

## You Can't Use What You Can't Reach By David J. Ahearn, DDS

A problem has emerged in our profession over the past two decades. Increasing complexity has resulted in the breakdown of the dental treatment environment. Advances in technology, and with it the range of products needed to provide services, have led to sprawl in operatory setups and equipment deployment (Fig. 1). Increasing procedural complexity has slowed treatment while widening the range of motion. These changes have simultaneously *decreased* per hour productivity when adjusted for inflation without improving our overall ergonomics. Only the increases due to advanced (in other words more costly) procedures have helped dental incomes to grow. The problem is simply that you cannot use that which you cannot reach.

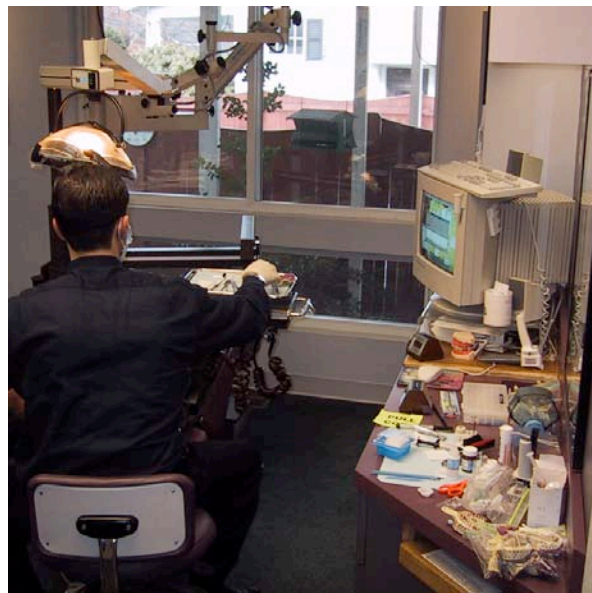


Fig.1 Chaotic treatment environment.

Accommodations that have been created by doctors in an effort to compensate for the increase in technology have been insufficient to offset the decrease in performance. Four handed dentistry – a great innovation - was primarily established for the purpose of expanding the range of motion for the operator, rather than to actually have four hands providing treatment. Higher performing products such as electric handpieces, have increased cutting efficiency while increasing wrist stress. Even loupes have traded improved visual acuity for fixed static posture.

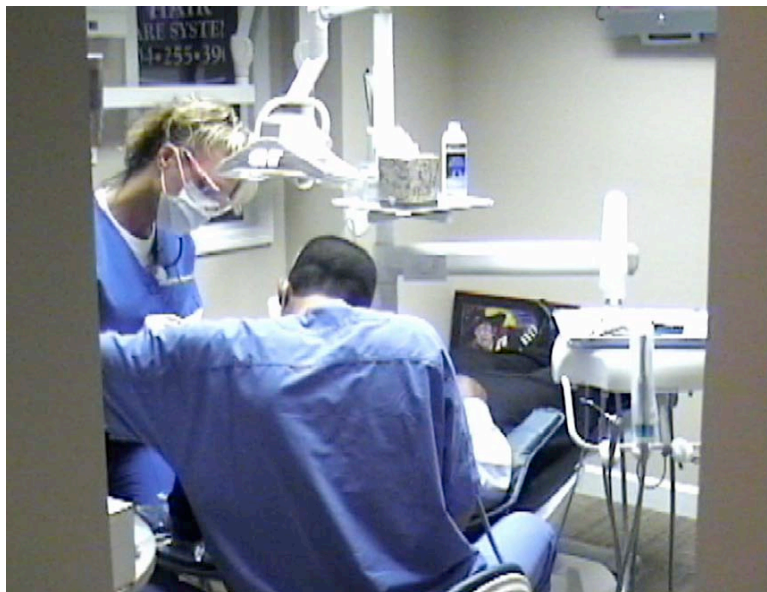
Dentists, unfortunately, have had little instruction on how to translate this increase in complexity to a more productive and healthier environment. The simple fact is that increased complexity has resulted in an increased range of motion by the operator in most dental practices. A simple example of this is operators stools. It is our most basic tool – yet it has not been significantly improved in most practices. During the 50 plus years of sit down dentistry there has been little research on the ergonomics of operator's stools and little education of the user regarding the objectives for this tool. In contrast to military training a fundamental activity early in *basic training* is the use of the personal weapon. Trainees spend countless days and hours learning every aspect of what is termed *their* weapon. In contrast, in dentistry significant effort

is placed on the *result* of dental treatment (what occurs at the end of a handpiece) while little effort is made to increase the operator's understanding of how those results are obtained physically (Fig. 2). The outcome is that technological improvements have resulted in little reduction to the incidents of Musculoskeletal Disorders (MSDs) in dentistry over the past decades.



*Fig. 2 Dental student learning how to create a great restoration at the expense of personal health.*

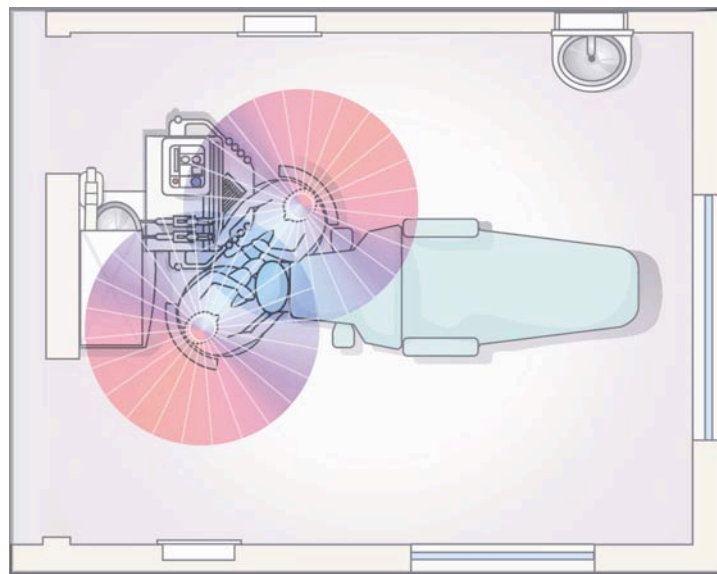
Patient chairs, an ideal place for improved ergonomic function for the operator, became wider and more plush over the decades, decreasing operator access for the benefit of the initial feel for the visitor (who is only at the office for one or two hour long visits a year in most situations). So, the question is: how to reset our sights on a simpler, more productive and healthier treatment environment (Fig. 3)?



*Fig. 3 Operator contorting to bulky equipment configuration.  
Note shoulder up, rotated torso and head tilt.*

It is my observation that the Toyota Production System principals of *Just in Time* and *Zero Changeover* can be applied as solutions to these problems. *Just in Time* principals will remove *bulk* inventory from the treatment environment while creating a physiologic range of motion for those products needed rapidly to perform core tasks. Further, the principles of *Zero Changeover* can then be applied so that operatories can be reconfigured in seconds for additional or different procedures as needed. This fundamental change in deployment has both ergonomic and productivity ramifications. With a significant decrease in operator range of motion, doctors and staff are able to function at a much more productive level (Fig. 4). Inventory volumes plummet while productivity increases.

Concomitantly, room sizes can decrease while the availability of products and technology increases. New technology can be introduced into the work environment much more rapidly as set up and restocking times approach zero. This is because *any* product can now be introduced to into any treatment room, at any time and in a location that is within the primary (direct reach) ergonomic zone.



*Fig. 4 A consolidated range of motion is central to improving workplace ergonomics.*

Given the compelling reasons for pursuing these benefits the question becomes: What are the obstacles to adoption of *Lean* principals in the dental treatment environment? The primary obstacle to this rethinking of the operatory is that it is counterintuitive. Instinctively, the response to running out of supplies during a procedure is to stock *more* of that item rather than stocking less with a much better flow. Table 1 is an outline for improving practice health and production using the *Lean* principles of *Just In Time* and *Zero Changeover*.

TABLE 1.	
1.	List all of the products needed for standard practice procedures and estimate a volume needed for 10 days of practice.
2.	Throw out all of the irrelevant product packaging included with the products in Step 1.
3.	Segregate your disposable product requirements and stock these in an easily accessible storage container.
4.	Consolidate core, preferred, daily products into a single Zirc, Clive Craig or Midmark container. Most practices are easily able to fit their typical materials for core procedures into a single Zirc tub.
5.	Post a picture of the filled containers in the resupply area so that anyone is able to easily restock.
6.	For items that are rarely used or used on a limited basis, keep them in their original packaging with their instructions in a central resupply area, categorized by use (e.g. Endodontics, oral surgery, etc.). Should a new product make its way into daily use it is then reassigned in one of the locations for the more frequently used products as stated in steps 2 and 3.
7.	In order to mobilize the less frequently used, but vital, technologies and products, segregate them into use groups suitable for rapid deployment. The use of rapidly movable storage and delivery systems designed for use on the doctor side of the treatment delivery process permit specialty procedure access directly to the dentist who, in most instances is best able to manage lesser used technology. Mobile deployment markedly reduces specialty supply volume, minimizes staff confusion and most importantly will permit set up for specialty procedures in any room in less than 45 seconds.

Once inventory becomes balanced within the useable range of motion, it becomes possible to focus on actual physical deployment – the first aspect of which is visibility. There is some controversy regarding the ideal focal length from which to perform dental care. It is my observation that the majority of magnification users seem to believe that it is necessary to pursue the longest possible focal length which will result in a very upright (and presumably more healthy) posture. Others such as those who adhere to the Performance Logic School believe that a much shorter focal length is healthier. Regardless of the focal length, what is clear is that the operator and assistant must be able to function at very close proximity to the treatment zone (Figs 5a & 5b).



*Figs. 5a & 5b: Choices in focal length effect room layout significantly. Equipping concepts worldwide have been shaped by proximity decisions in treatment.*

With all of the pressure on practitioners to learn to work with more and more complex systems and techniques, it is all too easy to lose sight of basic ergonomic principles. A reengineering process that streamlines core function and the time to complete tasks is often the simplest and most productive solution to improving or eliminating practitioner MSD's (Fig 6.), reduce stress and greatly improve productivity.



*Fig 6. Range of motion consolidation correlates directly with per hour performance.*

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*Design/Ergonomics ([www.design-ergonomics.com](http://www.design-ergonomics.com)) is a design and consulting group founded by Dr. David Ahearn. D/E creates high performance dental office designs and consults with doctors and universities regarding productivity constraints. Dr. Ahearn can be reached at 800-275-2547 or by email at [djahearn@desergo.com](mailto:djahearn@desergo.com).*