What is the difference between prednisone and dexamethasone? What is their dosing equivalency.

Dexamethasone is more potent than prednisone meaning a lower dose can be used to achieve that desired effect. The ratio that is typically stated to compare their dosing is 5:1 of prednisone to dexamethasone. This means that 40mg of prednisone is equivalent to 8mg of dexamethasone.

When should we initiate therapy with dexamethasone in the prehospital environment?

Asthma

Therapy should be initiated in the following circumstances in patients with an active diagnosis of asthma.

- Failure to respond to reliever medication (ipratropium/salbutamol) within 15 minutes.
- History of worsening asthma and sudden severe exacerbations

COPD

- Therapy can be considered in the following circumstances in a patient with an active diagnosis of COPD with signs of a severe exacerbation.
    - A COPD exacerbation is characterized by **significant dyspnea** and/or cough and sputum that worsen over the previous 14 days.
    - Severe exacerbation – meets 3 of the following 5 criteria RR over 24, HR over 95, Sa02 less than 92% on room air or patients regular oxygen requirements **plus** failure to respond to medical management, significant work of breathing (tripoding, accessory muscle use, indrawing), acute respiratory failure, onset of new physical signs such as confusion, drowsiness, cyanosis
- **Given lack of mortality benefit and general practice pattern of using prednisone for COPD patients, consider holding dexamethasone if**:
    - Relatively short transport time to hospital
    - Patient responding well to bronchodilators and O2 therapy, which is the mainstay of treatment acutely.
    - There is any doubt on the cause of the shortness of breath or the patient has other medical diagnoses that could lead to shortness of breath (i.e. CHF)

NOTE: Paramedics should generally not initiate dexamethasone for bronchospasm for a patient without a preexisting diagnosis of asthma or COPD as there is a broad differential for wheezing. Of note, patients can smoke and not develop COPD. If the differential

diagnosis is not clear, hospitals will have the opportunity to complete additional testing to confirm the diagnosis. If corticosteroids are ultimately provided in hospital, that is not an indication that we have missed an administration but rather a result of greater access to information in the hospital environment.

Croup

- It is reasonable to give dexamethasone to children with barky cough with history of viral illness that do not appear toxic or septic. Of note, cough it typically worse in the evening and overnight.
- The most common age range for croup is between 6 months and 3 years. Croup should not be the primary suspected condition in children less than 6 months old and dexamethasone should not be administered in this age group. For children over the age of 6, croup is still possible, however other differentials should be considered which include foreign body, RPA, and tracheitis. If there is not certainty around the diagnosis in this age group, consider early transport over administration of dexamethasone.

What are the expected risks and benefits?

Asthma: Oral corticosteroids can be life saving during asthma exacerbations, but there is increasing awareness regarding the risk of repeated course. If patients receive even 4-5 courses during their lifetime they have an increased dose dependent risk of developing diabetes, cataracts, heart failure and osteoporosis.

As such, if pt is managing well with bronchodilators, consider deferring decision for dexamethasone in patients who have had multiple steroid doses, particularly recently.

COPD: Oral steroids are shown to improve oxygenation, decrease length of hospital admission, and reduce risk of relapse or treatment failure. There is no mortality benefit.

Croup: Steroids are the mainstay of croup treatment and improve symptoms as well as reduce hospital length of stay in moderate to severe disease.

Why is the oral the preferred route for dexamethasone administration?

Dexamethasone (and all steroids) are very well orally absorbed (80%) which makes them very effective via this route[i]. Given we promote least invasive strategy, it is reasonable to start with the oral route of administration for most patients.

Why is the pediatric dose of dexamethasone HIGHER than the adult dose?

As a reminder, the equivalent dosing from prednisone/prednisolone to dexamethasone is 5:1. So, a 50mg dose of prednisone is equivalent to an 8mg dose of dexamethasone.

The reason the dose is higher is that there have been several studies looking at single (or in one trial two doses) of a higher dose dexamethasone (0.6mg/kg up to 16mg) versus multiday treatments with prednisone 50mg/day for 5-7 days. They found the results were equivalent or better for pediatric patients and generally were easier to adhere to given it was a single administration of medication. Pediatrics adopted this practice and all guidelines and preprinted order sets have this dosing listed.

The same trials didn't appear as effective in adults, and on top of that, adults typically don't have challenges with adherence so the recommendation for adult exacerbations are still prednisone 50mg for 5-7 days.

So when peds arrive at hospital, they are likely to receive either no or one more dose of dexamethasone. Adults would continue a steroid course for 5-7 days.

Why did the dose of dexamethasone in pediatric patients change from 0.5mg/kg to 0.6mg/kg?

Most resources and studies endorse 0.6mg/kg for management of pediatric croup. Initially the 0.5mg/kg dose was selected for ease of math in calculating doses. That lead to inpatient teams commenting on underdosing cases of pediatric croup. To align with health authorities and best practice, the dose has been increased.

What if the patient is already taking steroids at home?

It really depends on the dose of the medication. Different steroids have different potency. Prednisone is less potent than dexamethasone on a 5 to 1 basis. So prednisone 40mg is approximately equivalent to dexamethasone 8mg.

If a patient is taking prednisone 25mg PO daily or less or dexamethasone 4mg PO daily or less, suggest providing the patient with dexamethasone as outlined in the CPG/Monograph.

If the patient has received higher doses of steroid than those outlined above but continues to present with life threatening or severe asthma, suggest dose of IV dexamethasone.

If my patient has an active infection, such as pneumonia, will steroids worsen their infection?

This is a complex question. Steroids are an immunosuppressant. Steroids can increase risk of infection and impair wound healing when taken on an ongoing basis as they lower

patient's ability to fight infections. They also increase patients risk of developing unusual infections such as fungal infections.

When used in the short term, steroids have been studied in a variety of different infectious states including septic shock, pneumonia, and meningitis with mixed results. They have gained some support for use in severe pneumonia or shock though the support for this practice is mixed.

In short, if patients are suspected of having asthma/COPD as their primary disease process, it is reasonable to give steroids.

If their source of shortness of breath is unclear or difficult to determine – for example they have a clear fever, possible heart failure, or other suspected etiology, it is reasonable to withhold steroids.

The major benefit of steroids occurs when you provide them within the first 12 hours of arrival at the emergency department so a delay at the level of EHS will likely not impact the care and allow the ED department to complete further diagnostic testing. This is especially true in COPD.

How to determine the cause of a patient's shortness of breath when they have multiple possible causes?

This may not be possible prehospital and often complex patients may have multiple cause for shortness of breath (i.e. CHF exacerbation will trigger COPD exacerbation).

- Patients with known asthma or COPD may have insight to whether their acute episode is consistent with those diagnoses.
- Symptoms responding well to short acting bronchodilator (salbutamol) are more likely to be related to obstructive lung disease.
- Symptoms not associated with obstructive lung disease such as crackles, acute leg edema, chest pain, upper back pain, fevers, vomiting should lead to questioning whether obstructive lung disease is the main cause.
- Suggest avoiding dexamethasone in patients with known CHF or who are having CHF exacerbation even if a COPD exacerbation is suspected at the same time. NOTE: Only patients with a known diagnosis of asthma or COPD should be treated with dexamethasone. Wheezing has a broad differential that includes causes aside from asthma and COPD.

Should dexamethasone be used in anaphylaxis?

Dexamethasone is not considered adjunct for early treatment of anaphylaxis. Dexamethasone has an onset of action of approximately one to two hours, it has no role in the early management of anaphylaxis and focus should be given to well established treatments such as epinephrine. Some guidelines still cite its use as adjunct treatment in late anaphylaxis in patients who have bronchospasm and are not responding to first line therapies.

What pediatric specific information should I know about dexamethasone?

- In general, if there are short transit times to the hospital for pediatrics, suggest transferring the patient over administration of dexamethasone.
- In children less than 1, viral symptoms and wheeze are often due to bronchiolitis. This condition is unlikely to respond to bronchodilators and should not be managed with dexamethasone.

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