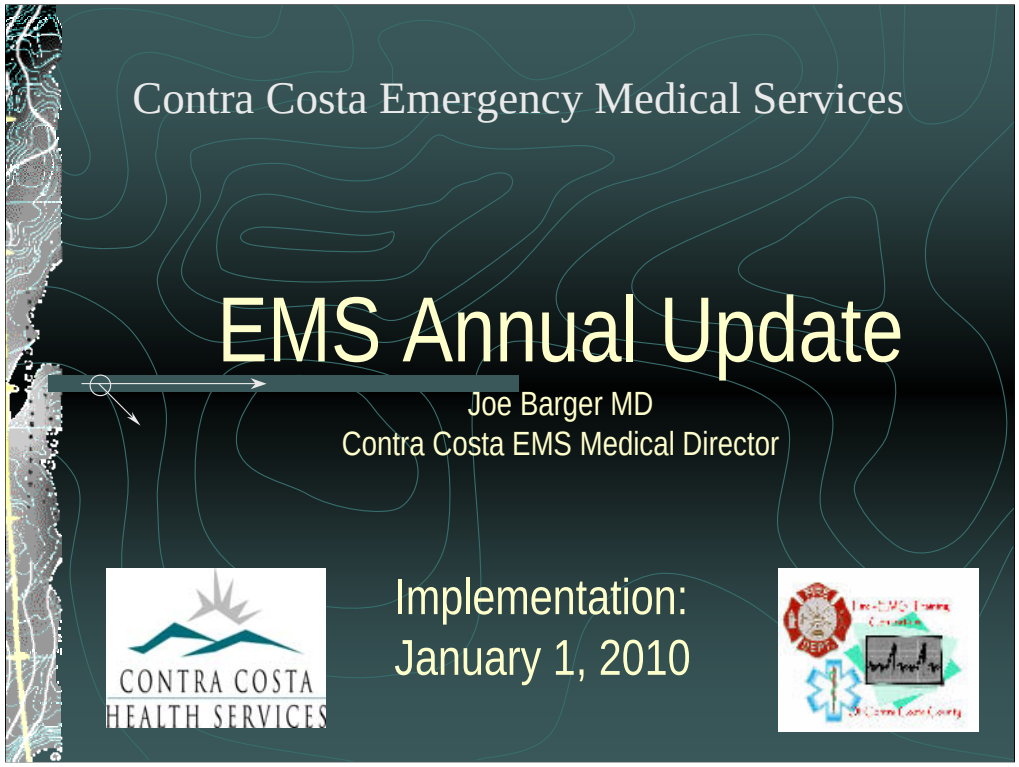
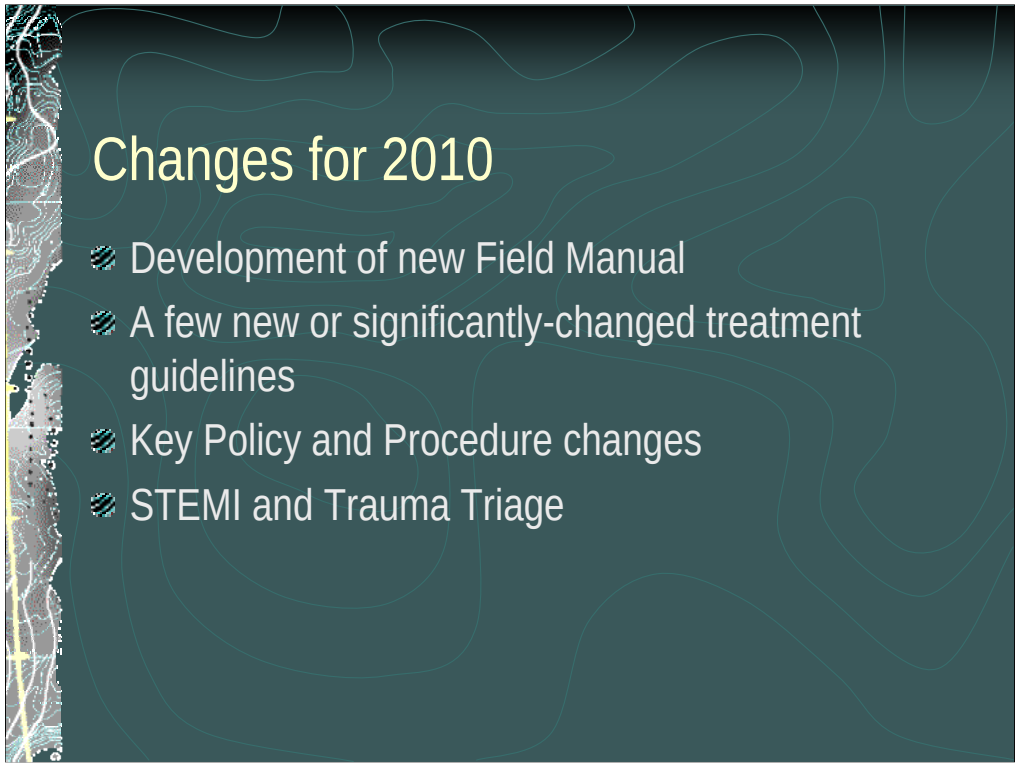


•Welcome to the Annual Contra Costa County EMS Update.

•The purpose of this update is to provide you with information and training on changes to Contra Costa prehospital care guidelines (PHCG) and (goldenrod) policy and procedures.

•Updated protocols, policies and guidelines go into effect January 1, 2010 and will be posted on www.cccems.org website at that time.

•If you have any questions after the presentation please contact your EMS provider agency educator or Contra Costa EMS.



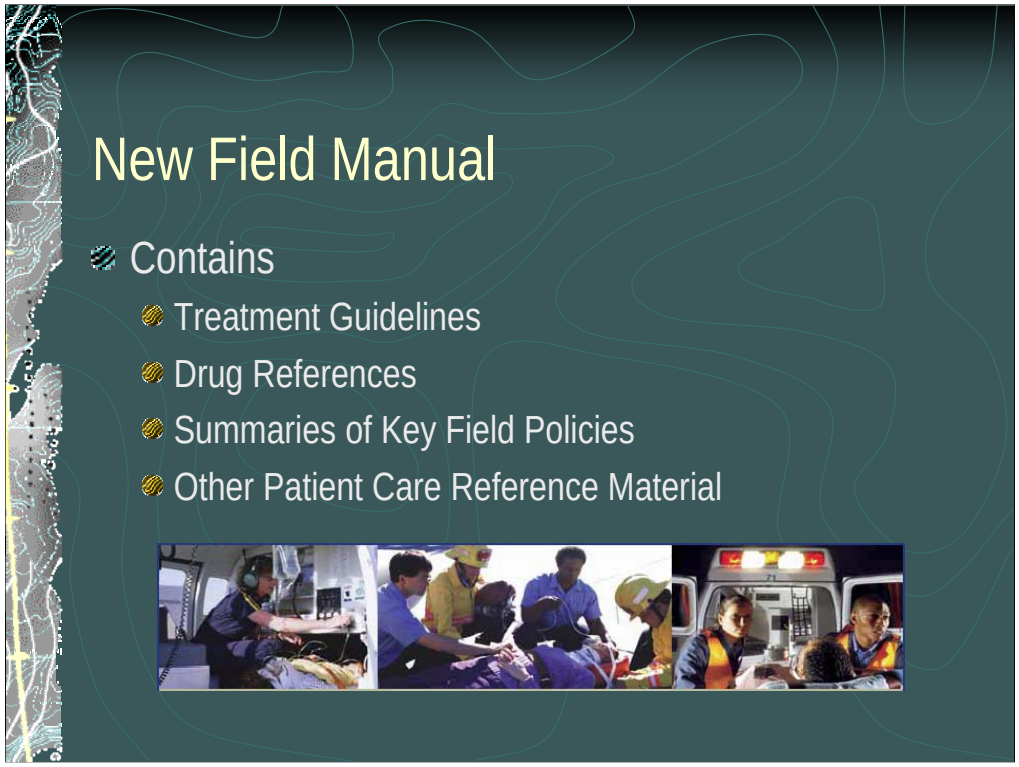
•There are many significant changes in the Prehospital Care Manual and in policies and procedures that will go into effect January 1.

•This presentation will go over many of the changes in great detail.

•Most patient treatment is unchanged but the format and content of our treatment guidelines have changed.

•In order to develop a pocket field manual information needed to be streamlined and duplication eliminated.

•Contra Costa EMS believes that the new format is more user-friendly and we will be looking for your comments and recommendations in the coming year to evaluate how effectively it meets your needs.

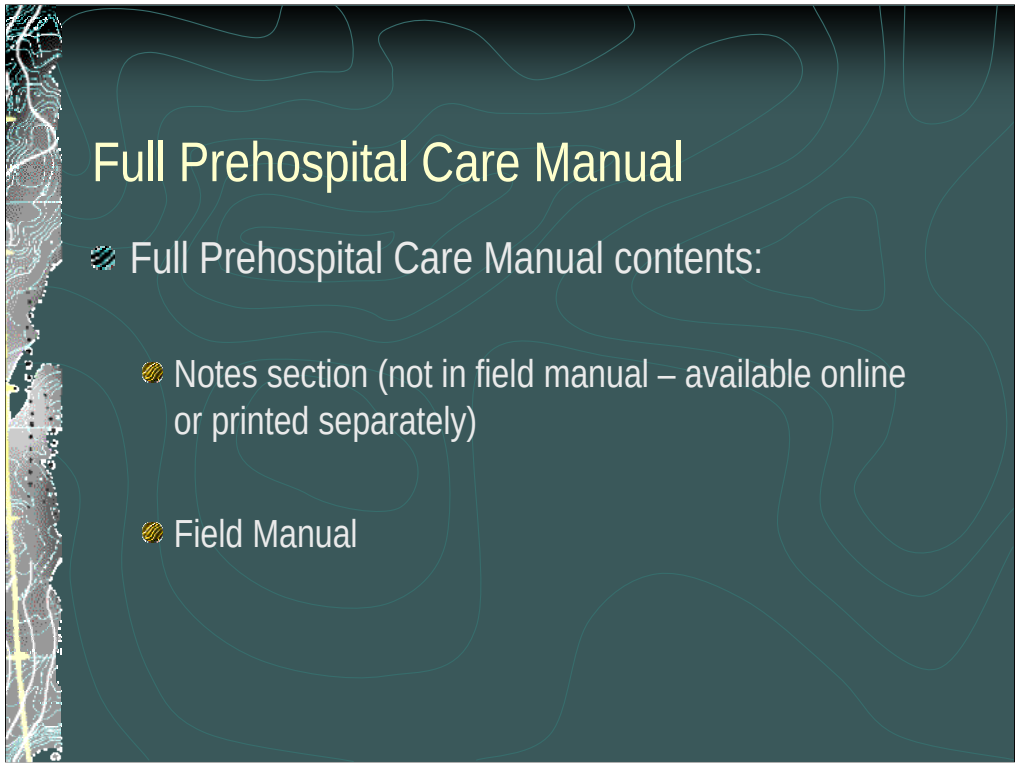


•The field manual is designed for a 4” X 6” format that truly should be pocket-sized.

•Compared to the field manuals that consisted of reductions of our full-sized pages, this should be more readable.

•In addition to all treatment guidelines, the manual has a number of reference documents, including summaries of key field policies.

•This is a new document for us, and we’re sure that in future years we can improve – we are certainly open to feedback on this.

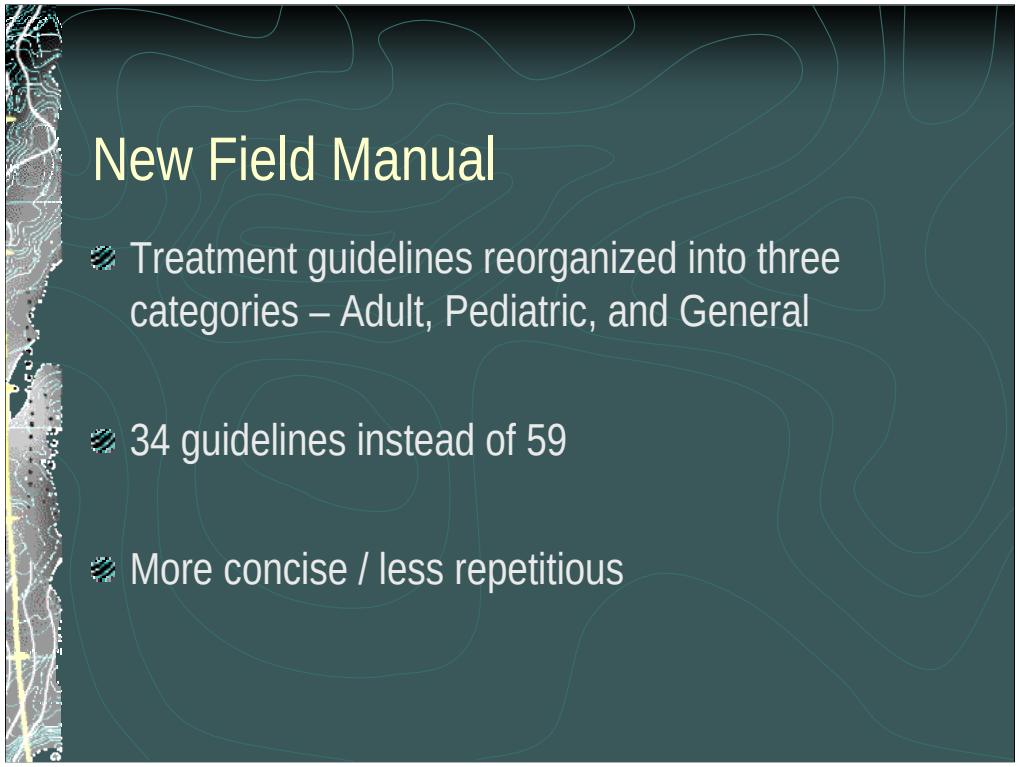


•Not all the contents of our current prehospital care manual will be in the field manual.

•Reference material that is unlikely to be consulted in the field was not included in the field manual.

•However those resources will still be available in the 8 ½ X 11 format along with the contents of the field manual.

•The 8 ½ x 11 format will still be available to you and available on our website at www.cccems.org

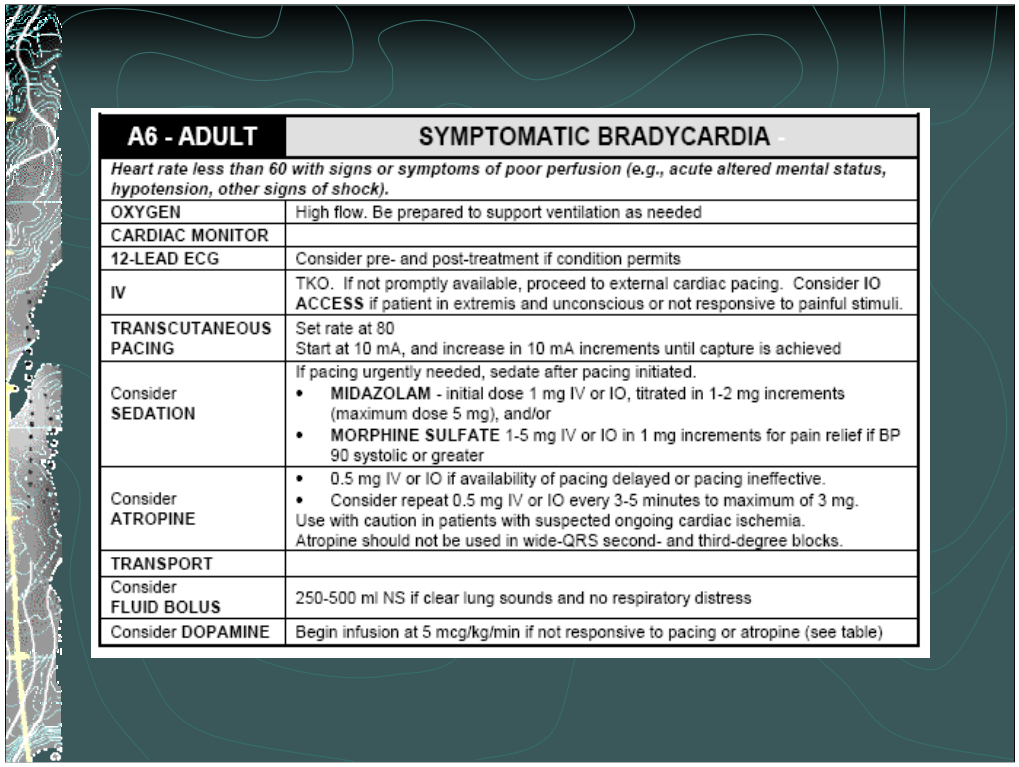


•We have reorganized from nine groups of guidelines down to three, adult, pediatric and general (many of which pertain to both adult and pediatric patients).

•When pediatric content is included in general guidelines, it is highlighted with a special icon (a star).

•In general, most guidelines have not changed significantly in terms of the treatments that are listed.

•The format has changed for all guidelines.

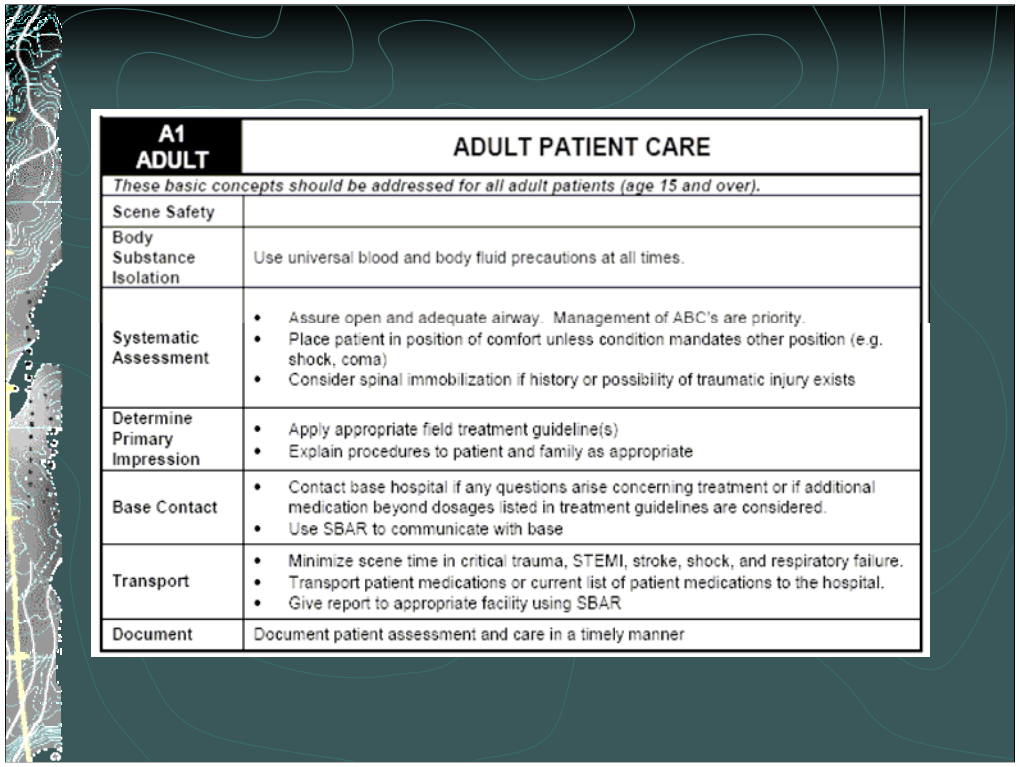


A6 - ADULT	SYMPTOMATIC BRADYCARDIA
Heart rate less than 60 with signs or symptoms of poor perfusion (e.g., acute altered mental status, hypotension, other signs of shock).	
OXYGEN	High flow. Be prepared to support ventilation as needed
CARDIAC MONITOR	
12-LEAD ECG	Consider pre- and post-treatment if condition permits
IV	TKO. If not promptly available, proceed to external cardiac pacing. Consider **IO ACCESS** if patient in extremis and unconscious or not responsive to painful stimuli.
TRANSCUTANEOUS PACING	Set rate at 80 Start at 10 mA, and increase in 10 mA increments until capture is achieved
Consider **SEDATION**	If pacing urgently needed, sedate after pacing initiated. • **MIDAZOLAM** - initial dose 1 mg IV or IO, titrated in 1-2 mg increments (maximum dose 5 mg), and/or • **MORPHINE SULFATE** 1-5 mg IV or IO in 1 mg increments for pain relief if BP 90 systolic or greater
Consider **ATROPINE**	• 0.5 mg IV or IO if availability of pacing delayed or pacing ineffective. • Consider repeat 0.5 mg IV or IO every 3-5 minutes to maximum of 3 mg. Use with caution in patients with suspected ongoing cardiac ischemia. Atropine should not be used in wide-QRS second- and third-degree blocks.
TRANSPORT	
Consider **FLUID BOLUS**	250-500 ml NS if clear lung sounds and no respiratory distress
Consider **DOPAMINE**	Begin infusion at 5 mcg/kg/min if not responsive to pacing or atropine (see table)

•Here is a sample of a treatment guideline.

•The key interventions are on the left-hand side and the details of care are on the right.

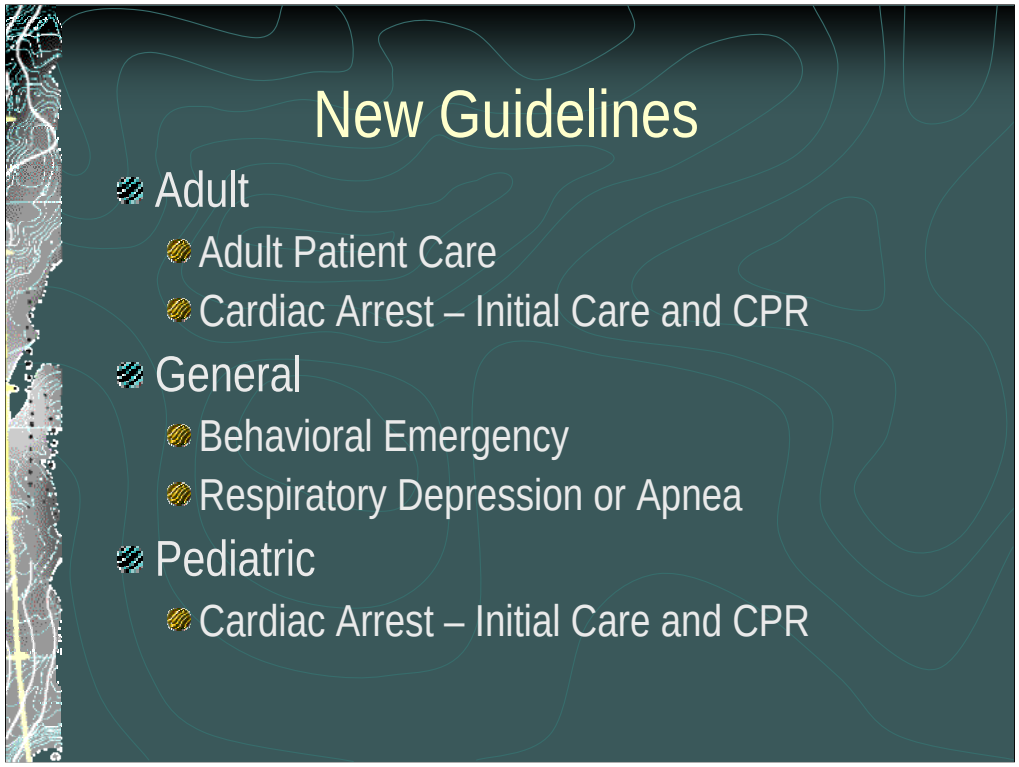
•All of the guidelines follow this format.



A1 ADULT	ADULT PATIENT CARE
These basic concepts should be addressed for all adult patients (age 15 and over).	
Scene Safety	
Body Substance Isolation	Use universal blood and body fluid precautions at all times.
Systematic Assessment	• Assure open and adequate airway. Management of ABC's are priority. • Place patient in position of comfort unless condition mandates other position (e.g. shock, coma) • Consider spinal immobilization if history or possibility of traumatic injury exists
Determine Primary Impression	• Apply appropriate field treatment guideline(s) • Explain procedures to patient and family as appropriate
Base Contact	• Contact base hospital if any questions arise concerning treatment or if additional medication beyond dosages listed in treatment guidelines are considered. • Use SBAR to communicate with base
Transport	• Minimize scene time in critical trauma, STEMI, stroke, shock, and respiratory failure. • Transport patient medications or current list of patient medications to the hospital. • Give report to appropriate facility using SBAR
Document	Document patient assessment and care in a timely manner

•One of the things we have done is to put some general guidelines in both an “Adult Patient Care” and “Pediatric Patient Care” guidelines that have some of the typical info that used to be in many of the guidelines – things like open airway, manage ABC’s, position of comfort.

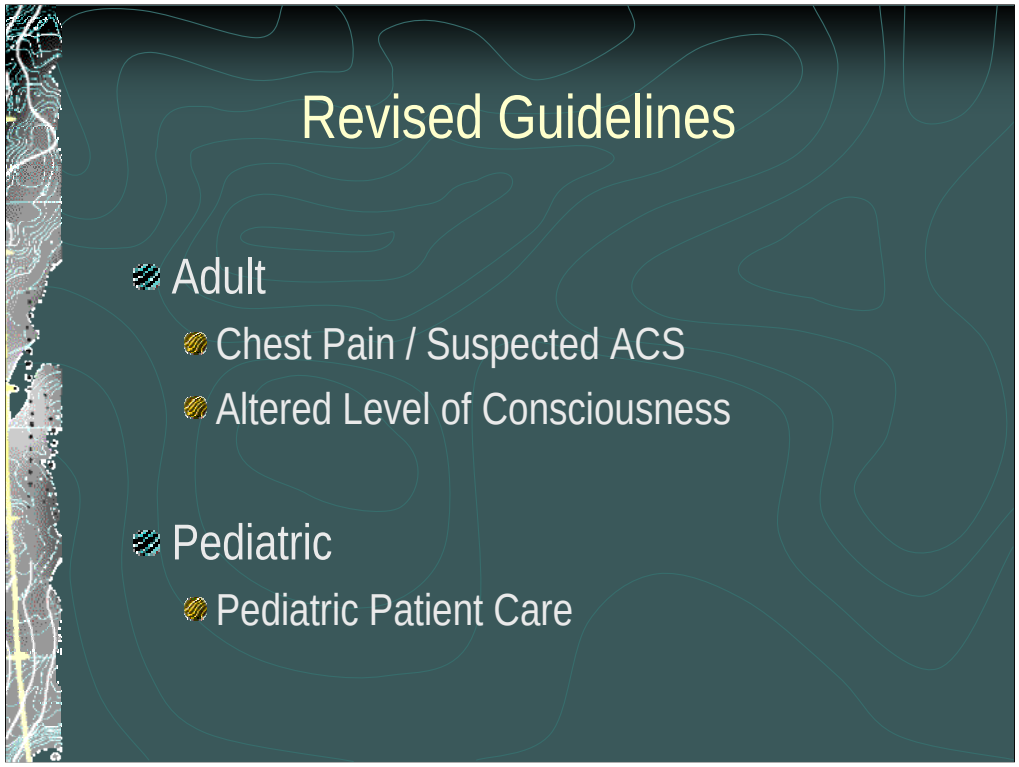
•These items are not repeated in the other treatment guideline and it is assumed that all patient care should follow these general guidelines as well as the guideline specific to the patient’s needs/complaint.



•For 2010 we have a few new guidelines.

•These include Cardiac Arrest, Behavioral Emergency and Respiratory Depression or Apnea guidelines which we will review in detail.

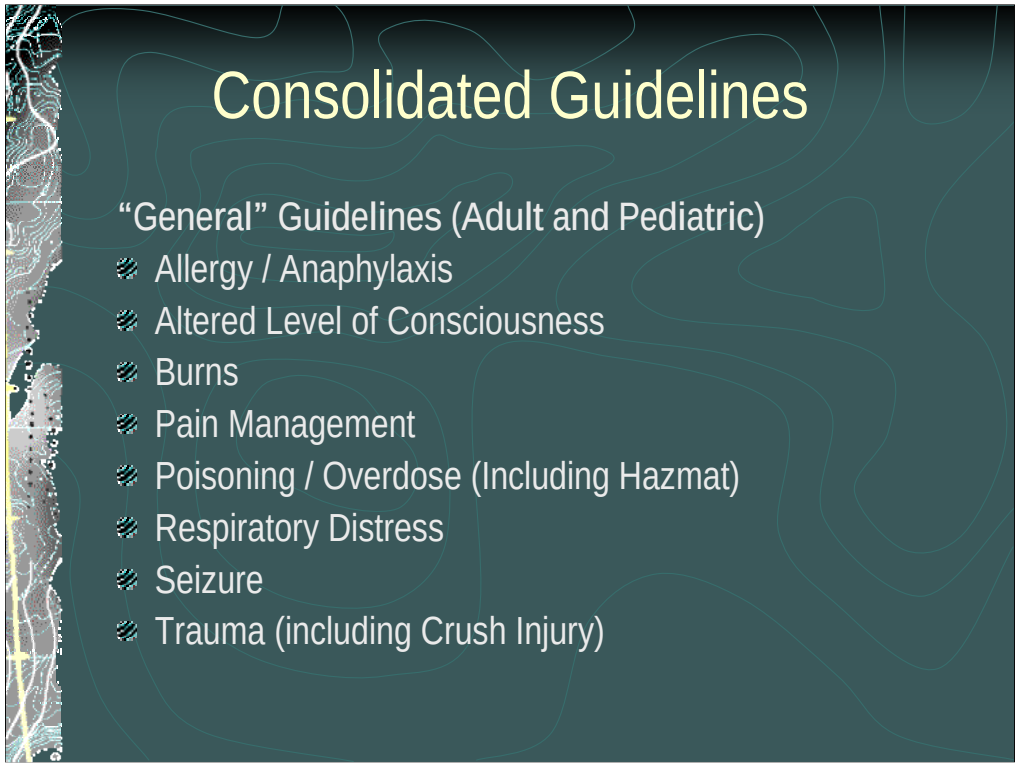
•The new adult patient care guideline is self explanatory and straight-forward.



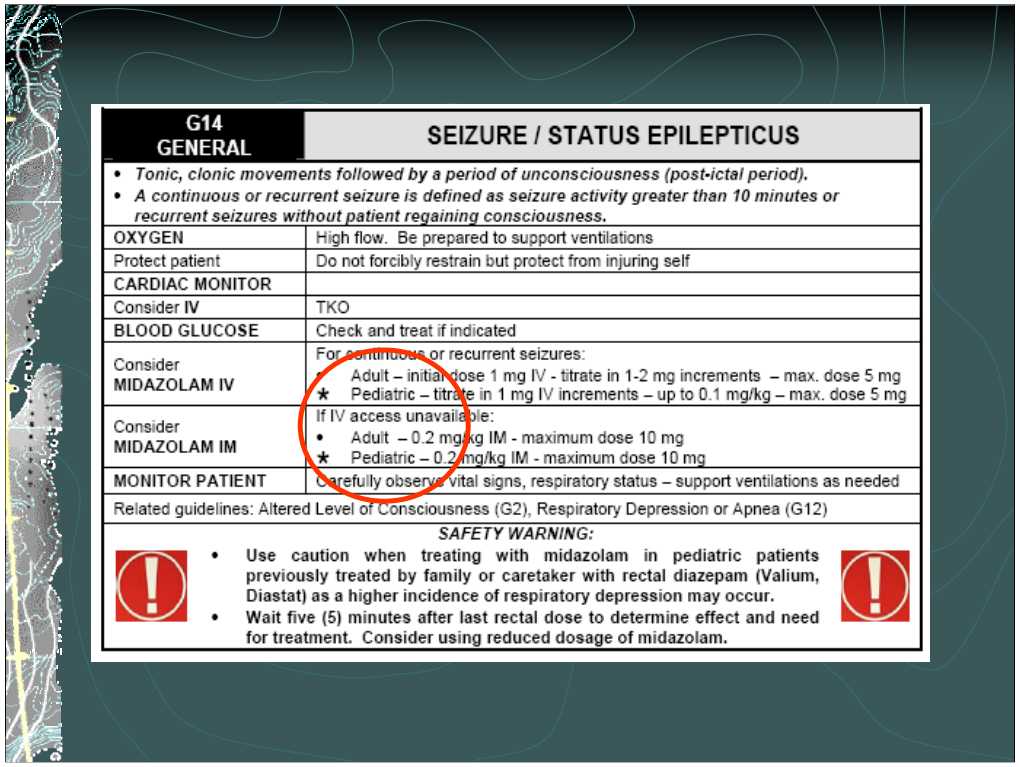
•We also have made some important changes to our Chest Pain / Suspected ACS guideline which will be discussed in greater detail.

•There are also changes in ALOC guideline that are the result of implementing the new guideline on respiratory depression or apnea.

•Our Pediatric Patient Care Guideline has also been revised to include the items that should be addressed on all calls, similar to the adult patient care guideline.



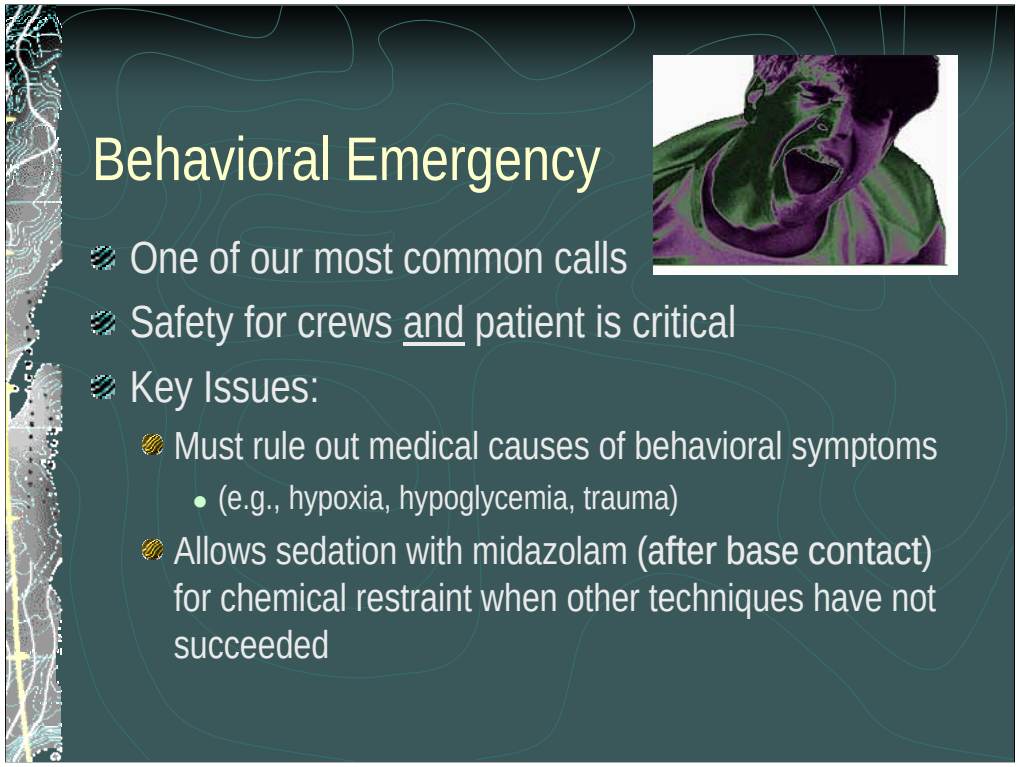
The eight treatment guidelines listed are ones in which there have been consolidation of adult and pediatric care into one guideline. For the most part the only differences in the guidelines were related to drug dose – both doses are listed in the new format.



G14 GENERAL	SEIZURE / STATUS EPILEPTICUS
• *Tonic, clonic movements followed by a period of unconsciousness (post-ictal period).* • *A continuous or recurrent seizure is defined as seizure activity greater than 10 minutes or recurrent seizures without patient regaining consciousness.*	
OXYGEN	High flow. Be prepared to support ventilations
Protect patient	Do not forcibly restrain but protect from injuring self
CARDIAC MONITOR	
Consider IV	TKO
BLOOD GLUCOSE	Check and treat if indicated
Consider MIDAZOLAM IV	For continuous or recurrent seizures: • Adult – initial dose 1 mg IV - titrate in 1-2 mg increments – max. dose 5 mg ★ Pediatric – titrate in 1 mg IV increments – up to 0.1 mg/kg – max. dose 5 mg
Consider MIDAZOLAM IM	If IV access unavailable: • Adult – 0.2 mg/kg IM - maximum dose 10 mg ★ Pediatric – 0.2 mg/kg IM - maximum dose 10 mg
MONITOR PATIENT	Carefully observe vital signs, respiratory status – support ventilations as needed
Related guidelines: Altered Level of Consciousness (G2), Respiratory Depression or Apnea (G12)	
SAFETY WARNING: • **Use caution when treating with midazolam in pediatric patients previously treated by family or caretaker with rectal diazepam (Valium, Diastat) as a higher incidence of respiratory depression may occur.** • **Wait five (5) minutes after last rectal dose to determine effect and need for treatment. Consider using reduced dosage of midazolam.**	

This shows one of the General guidelines for seizure – both adult and pediatric doses appear in the same guideline.

Note the star next to pediatric doses. All pediatric doses mentioned in the general guidelines have the star before them.



•It has been a long time coming but we have developed a guideline for behavioral emergencies.

•Somewhere between 10-15% of calls involve behavioral issues or mental health patients.

•Behavioral patients constitute a high volume high risk population in our EMS System.

•Changes in our policy reflect improved guidance for the protection of both our providers and the patient.

Behavioral Emergency

- Non-pharmacologic approaches to deal with patients (de-escalation and physical restraint) must be used/attempted prior to use of midazolam
- Base contact is required

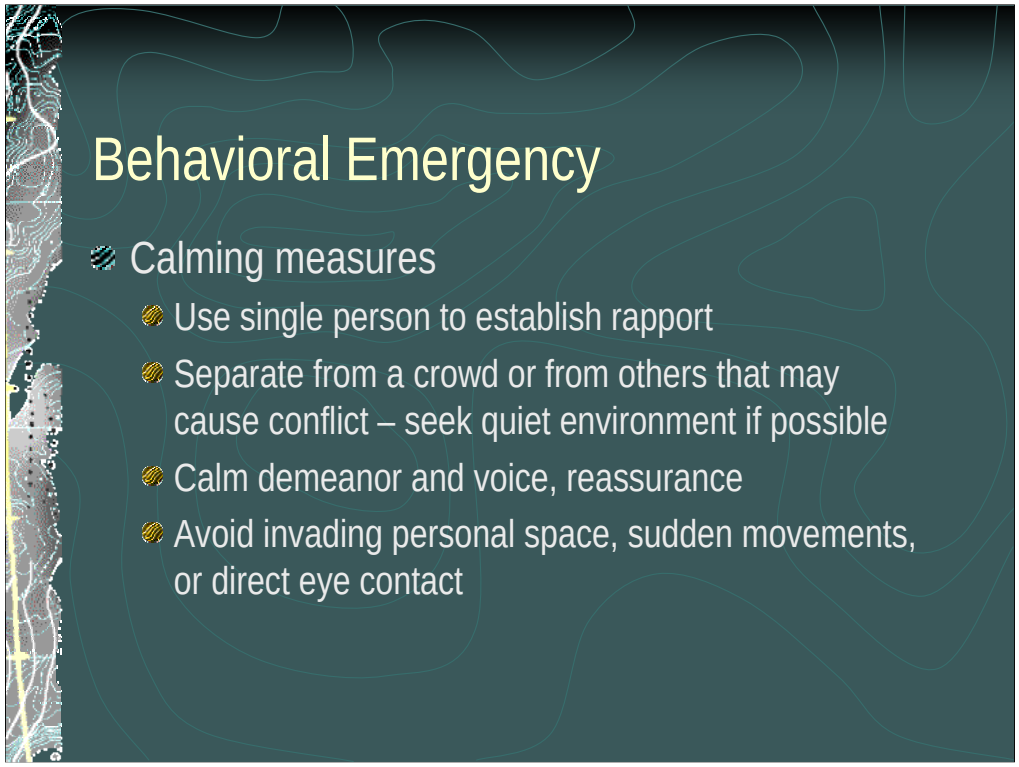
•Paramedics have always had the ability to call base for midazolam in behavioral emergency situations.

•That has not changed – the base still needs to be called.

•Currently we have been averaging around 4-5 calls for sedation for behavioral issues every year.

•We believe that there are more patients who may be in need of this treatment in order for everyone involved to be safe.

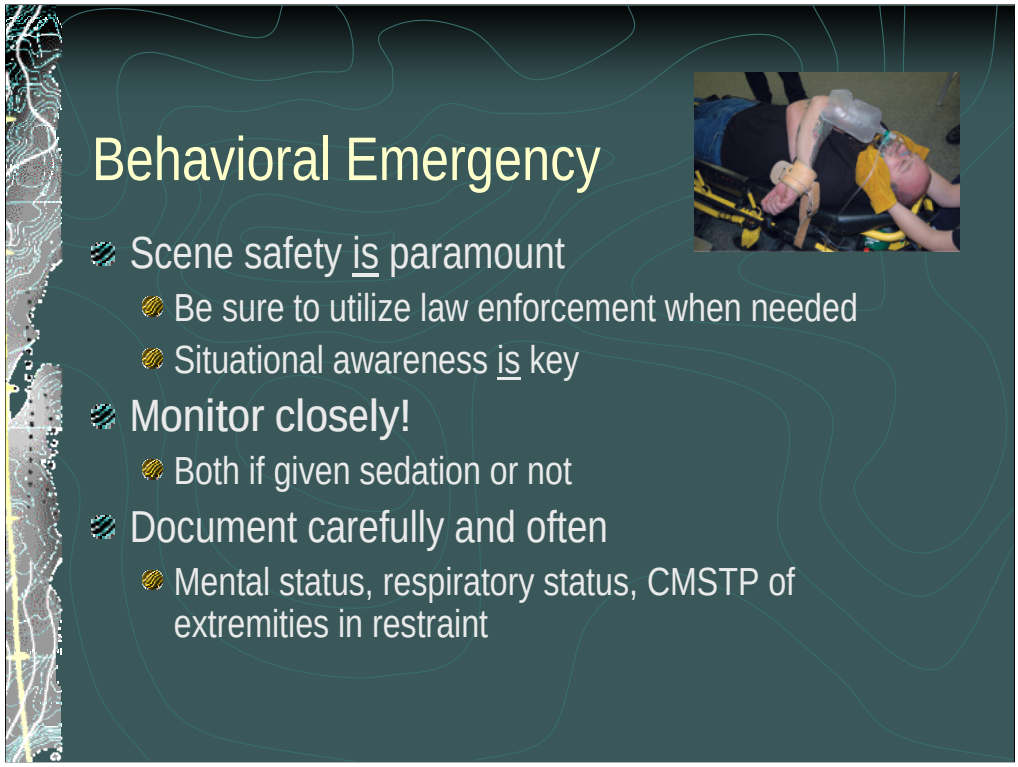
•But before using drugs, all the other de-escalation and restraint techniques need to be done or attempted.



•In the heat of the moment, there may be times where doing all of these things are difficult but what is clear is that in many situations, the behavior and actions of those taking care of these patients or others around them can either have a beneficial or detrimental effect.

•We want all personnel to do their best in these sometimes trying situations.

•If you need additional training on verbal de-escalation contact your EMS agency educator for the Fire EMS Consortium Training module on Behavioral Emergencies.

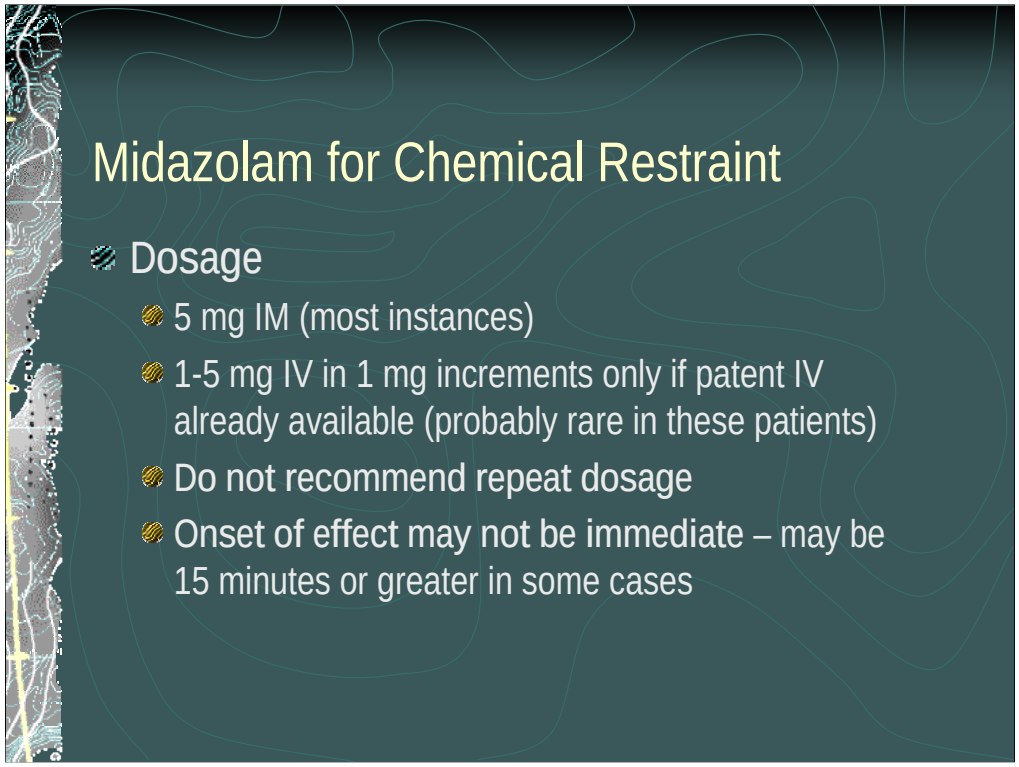


•Safety issues are paramount for both you and the patient.

•The patients who are sedated need close monitoring – ECG and pulse ox monitoring, when they can be done, should be done.

•Assessment of CMSTP of extremities of patients in restraings should be done every 15 minutes.

•Careful observation needs to be backed up with careful documentation – these can be risky patients from a medicolegal standpoint.

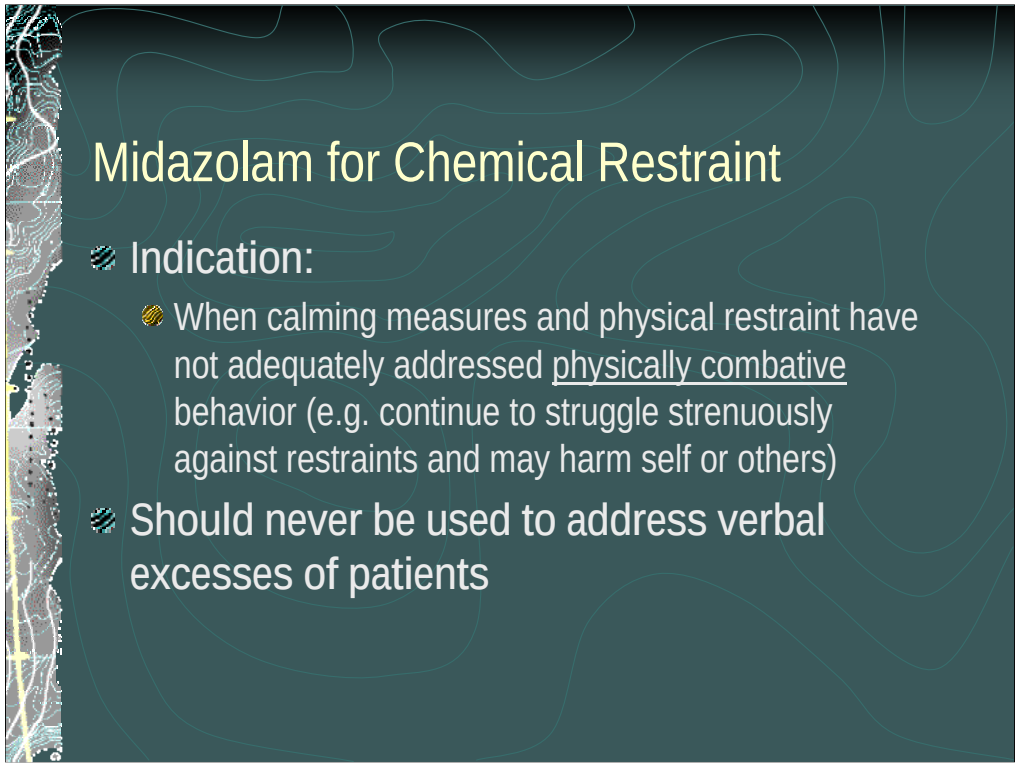


•Most of the time Midazolam will be given IM.

•If you could start and IV or keep one in, you probably wouldn't need the drug.

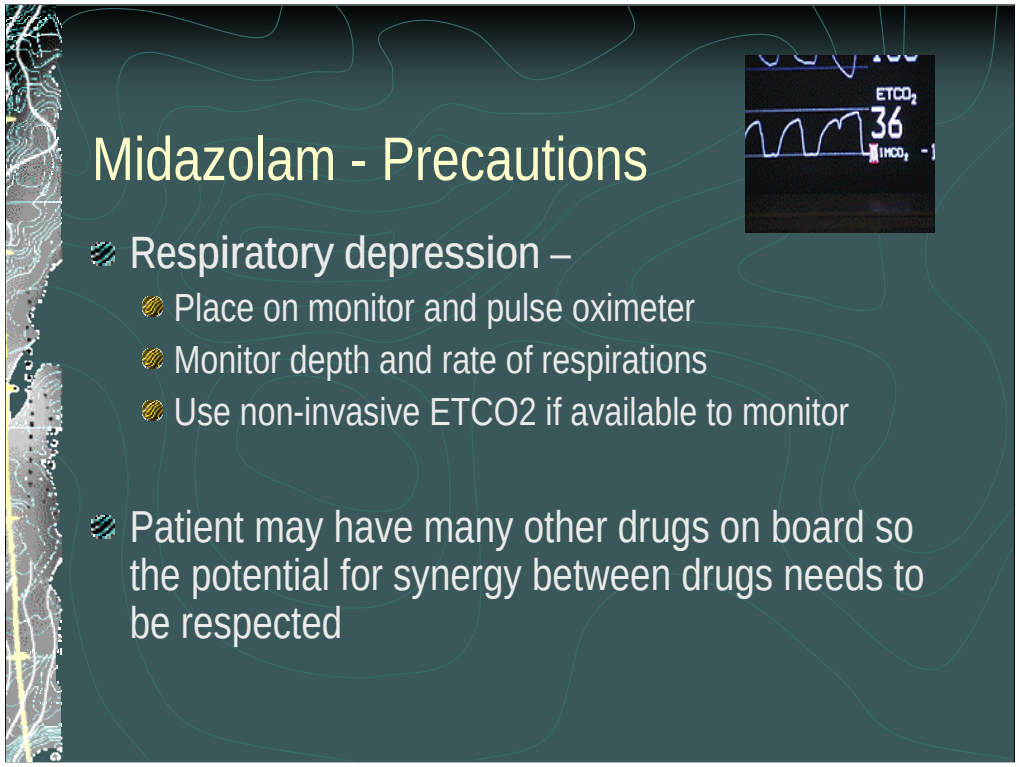
•The onset may be delayed and it is key that we don't add one layer of sedation over another and end up with respiratory compromise.

•For this reason, repeat dosage is not recommended.



•Chemical Restraint is not first line therapy and has significant risks associated with it.

•Documentation of the indication, base contact, patient monitoring and patient response is essential.

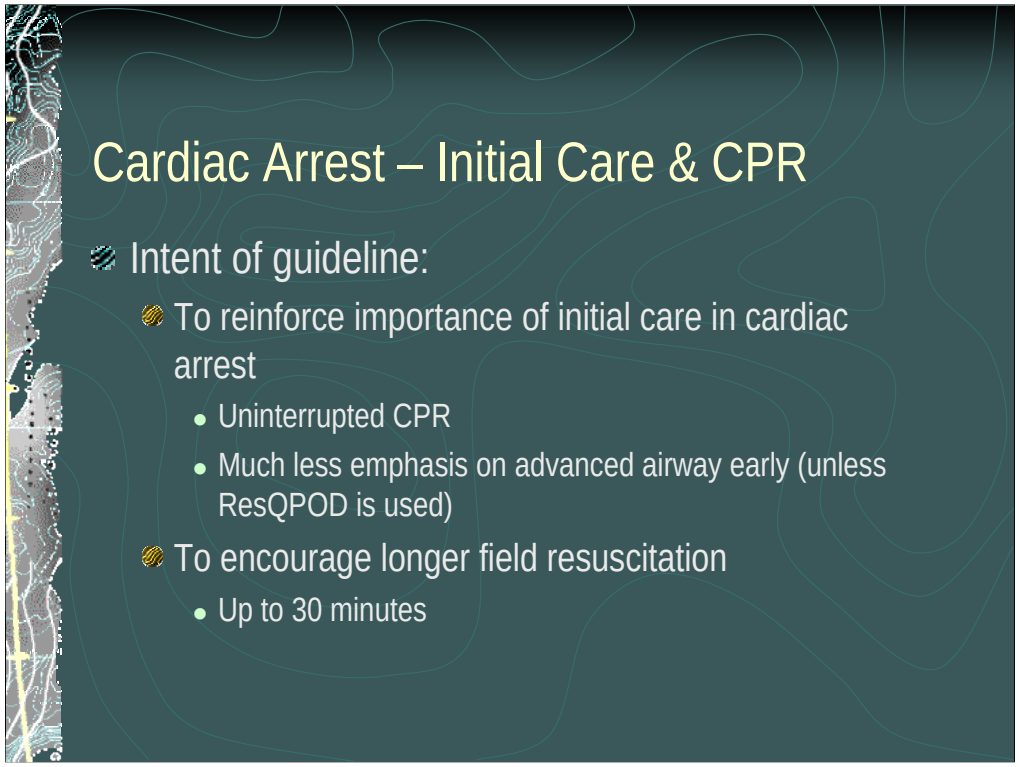


•Some agencies are adopting use of nasal cannula for monitoring end-tidal carbon dioxide.

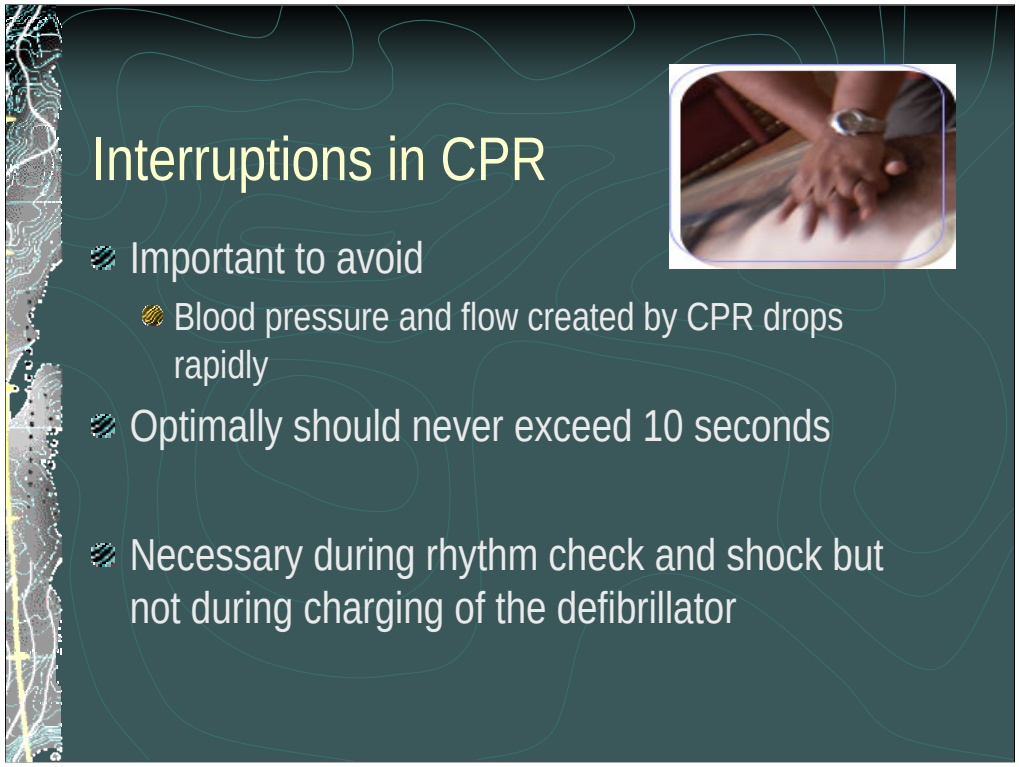
•This can be particularly helpful in early detection of respiratory depression and also will give a respiratory rate for documentation.

•These patients may have other drugs on board and BLS management of airway may be needed if there is a temporary decrease in respiratory rate or depth.

•Always be prepared to support ventilation



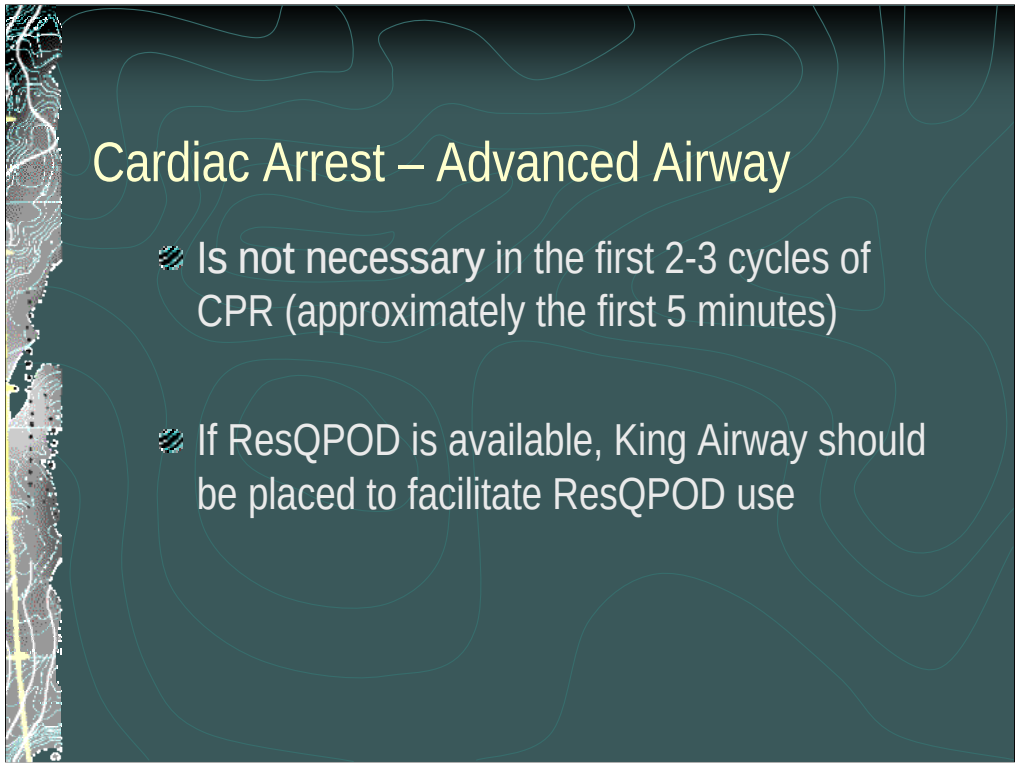
- We have introduced a Cardiac Arrest – Initial Care guideline because many of the critical steps that save lives happen in the first few minutes.
- There is little evidence that medications, IV's, or intubation lead to better survival – it is CPR and defibrillation, and if CPR is not done well, defibrillation may not work.



•CPR “builds up a head of steam” and helps move blood through the vascular system, and this is felt to be a critical item to condition the heart to be able to resume beating in an organized fashion.

•When we stop CPR we lose that head of steam and it takes a long time to re-establish it.

•The new CPR guidelines scheduled to come out late in 2010 may actually further increase the compression/ventilation ratio to further emphasize the importance of compressions over ventilation.



•For patients who truly have sudden cardiac death, most have adequate oxygen levels at the time of arrest.

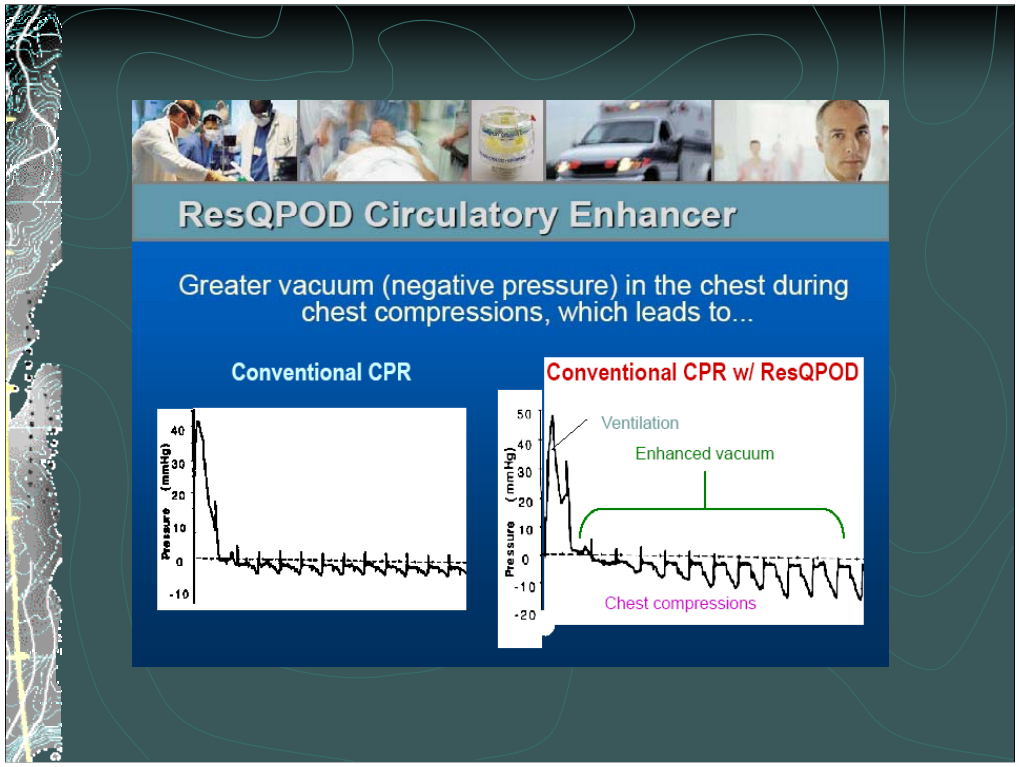
•That differs from those who may be arresting from a respiratory cause, drowning, trauma, and other causes.

•But in sudden cardiac arrest, there appears to be plenty of oxygen to sustain the body for several minutes – so the emphasis has turned away from maximizing oxygenation early in a cardiac arrest.

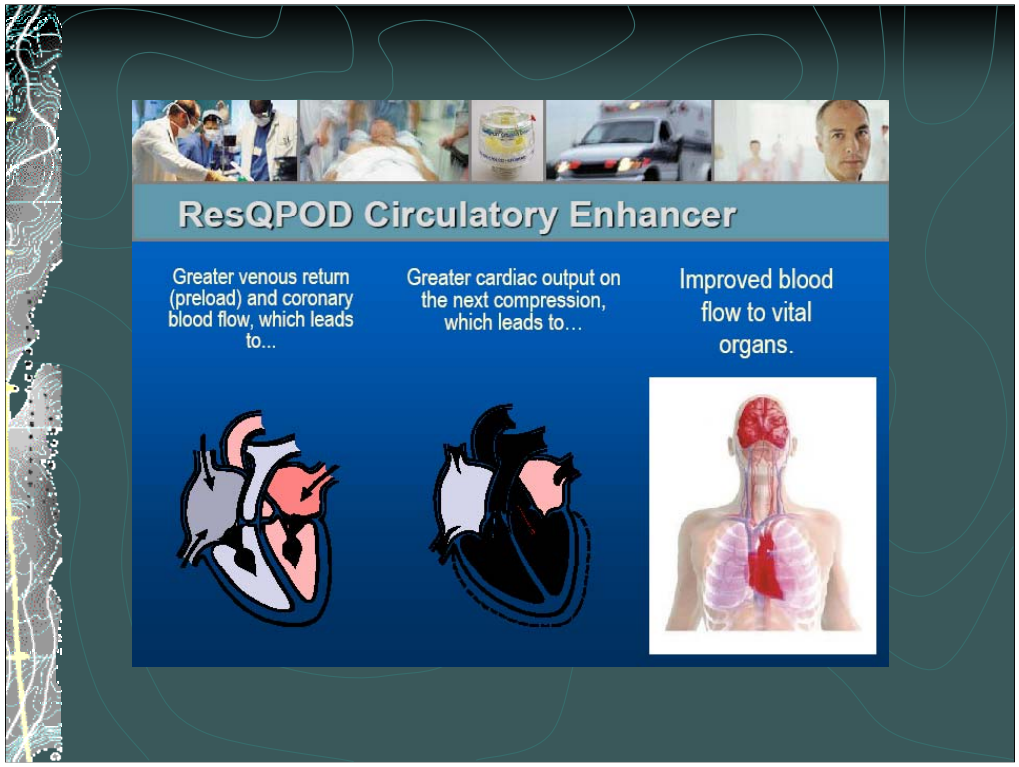
•Interruption of CPR to pass an endotracheal tube isn't a worthwhile tradeoff early in resuscitation.

•This is why we are not recommending any advanced airway in the first 2-3 cycles – unless ResQPOD is being used.

The ResQPOD is also called an impedance threshold device or ITD. It is currently being used in San Ramon and is an optional item to carry in Contra Costa, but several other agencies are planning to begin use of this in the near future. It keeps air from rushing back into the chest during chest recoil.



That creates a larger negative pressure or vacuum in the chest as the chest expands but the air doesn't return.



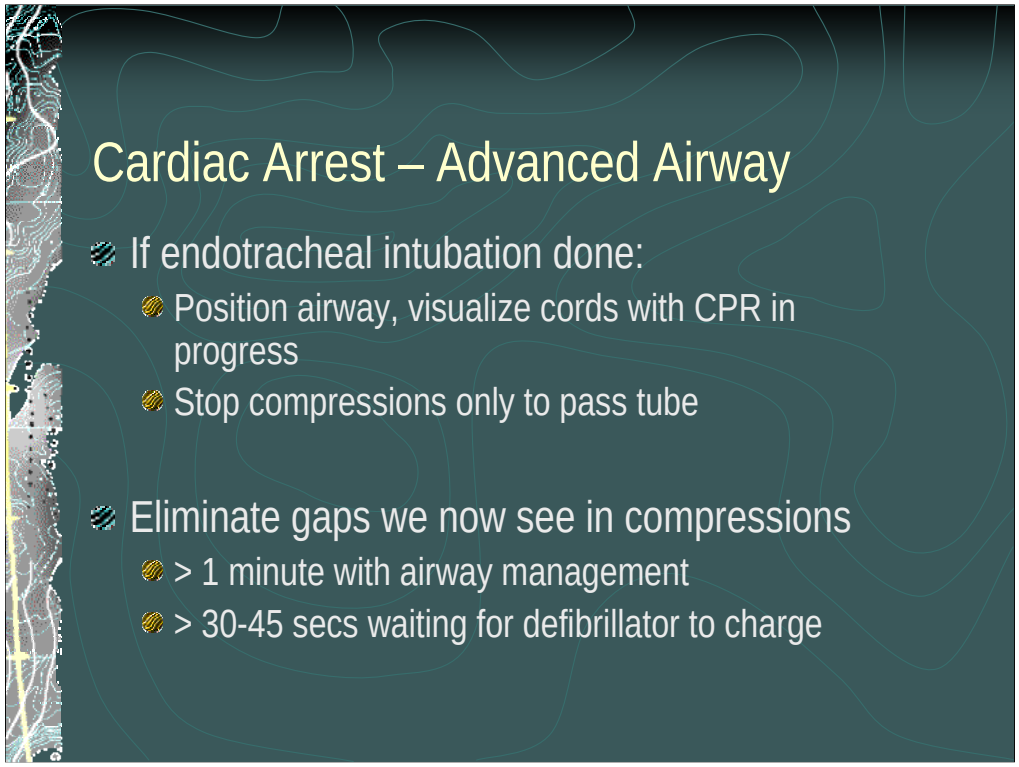
This improves venous return, which leads to more blood being pumped during CPR and better flow to vital organs. Whether this device makes a difference in outcome is still being studied but many preliminary studies are promising.

Cardiac Arrest and ResQPOD

- Impedance threshold device (ITD)
  - Can be done with a BLS airway but requires a continuous seal of the mask
  - Use with BLS airway not included in our treatment protocol

•The device can be used with a BVM, but it requires a continuous tight seal and it was decided that we will not use it with BLS airways at this point. So that is why we are recommending King Airway early – if we're going to use the ResQPOD we should use it as early as possible, and King airway allows rapid insertion without interruption of CPR.

• It can be used with an endotracheal tube as well.



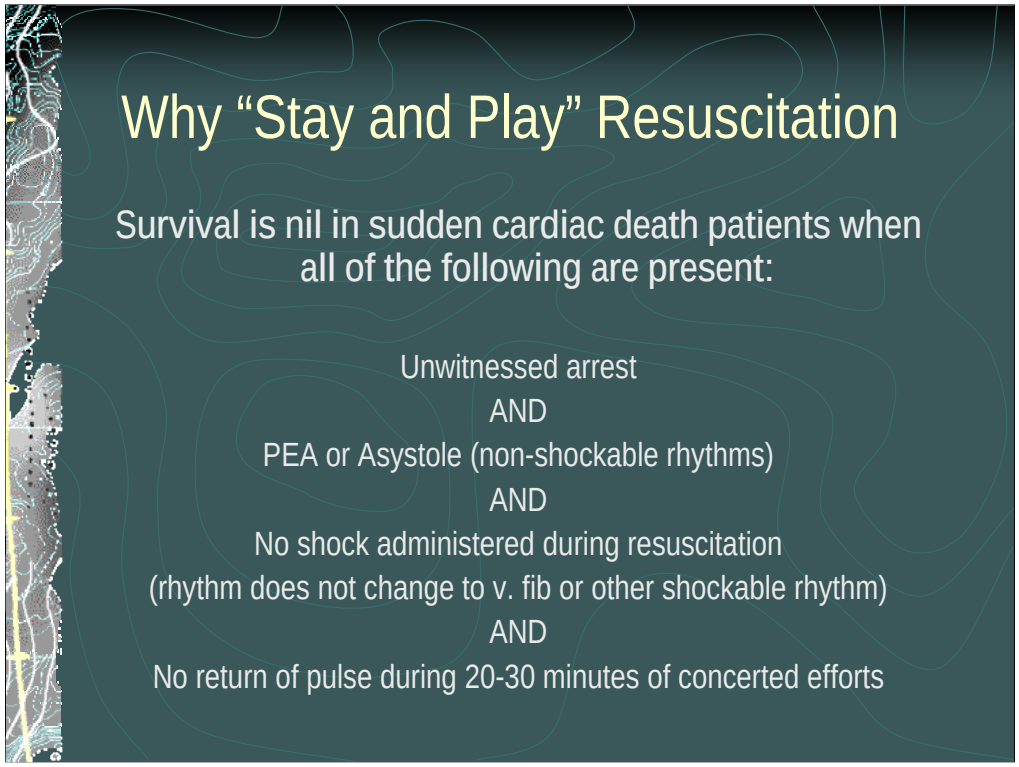
•We are recommending a change in the way we often do intubation – Currently we see many cases in which CPR is stopped while the airway is positioned, suctioning done, etc., and long gaps occur where CPR isn't done.

•Other EMS systems now only stop for tube passage and that is our goal – it may take some practice to get there.

“Stay and Play” Resuscitation

- EMS has essentially the same tools the hospital has to treat cardiac arrest
- Transport
  - Interrupts compressions
  - Less than optimal compression depth
  - Possible injury to rescuers en route

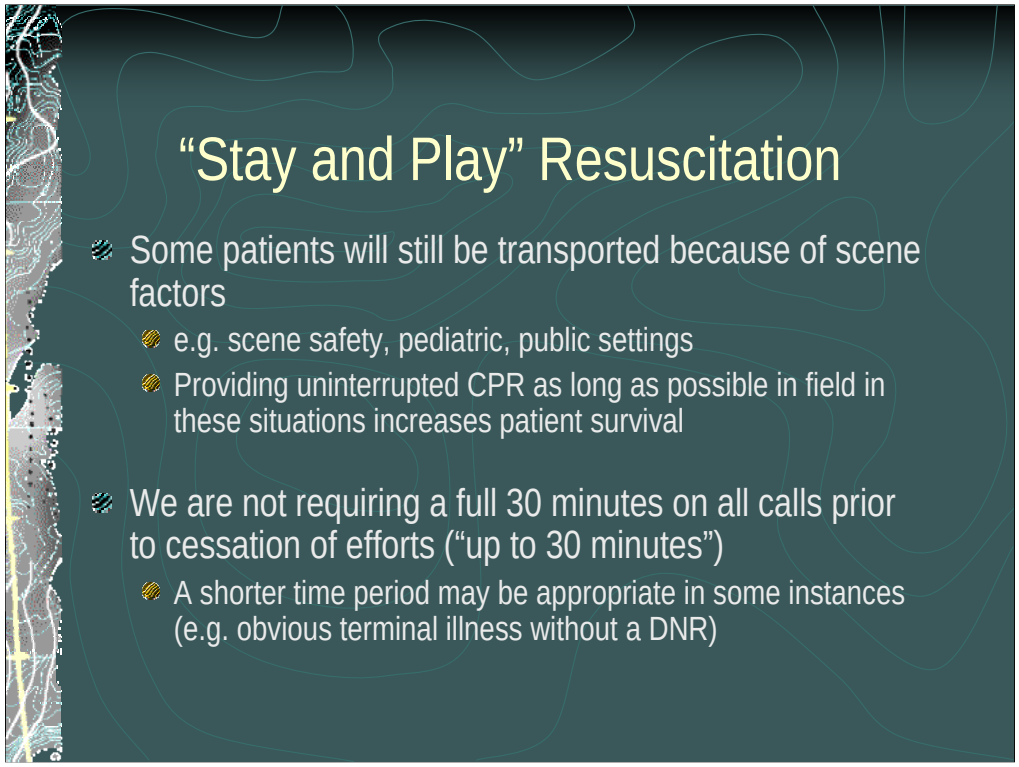
•Cardiac Arrest is really an EMS disease – we are the ones who make the difference.



•Transport to the hospital adds essentially nothing in terms of patient outcome.

•We believe there are many patients in whom “scoop and run” ends up both compromising the resuscitation and ends up taking a patient who will have no chance of survival unnecessarily. Interruptions in CPR and performance of less-than-optimal CPR is bound to occur in many if not most patients who are transported.

•Crews are subjected to risks of a Code 3 transport, patients do no better, and ED care for the living is disrupted.



•We know that we will still transport some patients no matter what, and that is entirely okay.

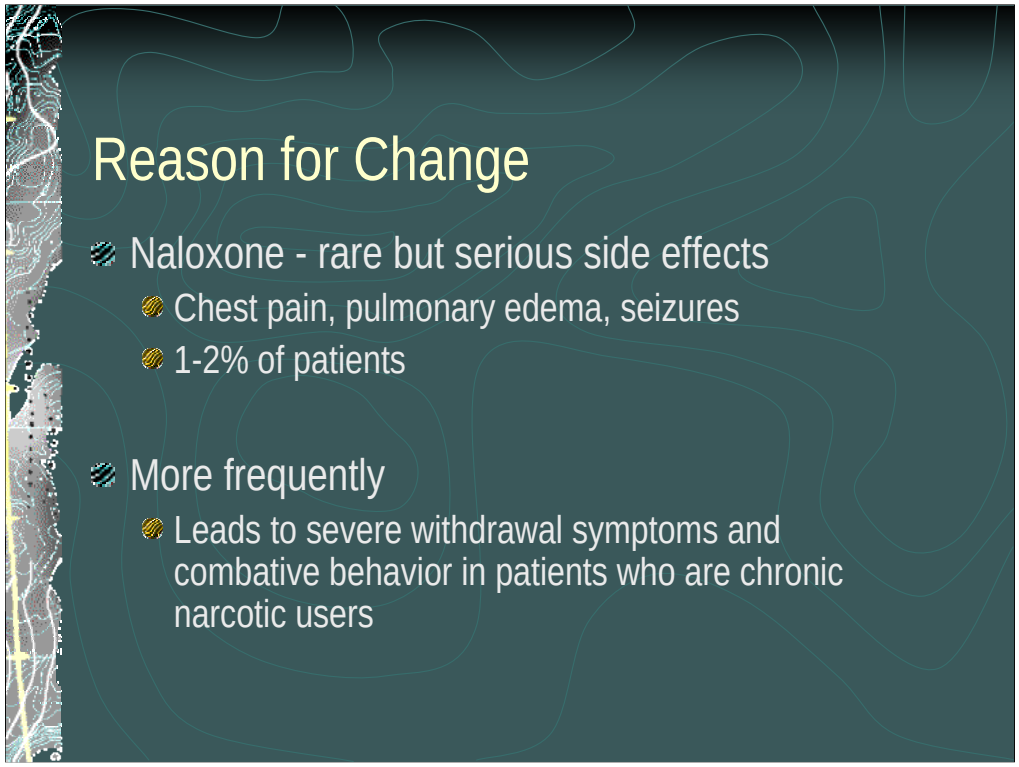
•Patients who have multiple rhythm changes and yet may have not have consistent return of circulation are also persons that we will end up transporting in many situations.

•And we don't have to work on every patient for 30 minutes – some we know at the outset are not likely to respond and if good initial care and medications haven't helped, further care is probably not going to.

Respiratory Depression or Apnea

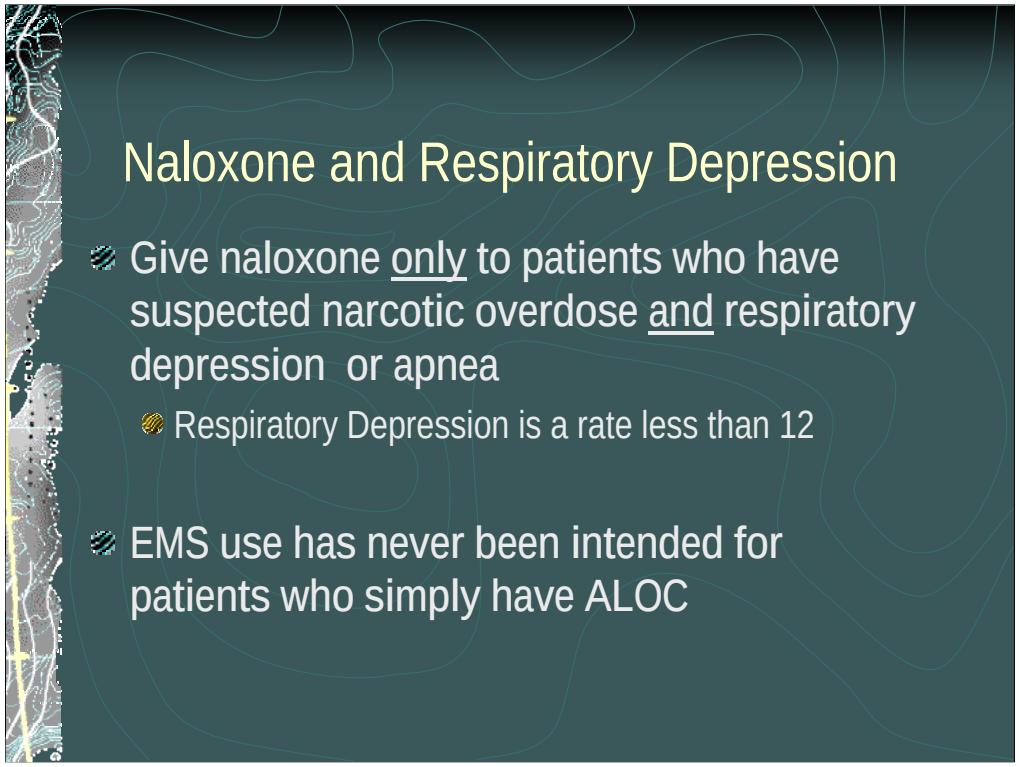
- Naloxone has been removed from the Altered Level of Consciousness treatment guideline
- Naloxone use addressed in new guideline:
  - Respiratory Depression or Apnea

•One of the major changes for this upcoming year surrounds Naloxone.



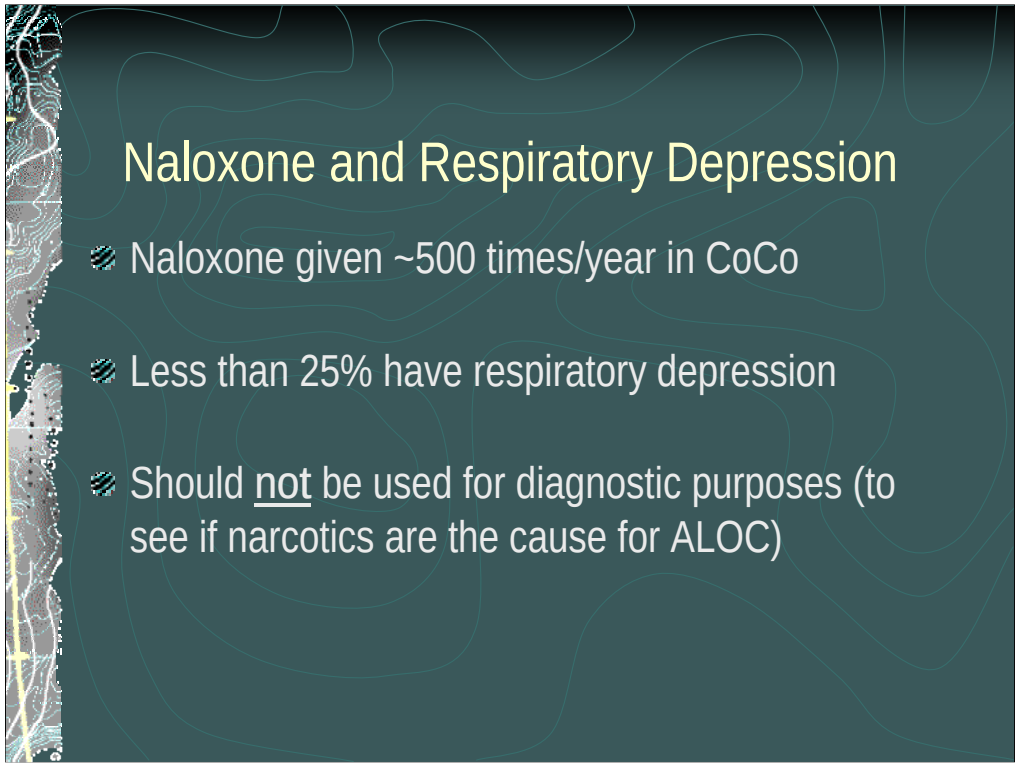
•On occasion, we see problems after naloxone administration for both prehospital and hospital personnel – it happens often enough that we would not call it a rare occurrence.

•There are true safety considerations for staff as well as the patient.

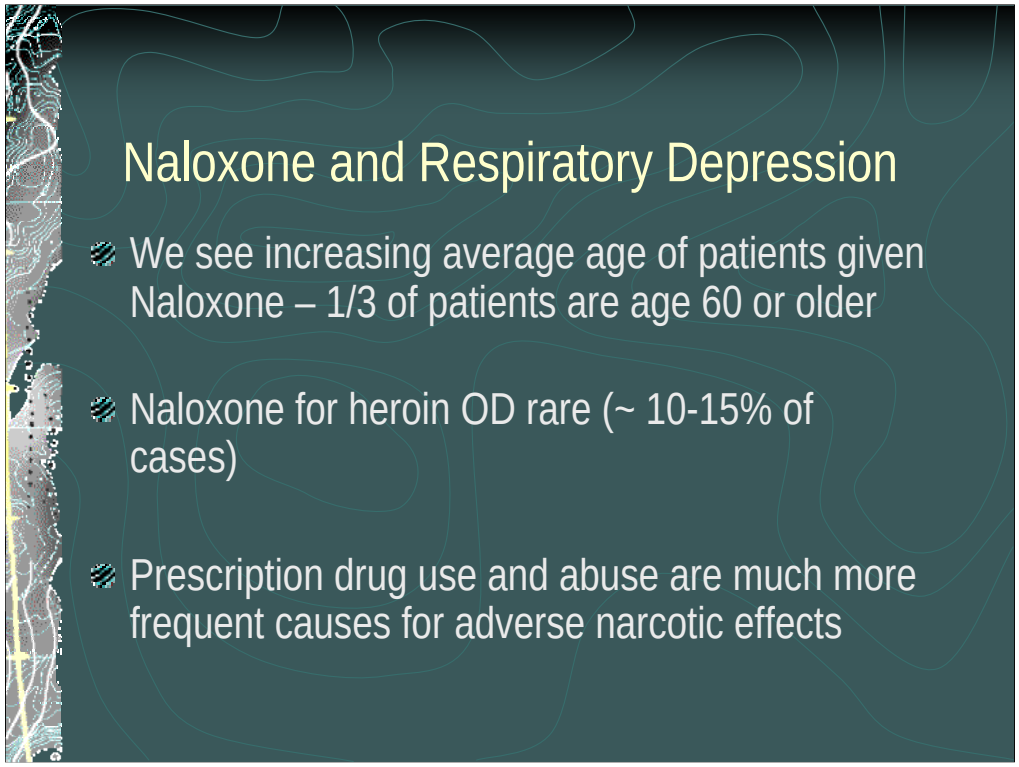


•The classic findings of narcotic overdose, aside from respiratory depression, include decreased level of consciousness and pinpoint pupils.

•Respiratory depression is what we are treating with naloxone, not the ALOC.

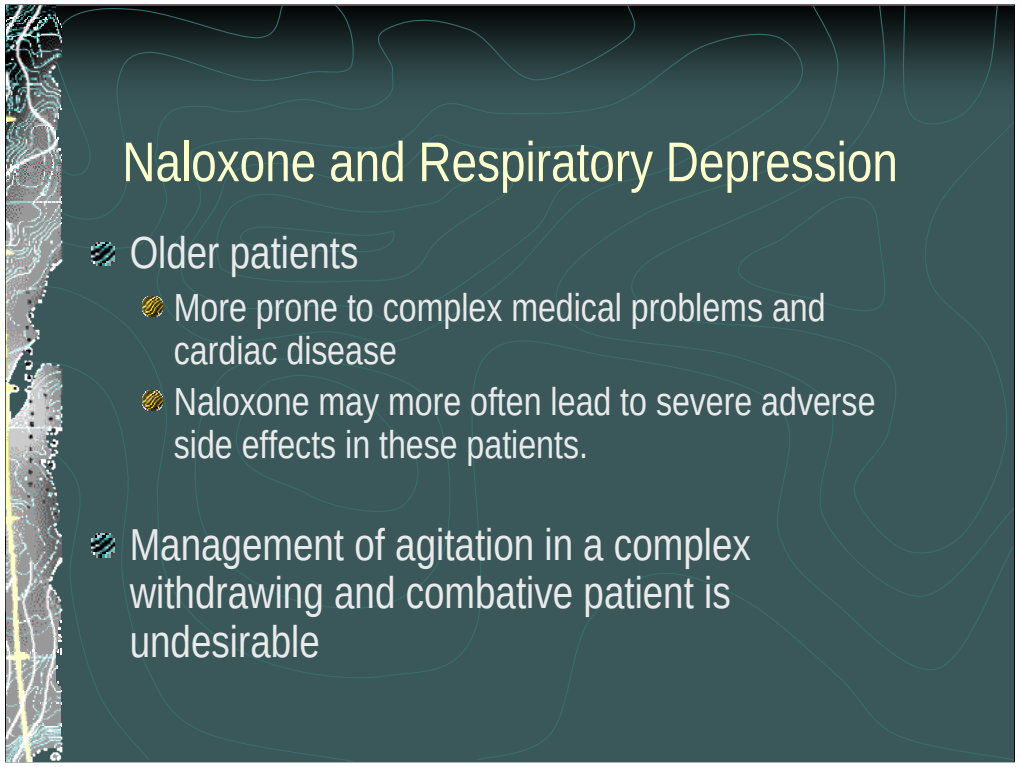


•Given the potential risks of naloxone, it should not be given if there is no respiratory depression.

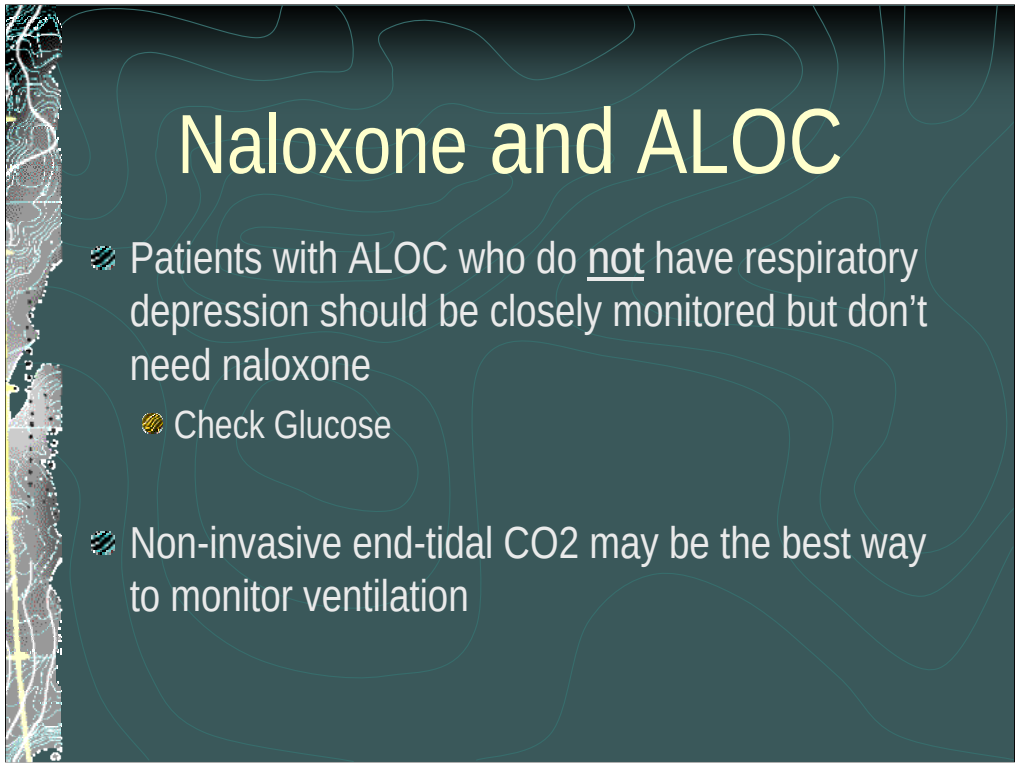


•We see increasing age and increasing incidence of adverse effects of prescription drugs – whether taken as directed or in an abusive manner.

•It is rarer now to see heroin OD's.

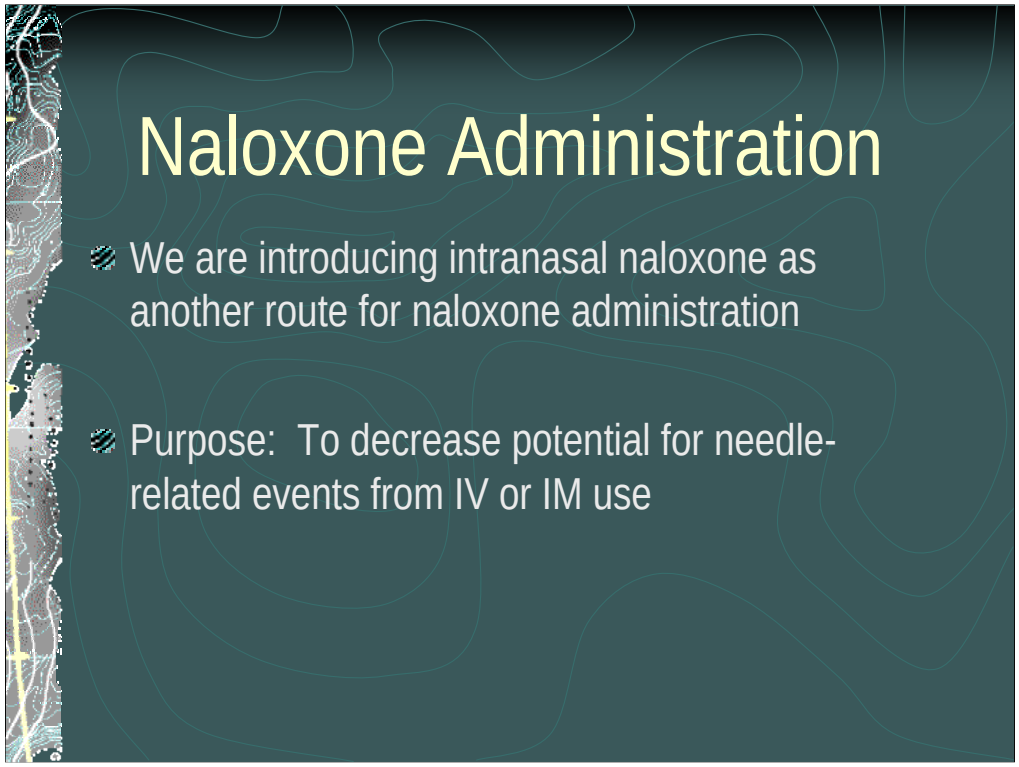


•So we definitely need to use much more caution when we're giving naloxone to older patients.



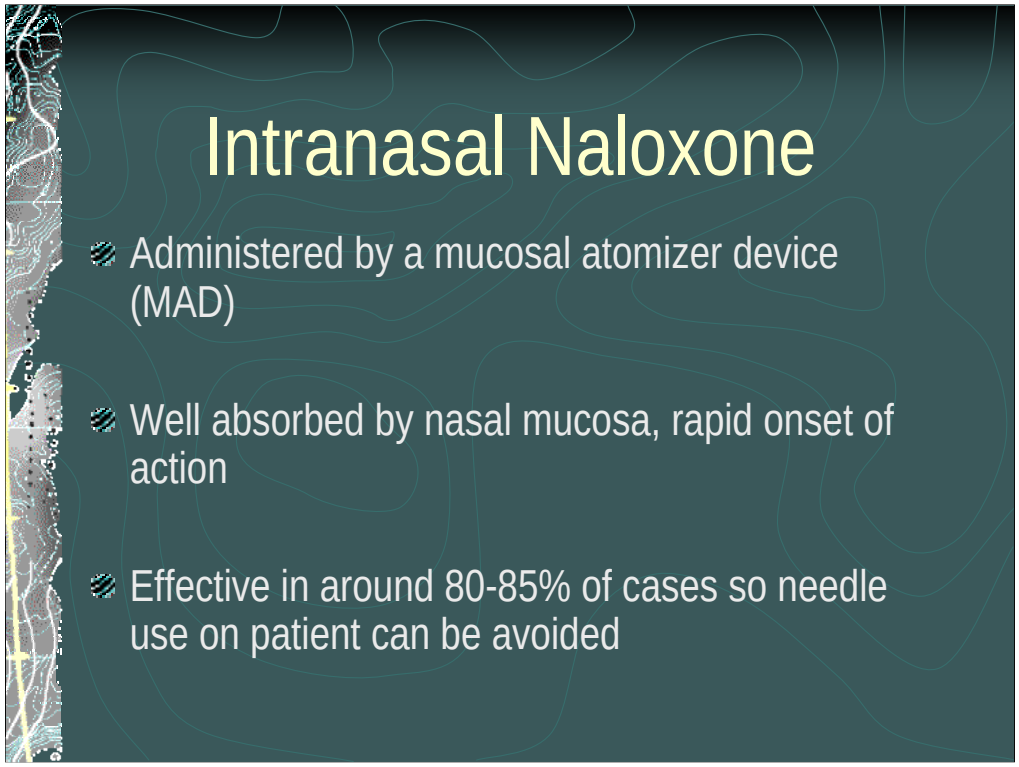
•Some provider agencies have end-tidal carbon dioxide cannulas that can monitor respiratory rate and CO2 levels – this may be a future way to better decide which patients are hypoventilating.

•Pulse oximetry is much slower to show changes in ventilation.



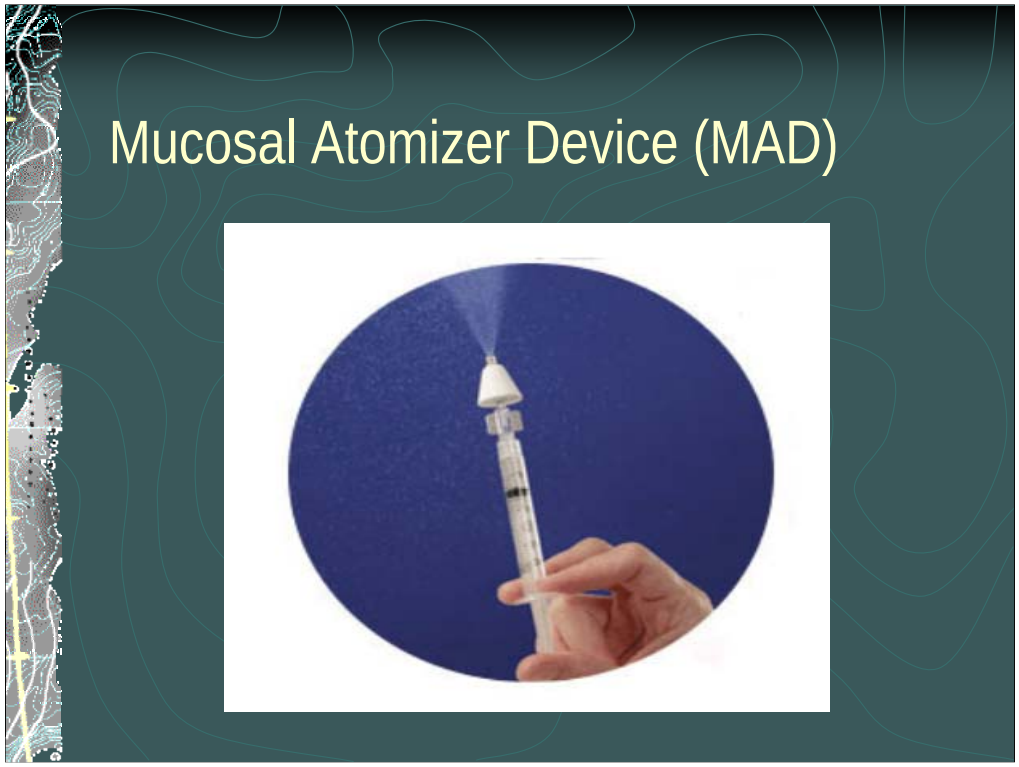
•Many other agencies have successfully implemented use of intranasal naloxone.

•This is being done in great part to enhance provider safety by avoidance of needles in many of these patients.



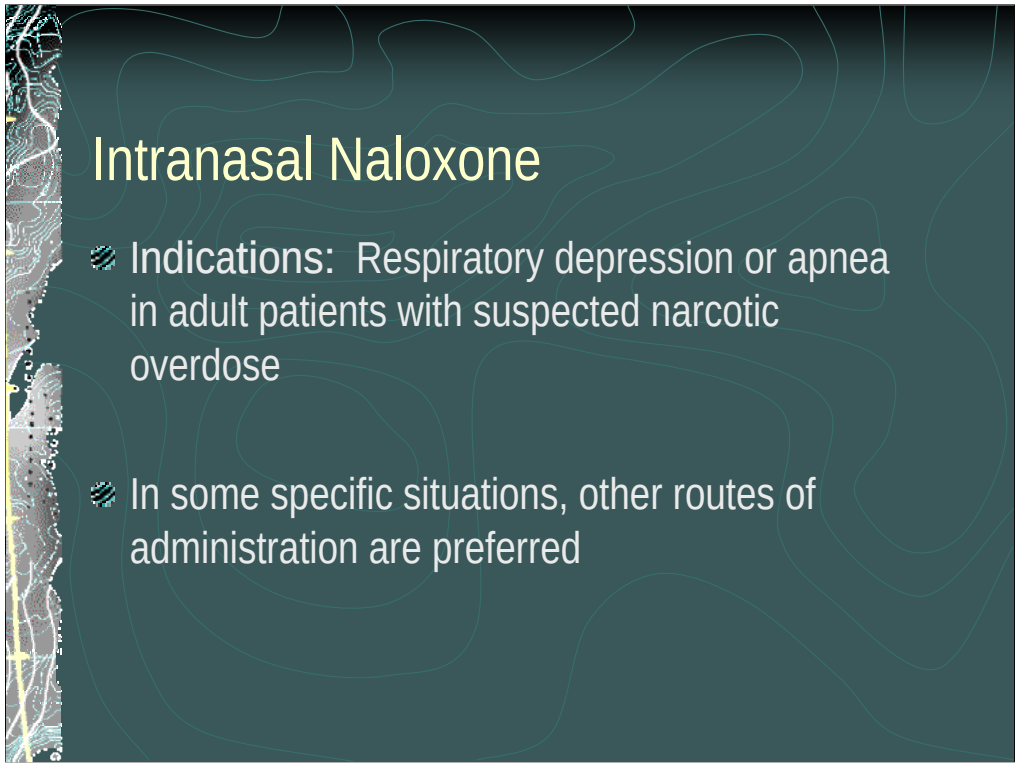
•The mucosal atomizer device is key to aerosolizing the medication so that it can be effectively absorbed.

•This is the Mucosal Atomizer Device.



This demonstrates the fine mist or atomization of the medication that allows for rapid uptake from the nasal mucosa. So it is an important part of the therapy. After drawing up 2 ml of naloxone, you will give 1 ml in each nostril. The little white flange blocks the nasal passage

•For now, we will not be using this device in pediatric patients (very few qualify for naloxone anyway) but this shows how the device is used.

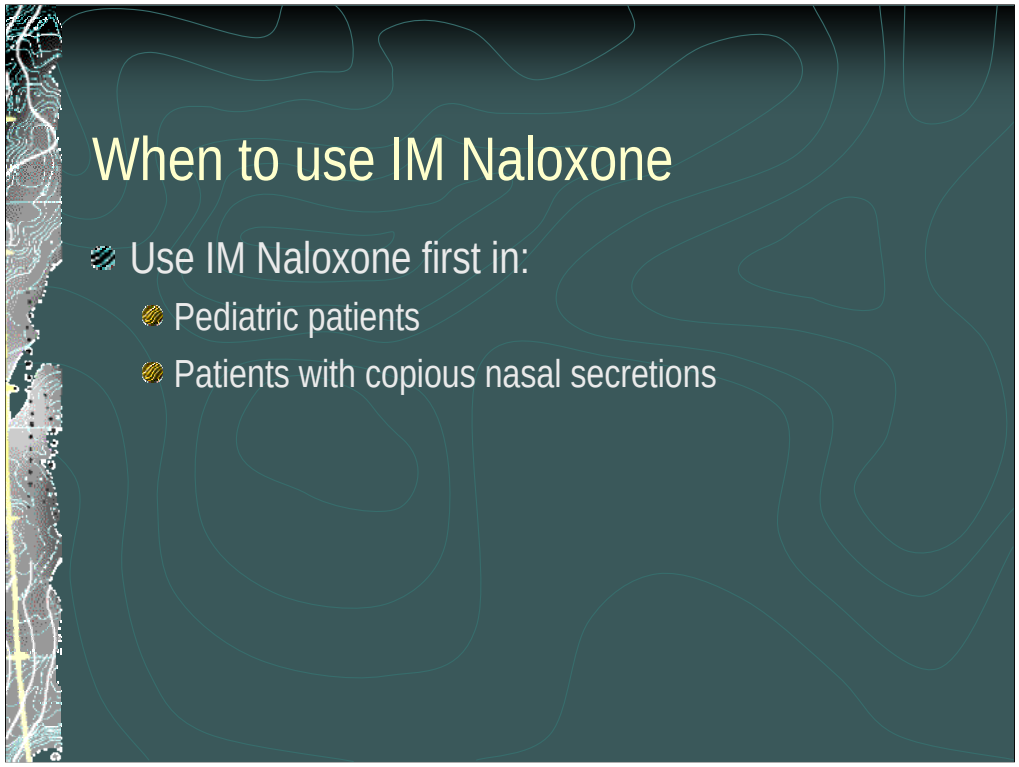


•We are using this in adult patients only as little data exists on pediatric use.

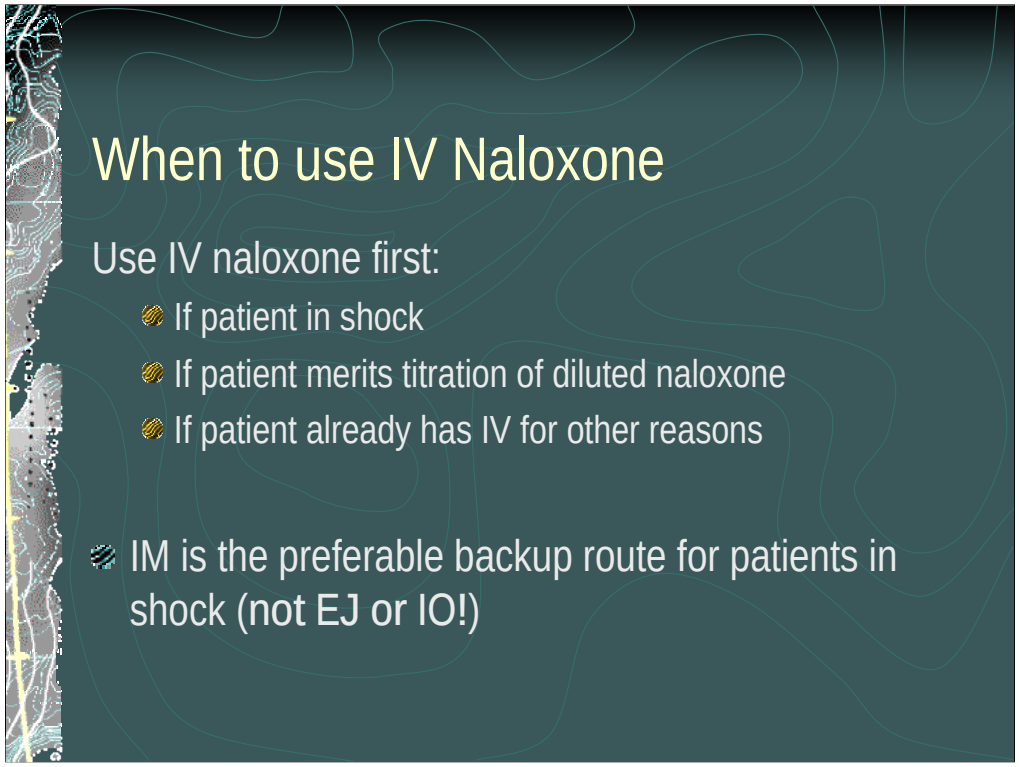
•Those specific situations will be discussed next.

Intranasal Naloxone

- Contraindications:
  - Respiratory rate 12 or above
  - Age < 15
  - Patients in shock
  - Patients who have copious nasal secretions
- Relative Contraindication:
  - Patients with long-term use of narcotics for terminal illness or chronic pain (IV titration preferable)

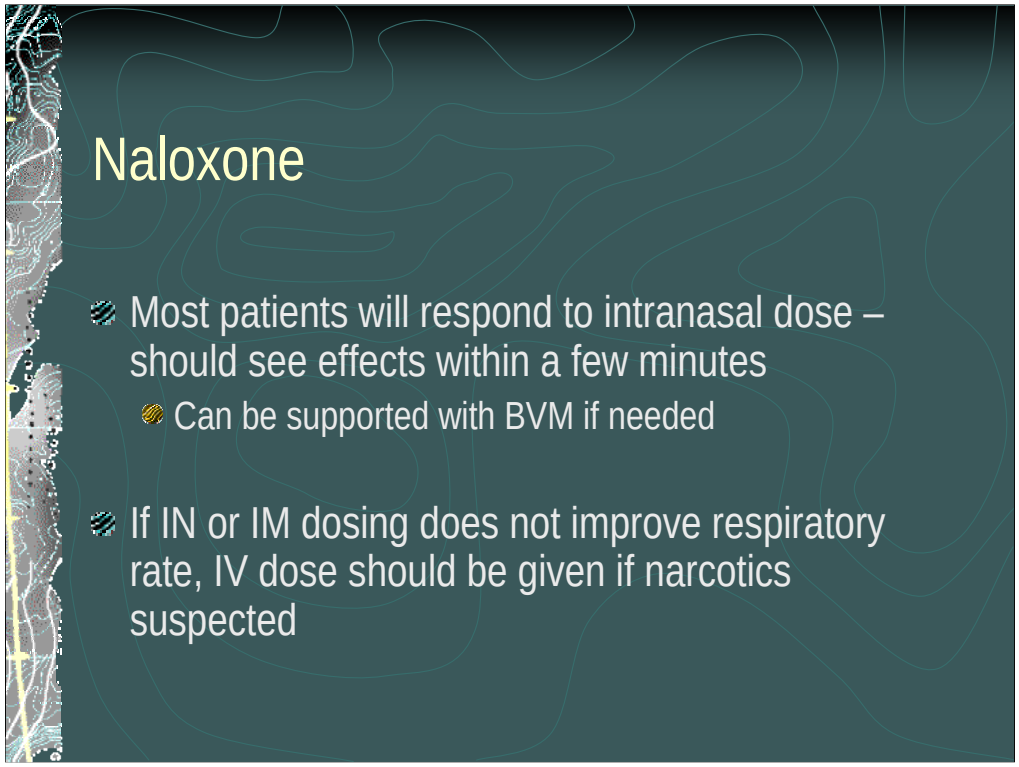


•IM Naloxone is an effective intervention in these circumstances. It is nearly as effective as the IV route in many studies and because the medication's peak absorption is a little more delayed, it may cause less adverse effects as well.



•Respiratory depression is manageable with BLS airway.

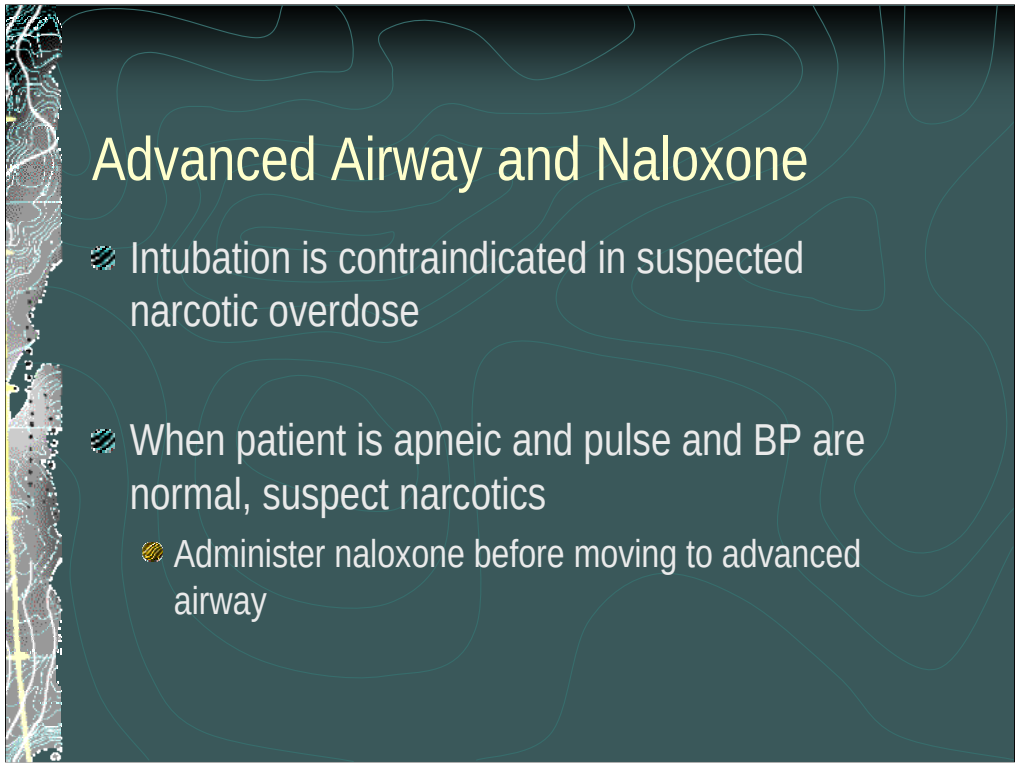
•Always titrate IV doses to avoid unintended consequences of acute withdrawal in at risk patients.



•Approach to Naloxone administration should be stair stepped.

•If IN or IM dose does not work then IV should be considered.

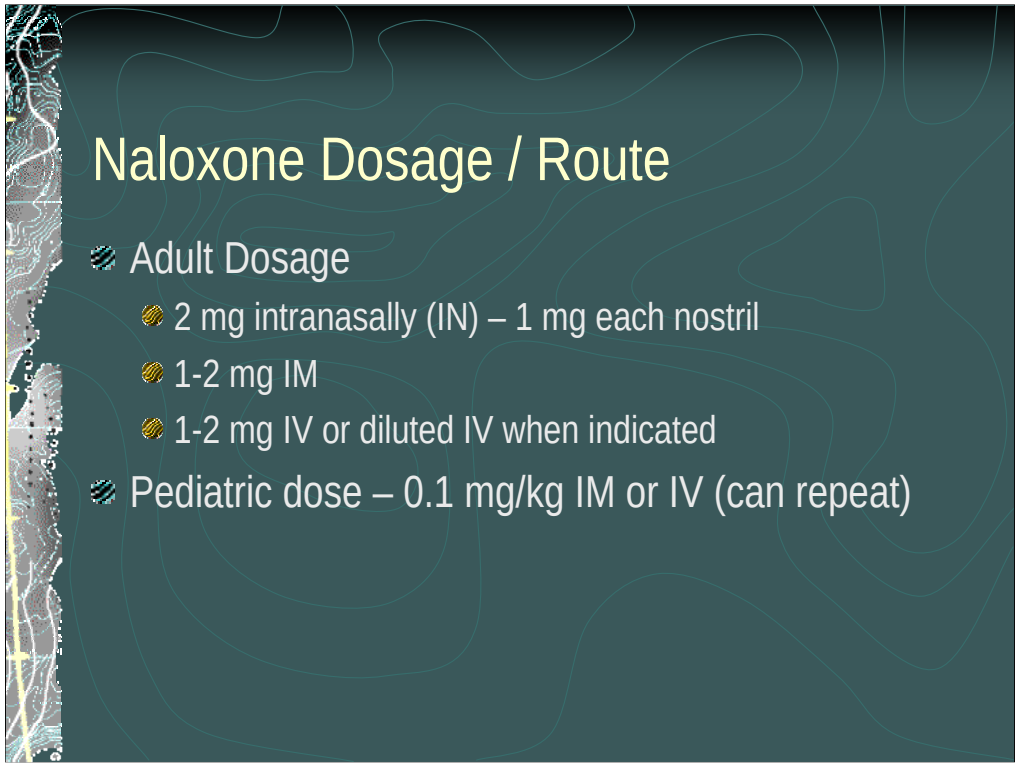
•Some patients may require higher doses or repeat doses, and of course some patients with respiratory depression will not respond because narcotics turn out not be involved in the situation.



•In the last few years we have had several patients who presented with respiratory arrest or markedly decreased respiratory rate, yet had remarkably normal blood pressure and pulse rates.

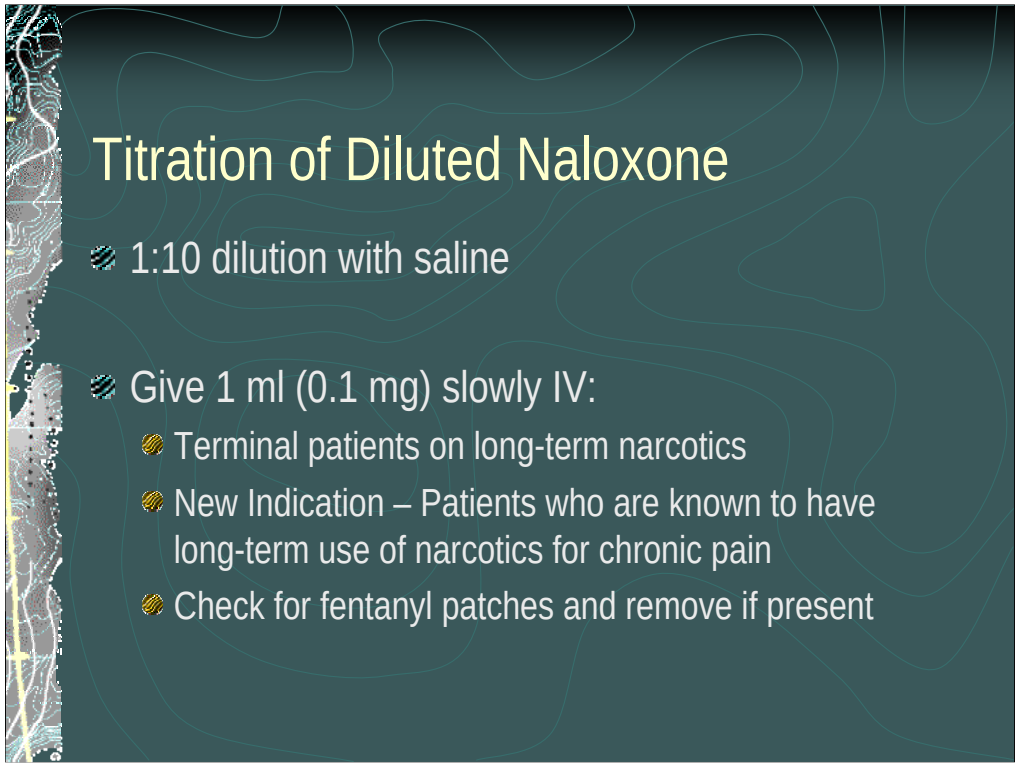
•Intubation was done or attempted on several of these, and later naloxone was given and addressed the problem.

•That combination of relatively normal pulse and blood pressure may be a clue to potential narcotic overdose in some cases.



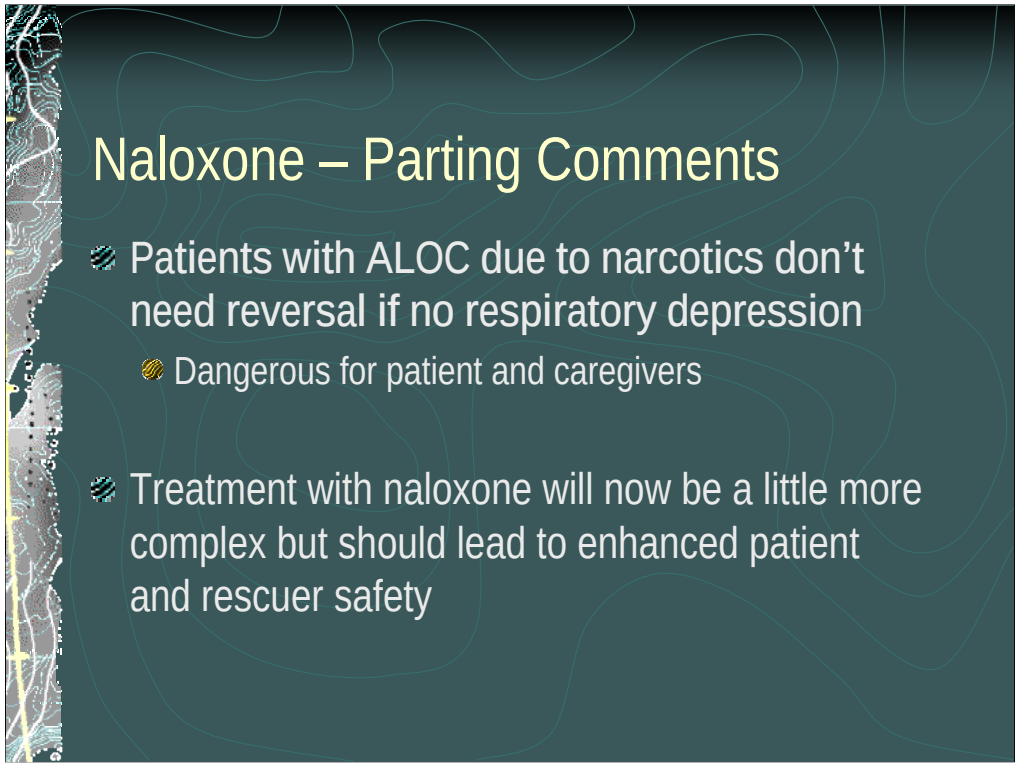
•So there are a variety of ways that naloxone can be given.

•Repeat doses may be needed in some cases.



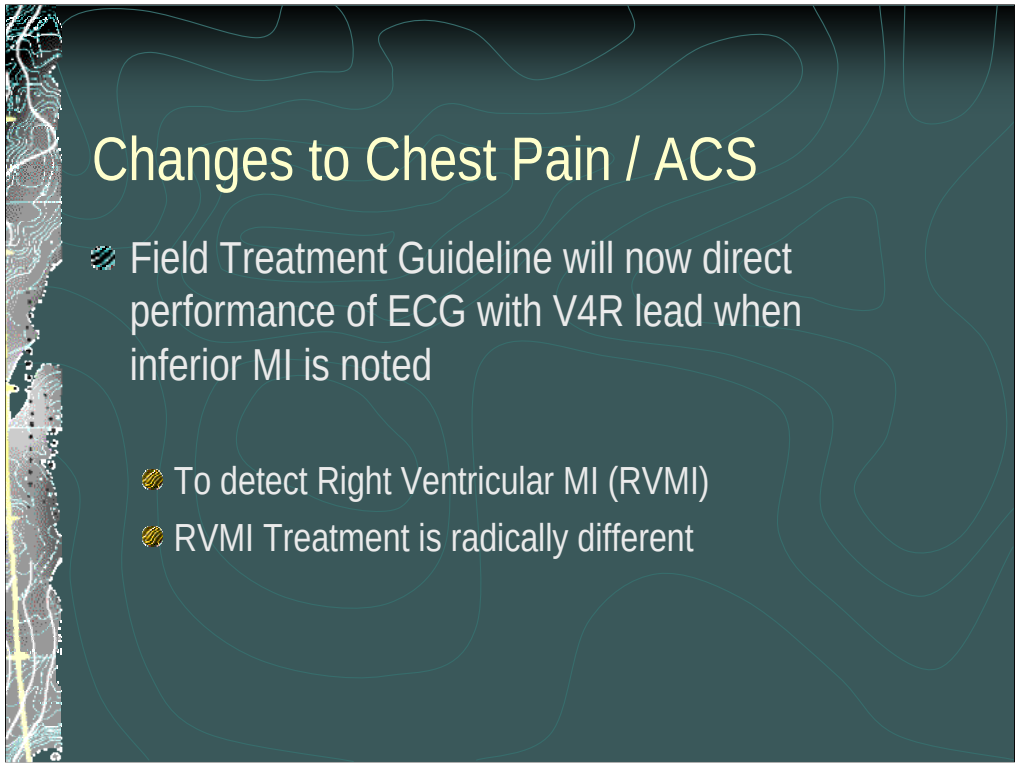
•The intent here is that patients who have been on long term treatment with narcotics, whether for terminal disease or chronic pain, should have reversal done slowly.

•These are patients who will likely have acute withdrawal and are at higher risk of complications.



•Acute withdrawal has even more dangerous consequences for the patient and those caring for them.

•**Remember: First, do no harm!**



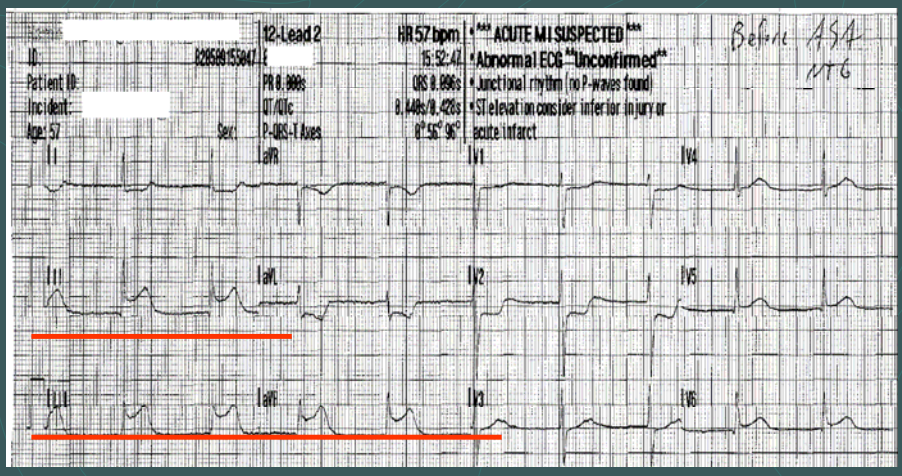
•Previously we have treated chest pain patients with MI in a similar fashion no matter what type of MI they have.

•With the 12-lead, we can detect right ventricular MI, which has a significantly different treatment approach.

Inferior MI Findings

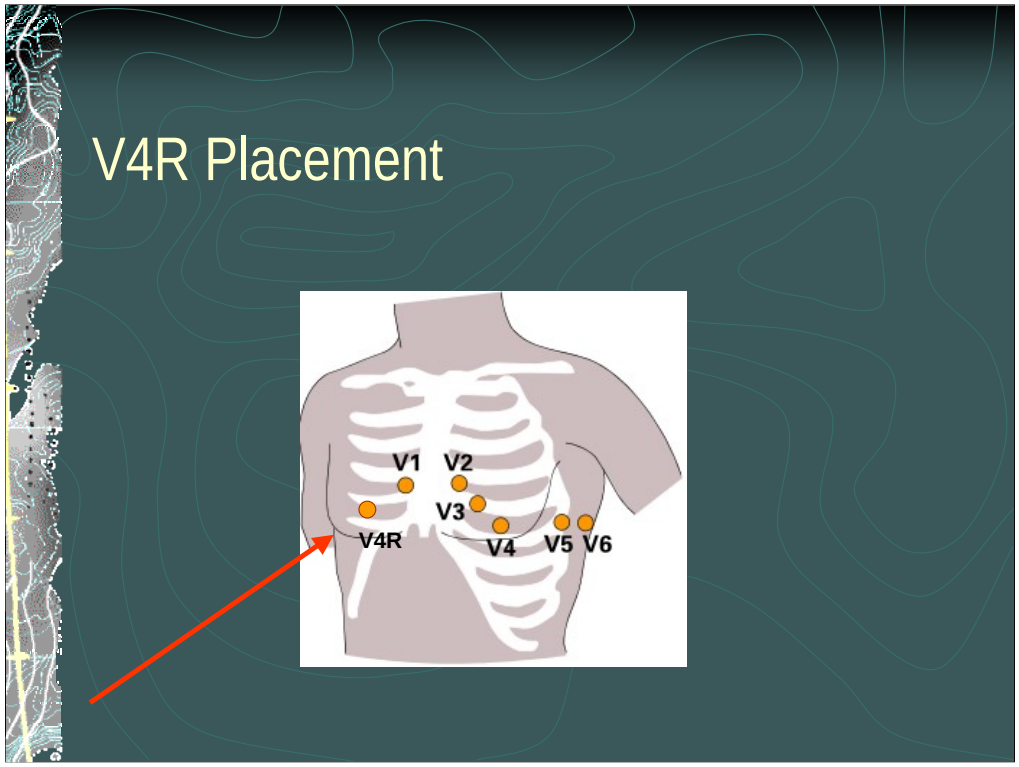
- ST-elevation in II, III, and aVF
- ***Acute MI*** message

Inferior MI



•When you see a classic pattern of II, III, and aVF, think possible right ventricular MI.

•Do V4R in these cases.



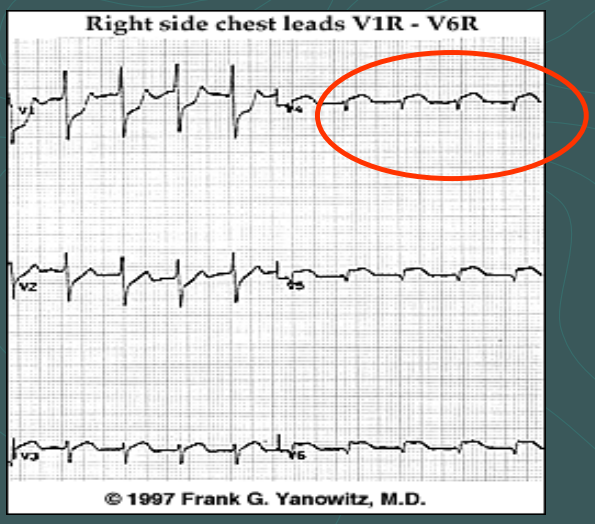
•V4R is simply the mirror image of V4, at the midclavicular line in the 5th interspace.

•After the initial ECG, move V4 to the right side and repeat.

•It's very important to label the ECG readout and note your findings in the PCR.

•The computerized readout may well not be entirely accurate on the ECG with V4R because it assumes typical lead placement – but you already know that it is a STEMI and you simply are looking for the right ventricular involvement.

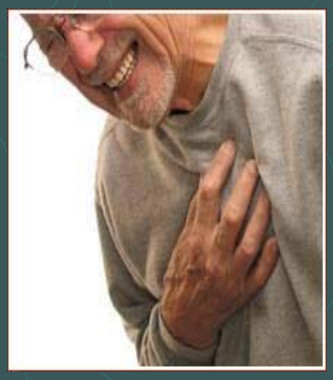
Right Ventricular MI



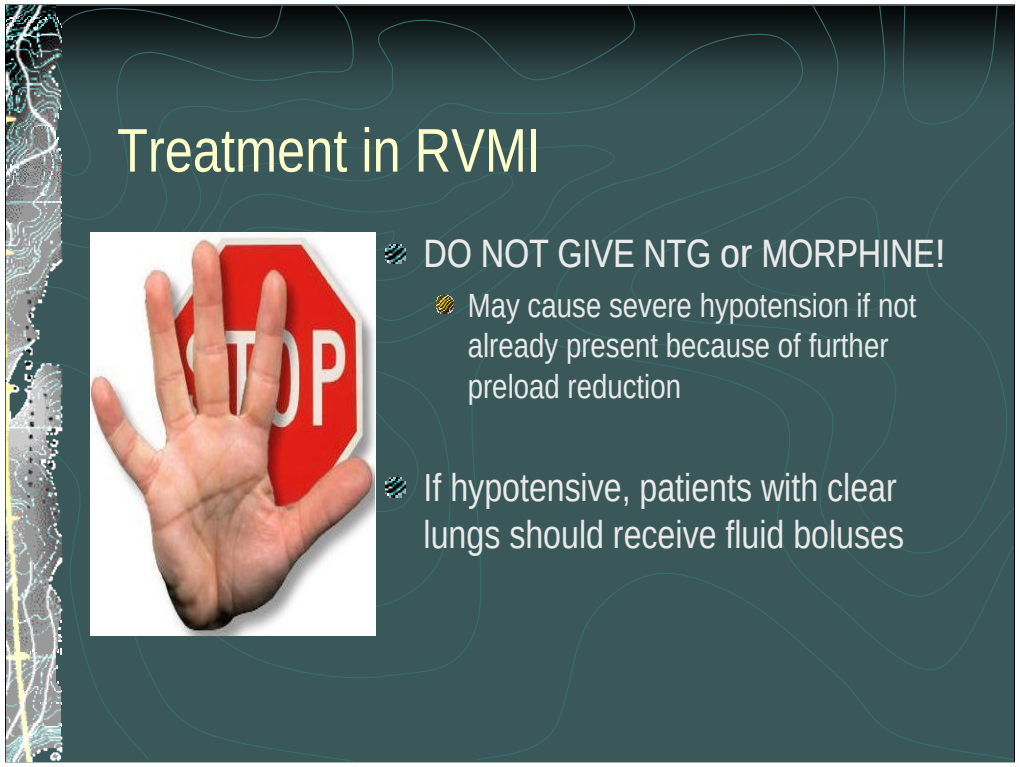
•This is actually an entire right-sided ECG V1R through V6R.

•We really only need V4R to diagnose right-sided MI and here you see ST elevation in V4 through V6, indicating a right sided MI.

Physiologic Consequences of RVMI



- Disrupts the circulation to the right ventricle
  - Decreases circulation of blood to the lungs
  - Decreases left ventricular filling so that hypotension may occur



•Right Ventricular MI is a condition that supports the notion of performing the 12-lead **before** considering use of NTG.

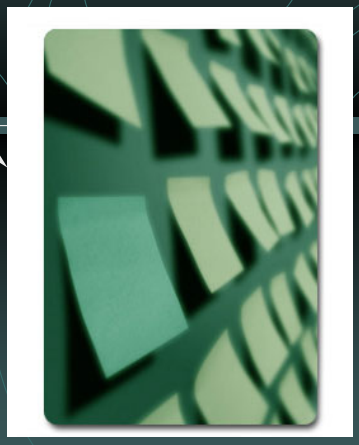
•The patient's BP may be adequate initially, yet drop when NTG is given.

•While both NTG and MS are important to provide comfort to most patients, we don't have a good option for pain relief with RVMI at this point. Rapid movement to the hospital and cath lab will get them their relief.

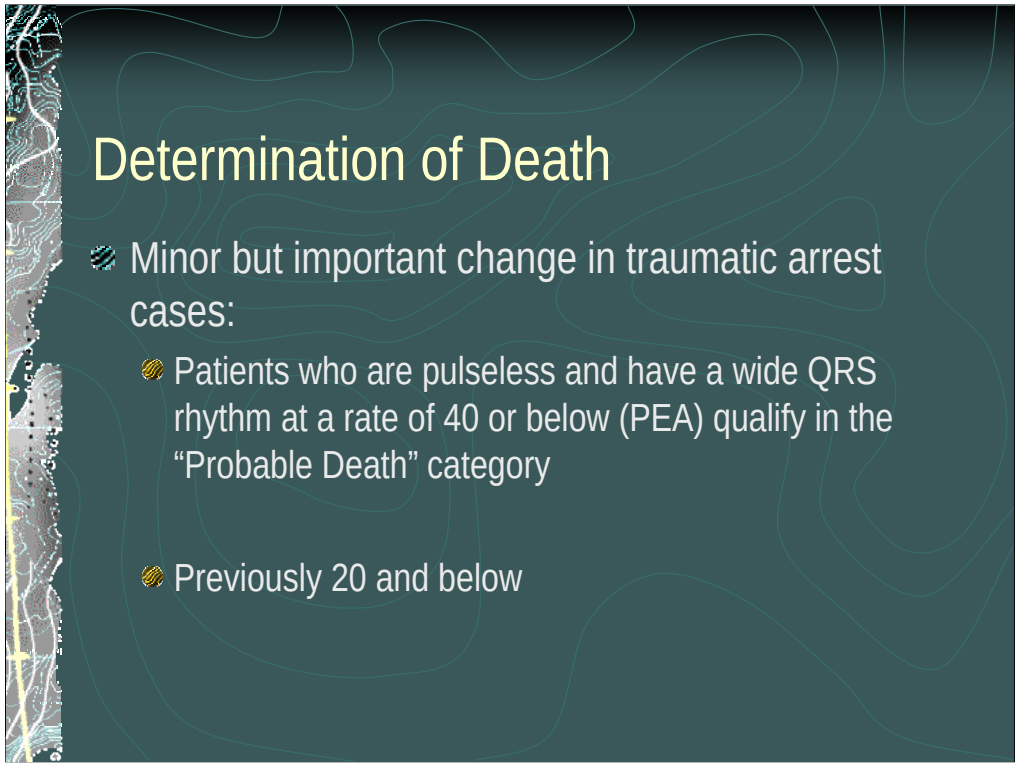
Prognosis of RVMI

- These patients may be very ill at onset
- If they recover from the initial episode, they do very well

Contra Costa Emergency Medical Services



Policy & Procedure Changes



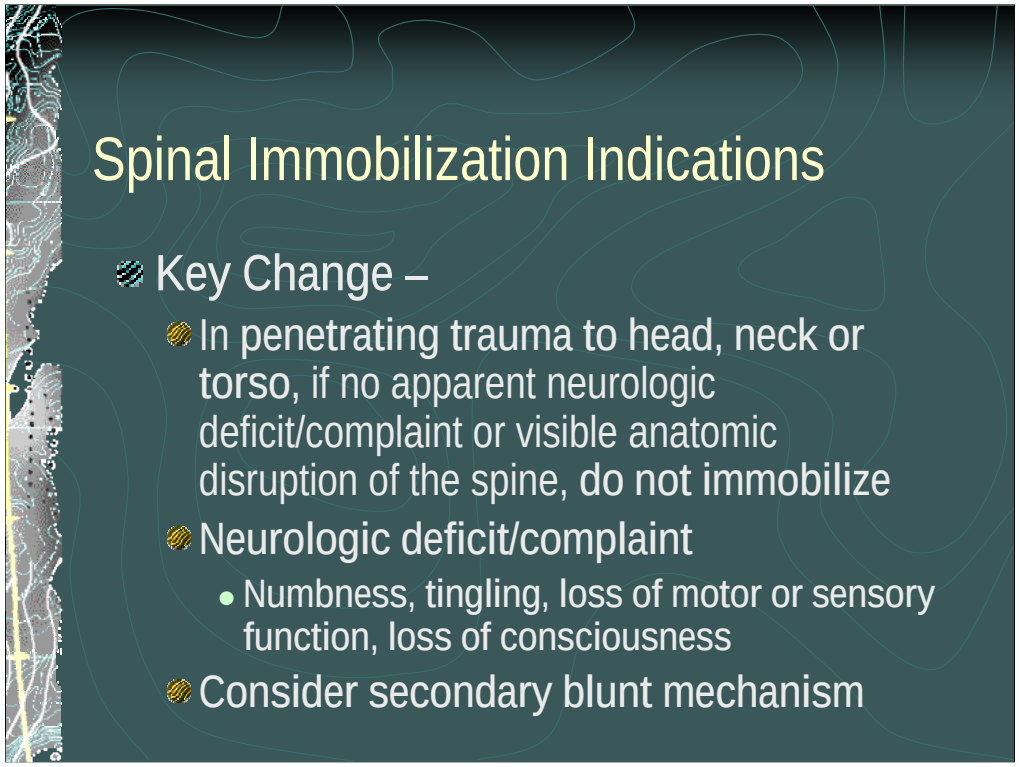
•We have made this change because no patients survive once their heart beat begins to slow with trauma and shock.

•The previous cutoff rate of 20 was not useful because many patients tend to have rates in the 30's, then rapidly go to zero, so few patients qualified and they were often transported when there was no chance of recovery.

•The new policy also will not require a "wide, bizarre rhythm" – just a widened QRS. Narrow complex QRS with bradycardia still merits resuscitation if encountered as this could potentially represent vagal tone.

Spinal Immobilization

- Changes reflects new PHTLS version with algorithm
- In the field manual, we summarize the concepts in a chart

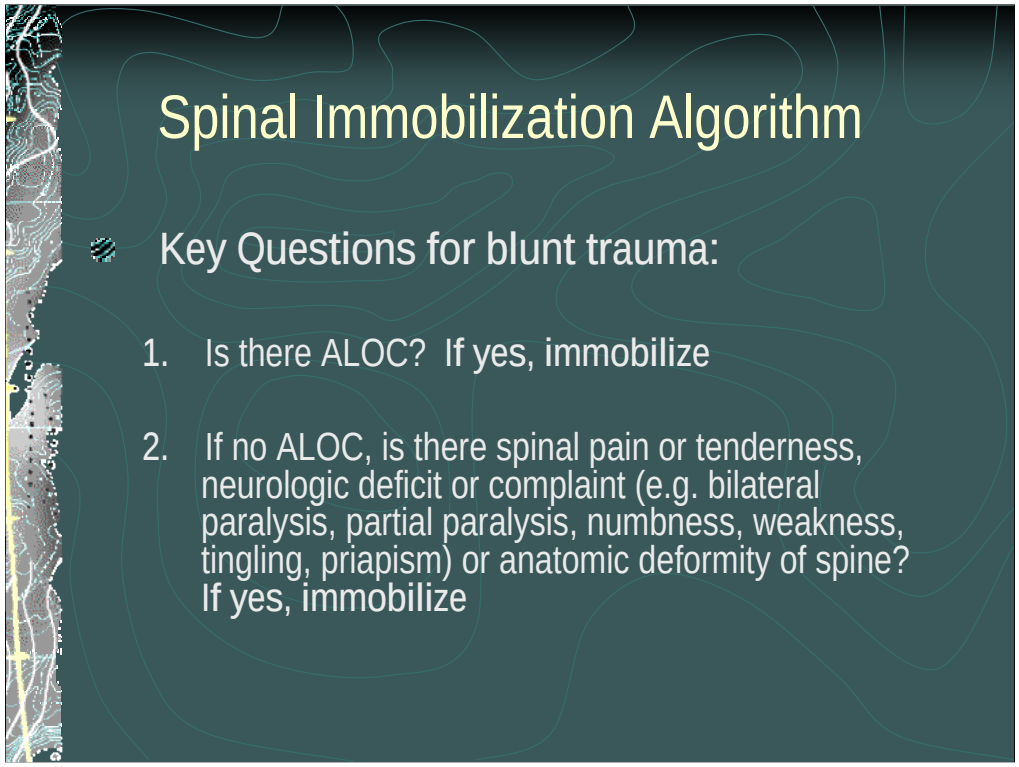


•Spinal immobilization in penetrating chest trauma with patients who are short of breath is counterproductive – and any management of airway is much more complex when patient is on a board with a collar

•If the injury is not to the head, neck or torso, immobilization is not necessary for penetrating injury.

•If the patient has neurologic complaints or deficits, as listed, immobilize. If there is loss of consciousness, immobilize.

•Always consider whether there could be a secondary injury from a blunt mechanism – a fall, car crash, etc.



•Spinal immobilization in blunt trauma is not significantly different with the new PHTLS version though things are slightly reorganized.

•There are a few key questions to ask:

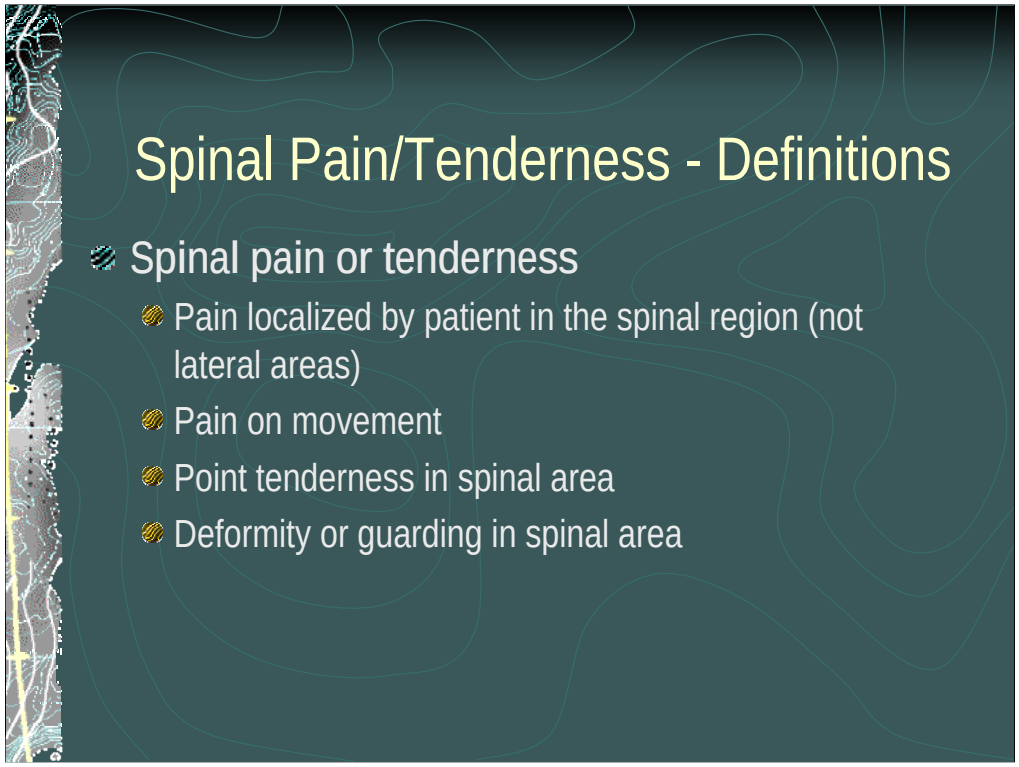
Spinal Immobilization Algorithm

3. If no ALOC, spinal pain/tenderness, neuro deficits or anatomic deformity, is there a concerning mechanism of injury?
   - If yes, consider factors that may hinder good assessment such as:
     - Presence of alcohol or drugs
     - Distracting painful injury
     - Inability to communicate

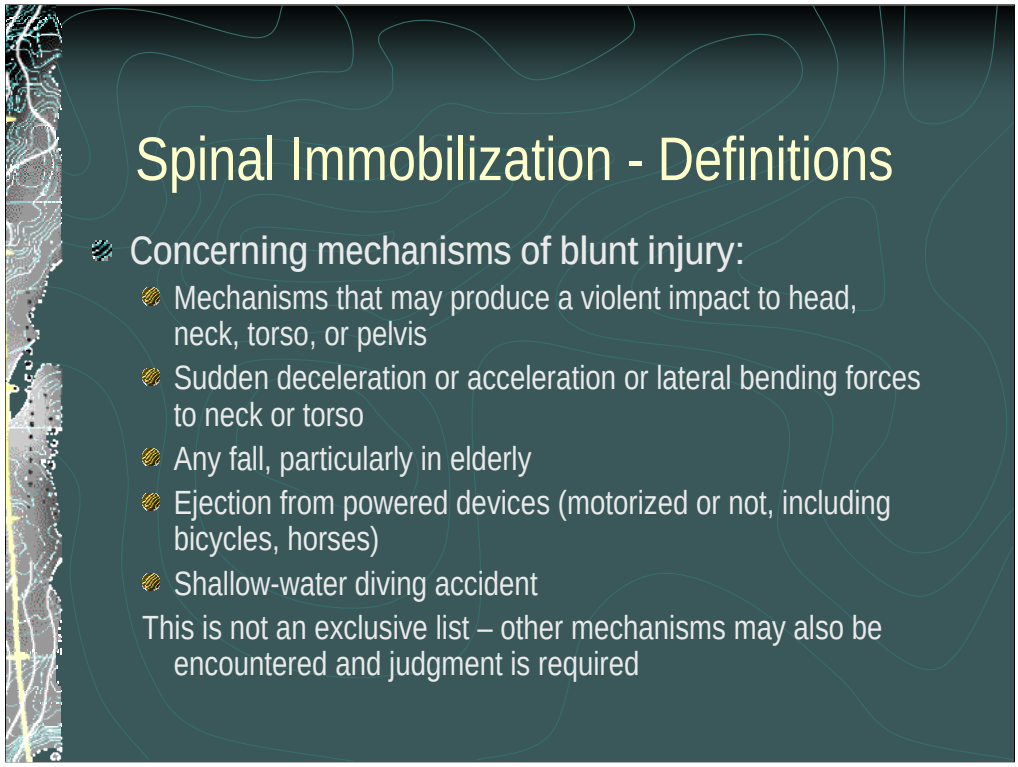
     If any of these exist – immobilize

Spinal Immobilization Algorithm

4. If there is doubt, immobilize! Use clinical judgment!

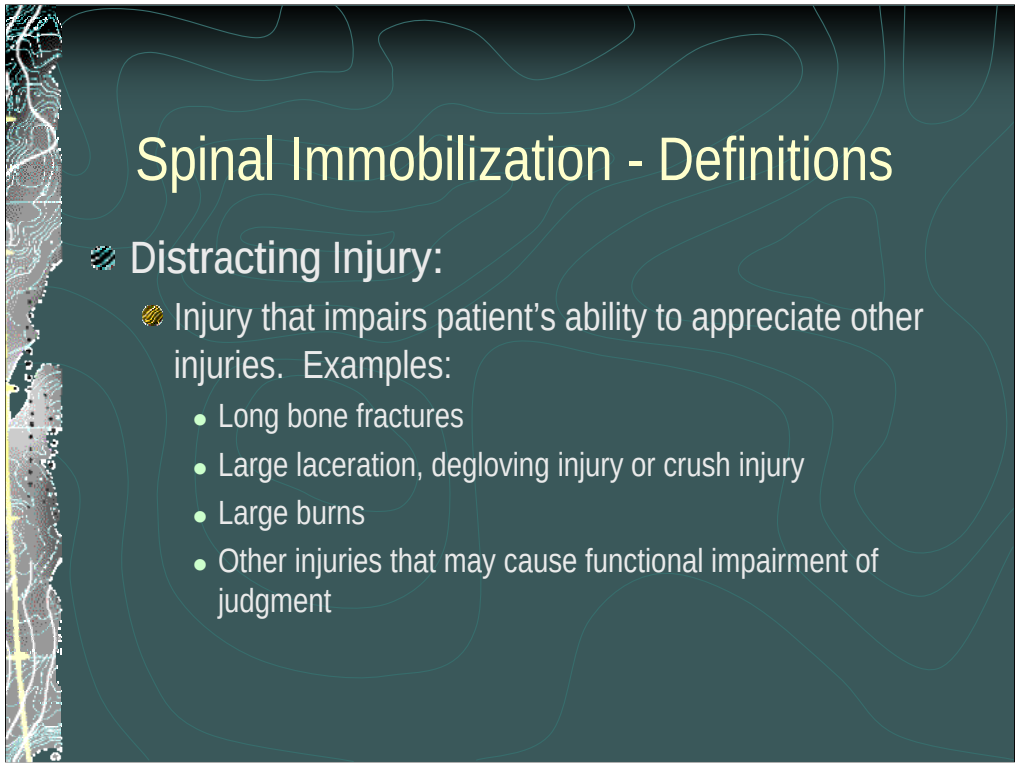


•I want to mention some definitions that help clarify the guideline -



•Review the definition.

•If you have questions contact your EMS agency educator.



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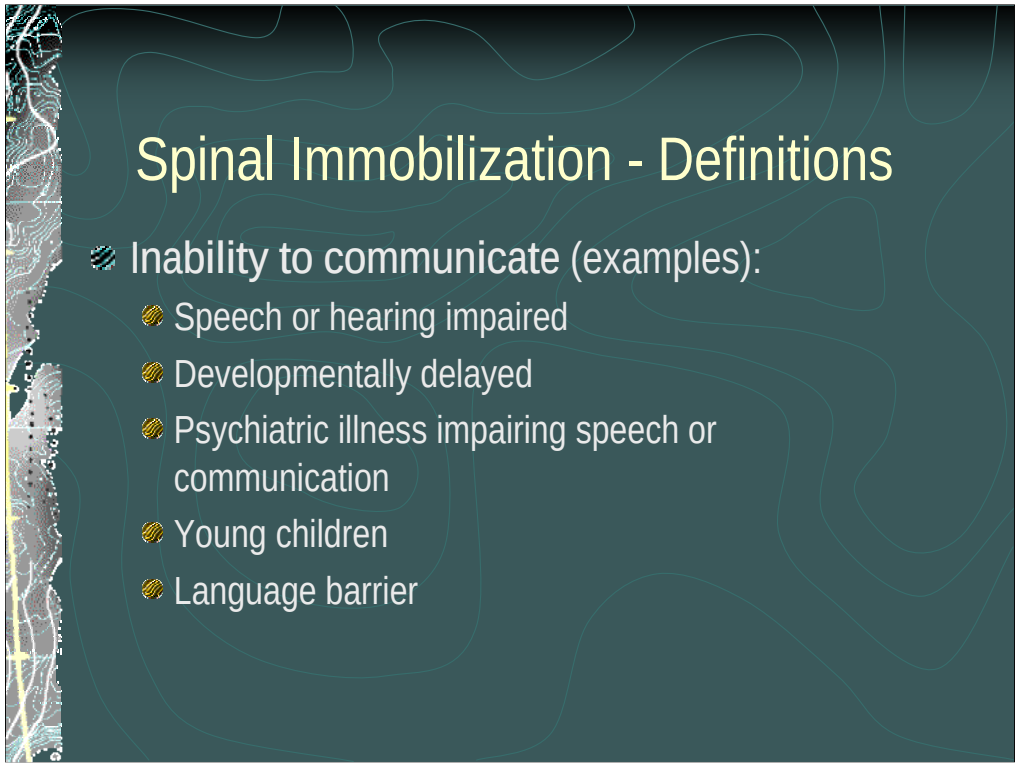

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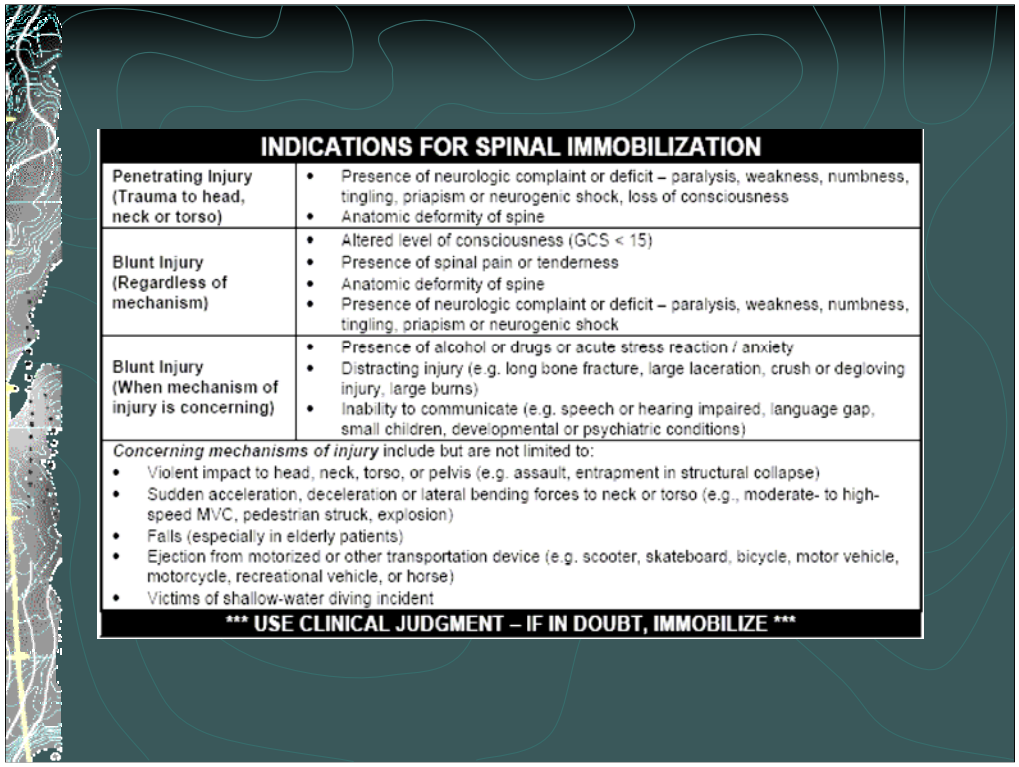
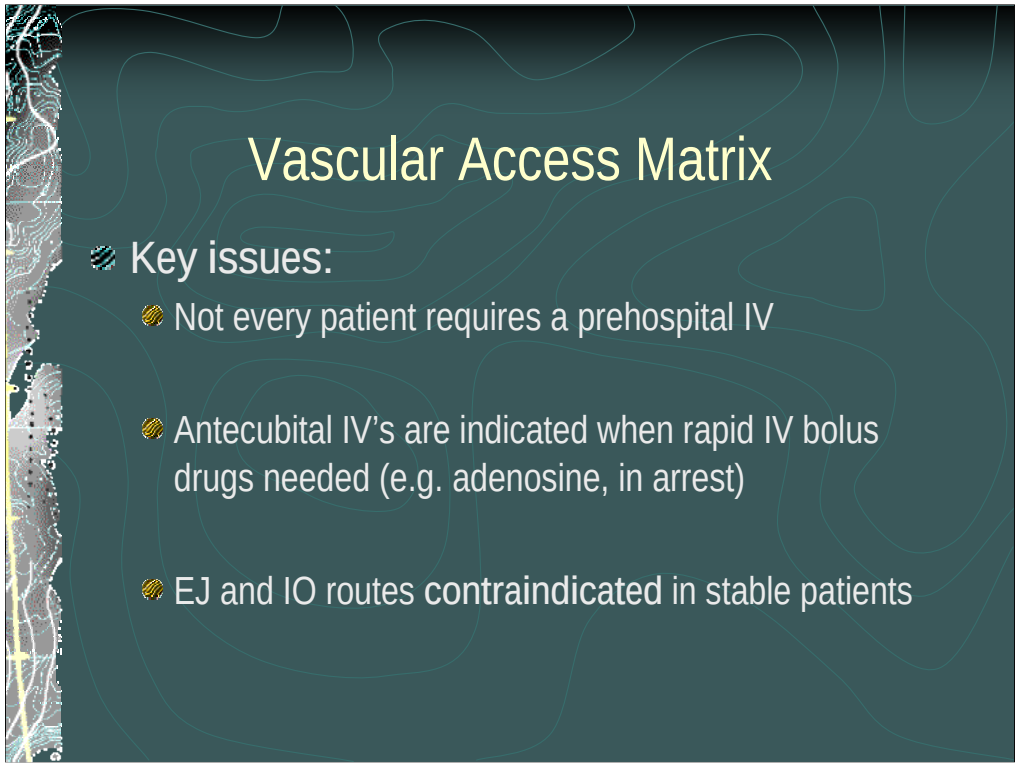


•This is how the indications are listed in the field manual.

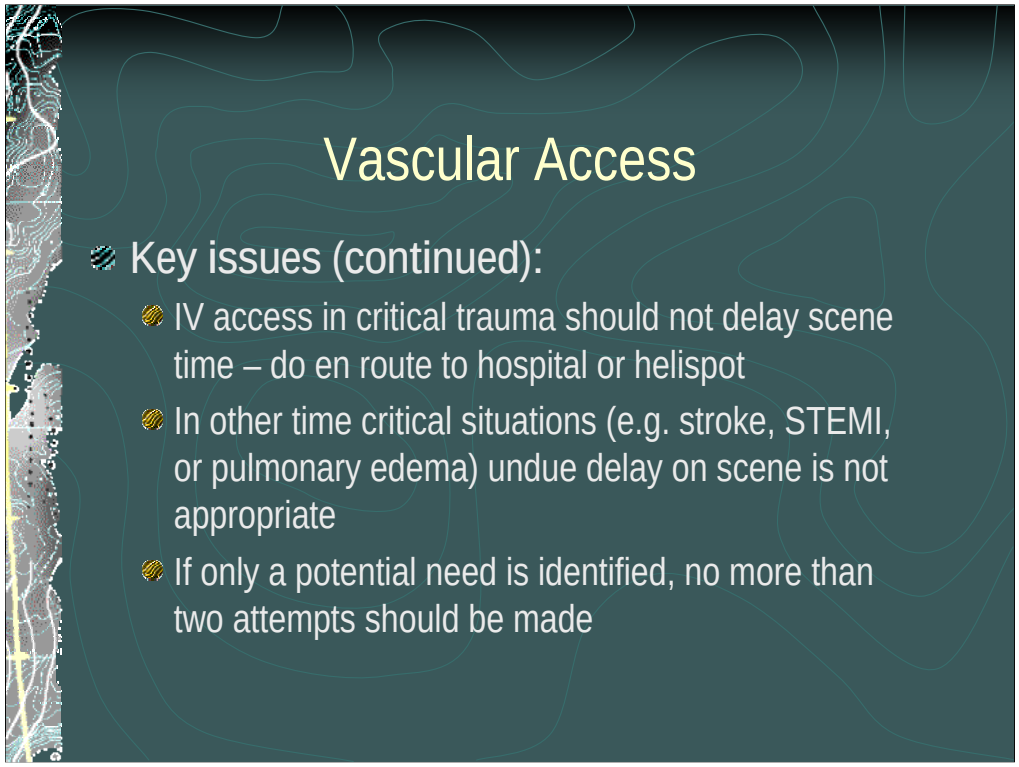
•Basically this is the algorithm from PHTLS boiled down to fit on the page.

•EMS is introducing a vascular access matrix to support appropriate vascular access decision making in the field.

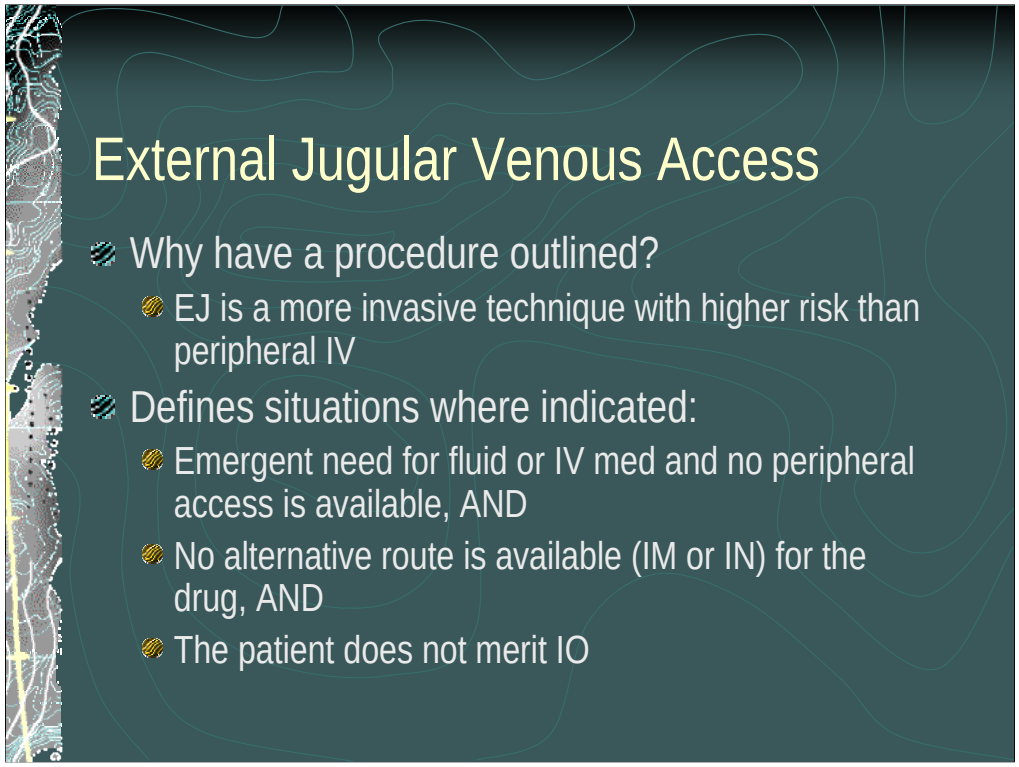


•Vascular access is an invasive procedure with indications and risks. An IV should be started if there is a need to administer IV medications or IV fluids, or if there is an anticipated need to give medications or fluids.

•Patients should receive vascular access appropriate to their condition

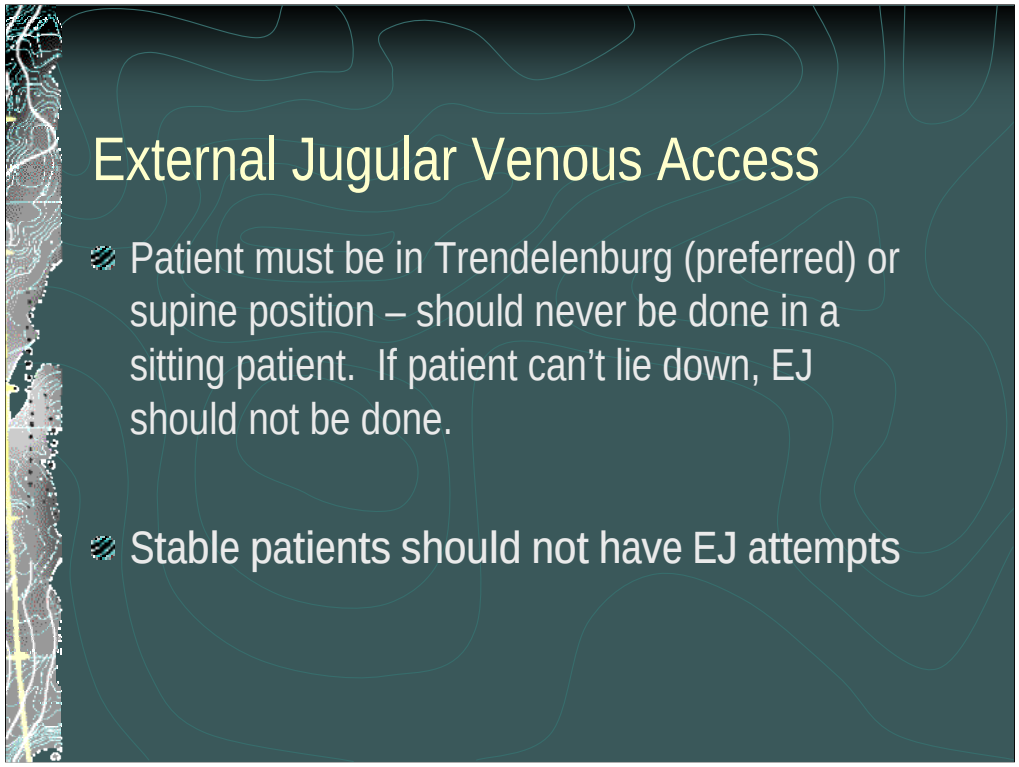


•Vascular access should never delay scene time in trauma or other critical situations.

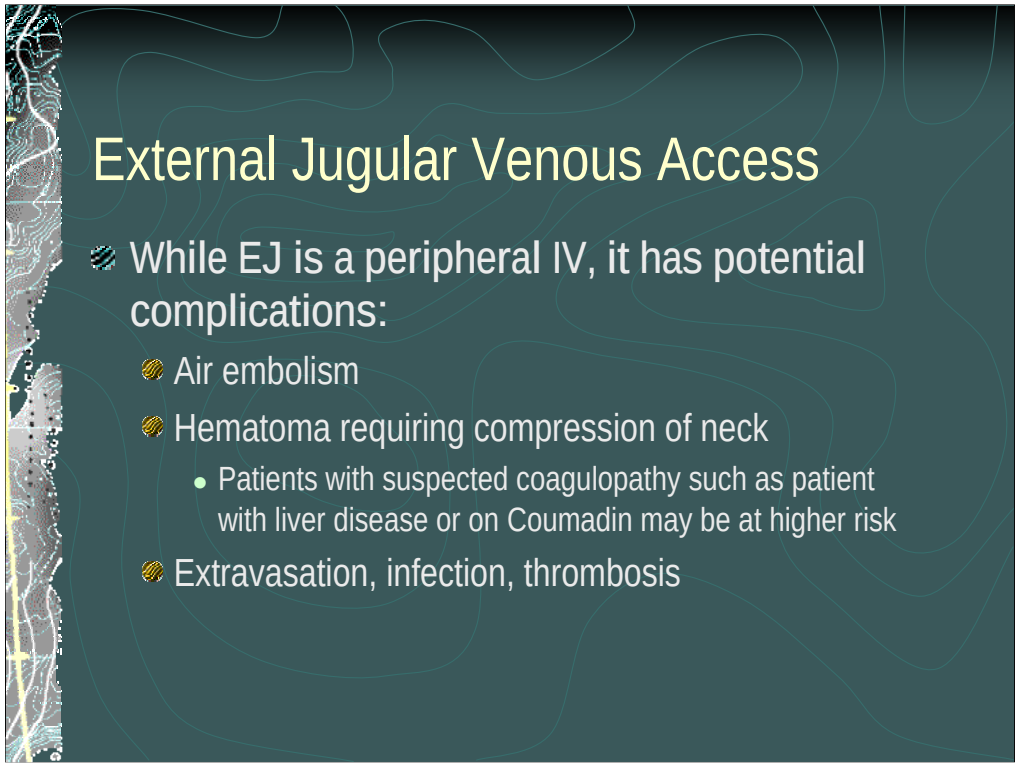


•Despite the advent of the IO, we still see a fair number of EJ's being used and we still see inappropriate use.

•A procedure has been added to the prehospital care manual to define the limited role EJ should play.



•If you cannot perform the procedure under safe conditions and no other options exist, the priority should be to get the patient to definitive care.

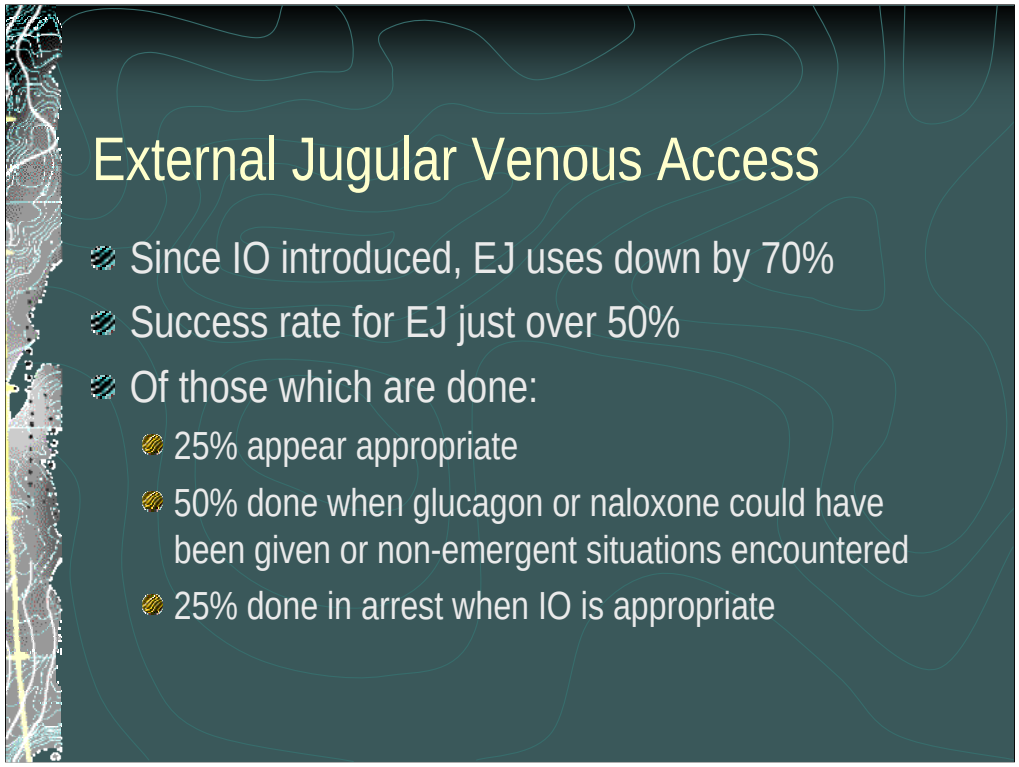


•External Jugular Access is considered invasive and has well known risks associated with it.

External Jugular Venous Access

- Why limit indications for EJ?
  - Some cases are done incorrectly (patient sitting)
  - Some cases are done inappropriately
    - Patient could have received Naloxone IM or Glucagon IM
  - Use in cardiac arrest problematic since success rate is much lower and it interrupts CPR

•Patient safety is really the priority and trumps all other considerations.



•Intraosseous access has markedly decreased EJ use.

•The success rates have been low all along.

•For arrest patients, it makes little sense to use an EJ with this success rate when IO is available – if the patient has no legs, that is a possiblity but that is very rarely encountered.

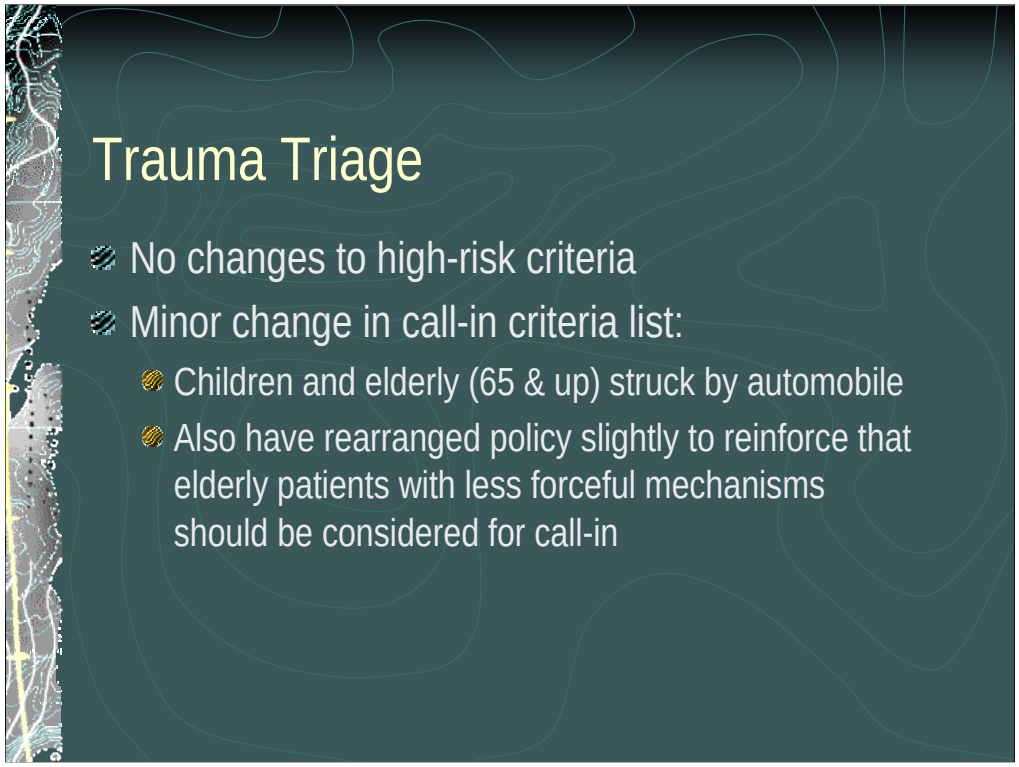
•The biggest issues are that there are alternatives to EJ when the patient has ALOC from hypoglycemia or narcotic and those should be used first. It's also important to remember that hypoglycemia does not kill in a few minutes – you need to let glucagon work for 15 minutes and recheck levels.

•If the patients aren't coming around, get them ready for transport.

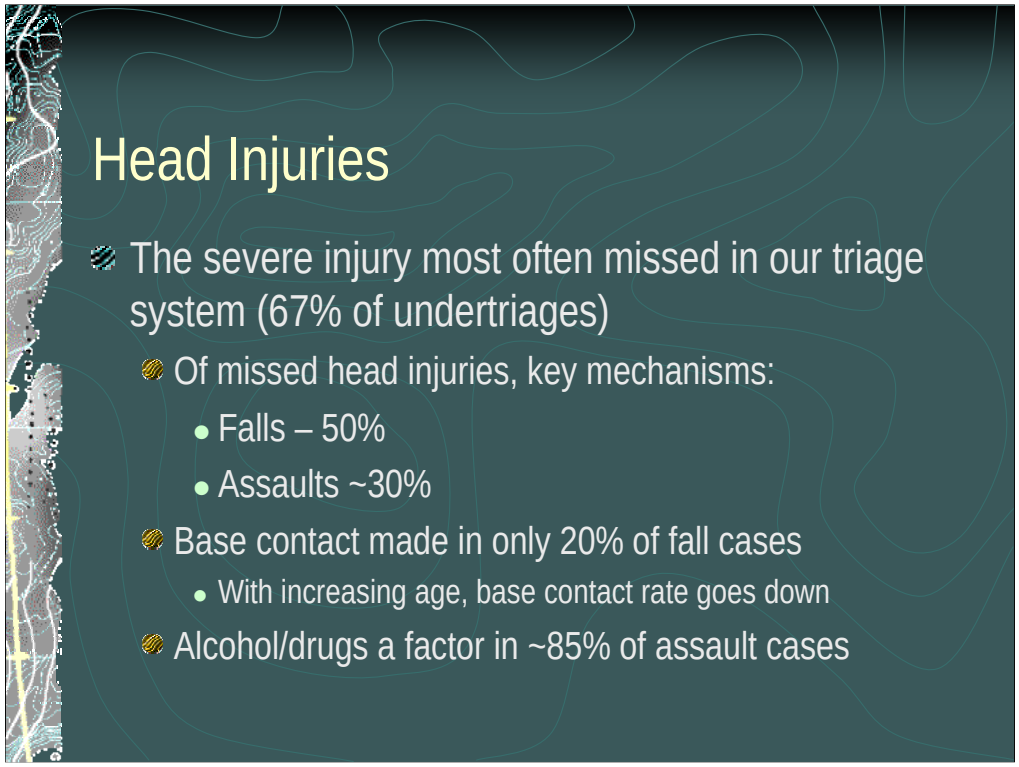
•Contra Costa has an active program of Quality Improvement

•Every year we have the opportunity of enhancing our protocols, education and policies based on evidence of what works and what does not work in our system.

•This year we have several areas of focus for quality efforts.



•Our trauma triage policy has changed based on our study of the data and looking at best practices in trauma triage.



•Our local data along with evidence in trauma and prehospital studies shows that occult head injury is a big problem.

•In particular, elderly patients with falls do not have a violent mechanism and may not present with prominent symptoms, but our index of suspicion needs to be higher in these cases.

•Alcohol is a confounding factor in assault cases – rarely in the elderly.

•We believe we can do better in this important high risk population.

•Of all the seriously injured patients that go to hospitals other than the trauma center, 75% , or around 3 calls per month, go there without any triage call being made, whereas around 25% or around one case per month is missed after the triage call is missed.

Head Injuries

- Potential important factors to consider when making judgment about call-in:
  - Presence of anticoagulants (Coumadin, Aspirin, Plavix)
  - Higher-risk symptoms like vomiting, combative behavior
  - Any alteration in known baseline CNS function of elderly patients

•The trauma center cannot take every elderly patient with a fall, and some with a variety of these important factors will not come to the trauma center.

•But there is no chance they will in many cases unless a call is made citing a concern.

•Simply making base contact, of course, is not enough – you need to effectively communicate.

•SBAR is the best practice communication tool for all field and base communication. If you have questions about SBAR contact your EMS training coordinator.

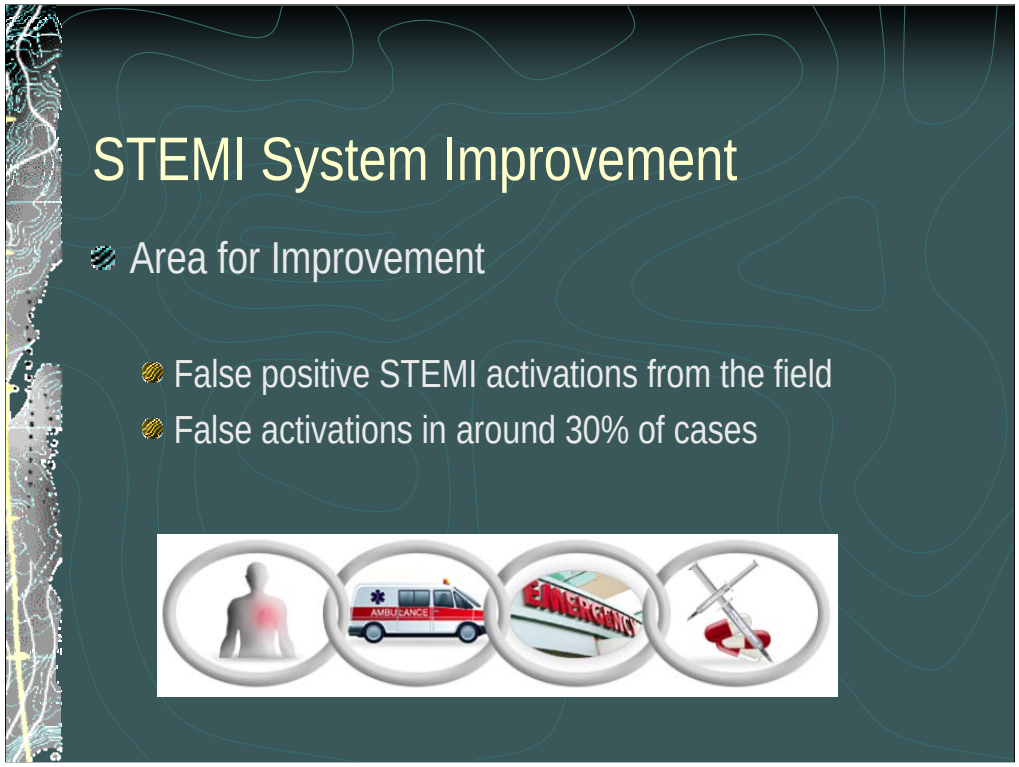
STEMI System Improvement

- STEMI System has been very successful in lowering door-to-intervention times at STEMI Centers – median time is < 60 minutes
- 89% of patients get intervention within 90 minutes of initial field ECG showing STEMI

•Our STEMI system started in September of 2008 and has been incredibly successful in lowering door-to-intervention times (so-called door to balloon or D2B or Door-to PCI are terms you will hear).

•Almost 90% get intervention within 90 minutes of the initial field ECG showing STEMI, and that performance is well above what has been seen around the country.

• So those are things to be very proud of with regard to the system.

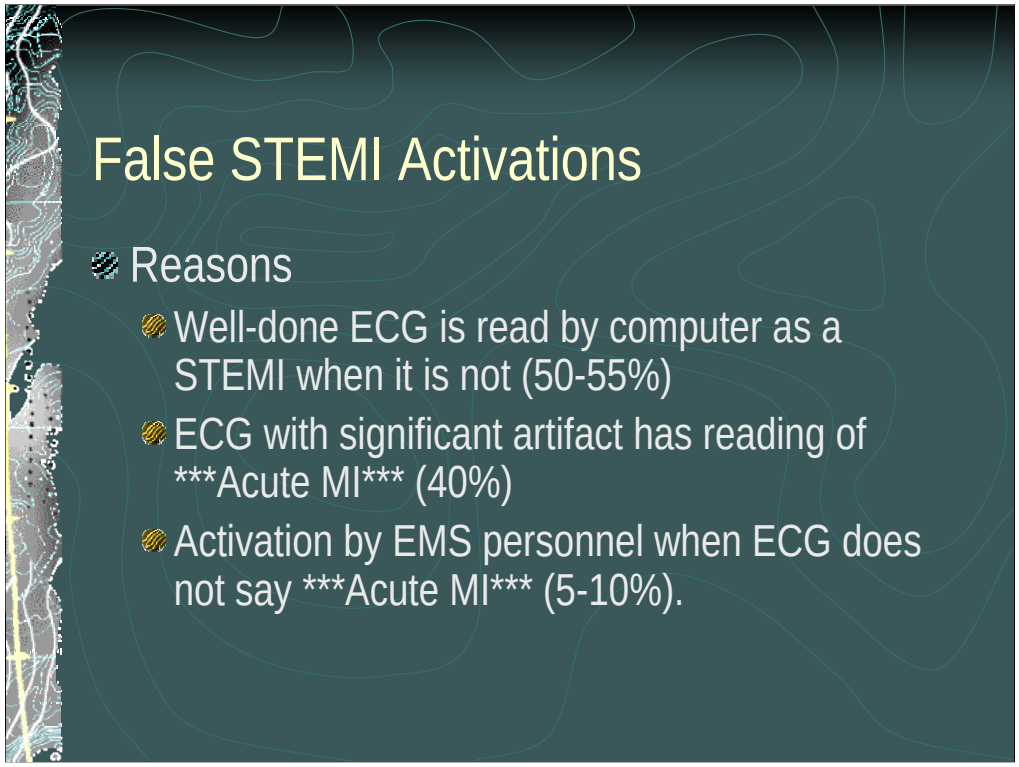


•Our primarily quality improvement focus for STEMI is the reduction of false positives.

•What's a false positive?

•Basically it is a patient who is triaged to a STEMI Center who does not have a STEMI.

•This is most likely do to problems with the ECG and not patient factors.



•Here is what we know from our experience with false positives since our STEMI System began.

Computer Misreads (No Artifact)

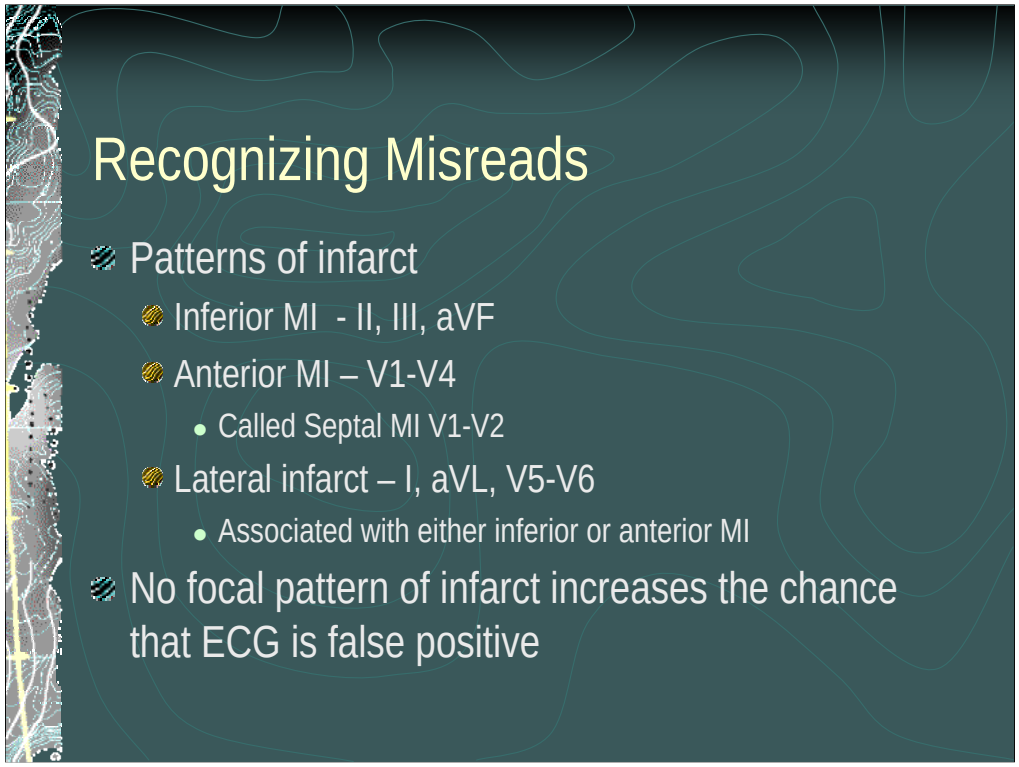
- Rapid heart rates
- Tachyarrhythmias
- Unrecognized paced rhythm
- Widened QRS (not enough for LBBB but enough to fool computer)

•All of these items will cause ST elevation, often quite diffusely, that is not ischemic in nature.

Recognizing Machine Generated Misreads

- How to Decrease Misreads
  - Look for pattern of infarct – if not present potentially a computer misread
  - ECG Transmission – Trial planned

•The 12 lead interpretation of the ECG is not perfect and it takes a combination of prehospital provider recognition and the 12 lead device to come up with a reliable 12 lead.



•Understanding patterns of infarct can help you identify when the ECG device is being fooled.

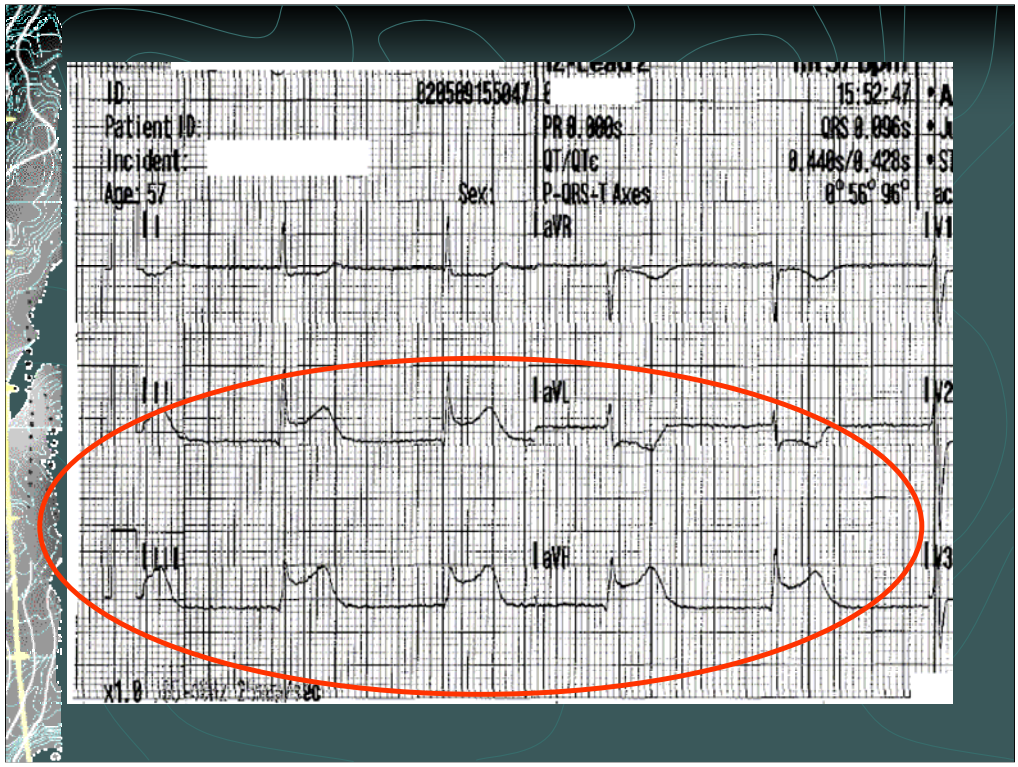
LOCALIZING SITE OF INFARCT

- Localization of an infarct pattern adds to the accuracy of ECG interpretation.
- A STEMI will have 1 mm or more ST-segment elevation in two or more contiguous leads (which means findings noted in the same anatomical location of the infarct).
  - Contiguous leads for inferior infarction include II, III, and aVF
  - Contiguous leads for anterior infarction include V1-V4 (V1-V2 elevation also called septal infarction)
  - Contiguous leads for lateral myocardial infarction include Leads I, aVL, V5, and V6
  - Lateral MI findings may be in addition to anterior or inferior MI patterns (anterolateral or inferolateral)
- In patients with an inferior infarct pattern (Leads II, III, aVF), a separate ECG with V4R should be obtained.
- A 1 mm ST-segment elevation in V4R when inferior infarction noted indicates right ventricular infarct

I – LATERAL or ANTERIOR	aVR	V1 – SEPTAL or ANTERIOR	V4 – ANTERIOR (V4R – RVMI)
II - INFERIOR	aVL – LATERAL or ANTERIOR	V2 – SEPTAL or ANTERIOR	V5 – LATERAL
III – INFERIOR	aVF - INFERIOR	V3 – ANTERIOR	V6 – LATERAL

•In the field care manual – we have added a section on localizing infarct patterns as a reference.

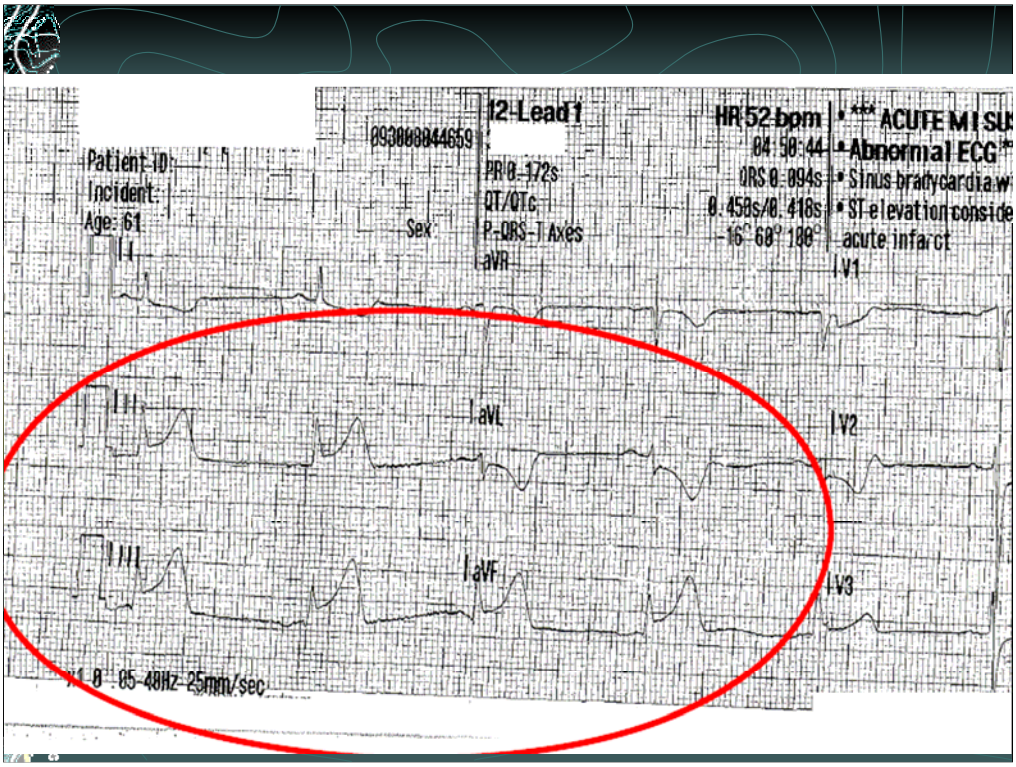
•Some have seen the clear plastic overlays that some manufacturers have for the same purpose.



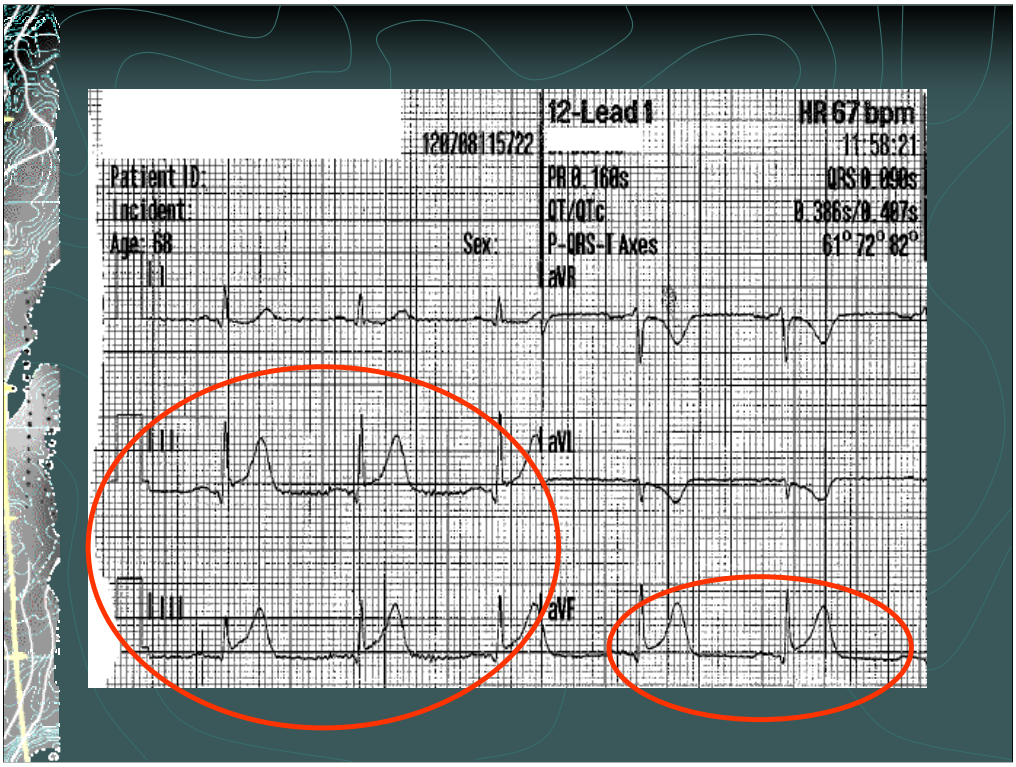
•Here's a good example of an Inferior MI. You can clearly see ST elevation in II, III, and aVF.

•This is the most common pattern we see in terms of MI.

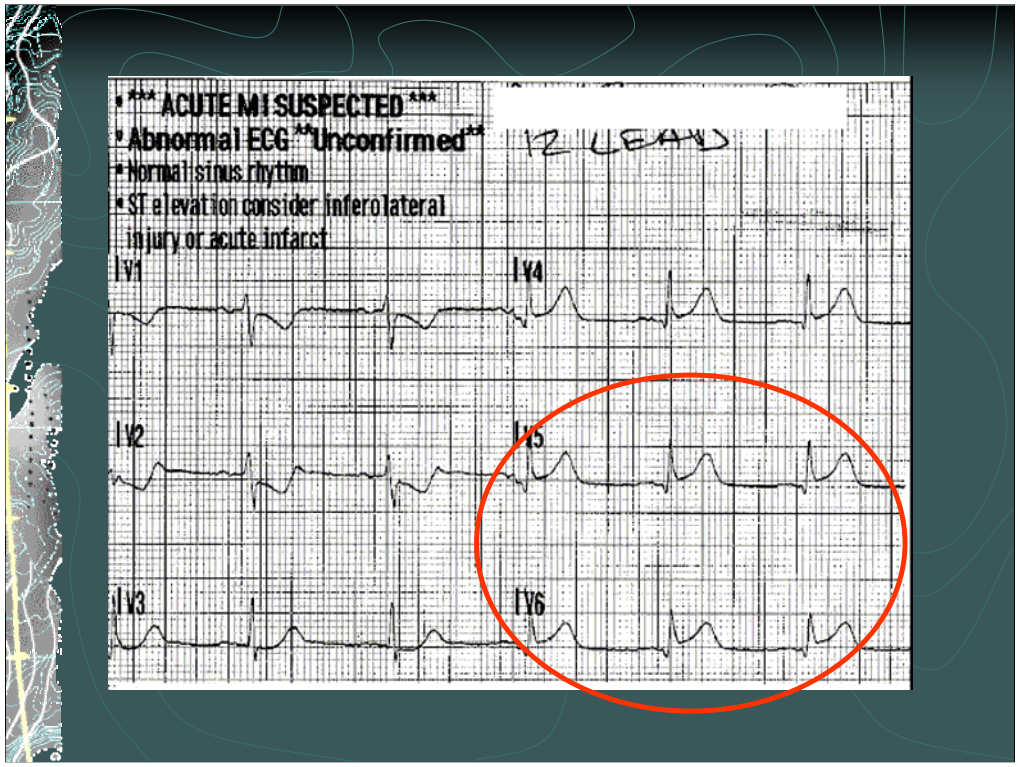
•Turns out this patient also has a junctional rhythm, not uncommon with increased vagal tone in inferior MI (bradycardia also).



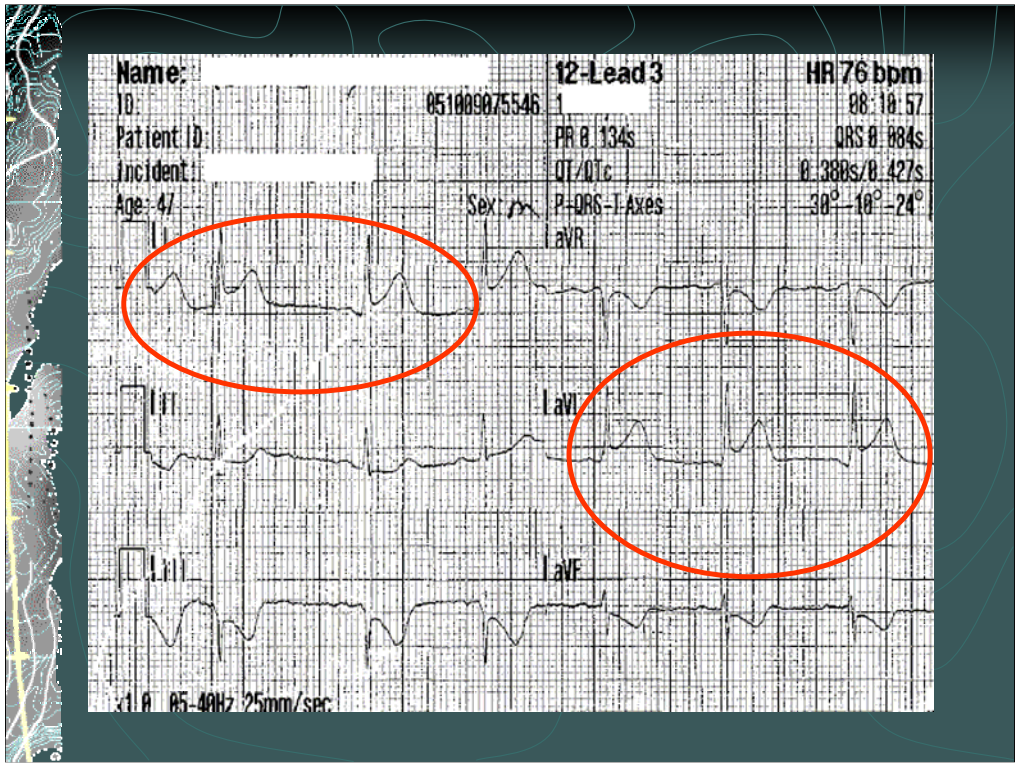
•Another example of clear ST elevation in II, III, and aVF



•Here's another one with II, III, and avF elevated – inferior MI pattern.

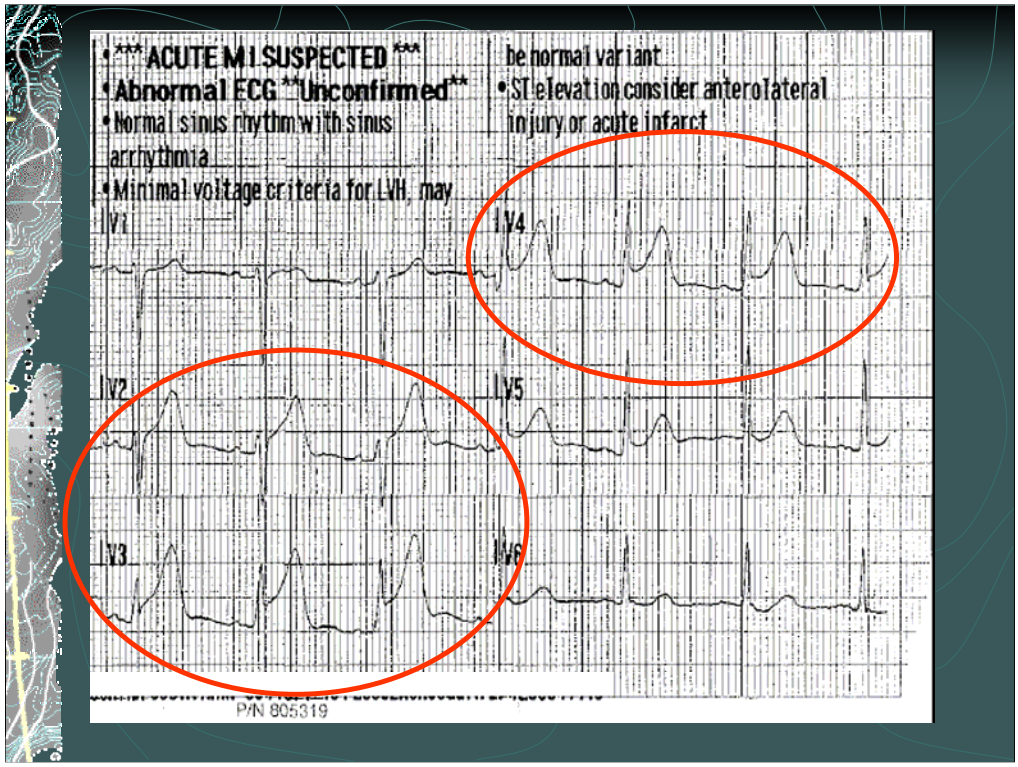


•And here is the other half of that same ECG showing elevation in V5 and V6 consistent with lateral infarct as well as inferior.



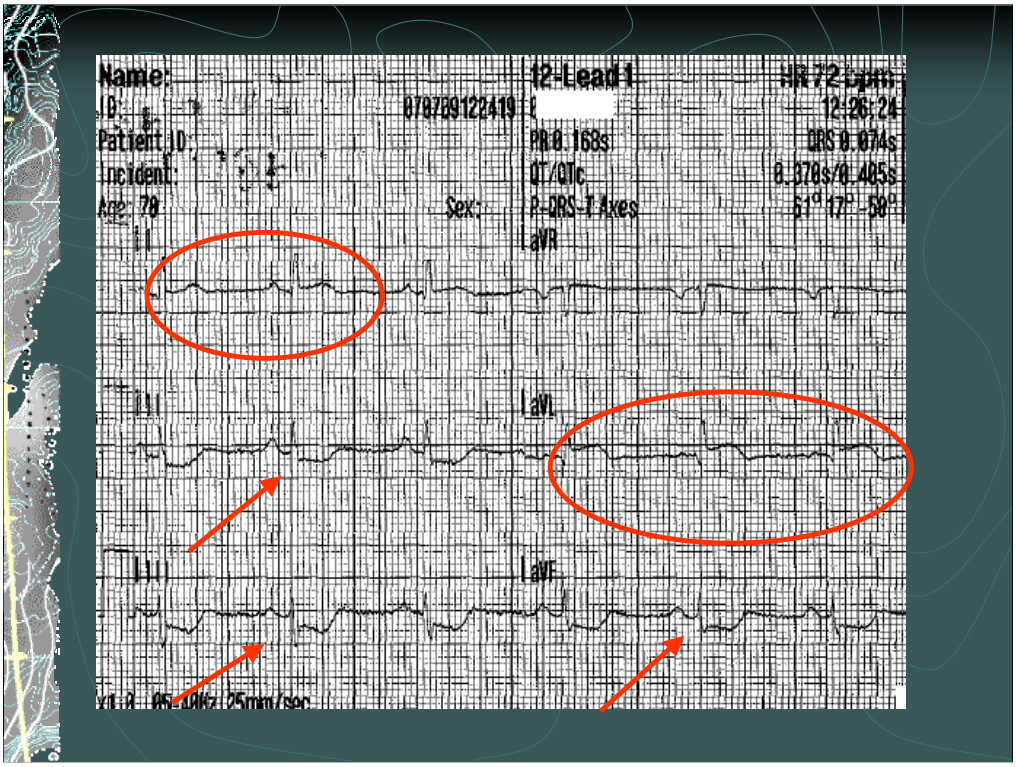
•Perhaps a little hard to see but this is the left side of an ECG with an anterolateral MI.

•There is marked ST elevation in leads I and aVL.



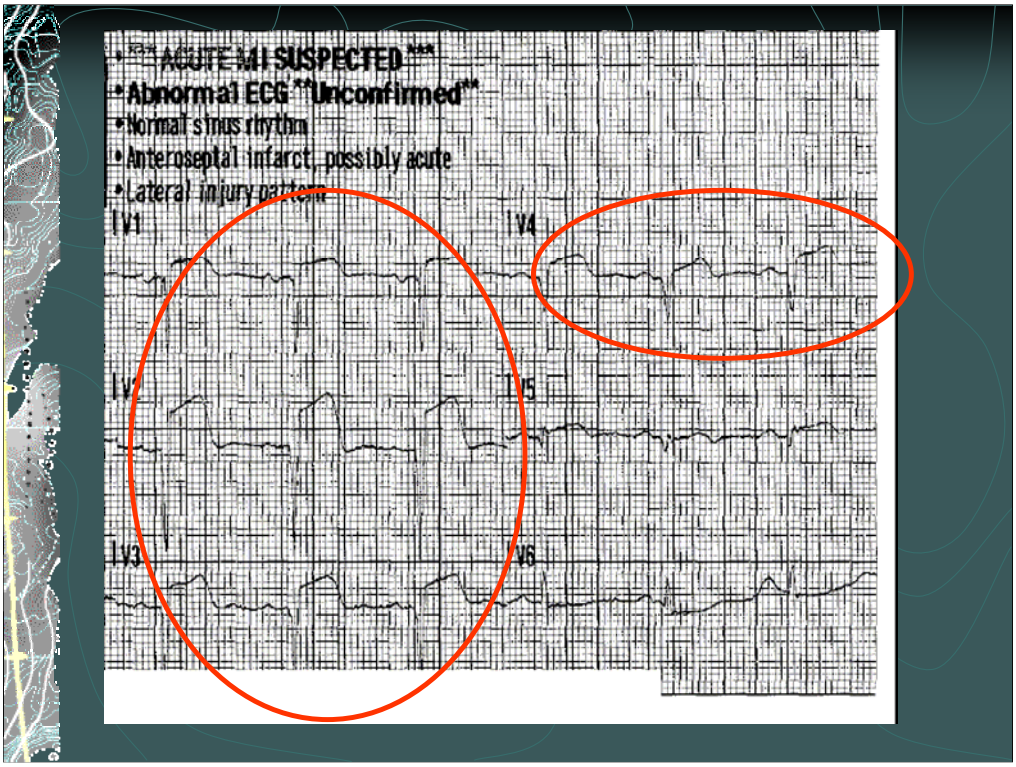
•Here is the other side of the same ECG showing anterolateral MI.

•Note the ST elevation in V2-V4.

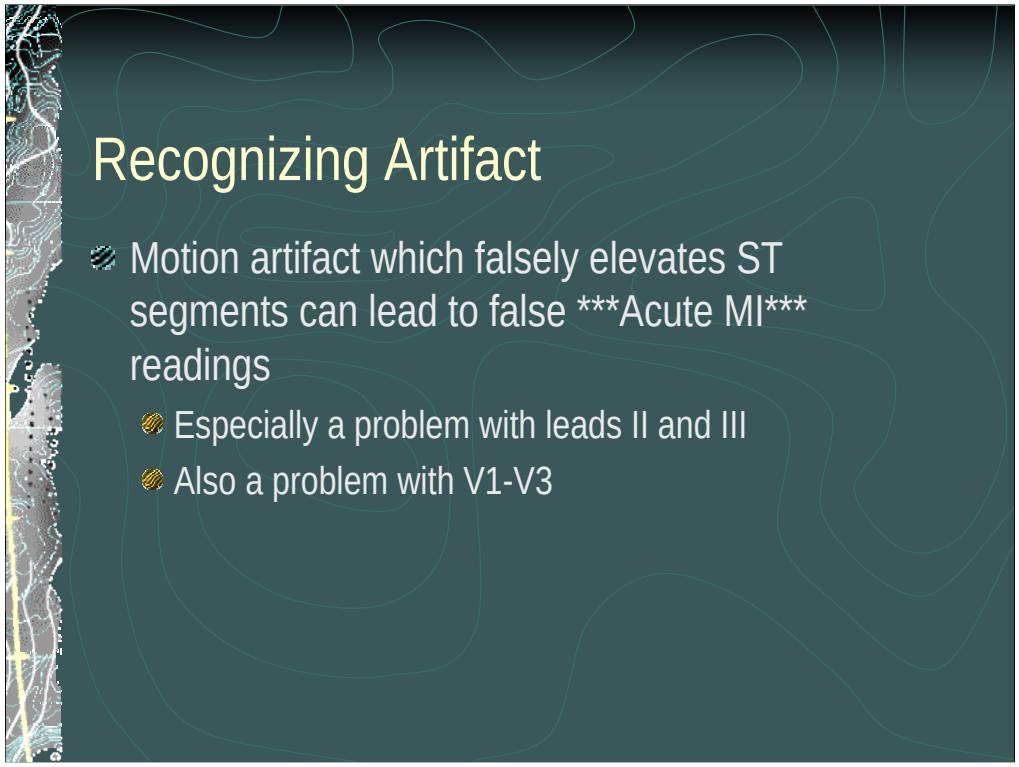


•Here is the left-hand side of another anterior MI – the ST changes are perhaps a bit subtle in Lead I and more obvious in aVL.

•The arrows denote marked ST depression in II, III, and aVF which are reciprocal changes that are often seen.

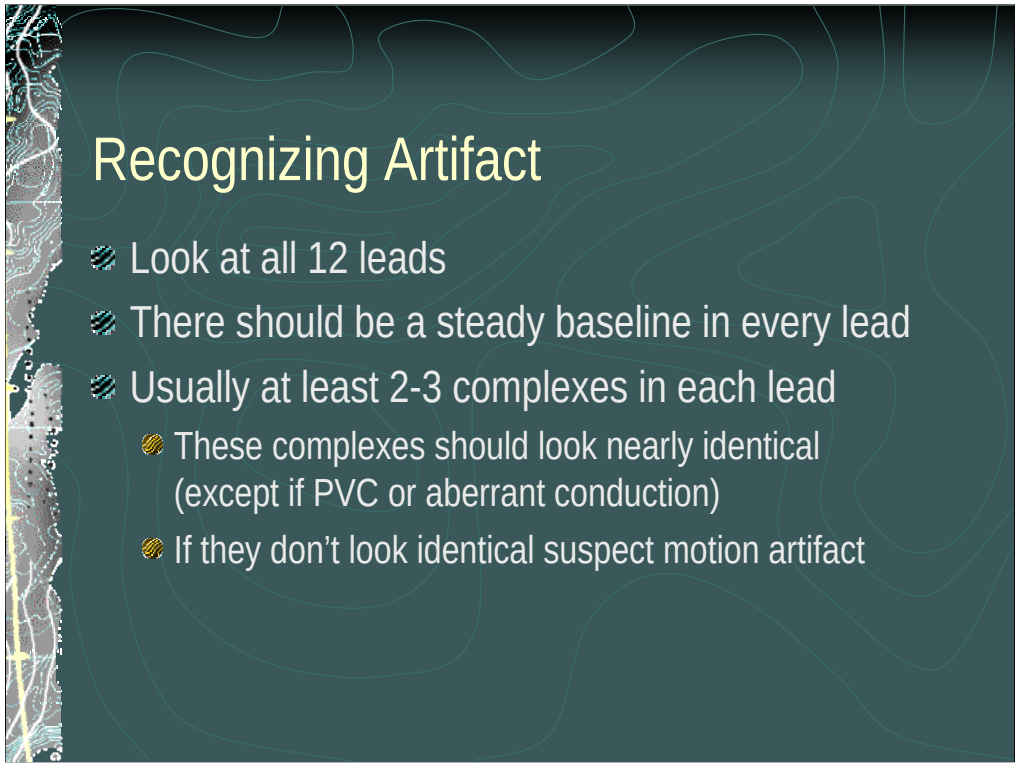


•Here is the right side of the same ECG – tombstones in V1-V4. This is a big-time anterior infarct in progress. This tracing is a little difficult to see on this slide but hopefully you can pick up the changes.

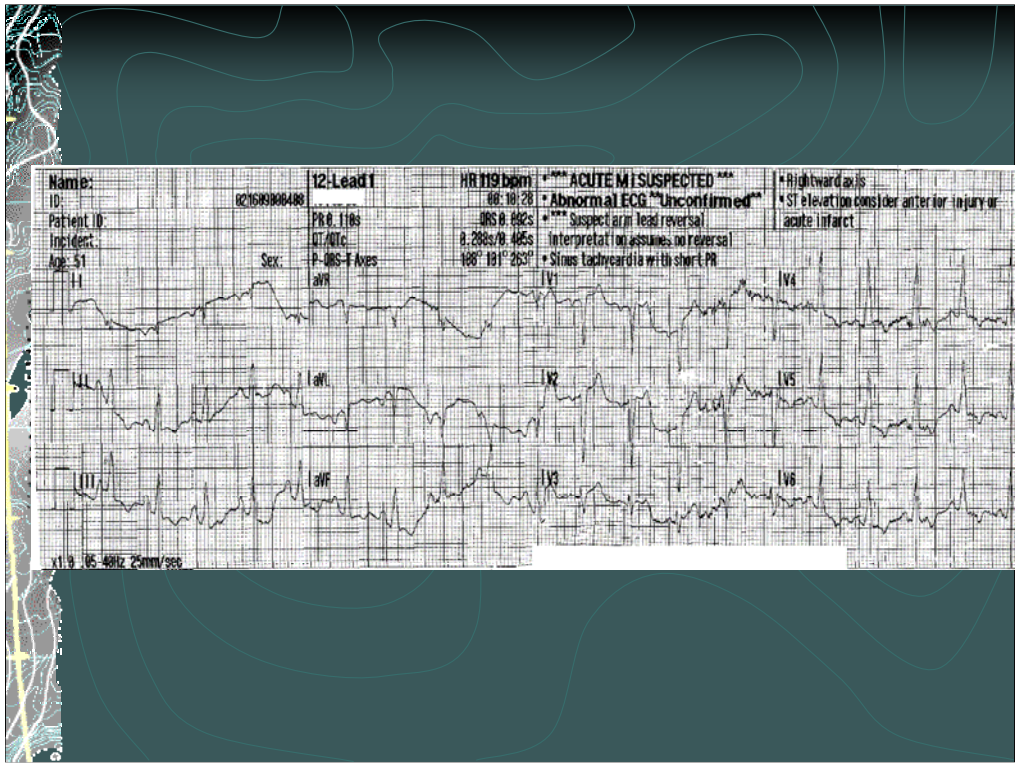


•Artifact is the most common reason for false positives and needs to be eliminated.

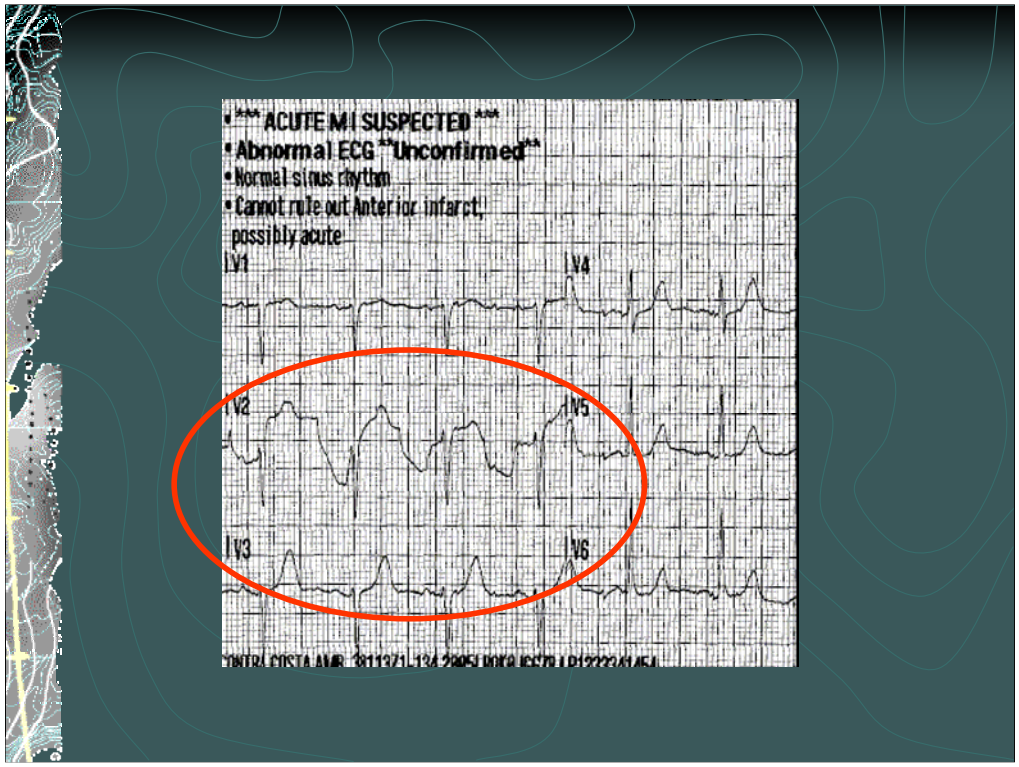
•Don’t let the excitement of getting a ECG positive for STEMI off the device sidetrack you to this common problem



•There are many things you can look at to assure you have minimal artifact.



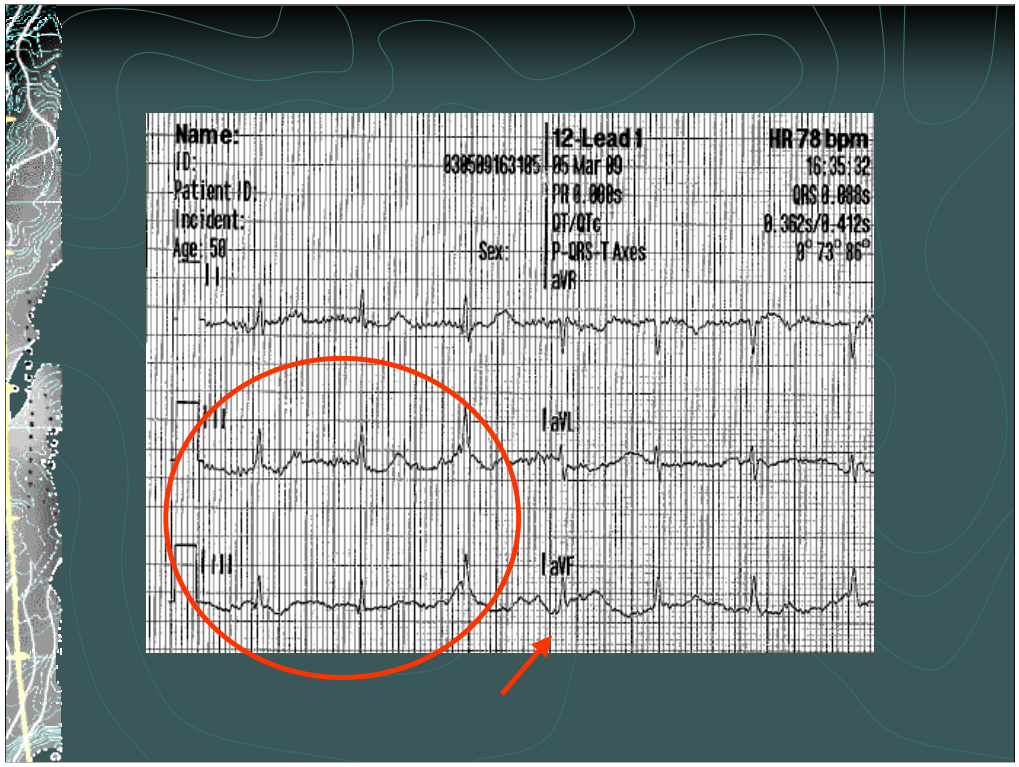
•This ECG has obvious artifact yet this patient was a STEMI activation (repeat ECG at hospital negative).



•This patient had a normal ECG on initial reading, then a second tracing was taken that said “Acute MI”.

• Each of the 4 complexes in V2 look very different while all the others in all 11 leads look similar.

• This is undoubtedly a lead contact issue. This ECG should be disregarded and repeated.



•This led to a false activation.

•The complexes in II and III are changing with each beat.

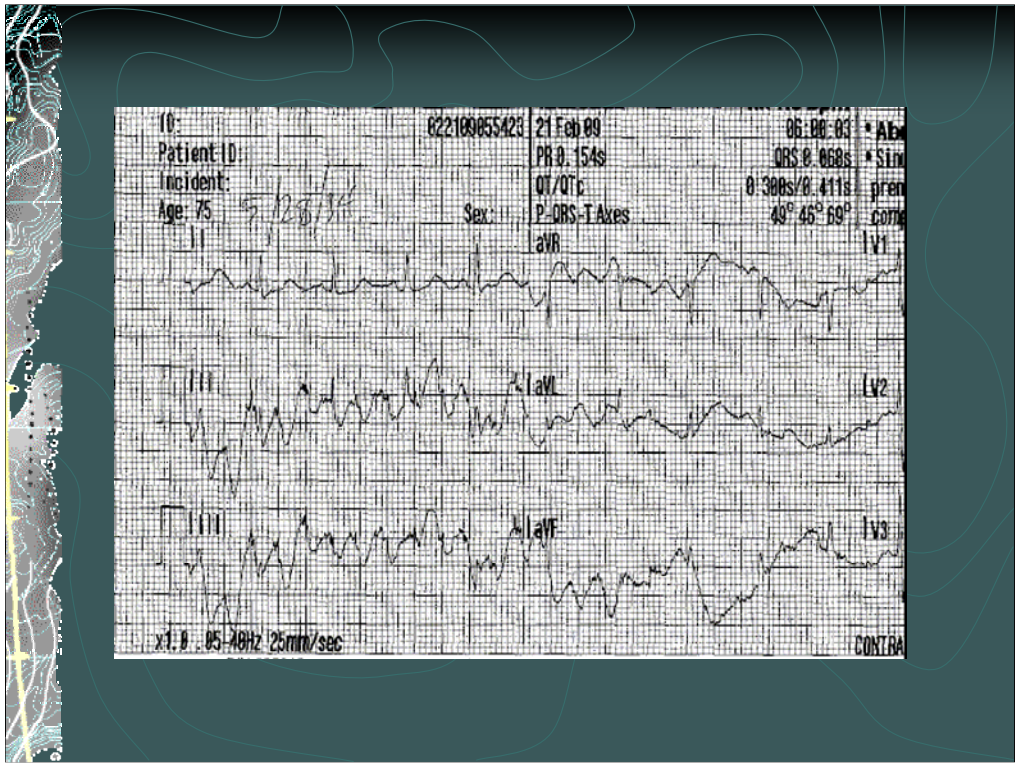
•aVF looks to have ST elevation in one complex and not in others.

•This is relatively subtle, but there just is no clear pattern of ischemia and there is artifact.

•The computer calls this a septal infarct and inferolateral injury pattern.

•There's no way that this could be considered an acceptable ECG given the artifact seen, and it should have been repeated.

•Again, it led to a false activation.

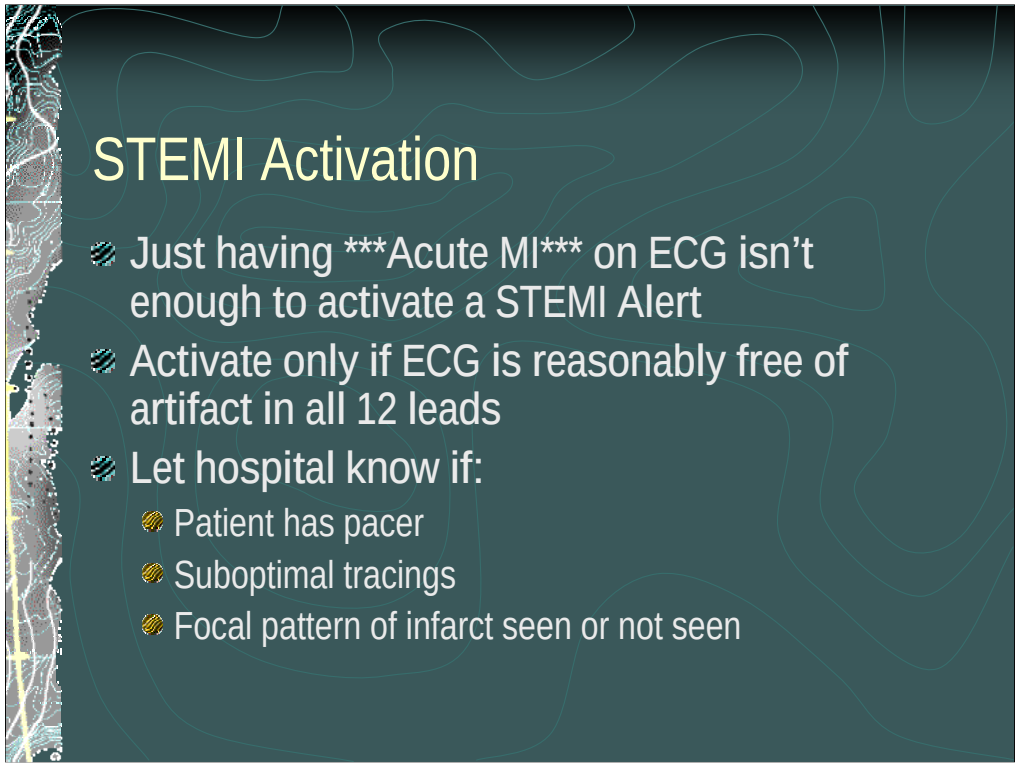


•Here's another that ended up with a false activation.

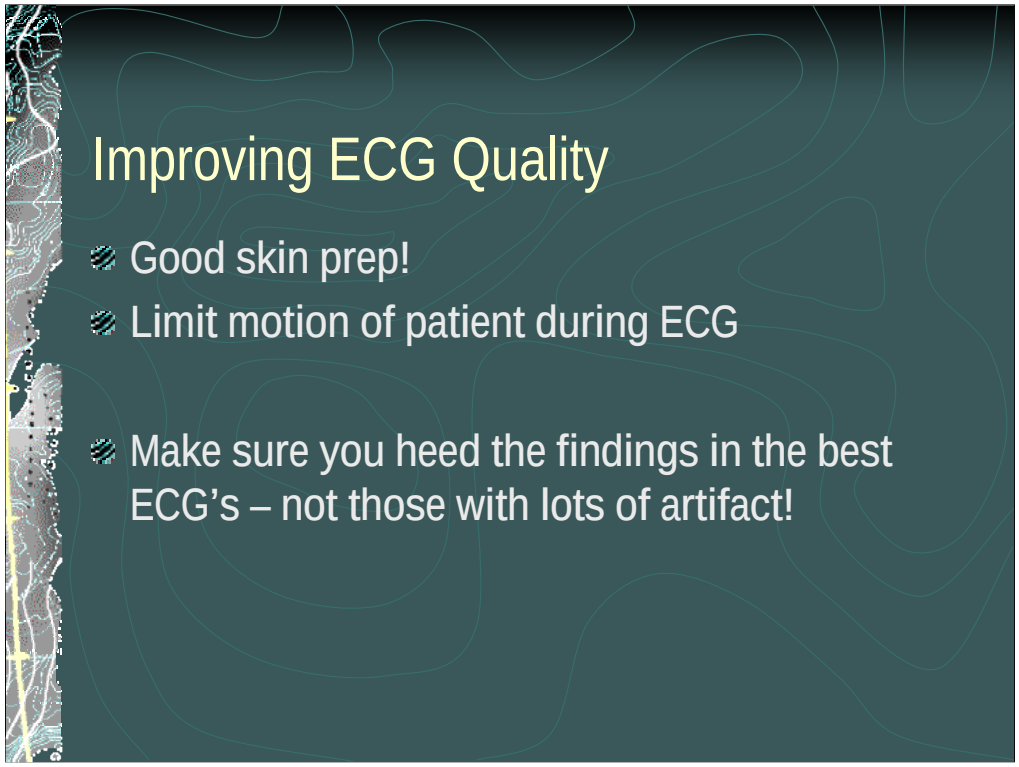
•These kind of false positives are easily avoided if you look at the 12 lead complexes themselves.

•Lead I looks pretty good, but just about all of the others are undecipherable.

•These are the kind that would make my hair fall out if I had any.



Look at all 12 leads, make sure you have a good tracing, and look for that focal pattern of infarct.



•These are simple but effective ways of reducing artifact.

Questions?

- This training will be made available on the EMS website at www.cccems.org
- A Self Study module is also planned so this can be a reference to you at anytime
- See your EMS Educator if you have further questions on any of this material or contact Contra Costa EMS.