

Q&A column, 7/15

Editor: Frederick L. Kiechle, MD, PhD

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Q. We recently reorganized the workflow in our blood bank in hopes of improving process control and reducing distractions. In doing so, we increased the potential for workplace injuries. The ergonomic issues are a major concern for a lot of workers. Employees on all three shifts are developing back and knee issues. We are an 800-plus-bed hospital lab with more than 30 people working in our department. The following issues have arisen:

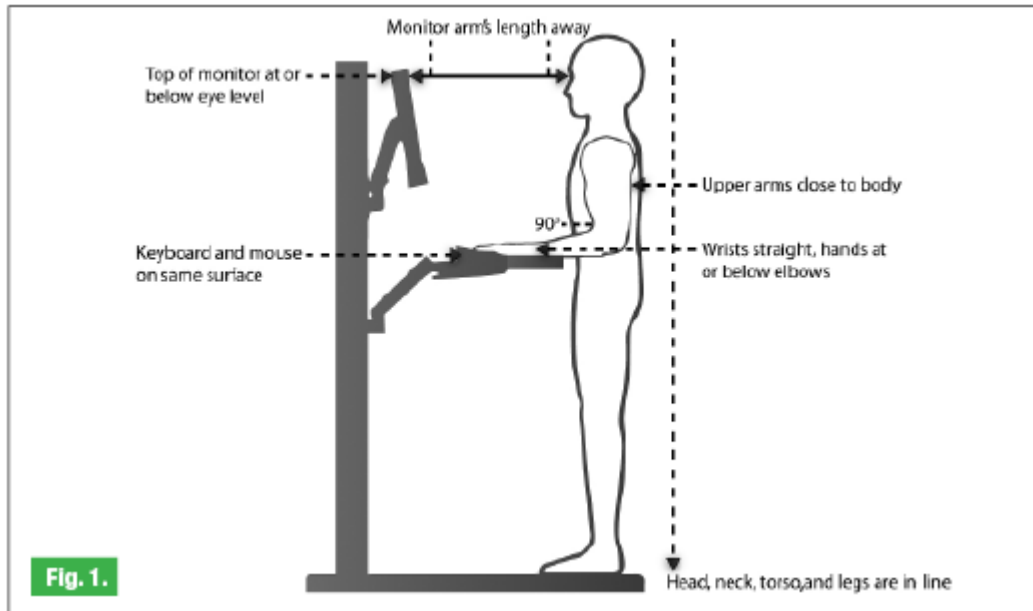
1. The racks that hold the specimens are too far away for our reach, as are the centrifuges. We are always leaning and stretching forward to perform our work. The benches don't have a lot of space, so the materials are deep.
2. The main centrifuge sits atop the registration bench and is two feet high. Continuous sitting, standing, sitting goes on. We perform about 150 type and screens a day. The printers that print in-house orders are also on this registration bench and, again, there is a lot of stretching and leaning forward to get these orders.
3. We have a tech who stands at the window issuing products all day. The bench there has a higher chair but with no room to fit a person's legs or knees when sitting—drawers take up all the space, so sitting is a rarity.

A. Work-related musculoskeletal disorders, such as those affecting the back and knees, are typically the result of cumulative exposure to ergonomic risk factors over a prolonged period. The most common risk factors that predispose an individual to those disorders are exertions or excessive force; awkward postures or static or sustained postures; repetitive motions; contact stresses; vibrations; and extreme temperatures, particularly cold environments.

Employees should evaluate work tasks, jobs, and equipment that could result in these risk factors and attempt to reduce exposure to them. The optimum neutral postures for standing and sitting workstations are shown in **Figs. 1** and **2**. While performing working tasks or jobs, the employee should attempt to maintain these neutral postures.

Suggestions for problem No. 1

- If the work area is used for sitting and standing, make sure the work surface is 38 inches above the floor or, ideally, adjustable up and down. This is the standing elbow height of the 5th percentile individual and will allow for both standing and sitting postures. If it is possible to sit, then knee spaces need to be provided. Knee spaces should be 27 inches wide and at least 18 inches deep at the knees and 45 inches at the feet.



- Stand or sit close to the work surface to avoid reaching.
- Keep frequently used items within arm's reach. Move items to the front edge of the work surface. Eliminate the need to reach across the body to retrieve supplies.
- If horizontal real estate is at a premium, then place other supplies vertically in tilt-front bins.

Suggestions for problem No. 2

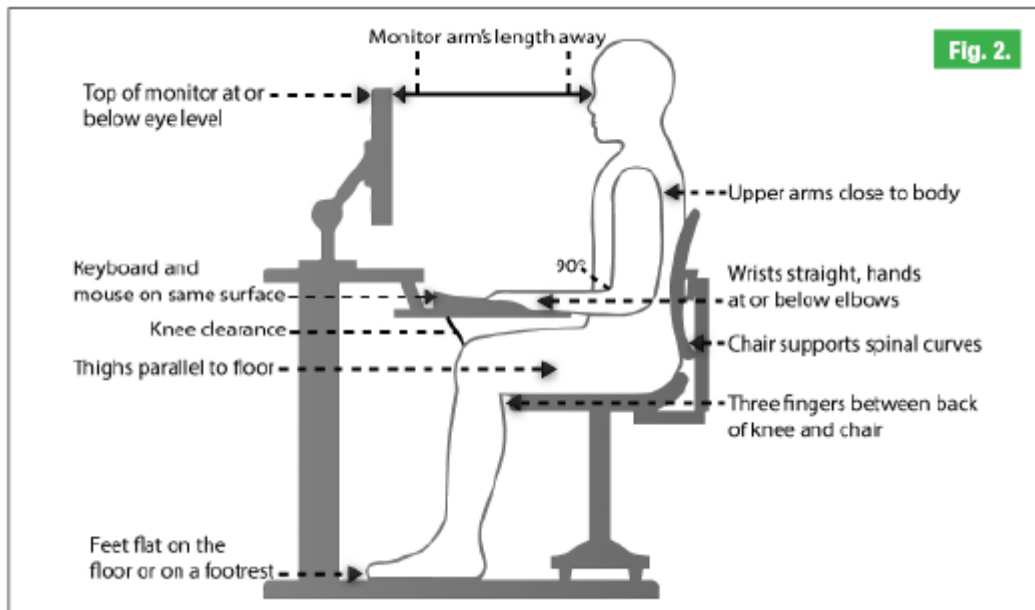
- The height of the work surface plus the height of the centrifuge or printers should be 38 inches above the floor or slightly lower. An optimum solution would be an adjustable work surface so individual users can adjust the height accordingly. This will reduce the need to reach the hands above the shoulders when moving tubes in and out of the centrifuge. The keyboard, mouse, and monitor should be height adjustable to accommodate all users. If the horizontal surface is limited, consider placing the keyboard, mouse, and monitor on a monitor arm.
- Frequent changes in body position will prevent sustained or static postures. A brief stretching break every 40 to 60 minutes or more

frequent mini breaks are recommended.

- Alternate between sitting and standing throughout the day.

Suggestions for problem No. 3

- If there is insufficient knee space for complete sitting, consider using a sit-stand chair. These chairs allow you to rest your buttocks on the seat and do not require the leg space beneath the counter that a typical chair or stool requires.



- Consider standing on an antifatigue mat to reduce the forces on the lower extremities and feet.
- Use a footrest while standing to reduce back pressure. Place one foot on the footrest to relieve pressure on that foot and alternate feet regularly.

The Eastman Kodak Company. *Kodak's Ergonomic Design for People at Work*, 2nd ed. Hoboken, NJ: Wiley; 2004.

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Q. What is ideal or acceptable month-to-month variation or lot-to-lot variation in mean values in various clinical chemistry tests such as lipid profiles and enzymes?

A. This is an interesting and important question. Unfortunately, it does not have a simple answer.

To start, we should define the terms more specifically. I am going to infer that the question refers to the mean of patient values (as opposed to quality control material), a parameter too few laboratories monitor on a regular basis. Also, I would propose that the mean value is not as good a marker as the median value; mean values will be affected by extreme values much more than median values. Finally, it may be best to restrict the analysis to outpatient values; again, hospitalized patients are likely to have many extreme values.

For some tests, like enzymes, electrolytes, and calcium, there should be little variation in the median values from outpatients over time. If the medians change, in all likelihood, the assays are not working properly, the reference intervals are no longer appropriate, and too many healthy patients will appear to be “abnormal.” It’s difficult to provide a single percentage of acceptable variation for all tests. It might be better to look at the percentage of patients who, with a given percentage change, will be called abnormal. For example, a five percent increase in alanine transaminase is unlikely to be terribly significant, whereas a five percent change in calcium would be significant.

It is important to point out that preferred laboratory practice is to check values on patient samples with each lot number change.¹

As an example, in our laboratory, when we receive (and before we implement) new lots of reagents or calibrators, we typically check five to 10 patient samples, looking for significant (as defined in the previous paragraph), systematic differences. In some cases, even if these comparisons look acceptable, we follow the patient medians after implementation to ensure ongoing consistency.

For “lipid panels” (as well as some other measurands like hemoglobin A1c, creatinine, bilirubin), in addition to ensuring that there is no significant shift over time, one should also ensure accuracy. Physicians interpret values on these tests using national or international guidelines, so getting an accurate answer is as important as getting consistent answers over time. An excellent way to do this is to participate in one of the CAP’s Accuracy-Based Surveys, where commutable material is used and your laboratory’s results are compared to the reference method results. Benchmarks for agreement for each of the components are defined by the guidelines and by the individual Surveys themselves. For example, for total cholesterol, the two components of total error, bias and imprecision, should each be three percent or less, meaning that the maximum deviation from the true value should be less than 10 percent.²

1. College of American Pathologists. COM.30450 New reagent lot confirmation of acceptability. In: All Common Checklist. April 21, 2014.
2. College of American Pathologists. Accuracy-Based Lipid Survey Participant Summary (ABL-B); 2012.

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Dr. Kiechle is medical director of clinical pathology, Memorial Healthcare, Hollywood, Fla. Use the reader service card to submit your inquiries, or address them to Sherrie Rice, CAP TODAY, 325 Waukegan Road, Northfield, IL 60093; srice@cap.org. Those questions that are of general interest will be answered.