OSTEOPATHIC MEDICINE AND PNEUMONIA

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The Cost of Pneumonia

- Pneumonia, the inflammatory state of lung tissue primarily due to microbial infection,
- Claimed 52,306 lives in the United States in 2007
- Resulted in the hospitalization of 1.1 million patients
- With an average length of in-patient hospital stay of five days
- pneumonia and influenza comprise significant financial burden costing the United States $40.2 billion in 2005

Osteopathic Manipulative Treatment (OMT) is a cost-effective adjunctive treatment of pneumonia that has been shown to reduce patients' length of hospital stay, duration of intravenous antibiotics, and incidence of respiratory failure or death when compared to subjects who received conventional care alone.

The use of manual manipulation techniques for pneumonia was first recorded as early as the Spanish influenza pandemic of 1918, when patients treated with standard medical care had an estimated mortality rate of 33%, compared to a 10% mortality rate in patients treated by osteopathic physicians.

When applied to the management of pneumonia, manual manipulation techniques bolster lymphatic flow, respiratory function, and immunological defense by targeting anatomical structures involved in the these systems.

Functional anatomy

- The anatomy involved in the respiratory system includes:
  - The lungs
  - The CNS
  - The muscles of the chest wall
    - The diaphragm
    - The intercostals
  - The pulmonary circulation
  - 150 joints of the thoracic cage

Innervation

- Parasympathetic innervation-Vagus Nerve (CN X)
- Sympathetic Innervation- T2-6
- Diaphragm innervation- Phrenic Nerve (C3-5)
- Visero-somatic reflexes will restrict movement of the thoracic cage
  - C3-4 and t2-9 somatic dysfunction are most common for lungs
- The diaphragm attaches to the chest, from rib seven to the fourth lumbar vertebrae. Pleura, diaphragm, peritoneum and omentum prepares lymph for the lung

Function

- Main function is the exchange of O_2 and CO_2 through the pumping action
- The four major aspects of respiratory functions are:
  - Ventilation
  - Pulmonary circulation
  - Gas exchange
  - Control of respiration

Goals of OMT

- Reduce parenchymal lung congestion
- Reduce sympathetic hyper-reactivity to the parenchyma of the lung
- Increased mechanical thoracic cage motion
- Increase immunologic mediators into circulation

Pneumonia

- Treatment should be aimed at the thoracic vertebrae and ribs to decrease muscular spasm and facilitate thoracic expansion and pulmonary ventilation.
- The objective is to reduce the amount of work required by the patient to breath.
- The patient can be treated in a lateral decubitus position to allow access to thoracic paravertebral musculature.
- To increase immunologic mediators into the circulation

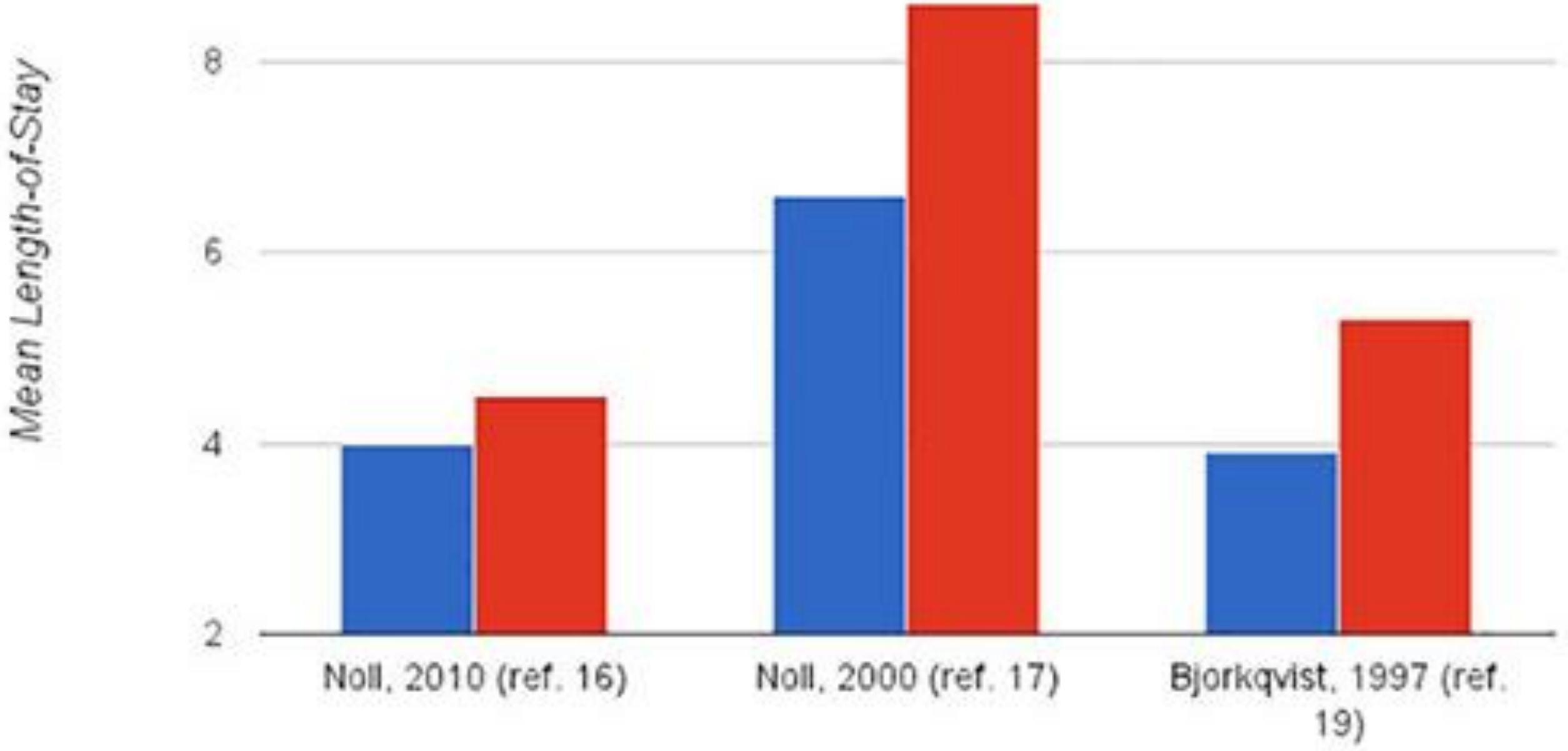
RANDOMIZED CONTROLLED TRIALS (RCT)

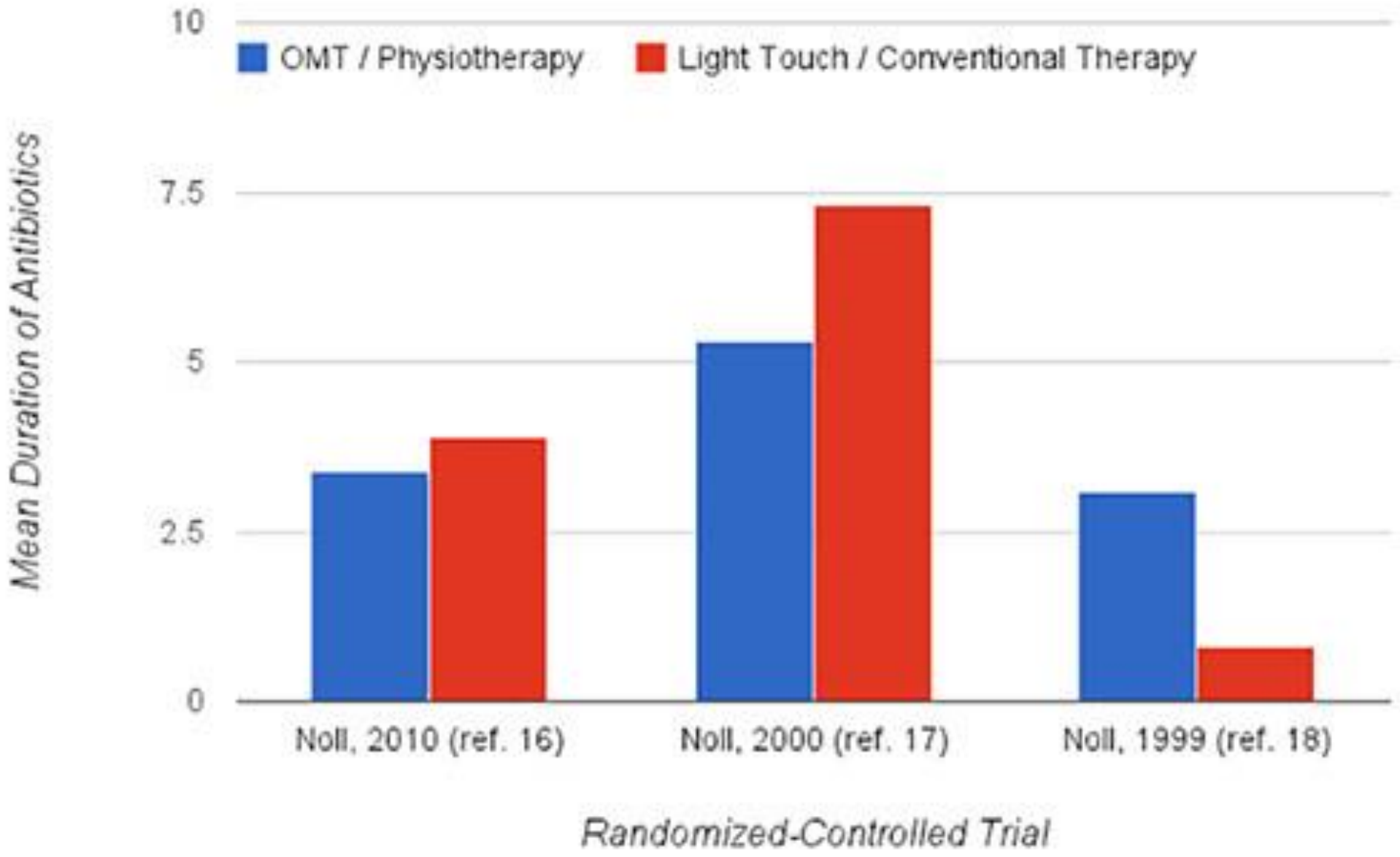
RCT

- In 1997, Bjorkqvist's *Bottle-blowing in hospital-treated patients with community acquired-pneumonia* compared outcome measures in pneumonia patients stratified to receive an adjunctive protocol for early mobilization, deep breathing, or bubble-blowing. Bubble-blowing was associated with a decreased LOS relative to the early mobilization group.[21]

RCT

- In 2000 and 1999, Noll published *Benefits of osteopathic manipulative treatment for hospitalized elderly patients with pneumonia* and *Adjunctive osteopathic manipulative treatment in the elderly hospitalized with pneumonia: a pilot study*.
- These trials reported that adjunctive OMT, when compared to light touch, was associated with decreased LOS and duration of intravenous antibiotics.


Mean Length-of-Stay
8
6
4
2
Noll, 2010 (ref. 16)
Noll, 2000 (ref. 17)
Bjorkqvist, 1997 (ref. 19)
Randomized-Controlled Trial


10
7.5
5
2.5
0
OMT / Physiotherapy
Light Touch / Conventional Therapy
Mean Duration of Antibiotics
Noll, 2010 (ref. 16)
Noll, 2000 (ref. 17)
Noll, 1999 (ref. 18)
Randomized-Controlled Trial

1

In 2010, Noll published *Efficacy of osteopathic manipulation as an adjunctive treatment for hospitalized patients with pneumonia: a randomized controlled trial.*

2

This was a multi-center randomized controlled trial involving 406 subjects that focused on adjunctive therapies for pneumonia in elderly patients.

3

The treatment group received OMT from an osteopathic specialist, which utilized techniques such as rib raising, doming the diaphragm, thoracic pump, and lymphatic pump.

4

A placebo group received light touch, while a control group received conventional care only.

5

Noll found that when compared to conventional treatment by per-protocol analysis, OMT was associated with decreased length of stay (LOS) and duration of IV antibiotics, as well as a lower incidence of respiratory failure and death.

Treatment

- Rib elevation and thoracic pump techniques are very useful in preventing venous stasis, which may lead to DVT and PE.
- Releasing thoracolumbar spinal somatic dysfunction will decrease diaphragmatic resistance, thereby increasing excursions.

Special attention

- T_2, T_3
- Pulmonary Plexus
  - The **pulmonary plexus** is an autonomic plexus formed from pulmonary branches of vagus nerve and the sympathetic trunk. The plexus is in continuity with the deep cardiac plexus
- Cardiac plexus
  - The **cardiac plexus** is a plexus of nerves situated at the base of the heart. It is formed by cardiac branches derived from both the sympathetic and parasympathetic nervous systems.
- Splanchnic plexus

Treat

- 2-3 times per day

Seated Techniques

- Seated thoracic fascial release
- Seated subscapular release
- Seated diaphragm release
- Seated rib raising
- Seated OA release
- Seated Diaphragm release

Supine Techniques

- Supine restoration of temporal bone motion
- Supine anterior cervical fascia release
- Supine mediastinal fascial release
- Supine liver pump
- Muscle Energy to Rib 1 - Exhalation Dysfunction
- Muscle Energy to Rib 1 - Inhalation Dysfunction

Other techniques

- Side-lying subscapular release
- Lumbosacral decompression
- Sympathetic stimulation

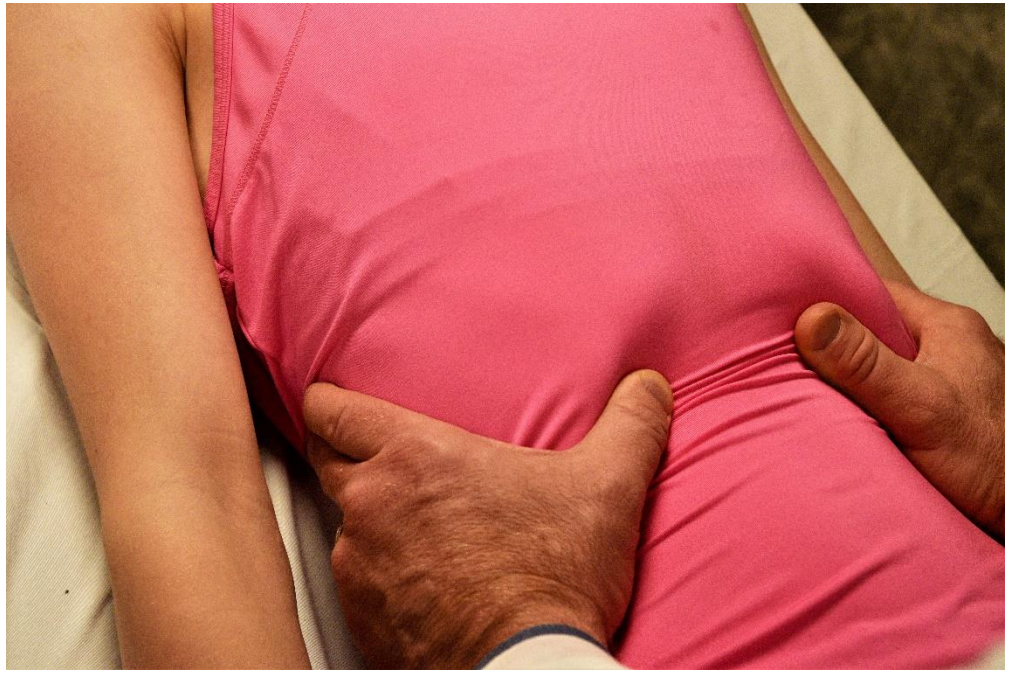
OMM for pneumonia

- Dooming the Thoracic Diaphragm
- Seated Rib Raising
- Thoracic Pump with Respiratory Assist

Doming the Thoracic Diaphragm [24,25]

- Assess thoracic cage motion bilaterally by palpating the rib cage while the patient inhales and exhales.
- Patient = supine; Physician = side of patient. Thumb tips should be placed inferolateral to the xiphoid process and rest along the anterolateral costal margin below rib 7, which corresponds to muscular attachments of the respiratory diaphragm. The remaining digits should rest along the inferolateral border of ribs 8-10.
- Instruct the patient to "take a deep breath and then breathe all the way out." As the patient exhales, follow the diaphragm by pressing thumbs posterior towards the table.
- Hold this point on the diaphragm as the patient takes the next deep inhalation. During the next exhalation, a further cephalad motion of the diaphragm is recommended (within a reasonable means and not providing any excessive discomfort to the patient). Continue to monitor the superior movement of the diaphragm.
- Repeat for three to five respiratory cycles, or until the diaphragm domes easily at the end of exhalation.
- Re-asses by monitoring the diaphragm for improvement in excursion.

Doming the Diaphragm: Supine



Rowane MP, Evans P. Basic Musculoskeletal Skills: The 15 Minute Office Encounter. Second Edition. Indianapolis, IN: American Academy of Osteopathy Publications, 2019.

Doming the Diaphragm: Sitting

Rowane MP, Evans P. Basic Musculoskeletal Skills: The 15 Minute Office Encounter. Second Edition. Indianapolis, IN: American Academy of Osteopathy Publications, 2019.

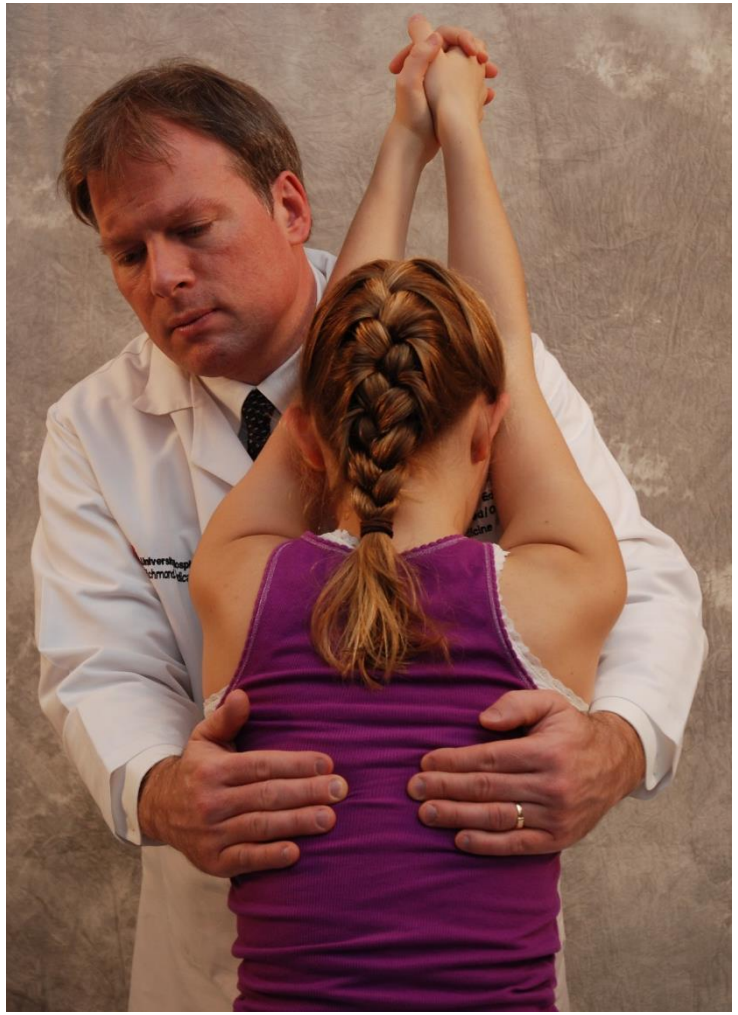
Seated Rib Raising [24,25]

- Assess respiratory motion by palpating the rib cage. In particular, assess specific ribs for individual restrictions that impede the motion of the entire thoracic cage.
- Begin by having patient seated. Stand facing the patient with one foot behind the other.
- Instruct patient to cross his or her arms and rest their elbows on your shoulder. Patient may rest his/her head on his/her arms.
- Reach underneath the arms of the patient. Position finger pads near the costotransverse articulation, at the level of ribs 2-6. The finger pads are used as a fulcrum for extension of the patient's spine.
- Lean weight onto the back foot and draw patient forward, providing an anterior-lateral traction of the rib angles. Also, extend the patient's spine by shifting center of gravity posteriorly, thereby stretching the intercostal spaces and engaging the restrictive barrier.
- Hold this position for one second, and then release by allowing your weight to transfer forward to the more anterior foot and the patient to spring back to a more upright position.
- Move finger pads down one rib level and repeat steps 4.5-4.6. Continue this step-by-step down the rib levels until the rib levels are out of reach (typically around ribs 6-8).
- Reverse the procedure by working back up the rib cage until reaching rib 2.
- Determine success of treatment by reassessing rib motion of previously restricted rib levels

Seated Rib Raising: Arms Crossed

Rowane MP, Evans P. Basic Musculoskeletal Skills: The 15 Minute Office Encounter. Second Edition. Indianapolis, IN: American Academy of Osteopathy Publications, 2019.

Seated Rib Raising: Arms Over Shoulder



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Thoracic Pump with Respiratory Assist

- Assess thoracic cage motion bilaterally by palpating the rib cage while the patient inhales and exhales.
- Patient = supine & Physician = head of the table. (Table height - adjusted to a comfortable height where the hands can fully extend onto patient's pectoral region.)
- Place hands over the patient's pectoral region, with heels of hands just distal to clavicles and thumbs at approximately 45 degrees to sternum.
- Patient to inhale and exhale deeply.
- Provide a compressive force downward onto the chest cage. Then, oscillate the degree of compression to produce a pump motion.
- Continue @ one minute or until adequate time passes for proper lymph flow.

Thoracic Pump

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Thoracic Pump Atelectasis Modification for Respiratory Assist Technique

- Patient to inhale deeply and then exhale deeply.
- During the exhalation phase, follow the chest wall down until exhalation is complete.
- At the end of exhalation, hold chest wall in place and provide resistance while patient begins inhalation.
- Follow this step (step 2d) for several cycles of inhalation/expiration (2-6 cycles).
- During the final inhalation phase, right before the patient has completed a full deep inhalation, rapidly remove hands from patient's chest to allow for a sudden influx of air into the patient's chest.
- Re-asses for improvements by palpating thoracic motion

Thoracic Pump Atelectasis Modification for Respiratory Assist Technique

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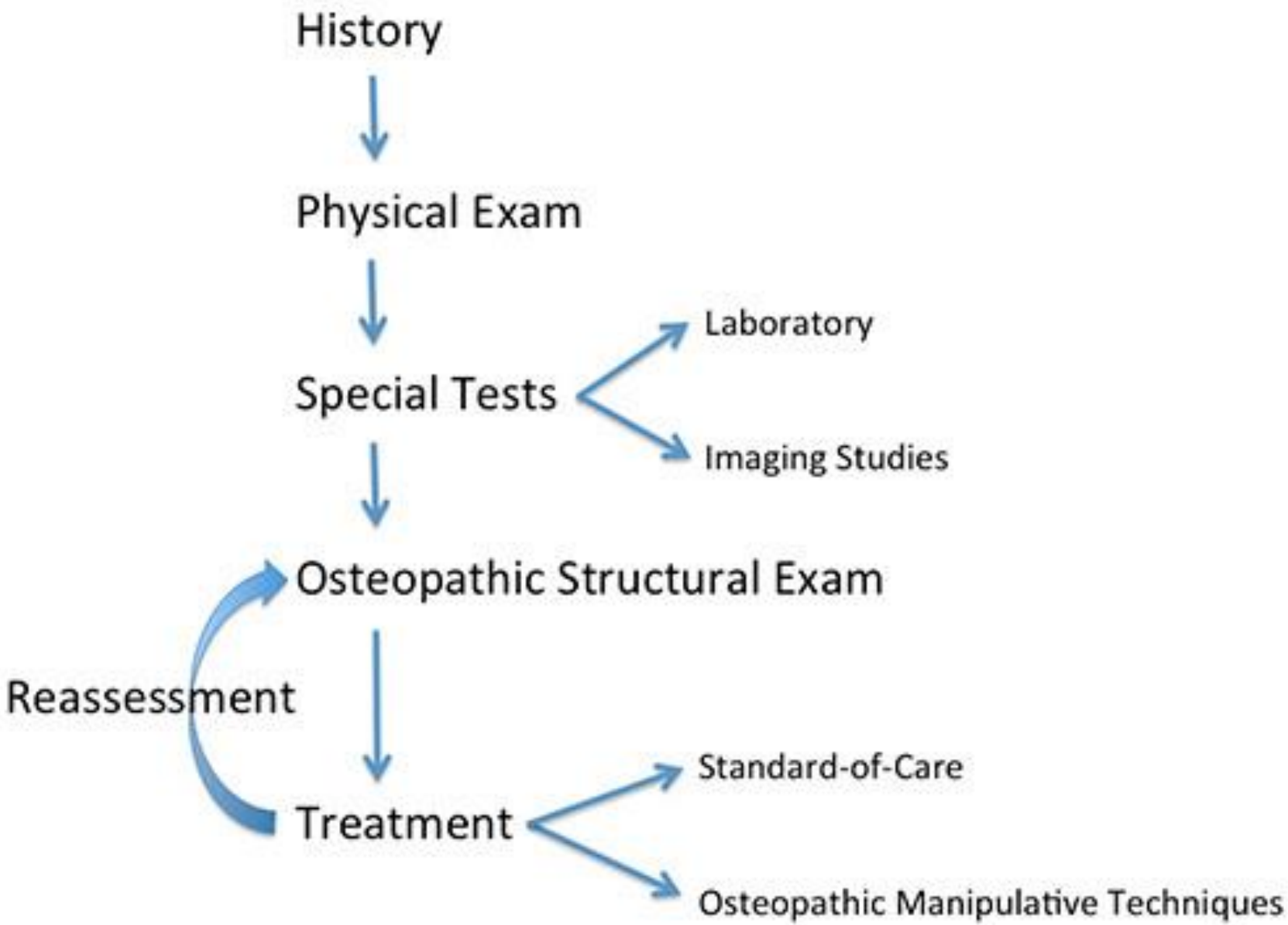
History
Physical Exam
Special Tests
Laboratory
Imaging Studies
Osteopathic Structural Exam
Reassessment
Treatment
Standard-of-Care
Osteopathic Manipulative Techniques

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