DO NOT LET POOR ERGONOMICS END YOUR CAREGIVING CAREER

Heavy is the Head

With the growing shortage of physicians, dentists, and caregivers it is imperative that medical device companies innovate around a supportive ergonomic solution which will decrease the incidences of career-ending injuries.

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Abstract

BACKGROUND

The ability to ensure a successful medical care provider's work life can be impacted by the limitations of the body. The stress and strain that incurs over time related to working environment can be debilitating, this is especially true for the medical/dental care provider. Surgical, dental, and procedural areas of care are prone to musculoskeletal disorders (MSD) which lends to the providers inability to care for the community at hand. With the growing shortage of physicians, dentists, and caregivers it is imperative that medical device companies innovate around a supportive ergonomic solution which will decrease the incidences of career-ending injuries.

AIM

The aim and purpose of this white paper is to provide the medical and dental professionals a look at how improved ergonomics, utilizing an innovative support system, can extend the quality of work life by putting the clinician back in charge of their future practice.

METHOD

The research question needing to be answered is: "In the Surgical, Dental, and healthcare professions, how can ergonomics vs poor ergonomics extend the quality of work life beyond 45 years old?" A literature search took place using key words: surgery, dental, ergonomics, musculoskeletal disorders, musculoskeletal injury, musculoskeletal pain, interventions.

OUTCOME

Although there are many interventions and outcomes out there today, the outcome of this paper has shown that the solutions to decrease MSD in the Surgical, Dental, and healthcare professions needs to be intuitive and does not rely on providers active participation.

Introduction

In the world of surgery, dental, and procedures, musculoskeletal pain (MSP) and injury is a common career ending occupational risk that is inherent to the care environment. The prevalence of MSP is extremely high and impacts lifestyles, careers, and overall productivity of these care givers. MSP directly correlates with the extrinsic risk factors related to the inherent body position required for surgical or procedural success. Self-care is usually not high on the care provider's list of priorities as they dedicate their whole selves, body included, to the patients at hand. Although this can be viewed as an admirable trait, it can also be counter intuitive, how can the providers care for the patients if they do not care for themselves? The economic impact is an additional burden as many of these providers are not financially able to retire due to outstanding student debt that was accumulated during training. This white paper will provide the reader with a synthesis of high-level secondary research related to the prevalence, and risks for provider work related MSD due to poor ergonomics. An in-depth discussion will take place of the evidence-based interventions and innovations that can mitigate the risk.

Prevalence and Incidences of Physician and Dentist Work-Related Musculoskeletal Disorders

The prevalence of physician and dentist work-related MSD has been called an "impending epidemic", as the patients benefit while the provider suffers[1]. Prevalence can be broken down into two categories, prevalence of work-related musculoskeletal injury and secondly, the prevalence of work-related musculoskeletal pain.

A systematic review and meta-analysis done by Epstein et al. that included 21 articles and 5828 physicians and dentists found that the most common work-related MSDs were related to degenerative cervical spine disease in 17% (457 of 2406 physicians) [2] and degenerative lumbar spine disease in 19% (544 of 2449 physicians)[2]. Epstein et al found that from 1997 to 2015, the prevalence of degenerative cervical spine disease and degenerative lumbar spine disease increased by 18.3% and 27%, respectively[2]. The research goes on to say that 60% had neck pain and 49% had lower back pain. That pain required a leave of absence, practice restriction or modification, or early retirement[2]. These percentages add to the burden of provider shortages as early retirement and inability to practice looms.

Several studies have found ergonomics education during medical training is limited, which can be problematic since there is a high prevalence in attrition among providers during and after training related to MSD[2]. The gap in knowledge related to ergonomics education and related interventions has been identified through various sources. For example, Gutierrez-Diez et al. provided 129 surgeons with a descriptive survey and found that 90% of the surgeons report suffering from MSDs and admitted to a lack of knowledge related to ergonomics[3]. The researchers also found that the prevalence of MSDs is higher in MIS surgeons than in any other occupational group[3]. They reported that the most vulnerable group is experienced surgeons and there is a potential risk that symptoms will be increased in the future[3]. Another study that was done found that the neck (63%) and lower back (60%) were the most prevalent painful body sites. A fourth of the surgeons who experienced pain in the neck and lower back reported feeling pain for more than 30 days within the past 3 months[5], this may be because ergonomic interventions were not put into place. The surgical practices and specialties that have been shown most at risk include, orthopedics, cardiac, cancer, plastic and dental[4]. Risk must be identified to implement interventions to mitigate it.

Identified MSD Risk

Surgeons and dentists inherently work long days and have physically demanding jobs. It has been shown that awkward postures, repetitive motions, and forceful exertions during procedures can often lead to muscular strain and the development of MSP[5]. When patient safety is on the forethought, correct ergonomics go to the wayside where patient specific needs pre-empt provider comfort and health. Other risks extrinsic to the procedural environment that are not often thought about include use of loupes, headlamps, and microscopes. Unique risks in laparoscopic surgery include table and monitor position, long-shafted instruments, and poor instrument handle design[6]. Khansa et al. reports that Musculoskeletal injuries are more common among surgeons than among the general population[7]. Kant et al evaluated the postures of operating room staff and found that up to 54% of time was spent in a forward, bent-head stance and 27% of the time was spent in a back twisted and bent stance[9]. While the risks are great there are evidence-based researched interventions that can decrease the risk of a career ending MSD.

Interventions

EDUCATION

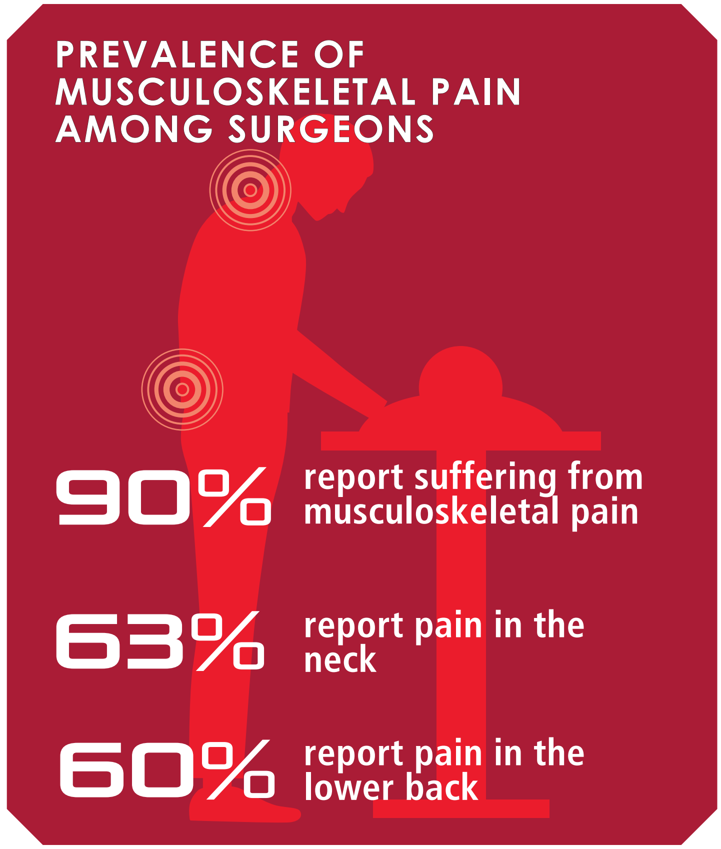
Evidence based interventions vary to decrease the incidences of MSD and start with education. In a recent institutional survey done by Winters et al. administered among resident and attending surgeons regarding musculoskeletal pain, posture, ergonomic education, and future improvements, found that 97% of resident and attending respondents experienced musculoskeletal pain and 83% reported a lack of education in posture and ergonomics[8]. They found that the poor postures related to MSDs were caused by the head forward and flexed position[8]. Winters, et al. went on to collaborate with the physical therapy group within the facility because of the lack of specific recommendations for decreasing the risk of MSD[8]. This group created an instructional video to assess the posture and demonstrated targeted stretching and strength exercises specific to the neck, back, and shoulders[8]. They recommend that a multidisciplinary approach, early surgeon buy-in, and repetitive incorporation of ergonomic principles are most likely to be successful in the long term[8]. While providers may be aware of the importance of good ergonomics, many do not know how to deal with it. Early ergonomic education and mindful ergonomics may not be enough to eliminate MSDs in the provider population.

TARGETED STRETCHING MICRO BREAKS (TSMBS)

One intervention that has been shown to improve the providers' postprocedural pain that is not well known and should be discussed is TSMBs. Park et al. set out to prove that TSMBs would improve the pain that was associated with provider neck and back pain. They found that their hypothesis was accurate, the perceived improvements in physical performance (57%) and mental focus (38%) was found to be improved after implementing TSMBS[10]. Not only did they see an improvement, 87% of respondents planned to continue TSMB[10]. TSMB is a simple way to decrease the pain that occurs during extended procedural times. Unfortunately, it does add time to the procedure itself which increases patient risk.

INNOVATION

Although the surgical and dental technology is ever increasing focusing on improving patient outcomes, there has been little innovation around improving the providers struggle with MSDs. Technology over time has attempted to solve the MSD problem, through postural awareness alone. Carbonaro et al. stated that workers are unaware of their posture and tend to forget good postural practices[11] so in response, the team created a biofeedback wearable smart vest. This system is able to extract the angular values assumed by spine, and when they exceed a predefined threshold value, the user is notified by a vibration mechanism that warns him/her of an incorrect and risky posture[11]. Cerqueira et al. proposed in their study[12] a smart vest, which, in addition to monitoring the posture of the subjects, allowed generating real time biofeedback to the worker through a vibro-tactile stimulus to immediately correct the posture. The small study of 5 individuals was proven to support the invention as results evidenced an overall reduction of the time



percentage spent in a high ergonomic risk level when executing the tasks with biofeedback[12]. Other wearable hepatic reminder options are available. Take for example the Smart Workwear System. This system found that the use of haptic feedback for work technique training has the potential to significantly reduce the time in adverse upper-arm postures[13]. Unfortunately, these innovative solutions depend on the wearer to act upon the hepatic reminder which may not be possible in a procedural situation. In a high acuity setting where a patient is present, the provider cannot stop and think about their posture and the cycle of MSD goes on. To minimize the distraction and time that MSP presents in the procedural space, a newfound innovative supportive tool has been created that will meet the needs of this provider population. This wearable solution is first of its kind and intended for use in the procedural areas and does not rely on provider response. The solution is called NeKSpine – this lightweight exoskeleton was created utilizing carbon fiber as an external head and neck supporting system. The exoskeleton is individually designed to the providers preference and ensures that minimal stress and strain of the head and neck occur during even the longest procedure. Early testing proves to be promising and more research is currently underway to validate the solution. This solution offers the kind of support that has been needed because it does not depend on intentional action by the provider, but rather improves ergonomics automatically.

Conclusion

The pain and suffering caused by MSD in the provider population is great and prevalent, the need to improve the future practice is unparalleled. There are unavoidable extrinsic risks that are inherent to the procedural environment. This paper has shown that there are vast interventions that can decrease the incidence of MSD but rely on intentional actions that many times are impossible in the procedural environment. Interventions and innovations that do not require active thought or participation are key to extend the quality of work life beyond 45 years old for the surgical, dental, and healthcare professions.

References

1. Park, Adrian, et al. "Patients Benefit While Surgeons Suffer: An Impending Epidemic." Journal of the American College of Surgeons, vol. 210, no. 3, Mar. 2010, pp. 306–13. *PubMed*, https://doi.org/10.1016/j.jamcollsurg.2009.10.017.

2. Epstein, Sherise, et al. "Prevalence of Work-Related Musculoskeletal Disorders Among Surgeons and Interventionalists: A Systematic Review and Meta-Analysis." *JAMA Surgery*, vol. 153, no. 2, Feb. 2018, p. e174947. *Silverchair*, https://doi.org/10.1001/jamasurg.2017.4947.

3. Gutierrez-Diez, Maria C., et al. "A Study of the Prevalence of Musculoskeletal Disorders in Surgeons Performing Minimally Invasive Surgery." *International Journal of Occupational Safety and Ergonomics: JOSE*, vol. 24, no. 1, Mar. 2018, pp. 111–17. *PubMed*, https://doi.org/10.1080/10803548.2017.1337682.

4. "A Surgeon's Pain: Realizing How Many Have Musculoskeletal Issues." *B-Reddy.Org*, 9 July 2018, https://b-reddy.org/a-surgeons-pain-realizing-how-many-have-musculoskeletal-issues/.

5. Dalager, Tina, et al. "Surgery Is Physically Demanding and Associated With Multisite Musculoskeletal Pain: A Cross-Sectional Study." *Journal of Surgical Research*, vol. 240, Aug. 2019, pp. 30–39. *ScienceDirect*, https://doi.org/10.1016/j.jss.2019.02.048.

6. Catanzarite, Tatiana, et al. "Ergonomics in Surgery: A Review." *Urogynecology*, vol. 24, no. 1, Feb. 2018, pp. 1–12. *journals.lww.com*, https://doi.org/10.1097/SPV.0000000000000456.

7. Khansa, Ibrahim, et al. "Work-Related Musculoskeletal Injuries in Plastic Surgeons in the United States, Canada, and Norway." *Plastic and Reconstructive Surgery*, vol. 141, no. 1, Jan. 2018, pp. 165e–75e. *IngentaConnect*, https://doi.org/10.1097/PRS.0000000000003961.

8. Winters, James N., et al. "Stretching and Strength Training to Improve Postural Ergonomics and Endurance in the Operating Room." *Plastic and Reconstructive Surgery Global Open*, vol. 8, no. 5, May 2020, p. e2810. *PubMed Central*, https://doi.org/10.1097/GOX.0000000000002810.

9. Kant, I. J., et al. "A Survey of Static and Dynamic Work Postures of Operating Room Staff." *International Archives of Occupational and Environmental Health*, vol. 63, no. 6, Feb. 1992, pp. 423–28. *Springer Link*, https://doi.org/10.1007/BF00386939.

10. Park, Adrian E., et al. "Intraoperative 'Micro Breaks' With Targeted Stretching Enhance Surgeon Physical Function and Mental Focus." *Annals of Surgery*, vol. 265, no. 2, Feb. 2017, pp. 340–46. *IngentaConnect*, https://doi.org/10.1097/SLA.0000000000001665.

11. Carbonaro, Nicola, et al. "A Wearable Sensor-Based Platform for Surgeon Posture Monitoring: A Tool to Prevent Musculoskeletal Disorders." *International Journal of Environmental Research and Public Health*, vol. 18, no. 7, Apr. 2021, p. 3734. *PubMed Central*, https://doi.org/10.3390/ijerph18073734.

12. Cerqueira, Sara M., et al. "Smart Vest for Real-Time Postural Biofeedback and Ergonomic Risk Assessment." *IEEE Access*, vol. 8, 2020, pp. 107583–92. *IEEE Xplore*, https://doi.org/10.1109/ACCESS.2020.3000673.

13. Lind, Carl Mikael, et al. "A Wearable Sensor System for Physical Ergonomics Interventions Using Haptic Feedback." *Sensors (Basel, Switzerland)*, vol. 20, no. 21, Oct. 2020, p. 6010. *PubMed Central*, https://doi.org/10.3390/s20216010.