

## Ergonomics: an imperative need for surgeons

*La ergonomía: una necesidad imperiosa para los cirujanos*

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From the beginnings of surgery, it was the nurses, kinesiologists, and the surgeons themselves whom indicated the patients about the best positions and movements that they could and should perform after a surgery. Generally, the objectives consists on mobilizing and strengthening joints and muscles, with the goal of preventing circulatory and respiratory complications, lessening the pain, and correcting the body's position, as well as the habituation and correct use of drainages, implants or stomas for example.<sup>(1)</sup>

It was Hippocrates who, with the theory of the four humors of the 5th and 4th centuries BC, started to consider physical injuries and diseases as natural events that can be treated, and not as irreparable divine punishments.<sup>(2)</sup> And it was on that very same ancient Greece that philosophers such as Hippocrates and Aristotle already spoke of the importance of adapting the work environment of the people (similar to nowadays ergonomics).<sup>(2)</sup>

During the Renaissance (15th and 16th centuries) an enormous leap happened in the study of human anatomy and systematic comprehension of physical activities' and exercise's medical role, based on two pillars, anatomical and kinetic, and allowed medical rehabilitation to being becoming a definitive discipline in the second half of the 15th century.<sup>(2)</sup> Despite this, the first explicit use of the word rehabilitation in a sanitary context would be in 1940.<sup>(3)</sup>

Another remarkable leap were the multimodal postoperative rehabilitation programs (fast-track surgery) and the Enhance Recovery After Surgery (ERAS). In

2001, the ERAS® Study Group is formed, later called ERAS® Society, whose objective is the development of perioperative attention and enhancement of the patient's recovery through investigation, education, auditory and implementation of the evidence-based practices.<sup>(4)</sup>

Everything listed up until this point was focused on the patient's wellbeing. And what about the surgeon's wellbeing? Surgical specialty is physically demanding and exhausting: it required surgeons to work many hours and in non-ergonomic positions for extended periods of time.<sup>(5)</sup>

These non-ergonomic positions carry work-related musculoskeletal disorders (WMSDs), with the currently preferred and defined term by the Disease Control Center being "musculoskeletal disorders (injuries or disorders of the muscles, nerves, tendons, joints, cartilages, and spinal discs) which are significantly contributed to be caused by the work environment and performance; and/or the condition worsens or persists longer due to the work conditions". They're represented by tendonitis, tenosynovitis, carpal tunnel syndrome, myalgias, cervicgia, low back pain as the most frequent ones, and always with pain and swelling being the predominant symptom.<sup>(5-6)</sup>

These WMSDs cause surgeons to more frequently take sickness leaves, professional performance's limitations and difficulties, even a likely early retirement of the professional activity. To avoid these complications, decadent factors must be recognized and modified to minimize pain, and thus promoting professional wellbeing and longevity.<sup>(7)</sup>

Etymologically, the word ergonomic comes from the

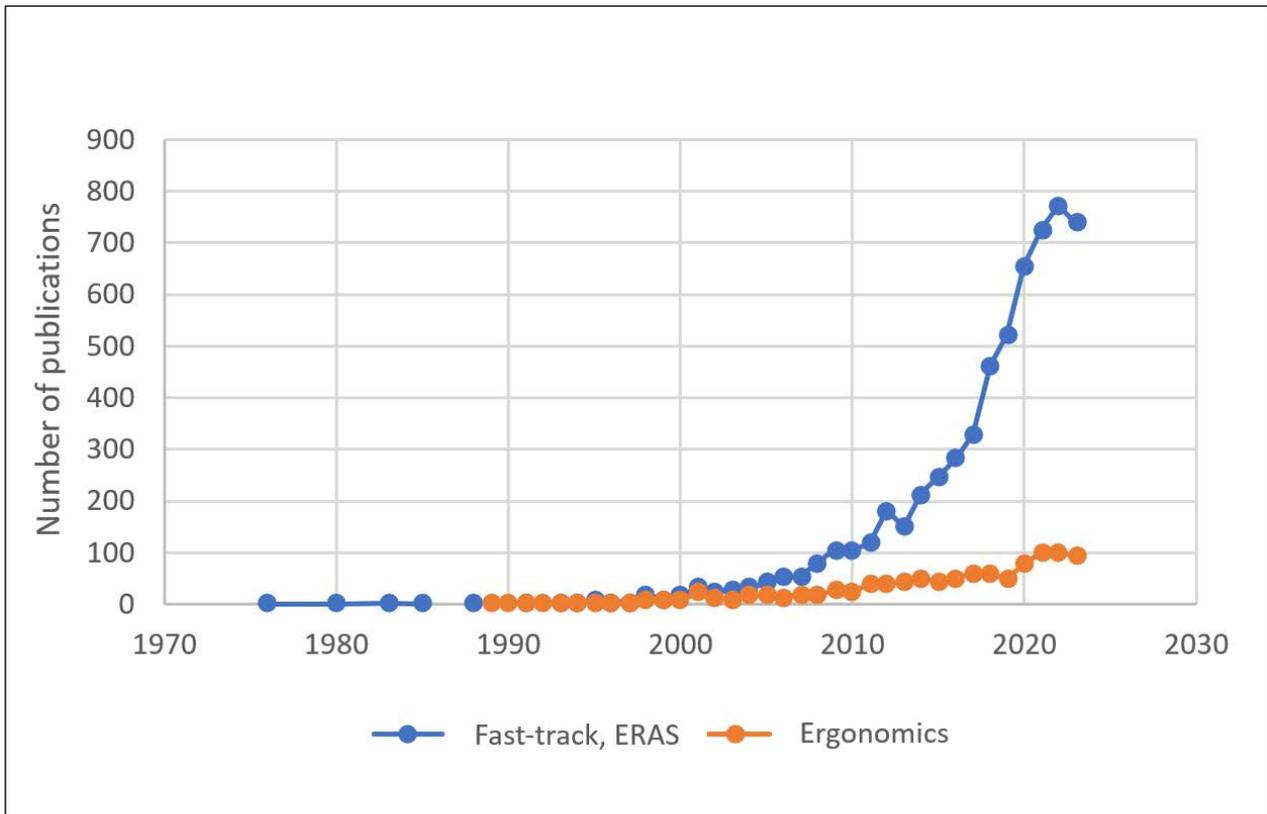
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**Graphic 1.** Number of publications about Fast-track and ERAS® compared to surgical ergonomics.

Source: PubMed. <https://pubmed.ncbi.nlm.nih.gov>  
 Search done: *ergonomic[Title/Abstract] AND surgery[Title/Abstract]*  
*fast-track[Title/Abstract] OR ERAS[Title/Abstract] AND surgery[Title/Abstract]*

Greek “ergon” which signifies work and from “nomos” law, rule, and has been popularized in the 40’s.<sup>(8)</sup> Ergonomics is a science that studies human being’s interactions with other elements of a system with the objective of optimizing efficiency and wellbeing of the human being. This could be one of the broadest definitions of the word.<sup>(8)</sup>

Within the surgical sphere it would be the relationship between the surgeon (or other members of the team) and the instruments, furniture, equipment, materials and even the environment where they perform.

It is worth noting that the importance given to the patient’s recovery and wellbeing in the postoperative (with fast-track protocols and ERAS® reaching 700 yearly publications in the past years) surpasses ten times the number of published articles about surgical ergonomics, which has a much slower and less accentuated ascendance curve (*see Graphic 1*).

With this it is interpreted that surgeons are more focused on the patient’s wellbeing than their own. It’s worth mentioning that in the last two decades there has been a proved increase on the importance of the surgeon’s wellbeing, although almost always centered solely around burnout.<sup>(5)</sup>

The American College of Surgeons, giving importance

to surgical ergonomics, formed the ergonomics committee, which carried out the first Hands On Surgical Ergonomics Clinic during their clinical congress in 2022, with simulation stations for open, laparoscopic and robotic surgery. In these stations they taught about the correct positions which a surgeon must maintain during surgeries.

Next are a list of important aspects to improve posture and ergonomics during surgery:<sup>(9-11)</sup>

1. Exercises: stabilization and stretching exercises must be performed before, during, and after surgeries. Between the listed examples are active movement range exercises, neck, shoulders, hands, and wrists stretching exercises, etc. Static body postures must be avoided.
2. Operating table: the table’s height must match with the surgeon’s elbows for open surgery, and lower for laparoscopic surgery, with the chance of ample movements. The height must allow an elbow positioning of 90-120° angles.
3. Surgical instruments: it’s recommended to use laparoscopic instruments with maximum palpate support, instead of putting the thumb through the rings. Avoid excessive pressure on the instruments

and locate the trocars in relation to the needed angle.

4. Monitor: must be in front of the surgeon, with the upper edge of the monitor at the surgeon's eye level. More than one might be needed for the surgical team's comfort.
5. Pedals: contact with them must not be lost.
6. Stress: use checking lists to avoid unforeseen situations. Perform brief breaks during the

operation for the team to have a physical and mental refreshment.

7. Lenses: adequate use of them in the required surgical expertise.

Societies and the surgeons themselves must take conscience of the importance of surgical ergonomics and perform training activities to prevent injuries that can affected the professional surgical performance.

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