Neonatal Mortality and Neonatal Resuscitation

Photo by Brett Nelson. No permission needed.

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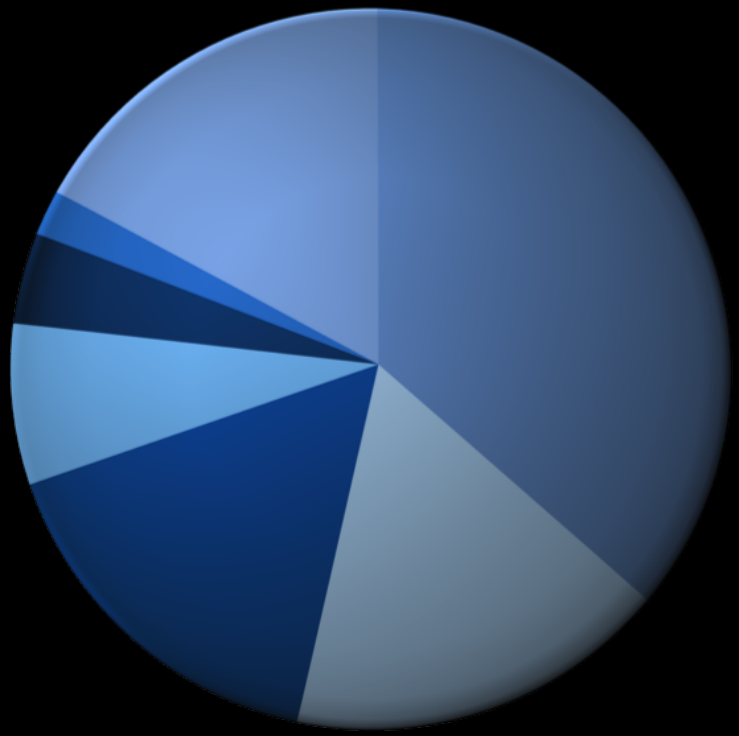
Discussion outline

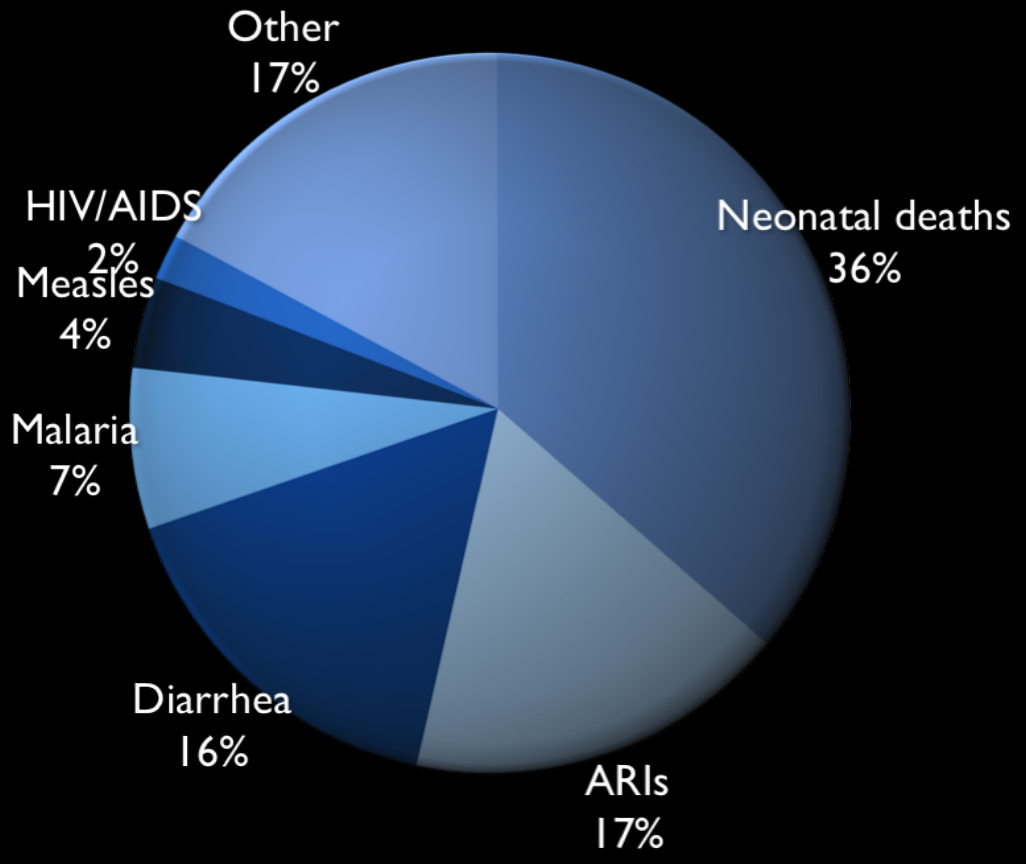
- Neonatal mortality
- Importance of newborn resuscitation
- Simple effective steps for newborn resuscitation
- Practicum

Causes of child mortality



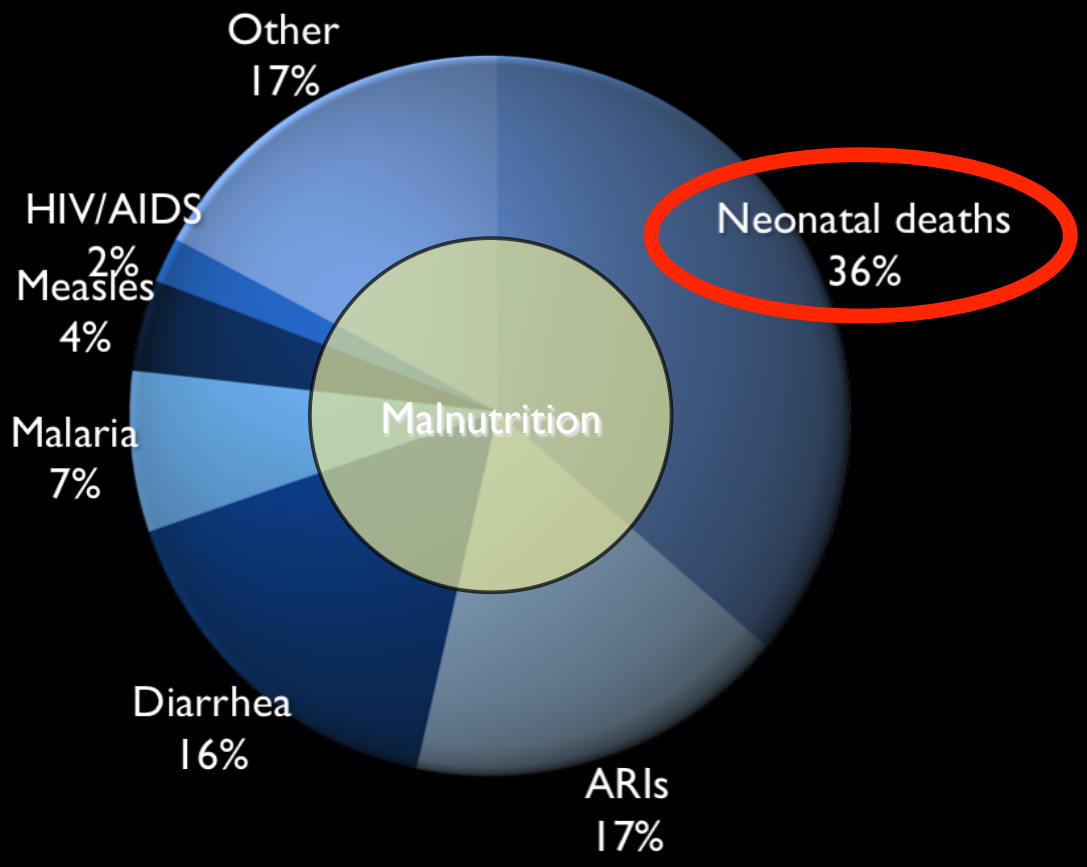
WHO. The global burden of disease: 2004 update.

Causes of child mortality



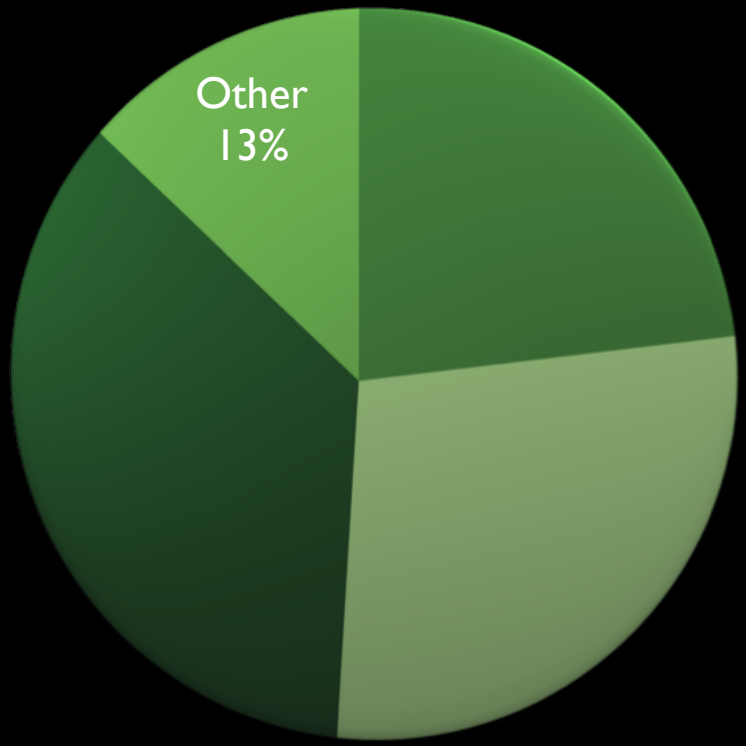
WHO. The global burden of disease: 2004 update.

Causes of mortality

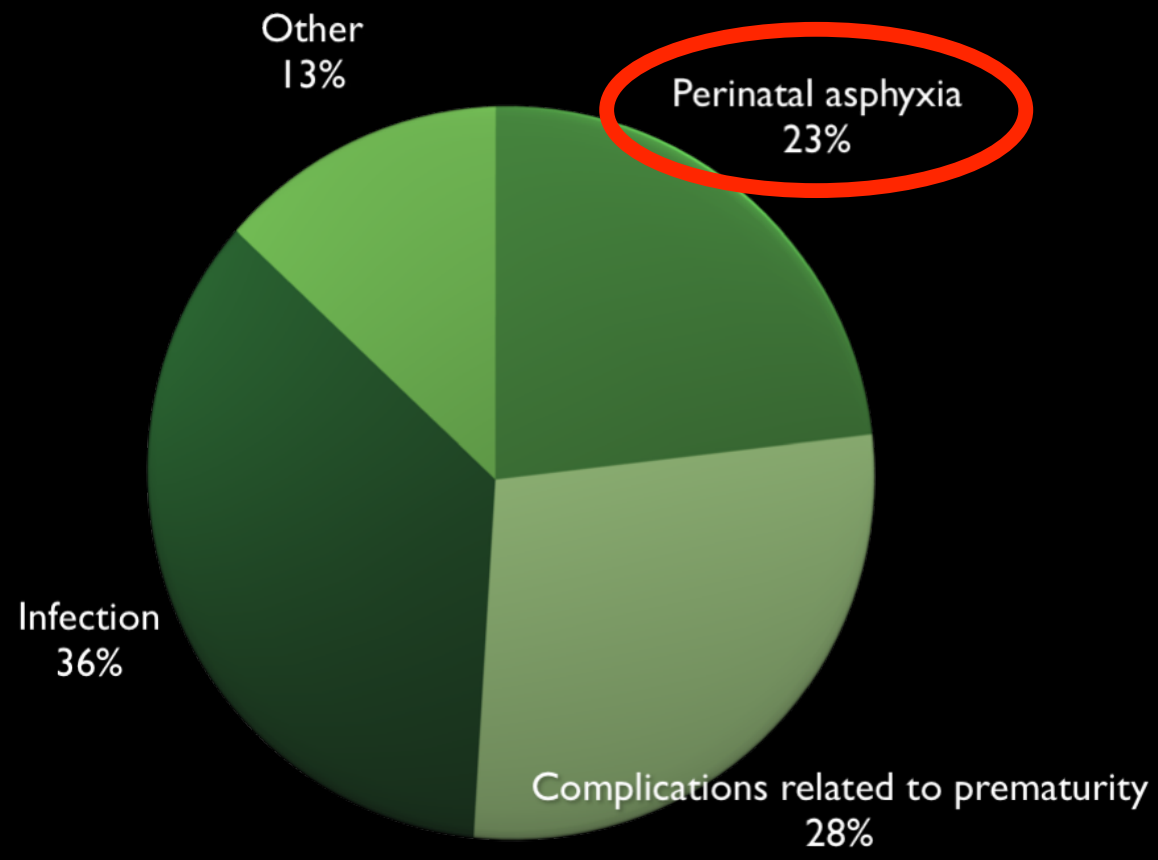


WHO. The global burden of disease: 2004 update.

Causes of neonatal mortality



Causes of neonatal mortality



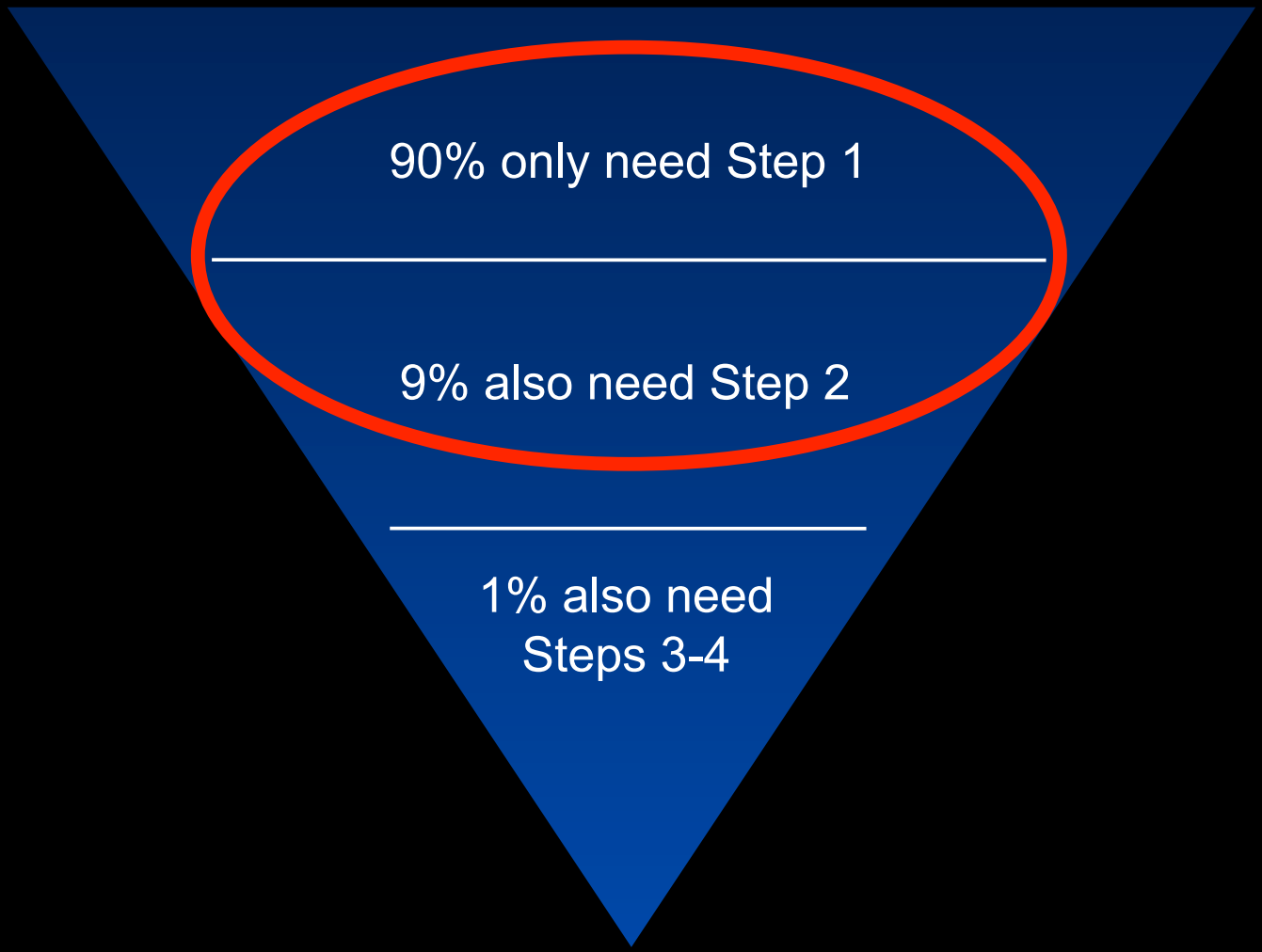
Importance of newborn resuscitation

- Newborn resuscitation is one of the most effective interventions in medicine!
  - Very simple equipment
  - Effective, step-wise interventions
  - Most babies quickly respond very well

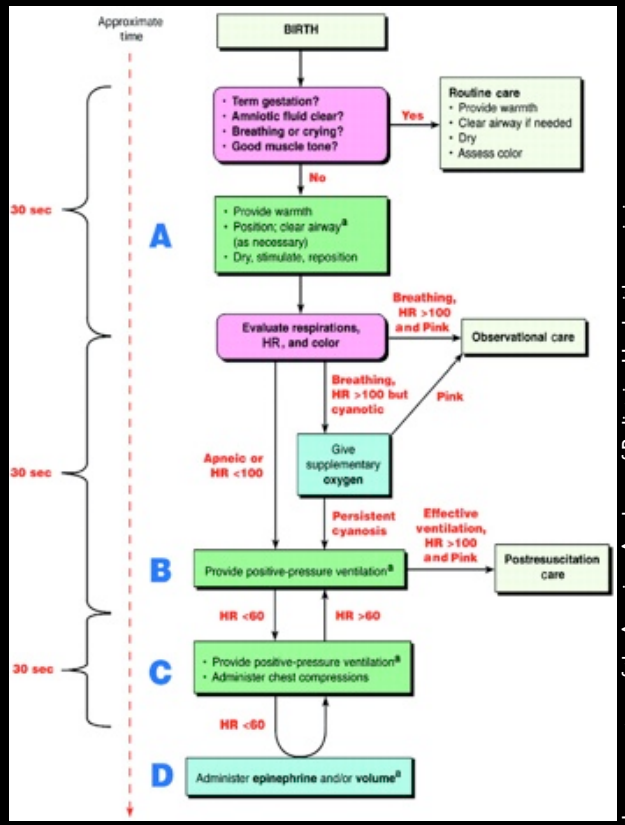
Which babies need resuscitation?

- 90% do well and only need warming, drying, stimulating, bulb suction (Step 1)
- But remaining need additional interventions:
  - 9% require bag-mask ventilation (Step 2)
  - 1% need major resuscitative interventions (chest compressions, intubation, medications; Steps 3 and 4)

Which babies need resuscitation?



Multiple evidence-based algorithms



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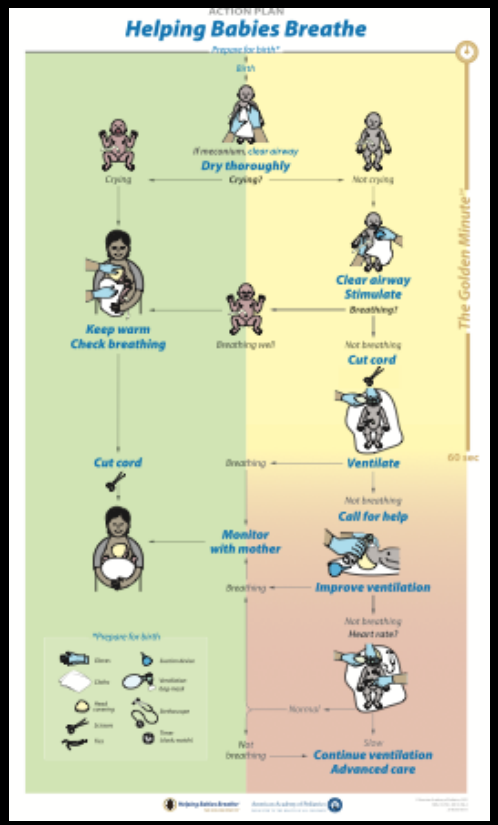
NRP



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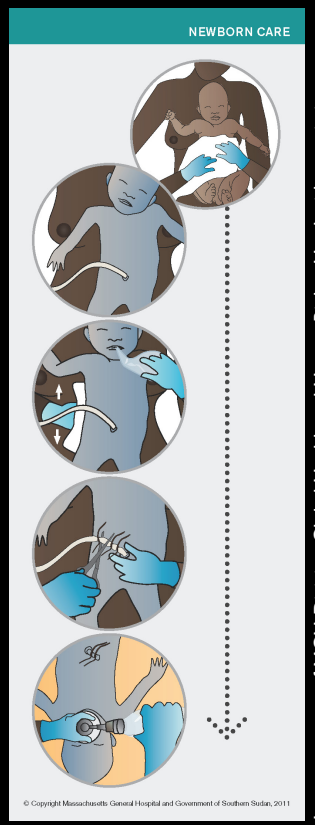
HBB



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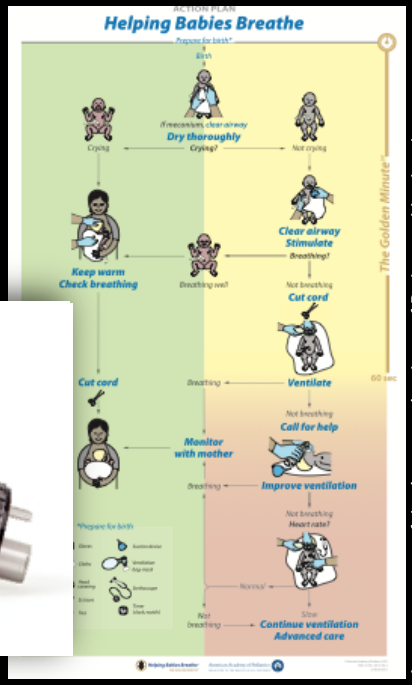
MNCS

Helping Babies Breathe

- NRP for resource-limited settings
- Released by AAP and partners in June 2010
- Pictorial algorithms and affordable resuscitative devices and training equipment

Image courtesy of Laerdal Medical. Used with permission.



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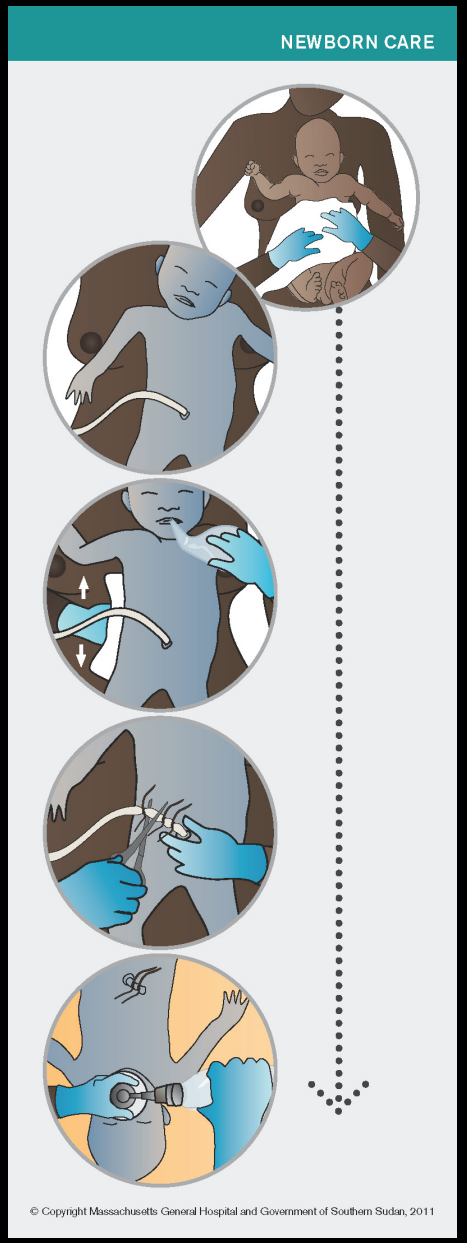
Newborn resuscitation for diverse settings

Photos by Brett Nelson. No permission needed.

Maternal, Newborn, Child Survival (MNCS)



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Prepare for resuscitation

- Always have resuscitation equipment ready
- Every delivery should have 1 person….
  - whose only responsibility is the baby
  - who is capable of initiating resuscitation
- When significant resuscitation is anticipated, have additional personnel present

4 resuscitation steps

- Each step involves increasing intervention
  - Step #1: warm, dry, stimulate, bulb suction
  - Step #2: + bag-mask ventilation
  - Step #3: + chest compressions
  - Step #4: + IV, intubation, epinephrine, etc.
- After every 30 seconds, assess baby and decide whether to go to next step

(For clarity in teaching clinical trainees, this algorithm attempts to synthesize the general approaches of NRP and HBB algorithms.)

1

Warm, dry, bulb suction and stimulate

Assess heart rate, breathing, color

Not breathing or HR <100

2

Give breaths with bag-mask

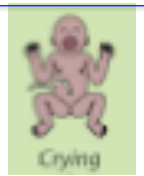
- head in sniffing position
- clear airway if necessary
- provide 40 breaths/min

Assess heart rate, breathing, color

HR <60

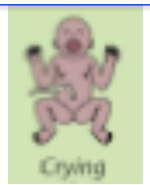
3+

Continue to provide 40 breaths/min



Breathing, pink, HR >100

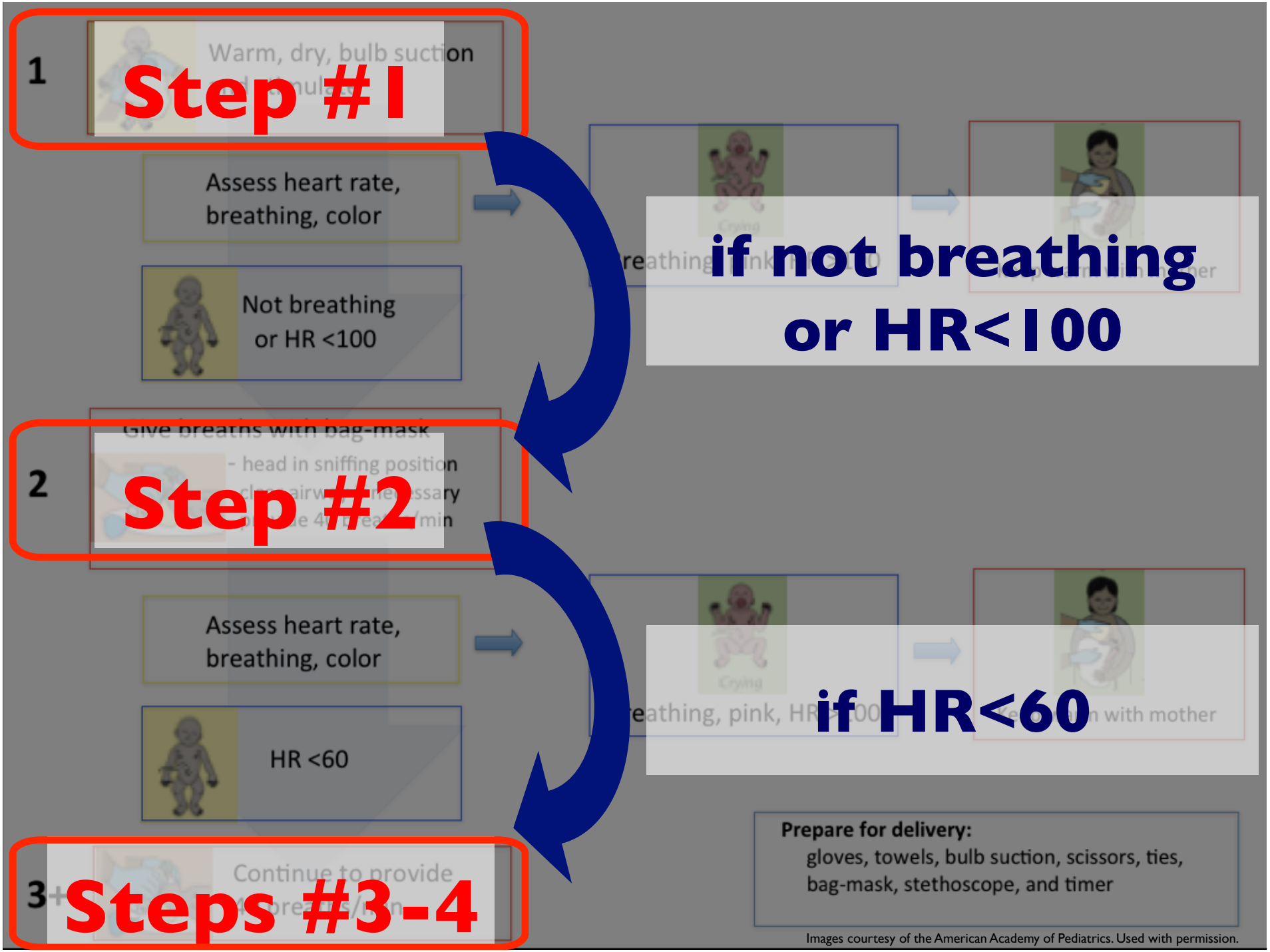
Keep warm with mother



Breathing, pink, HR >100

Keep warm with mother

Prepare for delivery:
gloves, towels, bulb suction, scissors, ties, bag-mask, stethoscope, and timer



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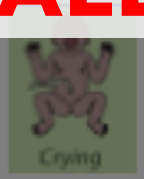
Step #1: for ALL newborns

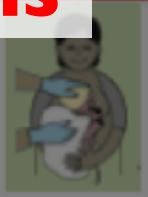
1

Warm, dry, bulb suction and stimulate

Assess heart rate, breathing, color



Breathing, pink, HR >100



Keep warm with mother

Not breathing or HR <100

2

Give breaths with bag-mask

- head in sniffing position
- clear airway if necessary
- provide 40 breaths/min

Assess heart rate, breathing, color

Breathing, pink, HR >100

Keep warm with mother

HR <60

3+

Chest compressions + other interventions

Prepare for delivery:
gloves, towels, bulb suction, scissors, ties, bag-mask, stethoscope, and timer

Step #1

Step #1: for ALL newborns

a. Warm
b. Dry
c. Bulb suction
d. Stimulate

} During first 30 seconds

Then, assess the baby.

Step #1

Warm the baby

- Dry baby with multiple dry towels
  - Accomplishes: warm, dry, and stimulate
- Remove all wet towels

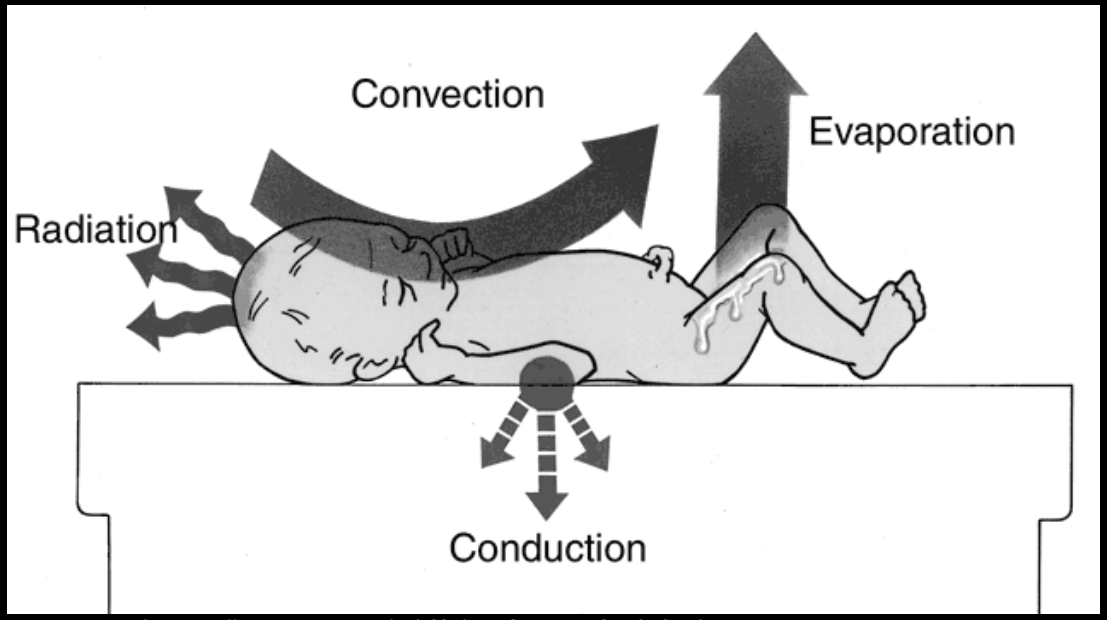


Image retrieved from http://whqlibdoc.who.int/hq/1997/ WHO_RHT_MSM_97.2.pdf. Image is in the public domain.

Step #1

Bulb suction

- Bulb suction Mouth and then Nose
  - "M" before "N"
- Deep suction only for significant secretions

Image courtesy of the American Academy of Pediatrics.
Used with permission.

Now, after 30 seconds of Step #1,
assess the baby…

And decide whether need Step #2

assess

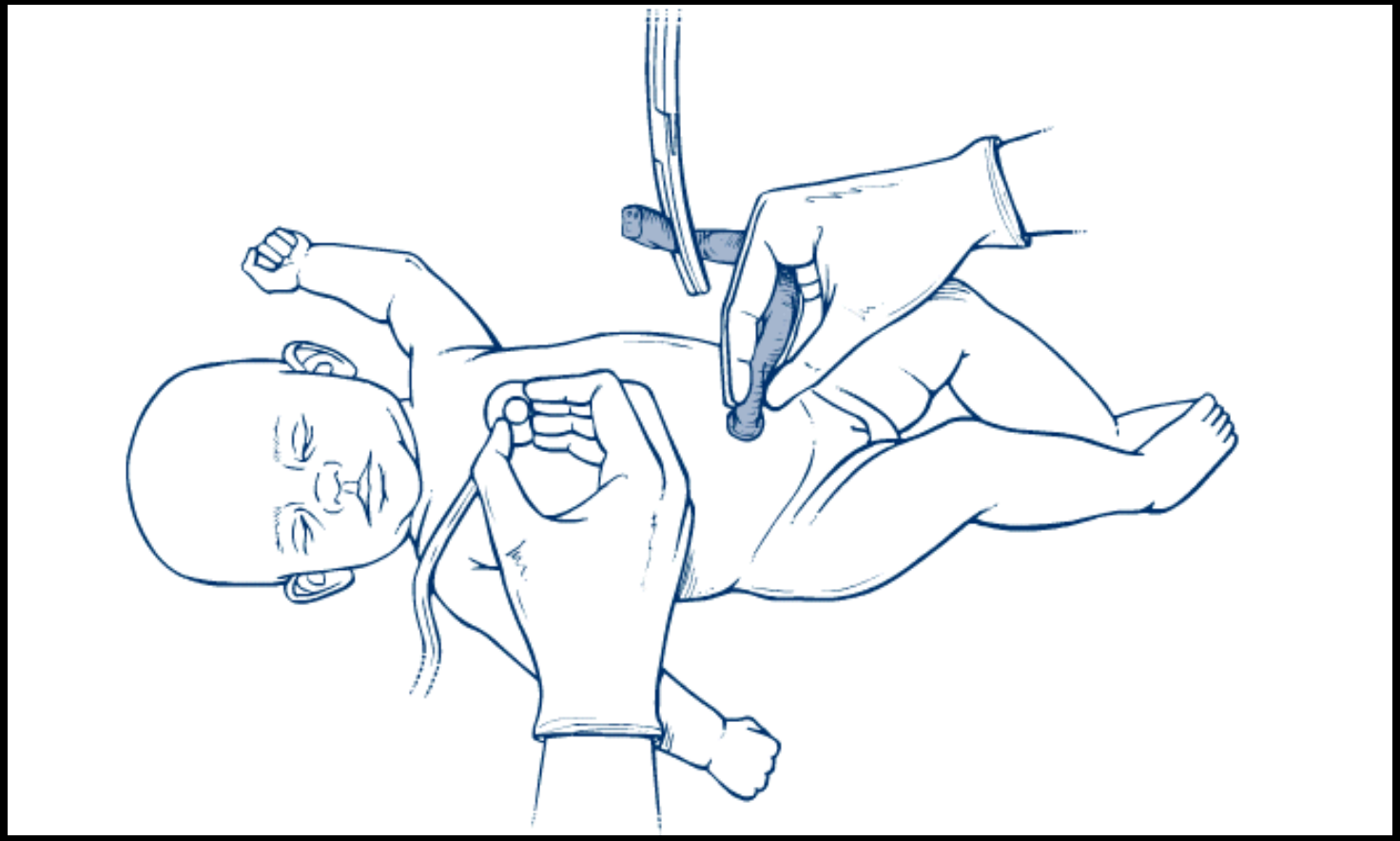
Assessing the baby

- Every 30 seconds, assess 3 things…

1. Heart rate (HR)
2. Breathing
3. Color

assess

1. Assess heart rate (HR)



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assess

2. Assess breathing

- Look for chest movement (or crying)
  - –Newborn needs to have good breaths or cry
  - –Grunting or weak breaths are not adequate

assess

3. Assess color

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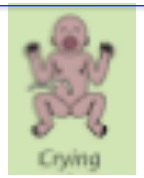
1

Warm, dry, bulb suction and stimulate

Assess heart rate, breathing, color



Breathing, pink, HR >100

Keep warm with mother

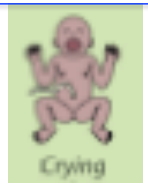
Not breathing or HR <100

2

Give breaths with bag-mask

- head in sniffing position
- clear airway if necessary
- provide 40 breaths/min

Assess heart rate, breathing, color



Breathing, pink, HR >100

Keep warm with mother

HR <60

3+

Continue to provide 40 breaths/min

Prepare for delivery:
gloves, towels, bulb suction, scissors, ties, bag-mask, stethoscope, and timer

1

Warm, dry, bulb suction and stimulate

Assess heart rate, breathing, color

Breathing, pink, HR >100

Keep warm with mother

Not breathing or HR <100

2

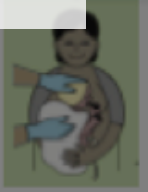
Give breaths with bag-mask

- head in sniffing position
- clear airway if necessary
- provide 40 breaths/min

Step #2: if not breathing or HR <100

Assess heart rate, breathing, color

Breathing, pink, HR >100



Keep warm with mother

HR <60

3+

Chest compressions + other interventions

Prepare for delivery:
gloves, towels, bulb suction, scissors, ties, bag-mask, stethoscope, and timer

Step #2

Step #2

- After 30 seconds of Step #1, begin bag-mask ventilation if not breathing or HR <100
  - Position the airway
  - Select appropriately sized mask
  - Give breaths (40-60 breaths/min)
  - Watch for good chest rise
- Re-assess after 30 seconds

Step #2

Position the airway

- Open airway by placing baby in neutral position
  - Chin lifted slightly up
  - Neck flexion or hyperextension closes airway

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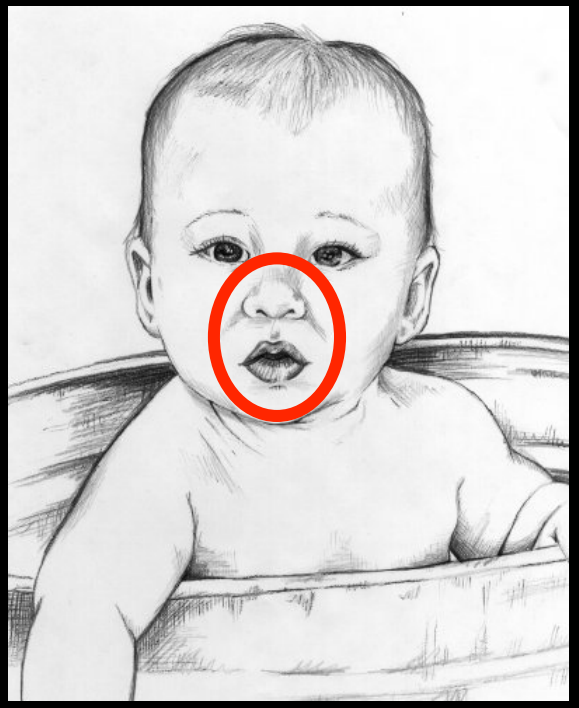
Step #2

Choose appropriate mask

Choose mask that covers nose and mouth but doesn't extend below chin



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Step #2

Hold bag-mask firmly

- Use "C-grip" to hold mask to face
- Use remaining 3 fingers to gently pull jaw up to mask

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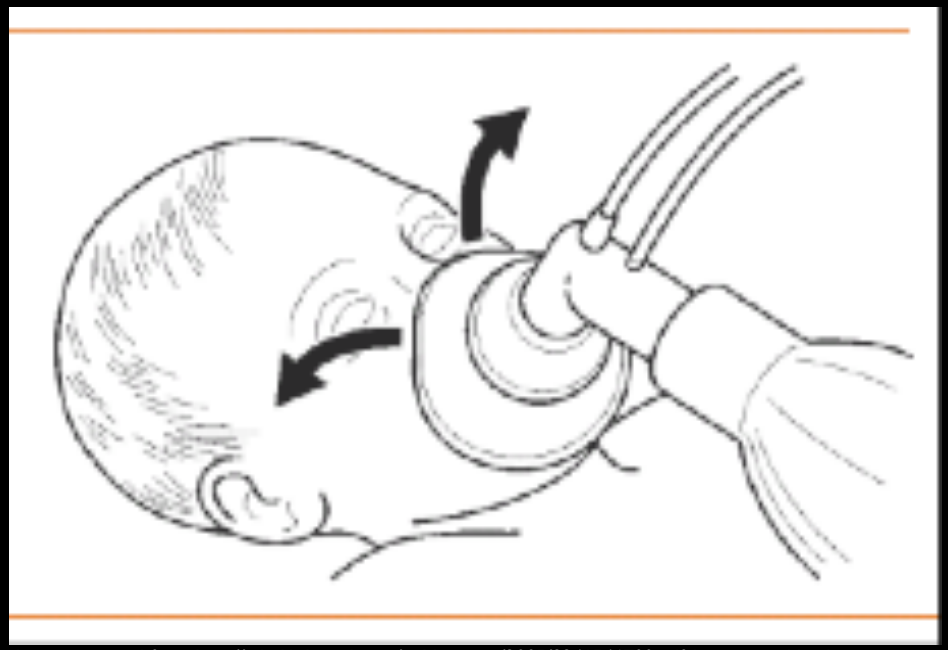
Step #2

Check good mask seal

- Give breaths at 40-60 breaths/min
- If you hear air escaping from mask, reposition or hold mask more firmly



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Step #2

Watch for chest rise

- Goal of bag-mask ventilation is good chest rise with each breath
- If poor chest movement:
  - Check seal of mask
  - Re-position newborn in neutral position
  - Re-suction airway
  - Try giving larger breaths

Image by WHO, retrieved from http://helid.digicollection.org/en/d/Js2889e/4.5.html. Image in public domain.

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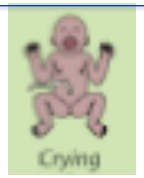
Now, after 30 seconds of Step #2, assess the baby…

And decide whether need Step #3

1

Warm, dry, bulb suction and stimulate

Assess heart rate, breathing, color



Breathing, pink, HR >100

Keep warm with mother

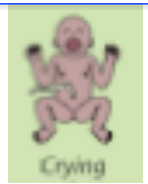
Not breathing or HR <100

2

Give breaths with bag-mask

- head in sniffing position
- clear airway if necessary
- provide 40 breaths/min

Assess heart rate, breathing, color



Breathing, pink, HR >100

Keep warm with mother

HR <60

3+

Continue to provide 40 breaths/min

Prepare for delivery:
gloves, towels, bulb suction, scissors, ties, bag-mask, stethoscope, and timer

1

Warm, dry, bulb suction and stimulate

Assess heart rate, breathing, color

Not breathing or HR <100

Breathing, pink, HR >100

Keep warm with mother

2

Give breaths with bag-mask

- head in sniffing position
- clear airway if necessary
- provide 40 breaths/min

Assess heart rate, breathing, color

HR <60

Breathing, pink, HR >100

Keep warm with mother

3+

Chest compressions + other interventions

Step #3: if HR <60

Prepare for delivery:
gloves, towels, bulb suction, scissors, ties, bag-mask, stethoscope, and timer

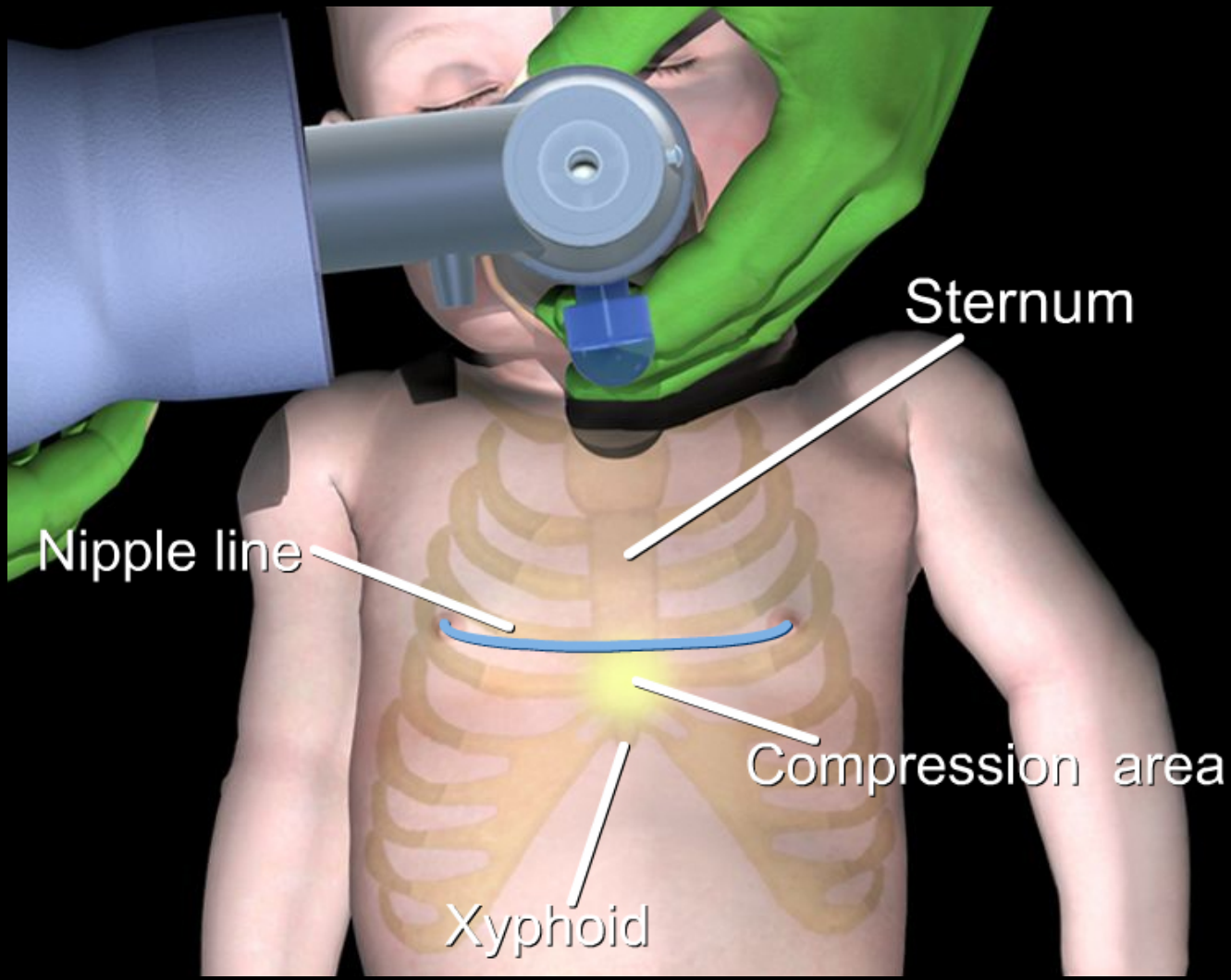
Step #3

Step #3

- After 30 seconds of Step #2, begin chest compressions if HR <60
  - Give chest compressions (90/minute)
  - Coordinate compressions with continuing bag-mask ventilation….
  - Call for assistance (for IV access, intubation, epinephrine)
- Re-assess after 30 seconds

Step #3

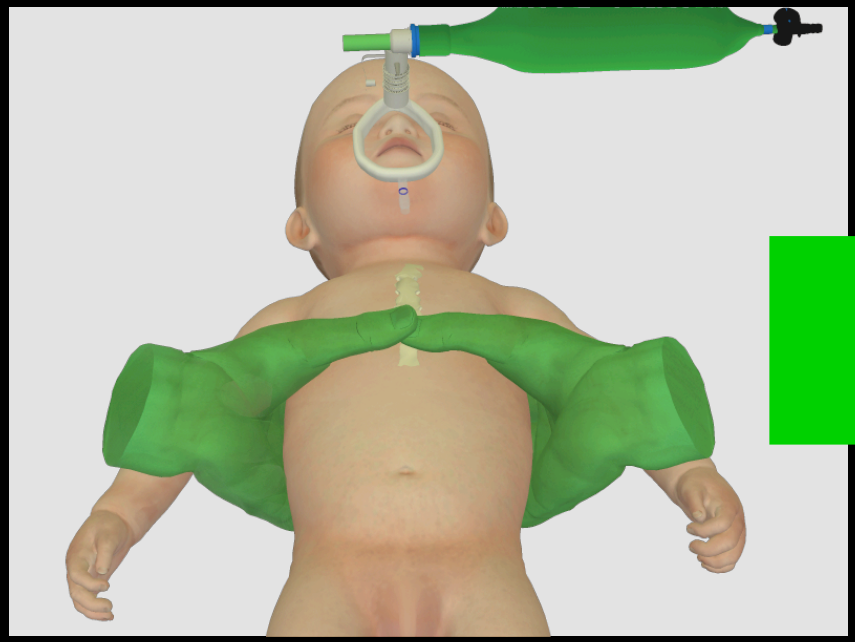
Chest compressions: location



Step #3

Chest compressions: 2 techniques

Hands around chest

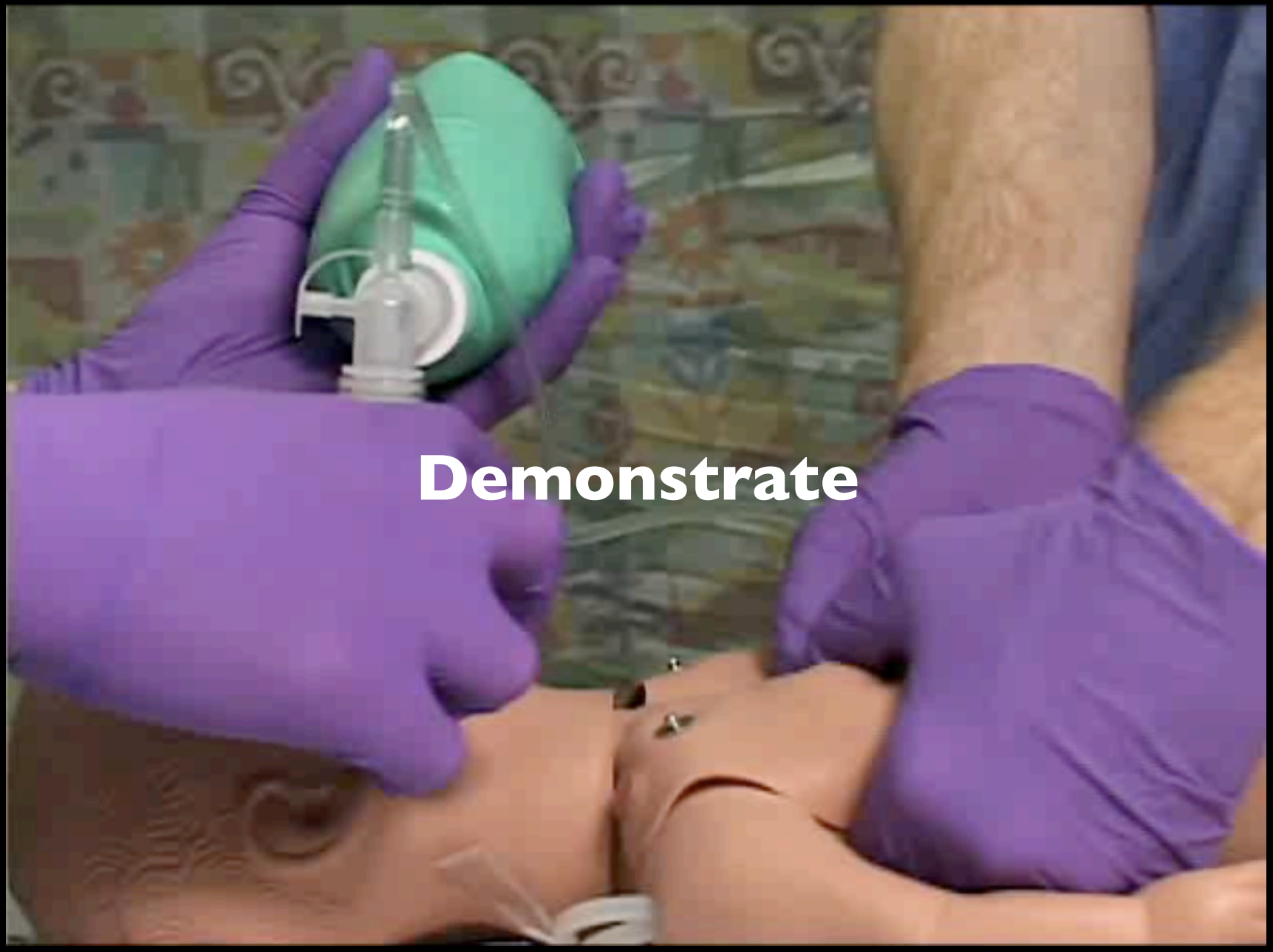


2-finger compressions

Step #3

Chest compressions

- Place thumbs on lower sternum
  - Just below nipple line
- Compress about 1/3 of chest depth
- Give 3 compressions for every breath
  - "1 and 2 and 3 and BREATHE"
  - 90 compressions and 30 breaths per minute



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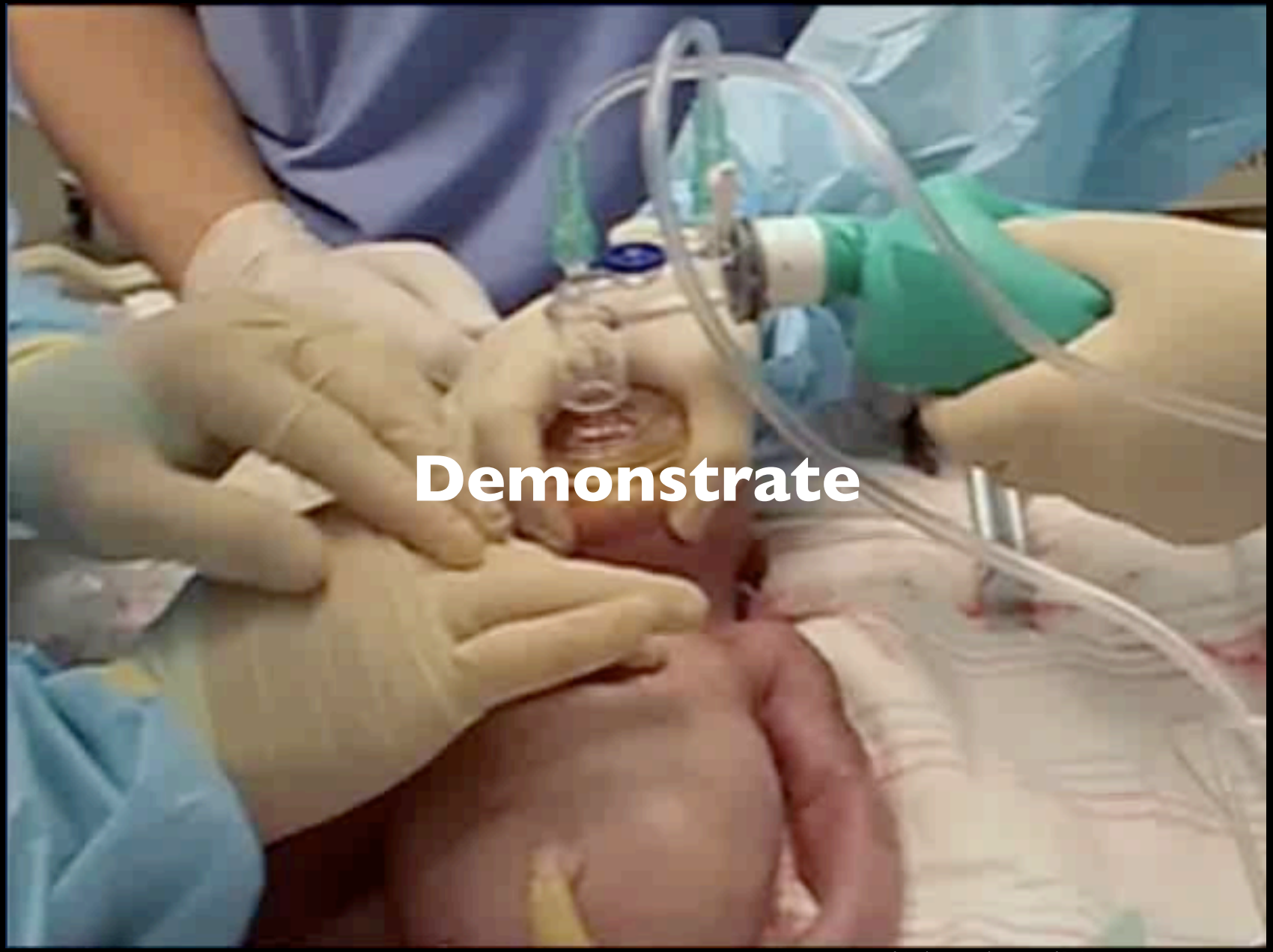

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Now, after 30 seconds of Step #3,
assess the baby…

And decide whether need Step #4

Step #4

Other interventions

While continuing ventilation and compressions, consider….

- Intubate with ETT (if not already done)
- Obtain access
  - –IV, umbilical catheter, IO
- Epinephrine by IV or ETT
- Repeat epinephrine, NS, sodium bicarb

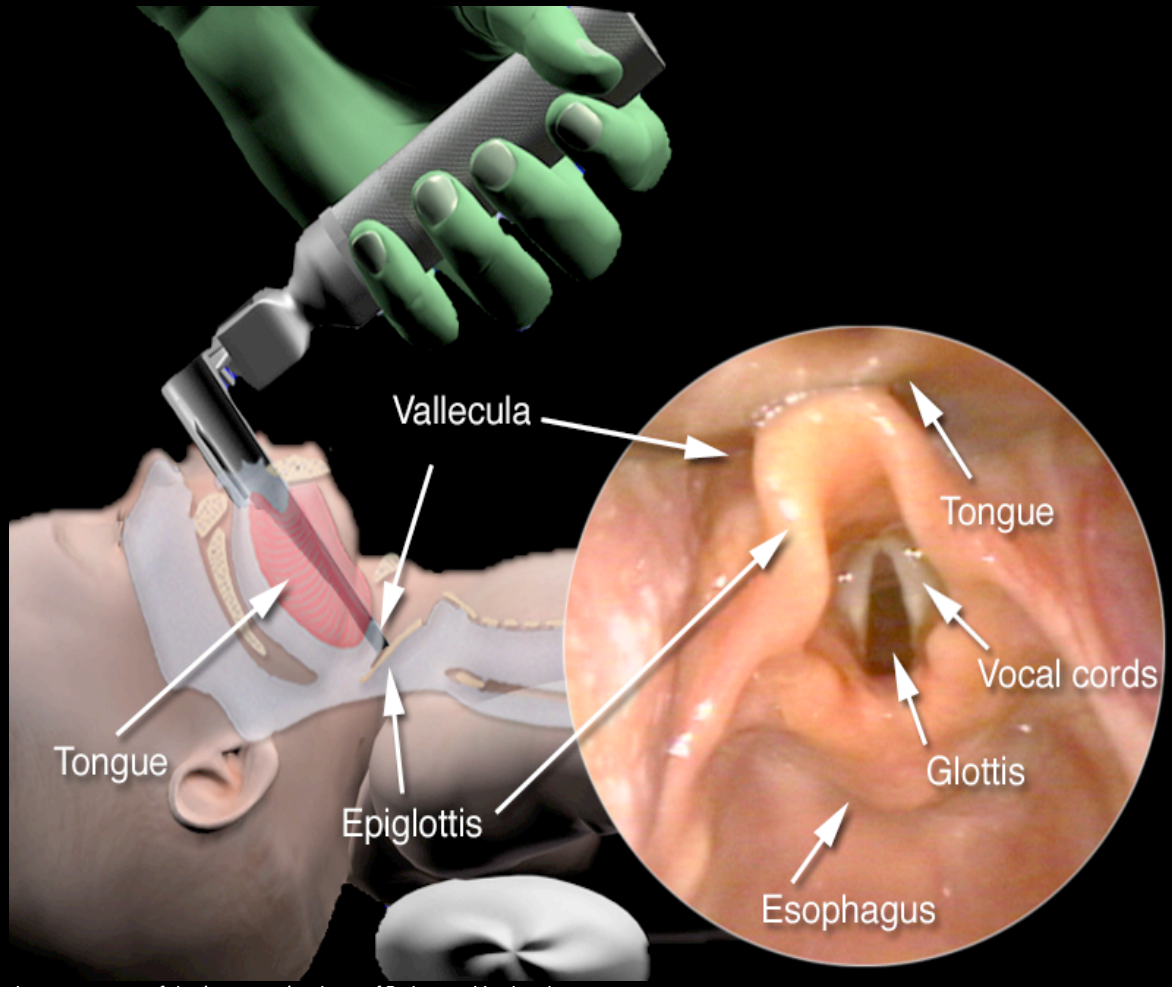
Step #4

When to intubate

- To suction trachea if meconium present and newborn not vigorous
- To improve effectiveness of ventilation after several minutes of bag-mask ventilation or difficult bag-mask ventilation
- To give epinephrine while IV access is being established

Step #4

Intubation: Anatomic landmarks



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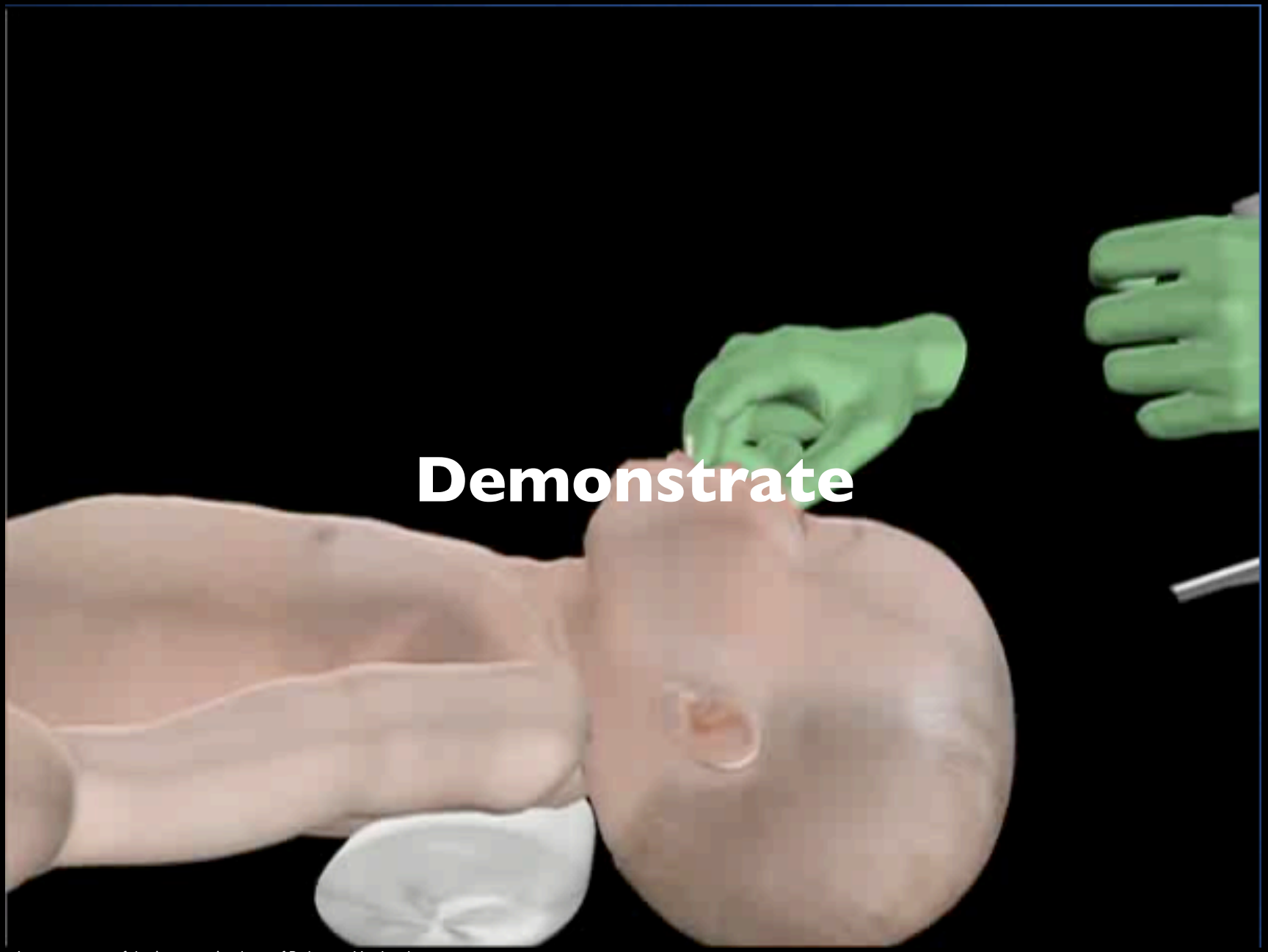

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Step #4

Intubation:
Signs of correct tube position

- Direct visualization of tube between cords
- Breath sounds over both lung fields
- Chest movement with each breath
- No gastric distention with ventilation
- Vapor in tube during exhalation
- Improved vital signs (HR, color, activity)
- Chest x-ray confirmation

Stopping resuscitation

If after 20 minutes of effective resuscitation….

- No breathing
- No pulse

…. the recommendation is to stop resuscitation

Summary (1)

- Neonatal resuscitation is one of the most effective medical interventions
- Ideally, every delivery attended by at least 1 trained person whose only responsibility is the baby
- When resuscitation is anticipated, additional personnel should be present

Summary (2)

- When a baby needs assistance, most important and effective action is to ventilate baby's lungs
- Ventilation can fix breathing, heart rate, and color

Summary (3)

Initially, assess the baby every 30 seconds and decide whether to go to next step

- Step 1: All newborns → warm, dry, bulb suction, stimulate
- Step 2: If HR<100 or apnea → bag-mask
- Step 3: If HR<60 → chest compressions
- Step 4: If still HR<60 → ETT, IV, epinephrine

Neonatal resuscitation practice