inhalers (MDIs) what is the optimal time to hold the breath after inhaling?
- a. 4 seconds
- b. 6 seconds
- c. 8 seconds
- d. 10 seconds
Question #3

Which is the recommended method for tracking remaining doses in dry powder inhalers?
   a. Float test
   b. Shake test
   c. Indicator window
   d. Recording usage

Question #4

Which of the following statements is true regarding peak flow monitoring?
   a. Measures FEV1
   b. Objective measurement of small airway function
   c. Acts as an early warning system
   d. Difficult to use for most patients
Question #5

Which type of peak flow meter is recommend for use in children?

a. High flow meter
b. Low flow meter
c. Peak flow meters are not recommended in children < 12 years old
d. One with a spacer device
Overview of Medication Administration

Advantages of Inhalation

• Delivery direct to site of action
• Rapid onset
• Decreased doses
• Decreased adverse effects
How MDI Technology Works

- Larger particles (>5μm) impact upper airway
- Aerosol plume
- Particles between 1-5μm pass into airways
- Small particles (<1μm) expelled

Disadvantages of Inhalation

- Many patients use ineffectively
- Requires ongoing patient education and monitoring
Types of Inhalers

• Metered dose inhalers (MDIs)
  – Jet nebulizers
  – Breath-actuated aerosols
• Dry powder inhalers (DPIs)

MDIs

• Portable, multidose systems
• Drugs held in suspension or solution in a liquid propellant under pressure
• When activated, valve system releases a metered volume of drug and propellant
MDIs

• Jet nebulizers (press and breathe)
• Pressurized canister containing medication and propellant
• Metering chamber delivers a consistent dose
• Dose propelled at 70 mph
• Examples: β2-agonist, corticosteroids, cromolyn, nedocromil and ipratropium

MDIs

• Breath-actuated aerosols
• Delivery initiated by patient’s inspiratory effort
• Eliminates need for hand-lung coordination
• Examples: Pirbuterol Autohaler (Maxair®)
Chlorofluorocarbons
Montreal Protocol on Substances that Deplete the Ozone Layer
Phase out 12/31/2008

Differences Between CFC and HFA Based Inhalers

<table>
<thead>
<tr>
<th></th>
<th>CFC</th>
<th>HFA</th>
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</thead>
<tbody>
<tr>
<td>Spray volume</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Spray force</td>
<td>Higher</td>
<td>Lower (~1/3)</td>
</tr>
<tr>
<td>Spray temperature</td>
<td>Cold</td>
<td>Warm</td>
</tr>
<tr>
<td>Dose delivery (nearly empty canister)</td>
<td>Erratic</td>
<td>More consistent</td>
</tr>
<tr>
<td>Dose delivery (under different temperatures)</td>
<td>Variable</td>
<td>More consistent</td>
</tr>
</tbody>
</table>

# Availability of HFA Inhalers

<table>
<thead>
<tr>
<th>Albuterol</th>
<th>Proventil® HFA, Ventolin® HFA, ProAir® HFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levalbuterol</td>
<td>Xopenex® HFA</td>
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<tr>
<td>Ipratropium</td>
<td>Atrovent® HFA</td>
</tr>
<tr>
<td>Beclomethasone</td>
<td>QVAR®</td>
</tr>
<tr>
<td>Flunisolide</td>
<td>AeroSpan® HFA</td>
</tr>
<tr>
<td>Fluticasone</td>
<td>Flovent® HFA</td>
</tr>
</tbody>
</table>

## Albuterol HFA

- Albuterol with hydrofluoroalkane (HFA-134a) propellant
- Same clinical response as CFC-propelled albuterol MDI
DPIs

- Do not contain propellants
- Delivery initiated by patient’s inspiratory effort
- Eliminates need for hand-lung coordination
- Do NOT use with spacers
- May be difficult to use during an acute exacerbation
- Examples: Albuterol (Rotahaler®), Budesonide (Turbuhaler®), Fluticasone (Rotadisk®), Salmeterol (Diskus®)

Drugs available in both a DPI and MDI cannot be interchanged
Key Point

- The dose listed for MDIs = amount that reaches patient following activation
- The dose listed for DPIs = amount released into dosing reservoir before inhalation

Choose your option below.

Next Topic: Inhaler Technique
Inhaler Technique

• About 50 - 75% of patients have poor or less than optimal technique
• Each system operates differently
General Inhaler Technique

• If required, load device
• If required, shake the inhaler
• Tilt head back slightly
• Position the mouthpiece
• Breathe out
• If required, actuate and breathe in (3-5 seconds MDI, 1-2 seconds for DPI)
• Hold breath for 10 seconds
• Exhale

Variations in Technique:
Open vs. Closed Mouth

OPEN MOUTH
• Less drug deposited on throat and mouth
• Increased drug delivery to lung
• Less propellant to lungs
• More coordination

CLOSED MOUTH
• More drug deposited on throat and mouth
• Less drug delivered to lungs
• Acceptable alternative if open mouth is difficult
Variations in Technique: Jet Nebulizer MDI

- Key step is coordination between actuation of the device and inspiratory effort
  - Most common mistake is poor timing
  - Best to press down on the inhaler at start of inhalation
  - Patient should keep inhaling as they press on the inhaler
  - Press inhaler only once while inhaling = 1 breath for each puff

Variations in Technique: DPIs

- Key step is rapid, deep inhalation
- Keep device parallel to the ground
- Do not breathe into the device
Instructions for Pirbuterol
(Maxair Autohaler®)

- Loading the dose:
- Hold upright so arrows point up
- Raise lever and snap into place
- Gently shake several times

Instructions for Pirbuterol
(Maxair Autohaler®)

Using the device:
- Do not block air vents with hand
- Exhale normally
- Close lips around mouthpiece
- Breathe in deeply
- Inhaling will trigger a click and will feel a puff. Continue inhaling.
- Hold breath for 10 seconds and breathe out slowly
- Lower the lever
Instructions for Salmeterol (Serevent Diskus®)

Loading the dose:
• Push thumb grip until mouthpiece appears and snaps into position
• Slide lever away from self until it clicks (top of blister is peeled back and drug is available for inhalation)
• The Diskus should be kept in a level horizontal position during use

Instructions for Salmeterol (Serevent Diskus®)

Using the device:
• Breathe out as far as comfortable
• Close lips around the mouthpiece
• Breathe in steadily and deeply
• Hold breath for 10 seconds and breathe out slowly
• Close device
Video of Powder Disk Inhaler

- http://www.mayoclinic.com/health/asthma/MM00405

Instructions for Budesonide (Pulmicort Turbuhaler®)

Loading the device:
- Remove cover and hold upright
- Twist brown grip fully to right and back to left. Will hear a click (This releases 20 mcg of drug onto a disk in inhaler)
- Do NOT shake
Instructions for Budesonide
(Pulmicort Turbuhaler®)

Using the device:
• Breathe out fully
• Place mouthpiece between lips
• Breathe deeply and forcefully (This forces drug through conical holes in mouthpiece)
• Replace cover

Video of Dry Powder Tube Inhaler

• http://www.mayoclinic.com/health/asthma/MM00404
Instructions for Formoterol (Foradil Aerolizer®)

• Loading the device:
  • Drug comes in clear gelatin capsules
    – Dispensed with 60 caps in aluminum blister packs wrapped in foil pouch
  • Remove foil blister packaging
  • Twist mouthpiece in direction of arrow to open
  • Place capsule in chamber; close mouthpiece
  • Press and release buttons on side of device, only once

Instructions for Formoterol (Foradil Aerolizer®)

• Using the device:
  • Breathe out fully
  • Inhale quickly and deeply (causes capsule to spin)
  • “See, hear and feel”
    – Visually inspect the capsule
    – Inhaler produces a whirling sound
    – Taste lactose powder
Video of Single Dose Dry Powder Inhaler

- [http://www.mayoclinic.com/health/asthma/MM00406](http://www.mayoclinic.com/health/asthma/MM00406)

Skills Training Steps

- Tell patient the steps and give written instructions
- Demonstrate how to use
- Ask patient to demonstrate how to use
- Tell patients what they did right and what needs improvement
Common Errors in Using Inhalation Devices

MDIs
- Not shaking inhaler prior to use
- Not removing cover
- Not exhaling prior to dose
- Actuating canister too late in inspiratory effort
- Not holding breath for adequate time period
- Multiple actuations of device with a single breath
- Not waiting adequate time between inhalations

DPIs
- Shaking the device after drug has been loaded
- Loss of the dose due to improper handling of the device
- Exhaling into the device
- Not having an adequate inspiratory effort
- Inadequate breath-holding period
Timing Between Inhalations

Same medication
1 minute

Different medications
5 minutes

Interactive Check Point

Which of the following is the best way for a patient to check how many doses are left in a MDI?

a. Float test
b. Manually track doses
c. Dose tracking device
d. All of the above
Interactive Check Point
Answer

b and c
Manually track doses or using a dose tracking device are the best way for a patient to track how many doses are left in an MDI. The float test is not an accurate method and thus should not be used

Determining if Canister is Empty

3 methods:
• Record doses
• Electronic dose counter (Doser® or MD Turbo™)
• Indicator window
Determining if Canister is Empty

- Record doses
- Keep ongoing record of when inhalations are used

Doser®
- Device that attaches to top of MDI canisters
- Records number of times inhaler has been actuated
- Sounds alarm when nearly empty
- Tracks use in past 30 days
- www.doser.com
Determining if Canister is Empty

- Indicator window on some devices
- Examples
  - Budesonide DPI
    - Red mark appears when 20 doses remain
    - Once red fills the indicator window, 0 doses remain
  - Salmeterol DPI
    - Built in counter

CFC Based Inhaler
Storage Recommendations

- Upright position (valve down)
- Avoid temperature extremes
Storage Recommendations

• NOT as important with HFA inhalers
  – Store at room temperature
• Avoid humid environments with DPIs

Inhaler Maintenance

• MDIs
  – Rinse plastic mouthpiece and cap daily
  – Wash with dish washing soap twice weekly
• DPIs
  – Clean with brush or dry cloth
  – Do NOT use water
Devices To Improve Delivery of Inhaled Medications

- Spacers
- Holding chambers
- Nebulizers
- Breath activation system

Spacers

- Increase the distance the drug has to travel before inhaled
  - Slows the aerosol
  - Reduces particle size
  - Traps large particles within the spacer
- Reduce drug deposition in oropharynx
- Very important for corticosteroids
- Do not obviate coordinating actuation and inhalation
Holding Chambers

- Reduce drug deposition in oropharynx AND reduce need for hand-lung coordination
- One-way valve allows dose to be held in chamber prior to inspiration
- Either a single slow, deep inspiration or series of smaller breaths equally effective

Everyone could benefit from the use of a holding chamber
Performance of spacers and holding chambers depends on:

- The particular device
- The MDI used

General Considerations for Use of Spacers and Holding Chambers

- May increase dose of drug delivered
- Actuate inhaler only once into device per inhalation
- May be as effective as nebulizers
- Must be regularly cleaned
Cleaning Instructions

• Should be cleaned several times weekly
  – Disassemble the device
  – Wash all the parts in warm water with a mild liquid soap
  – Allow to air dry
  – Reassemble
• Washing with soap reduces the static charge that accumulates on the walls of plastic devices

Examples

• Spacers – Do not require RX
  – Optihaler®
  – Microchamber®
• Valved holding chambers
  – Aerochamber Max®
  – Optichamber®
  – Vortex®
  – PrimeAire®
  – EZ Spacer®
  – LiteAire®
  – LeverHaler®
Video of Metered Dose Inhaler and Holding Chamber

- http://www.mayoclinic.com/health/asthma/MM00608

Breath Activated Dose Counting System

- MD Turbo™
  - Handheld device to help patients coordinate the press and breathe action of MDI
  - Inhaler is loaded into the device
  - Triggers the inhaler during the patient’s inspiratory breath (between 30-60 l/min)
  - www.mdturbo.com
Nebulizers

- Continuously produce aerosols
- Coordinated breathing not important to drug delivery
- Slow tidal breathing with occasional deep breaths

Types of Nebulizers

- Jet nebulization
  - Flow of gas from compressor or compressed gas source produces aerosolization
- Ultrasonic nebulization
  - High-energy sound waves induce vibrations producing aerosolization
  - Only medication in solution can be used
**Nebulizers - Indications**

- Difficulty with MDI technique
- Children < 5 years old and the elderly
- Some patients with severe asthma
- Delivery method of choice for cromolyn in children

**Nebulizer - Disadvantages**

- Expensive
- Time consuming
  - Treatment can take 5 – 20 minutes
  - Proper cleaning procedure
- Bulky
- Output is device dependent
  - Makes device comparison / selection difficult
Nebulizer Cleaning

• After each treatment
  – Rinse mask/mouthpiece and syringe in warm water for 20-30 seconds
  – Air dry

• After last treatment of the day
  – Wash all components with mild dishwashing detergent and warm water
  – Rinse and air dry

• Once or twice a week
  – Wash and rinse as above. Soak cleaned components in disinfectant solution for 30 minutes
  – Rinse and air dry

Nebulizer versus MDI in Acute Asthma

• Cochrane Review
  – Metered-dose inhalers with spacer produces outcomes that are at least equivalent to nebulizer delivery
  – Holding chamber/spacers may have some advantages compared to nebulizers for children with acute asthma

Cochrane Database Syst Rev. 2006 Apr 19;(2):CD000052
Patients older than 5 who have difficulty using MDIs:

- MDI + holding chamber
- Breath actuated inhaler
- DPI
- Nebulizer

Choose your option below.

Next Topic: Application Exercise #1 — Inhaler Use
Application Exercise

Inhaler Use

Case Presentation

- James is a 17 year old patient who presents to the pharmacy with a prescription for albuterol HFA Inhaler, 2 puffs prn asthma symptoms, 17 grams with 6 refills
Case Presentation

- Current medications: desloratadine 5 mg qd in spring and fall for allergy symptoms
- Medical History:
  - No medication allergies or intolerance
  - Seasonal allergies
  - Asthma
    - Known trigger is pollen

Which is the best way to ensure James knows how to use this inhaler?

a. Ask him how he will use it
b. Show him proper technique and have him demonstrate
c. Provide instruction sheet
d. Have him watch a video demonstration
Best Answer

b. Show him proper technique and have him demonstrate
   • In addition to having him demonstrate his technique, you should provide feedback on his technique and correct any problems
   • A video and/or patient instruction sheet are helpful but do not substitute for observing and providing feedback on the patient’s actual use

How long should he wait between inhalations?

a. 1 minute
b. 5 minutes
c. 10 minutes
d. No time
Best Answer

a. 1 minute
   • Allowing at least some time between inhalations is optimal. This allows the first inhalation to begin working to allow deeper penetration of the second inhalation

How should he store and clean his inhaler?

a. Store in cool dry place, wash weekly
b. Store at room temperature, rinse plastic mouthpiece and cap daily and wash with dish washing soap twice weekly
c. Store with stem down, wash with dish washing soap twice weekly
d. No specific storage requirements, wipe with dry cloth daily, no water washing
Best Answer

b. Store at room temperature, rinse plastic mouthpiece and cap daily and wash with dish washing soap twice weekly
• Because this is an HFA inhaler it does not need to be stored stem down
• Because it is an MDI, the mouthpiece can be washed

Choose your option below.

Next Topic: Patient Monitoring
Patient Monitoring

Recommended Monitoring

• Signs and symptoms of asthma
• Pulmonary function
• Quality of life/functional status
• History of asthma exacerbations
• Pharmacotheraphy
• Patient-provider communication and patient satisfaction
Signs and Symptoms of Asthma

• Has your asthma been better or worse since last visit?
• In past 2 weeks, how many days have you
  – Had coughing, wheezing, SOB, or chest tightness during the day?
  – Awakened from sleep because of symptoms?
  – Awakened with symptoms that did not improve with β2-agonist?
  – Had symptoms while exercising/playing?

Choose your option below.
Next Topic: Peak Expiratory Flow Rate (PEFR) Monitoring
Peak Expiratory Flow Rate (PEFR) Monitoring

Peak Expiratory Flow Rate

• The maximum flow rate obtained during a forced expiration with the lungs fully inflated
• Measured using a Peak Flow Meter (PFM)
• Recorded in liters/minute
Peak Flow Monitoring

• Early warning system
  – Helps detect airway obstruction before symptoms are present
  – Allows early intervention which may prevent attacks or decrease severity
• Assess and adjust drug therapy
• Provides patients with perception of their airway obstruction

Peak Flow Meter

• Simple to use
• Inexpensive
• Portable
• Provides reproducible quantitative results
Limitations of Peak Flow Monitoring

• Effort dependent
• Measures only large airway function
• Unreliable in children < 5 years old

Indications for Peak Flow Monitoring

• Persistent asthma
• History of severe exacerbations
• Poor perceivers
• Any patient who prefers this method
Peak Flow Meter Selection

- Accuracy and reproducibility
- Results can vary between meters
- Use the same meter for comparability of results
Technique

• Must be taught and reassessed frequently
  – At time of meter selection
  – One month later
  – Every 6 months thereafter
• Use same meter

Using a Peak Flow Meter

• Remove gum or food from mouth
• Place indicator at bottom of PFM scale
• Stand
• Fully inflate lungs by taking a deep breath
• Place lips firmly around the mouthpiece
• Blow out as hard and fast as possible
• Wait 10 seconds between measurements
• Repeat twice
• Record the highest of the three readings
Key Step

• Patient must exhale as forcefully as possible each time to get an accurate reading

Meter Cleaning

• Wash inside and out with warm water and a mild liquid soap and air dry
• Can be cleaned on the top rack of the dishwasher. After cleaning, shake out any remaining water and allow to air dry
Uses of Peak Flow Monitoring

- Monitoring during exacerbation
- Short-term monitoring (2-3 weeks)
- Long-term daily monitoring

Monitoring During Exacerbation

- Helps determine severity
- Guides therapeutic decisions
Short-term Monitoring

• Evaluate response to chronic therapy
• Evaluate changes due to irritants or allergens
• Establish personal best

Changes due to irritants or allergens – may need to measure peak flow 4x/day

Long-term Daily Monitoring

• Recommended in moderate to severe persistent asthma
• Poor symptom perception
• History of severe exacerbation
Long-term Monitoring

• Use every morning upon awakening
  BEFORE medications
  – Compare to personal best using peak flow
    zone system

Personal Best

• The highest peak flow rate the patient
  can achieve when his/her asthma is
  well controlled
Establishing a Personal Best

- Two methods:
  - Use predicted average PEFR
  - Determine patient's own personal best

Establishing a Personal Best

- Highest peak flow value obtained over a 2-3 weeks with asthma well controlled
- Measure and record values in early morning and late afternoon/early evening
- Additional readings are needed if a patient needs to use SABA
Interactive Check Point

Given the following peak flow readings, what is this patient’s personal best?

<table>
<thead>
<tr>
<th>Day one</th>
<th>Day five</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 AM</td>
<td>450</td>
</tr>
<tr>
<td>12 noon</td>
<td>480</td>
</tr>
<tr>
<td>6 AM</td>
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</tr>
<tr>
<td>12 noon</td>
<td>500</td>
</tr>
<tr>
<td>Day two</td>
<td>Day six</td>
</tr>
<tr>
<td>6 AM</td>
<td>450</td>
</tr>
<tr>
<td>4 PM</td>
<td>420</td>
</tr>
<tr>
<td>7 AM</td>
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<td>5 PM</td>
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<td>6 AM</td>
<td>470</td>
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<tr>
<td>6 PM</td>
<td>470</td>
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<tr>
<td>Day four</td>
<td>Day eight</td>
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<tr>
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<tr>
<td>5 PM</td>
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</tr>
</tbody>
</table>

Interactive Check Point Answer

- 500
- The personal best is 500 based on only 8 days of values. Would be more accurate to continue to monitor for full 2 weeks and possibly longer
Considerations

- May need a course of oral steroids to establish a personal best
- Exclude outlying values
  - “Spitting”
  - Coughing

Re-establishing Personal Best

- Yearly in adults
- Every 6 months in children
- When changing meters
Peak Flow Zone System

- **All Clear**: 80-100% of personal best
- **Caution**: 50-80% of personal best
- **Alert**: < 50% of personal best

Calculating Peak Flow Zones

1. Personal Best = 500 l/min
2. Multiply personal best by 0.8 and 0.5
   - 500 x 0.8 = 400 l/min  500 x 0.5 = 250 l/min
3. Establish Zones
   - Green = 80 - 100% = 400 - 500 l/min
   - Yellow = 50 - 80% = 250 - 400 l/min
   - Red = below 50% = below 250 l/min
Asthma Action Plan

• Written medication plan based on peak flow zone system or symptoms
• Patient’s action plan
  – Established by the physician
  – Allows patient to adjust medications to variations in peak flow rates or symptoms

Basic Asthma Action Plan Based on Peak Flow Values

• Green zone
  – Take medications as usual
• Yellow zone
  – Use SABA
  – Check about changing medications or increasing dose
• Red zone
  – Use SABA
  – Call doctor or go to emergency room
Monitoring Points for
Peak Flow Monitoring

• Please show me your peak flow monitoring values since your last visit
• Please show me how you measure your peak flow
• When do you usually measure your peak flow?

Patient Documentation

• Recording results
  – Diaries, logs, and charts
• Items to record
  – Time
  – Result
  – Symptoms experienced
  – Time since last dose of β2 agonist
Other Physical Assessment Parameters

- Respiration Rate - normal 12-20 breaths per minute (BPM)
- Use of accessory muscles

Respiration Rate

- Abnormalities of breathing rate and pattern can indicate an asthma exacerbation
- NOT specific
Respiration Rate

• Measurement:
  – Perform without patient’s knowledge
  – One rise (inspiration) and fall (expiration) of the chest represents a respiration
  – Count the number of respirations per minute
    • If regular count for 15 seconds x 4
    • If irregular, count for 1 minute

Respiration Rate

• Interpretation:
  – Adult normal
    • 12-20 breaths per minute with regular rhythm
Respiration Rate

**Interpretation:**
Child normal
- < 2 months < 60 breaths per minute
- 2-12 months < 50 breaths per minute
- 1-5 years old < 40 breaths per minute
- 6-8 years old < 30 breaths per minute

Quality of Life (QOL) and Functional Status

- Since last visit, how many days has asthma caused you to:
  - Miss work or school?
  - Reduce your activities?
  - (For caregivers) change your activity because of child’s asthma?
- Since last visit, have you had any unscheduled doctor’s visits, emergency room visits or hospital stays?
Monitoring Exacerbation History

• Since last visit, have you had any times when asthma was a lot worse than usual?
  – If yes, what caused symptoms to get worse?
  – If yes, what controlled the symptoms?
• Have there been any changes in your home or work environment?

Monitoring Pharmacotherapy

• What medications are you taking?
• How do you feel about taking medications?
• How often do you take each?
• How much do you take each time?
• Have you missed or stopped taking any?
• Any problem filling your prescription(s)?
Monitoring Pharmacotherapy Continued

- How many puffs of $\beta_2$ agonist do you use per day?
- How many $\beta_2$ agonist inhalers did you use in the past month?
- Have you tried other medications or remedies?
- Have your asthma medications caused any problems?
- Please show me how you use your inhaler?

Monitoring Patient-Provider Communication and Patient Satisfaction

- What questions do you have about your asthma action plan?
- What problems have you had with the plan?
- What has prevented you from getting the treatment you need?
- How can we improve your asthma care?
Choose your option below.
Next Topic: Application Exercise #2

Application Exercise
Peak Flow Meter Use
Case Presentation

• Sue is a 35 year old who you instructed on peak flow monitoring 2 weeks ago
• Her current medications are budesonide (Pulmicort Turbuhaler®) 1 puff bid and prn albuterol

Case Presentation

• Sue brought her peak flow meter readings over the past 2 weeks (see next slide) to the visit today. Her asthma has been stable and all readings were taken before medication administration. She has not needed any prn albuterol
Two Week Peak Flow Record

<table>
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</tr>
<tr>
<td>6 AM</td>
<td>500</td>
</tr>
<tr>
<td>Day seven</td>
<td>Day fourteen</td>
</tr>
<tr>
<td>6 AM</td>
<td>500</td>
</tr>
<tr>
<td>6 AM</td>
<td>490</td>
</tr>
</tbody>
</table>

Best Answer

520 l/min
- 520 l/min was the highest value she obtained over the two week period so this is her personal best
Case Presentation

• The 520 l/min value was obtained about an hour after a dose of a short acting $\beta_2$ agonist. She had forgotten to get a value before any medications that day.
• For now, you will use 520 l/min as her personal best.

Determine the Zones for her Asthma Action Plan

• Her green zone is _________
• Her yellow zone is ____________
• Her red zone is ______________
Best Answer

- Her Zones are as follows:
  - Green (80 -100%) = 416 - 520 l/min
  - Yellow (50 - 80%) = 260 - 416 l/min
  - Red (< 50%) = < 260 l/min

Sue’s Action Plan

- Green Zone: All Clear ◆ This is where you should be every day. ◆ Peak Flow 416-520 l/min
  - Budesonide 1 puff 7 AM and 7 PM
Sue’s Action Plan

• Yellow Zone: Caution ◆ You need to take action to get your asthma under control. ◆ Peak Flow 260-416 l/min
  – Albuterol 2 puffs every 20 minutes for up to 1 hr
• If you DO NOT feel better in 1 hour or your peak flow is under 364 (70% of your personal best), follow the Red Zone plan. If you go into the Yellow Zone often, tell your doctor. Maybe your Green Zone medications should be changed to help keep you out of the Yellow Zone. Remember, there is no parking in the Yellow Zone.

Sue’s Action Plan

• Red Zone: Medical Alert ◆ This is an emergency! Get help immediately! ◆ Peak Flow < 260 l/min
• Albuterol 4 puffs and call doctor
• Call 911 if any of the following happens:
  – You are still in red zone after 20 minutes
  – Your lips or fingernails are blue
  – You have trouble walking or talking because of breathing problem
Thank you for your participation.

Click below to proceed to the post test