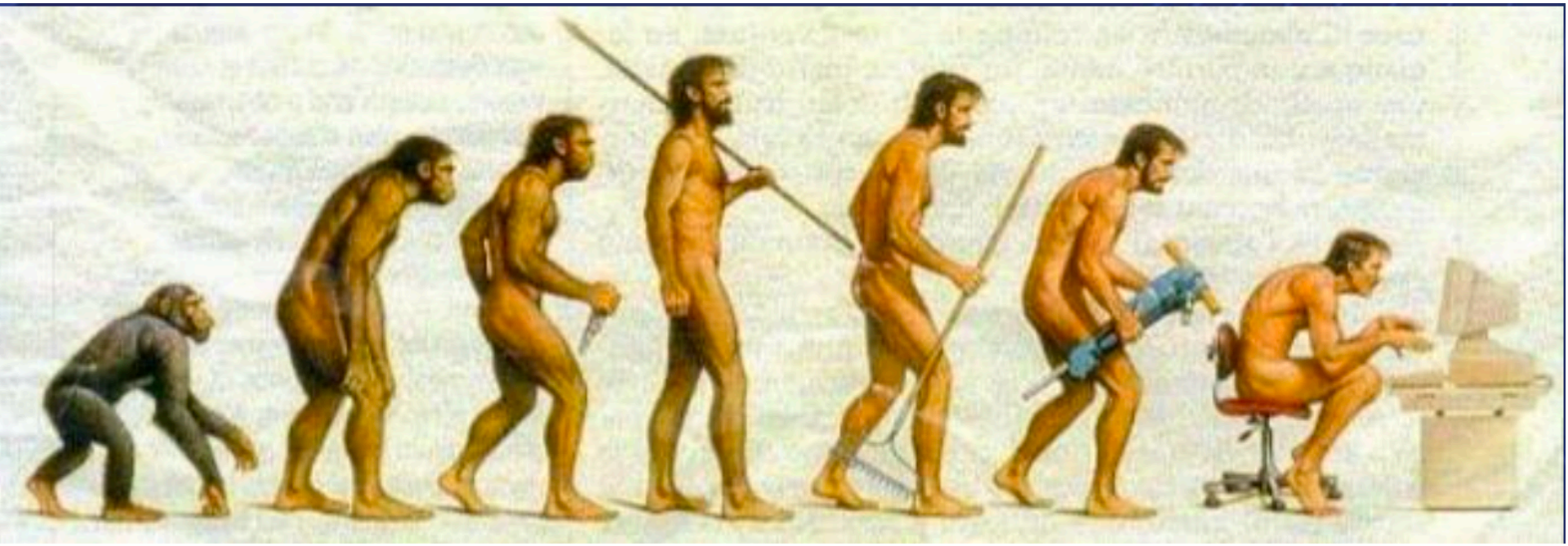
Automatic Assessment of Surgical Ergonomics



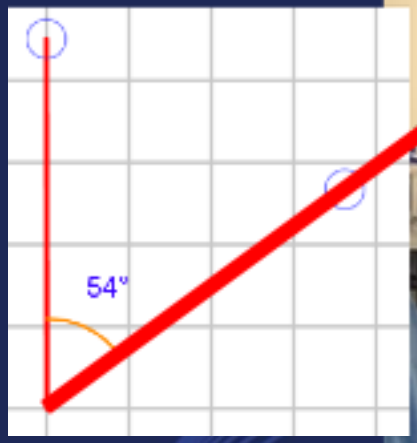
Automatic Assessment of Surgical Ergonomics

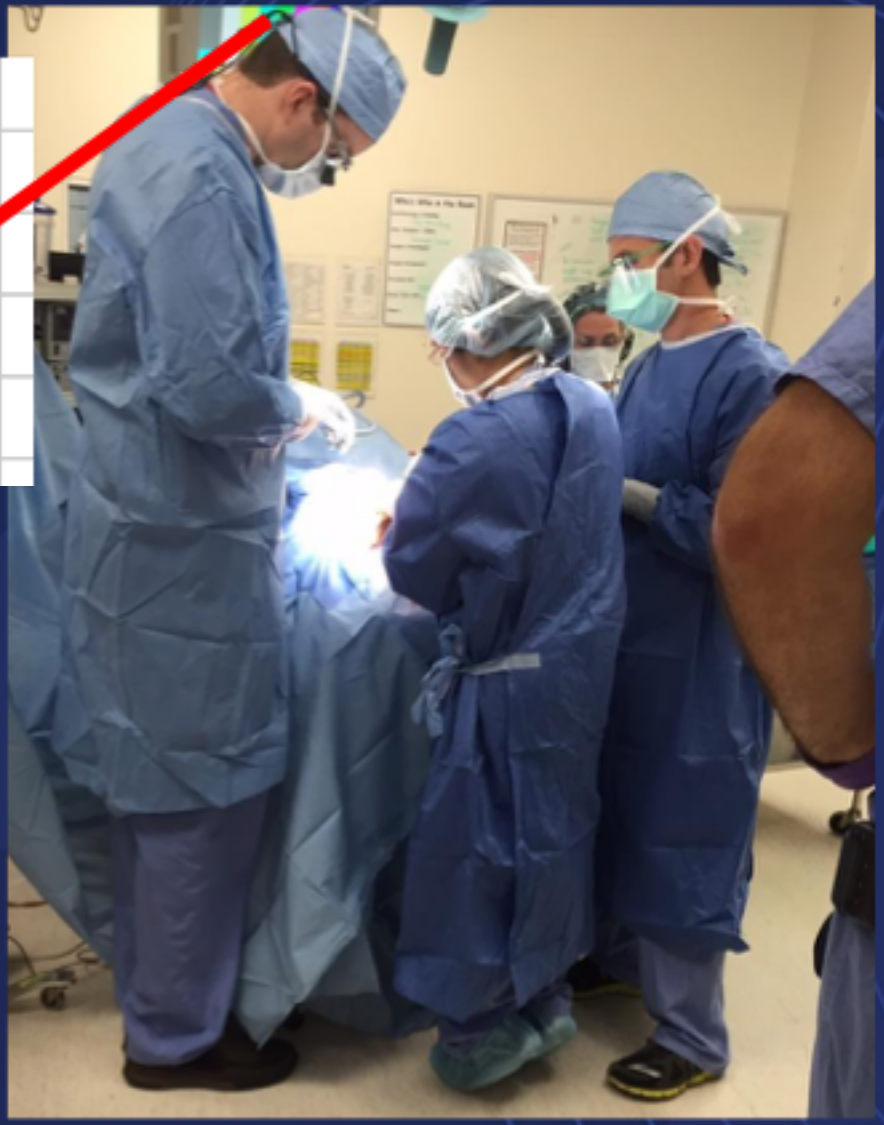
• Surgery may require the adoption of awkward body postures, static muscular loads
• Increased compressive, shear, and tensile forces on musculoskeletal tissues
• Jobs that require neck flexion greater than 15 to 20 degrees are associated with tension myalgia (Ariens GAM et al. Occup Environ Med. 2001)
• Observational posture studies indicate that surgeons spend >50% of their time in the OR with head in flexion, thus increasing their risk for musculoskeletal disorders of neck (Kant IJ, Int Arch Occup Environ Health, 1992)

Ergonomics benefits the patient too!

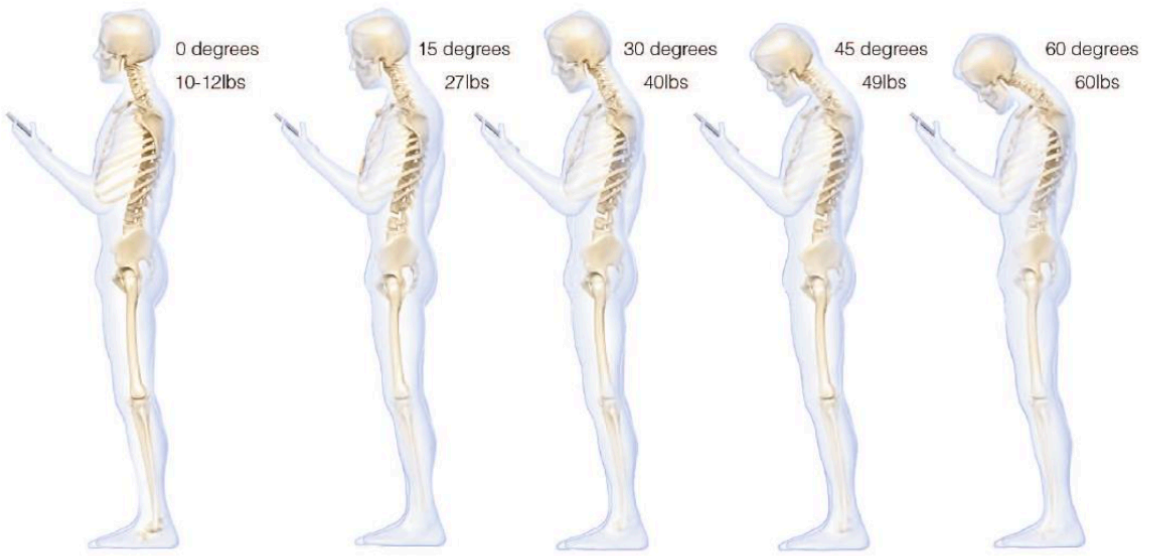
- Suboptimal working postures are associated with poor work efficiency, which can impact costs and patient safety
- An optimized surgical setting has been shown to improve task efficiency and performance

Jefferson.
HEALTH IS ALL WE DO





Assessment of Stresses in the Cervical Spine Caused by Posture and Position of the Head



Position	Neutral	15 °	30°	45 °	60 °	90°
Force To Cervical Spine	10-12lbs.	27lbs.	40lbs.	49lbs.	60lbs.	Not Measurable

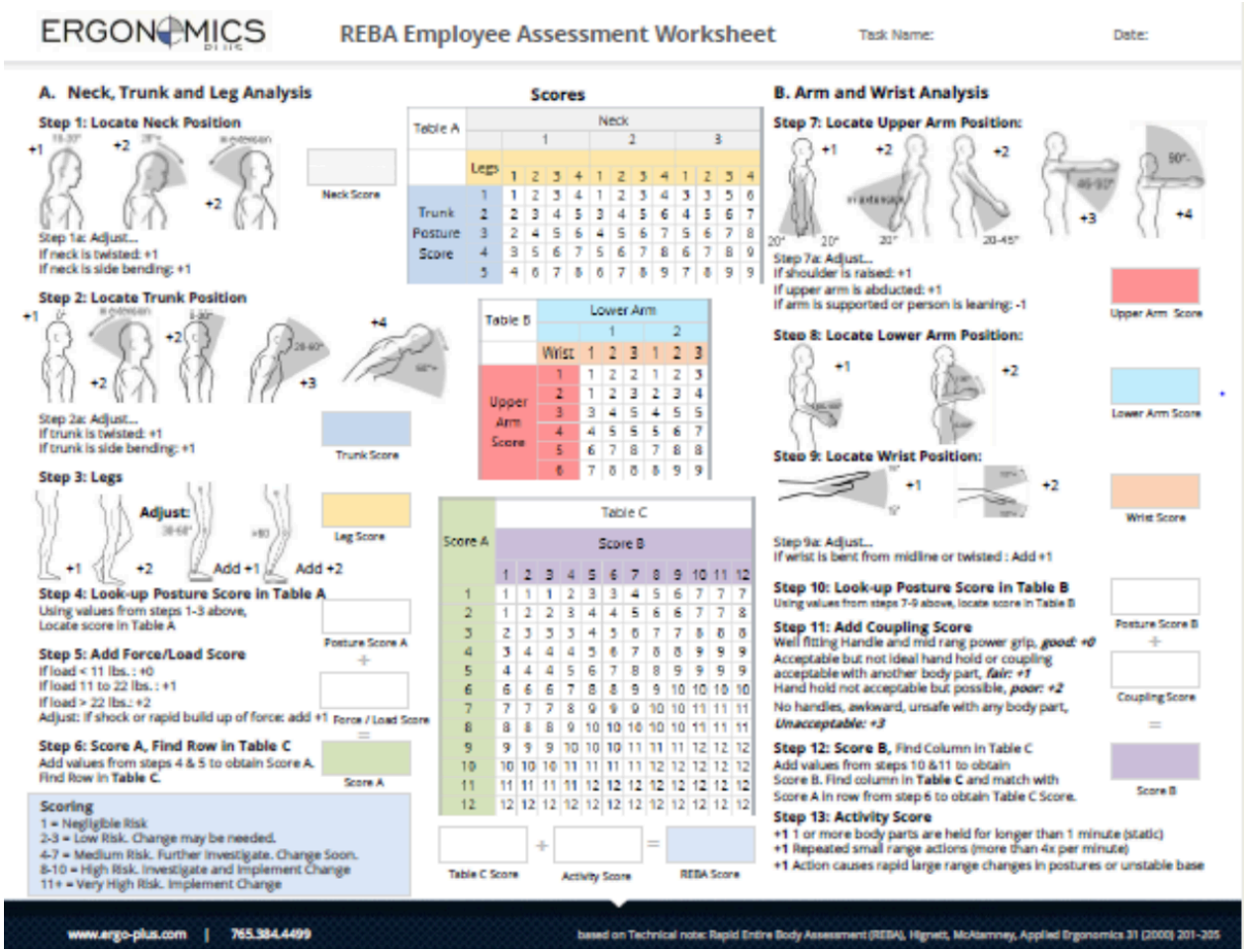
Figure 1. The weight seen by the spine increases when flexing the neck at varying degrees. An adult head weighs 10-12 pounds in the neutral position. As the head tilts forward the forces seen by the neck surges to 27 pounds at 15 degrees, 40 pounds at 30 degrees, 49 pounds at 45 degrees and 60 pounds at 60 degrees.

Hansraj K. Surg Technol Int. 2014.

Automatic Assessment of Surgical Ergonomics

REBA: Rapid Entire Body Assessment

Validated tool in manufacturing and industry.



Automatic Assessment of Surgical Ergonomics

REBA: Rapid Entire Body Assessment

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Automatic Assessment of Surgical Ergonomics

- **What Students Will Do:**
  - Create an algorithm that will automatically identify joints on a body and measure body angles from short video clips.
  - Score the body angle measurements according to the validated REBA scale. Assign a REBA score to the surgeon in each video clip.
- **Deliverables:**
  - A functional algorithm that will automatically assign a REBA score to a large number of surgical videos.
    - Identify the duration of time spent at "dangerous" REBA scores.
  - This can also be in the form of a phone app.
- **Size group: 1-3**
- **Mentors:**
  - Dr. Deepa Galaiya, gdeepa1@jh.edu
  - Dr. Eric Formeister, eformei1@jh.edu
  - Dr. John Carey, jcarey@jhmi.edu