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# What's a Librarian to Do?

## Literature Review: The Carpal Tunnel Syndrome

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### ABSTRACT

Because carpal tunnel syndrome is considered significantly prevalent among library workers, this literature review was begun to check the injury's prevalence, seriousness, and potential remedies. The literature review quickly showed the topic fraught with difficulties in everything from trying to define the syndrome to considering best treatments for those afflicted. Although library literature was sparse, the literature was replete with good information and advice. There is still much confusion surrounding the topic, however, and additional information including medical literature was sought to clarify and amplify some of the major aspects of carpal tunnel syndrome as it relates to library workers.

### Introduction

Though it may be difficult to verify the scope of carpal tunnel syndrome in libraries, there is no doubt it is fast growing and causing considerable lost days of service and even lost jobs for many, including library workers. Wanting to understand the problem, to determine its breadth, and to offer possible remedies, this literature review was undertaken. But quickly it was found more difficult than when first approached. There is little written about the subject in library literature. Therefore, it was necessary to include additional information found in other areas such as medicine and the occupational sciences.

Before discussing issues such as how carpal tunnel syndrome (CTS) has grown in the library world, it is important to define CTS. Numerous basic questions need to be addressed. For instance, what causes the syndrome? Can it be prevented? How is it diagnosed? What can be done to resolve the problem once it occurs? At first glance these questions seem rather uncomplicated and straight forward. There are a few significant library articles written about CTS by practicing librarians, and there certainly is much about the syndrome among library workers. So, what's a librarian to do? Controversy surrounds everything from the definition of CTS to its treatment. These questions call for careful examination especially when discussing the relationship of CTS and librarianship.

The literature presented is not meant to be construed as medical advice, but may be used as a launching pad for library workers to dialog with their library administrators and appropriate medical personnel. These findings may also stir discussions among other administrators such as human resources and others especially as librarians contemplate policies regarding such injuries.

### Literature Review

#### Definitions

What is the carpal tunnel, and what is the syndrome? William Atkinson, free lance writer from Illinois who frequently writes about risk management, described the carpal tunnel as "a slender conduit in the base of the palm through which blood vessels, the median nerve and flexor tendons of the fingers and thumb pass"<sup>1</sup> The carpal tunnel is in the wrist, not as Atkinson implies, *in the base of the palm*. Mayo Clinic defines the carpal tunnel as: "Bounded by bones and ligaments, the carpal tunnel is a narrow passageway – about as big around as your thumb – on the palm side of your wrist."<sup>2</sup> Atkinson did, however, give a good description of carpal tunnel syndrome:

*When tissues within the carpal tunnel are inflamed or become swollen, the median nerve is compressed. The pinching of the median nerve, which is the result of repeated pressure, causes the tendons in the wrist to swell and press against the median nerve. This can lead to tingling, numbness, a burning sensation and pain (sometimes severe) in the hand, wrist and forearm. Symptoms may also include a buzzing or electric –shock feeling when the forearm muscles are relaxed. Some patients even lose grip strength.<sup>3</sup>*

According to Barry Simmons, associate professor of orthopedic surgery at Harvard Medical School, "Carpal tunnel syndrome is sometimes described or classified as a repetitive stress injury, but that's incorrect." There is disagreement in the use of the phrase, repetitive stress injury. Simmons rejects the phrase altogether because the phrase stresses the idea that repetition causes the injuries. He believes the cause may be more closely aligned with "prolonged finger loads or static forces or high forces."<sup>4</sup>

Symptoms are certainly a part of any definition of a medical condition. Helen Maher (PhD, RN), author of several articles concerning

occupational health nursing, and occupational health consultant, wrote there may be “pain, weakness, and tingling in the thumb and index, middle and half the ring fingers” including discomfort during the night while sleeping. In addition, the tingling sensation may cause pain to move into the arms.<sup>5</sup> James M. Kusack (PhD), professor of Information & Library Science at Southern Connecticut State University, mentioned in his *Library Journal* article that sometimes the pain can radiate to the shoulder and even cause weakness in the muscles.<sup>6</sup> According to Diana Piazzini, MD, Department of Physical Medicine and Rehabilitation, Universita Cattolica, Rome, Italy, et al, it was suggested that CTS can lessen the sensation of touch.<sup>7</sup>

### Statistics

How widespread is carpal tunnel syndrome? It is apparent that CTS is a national problem. The Bureau of Labor Statistics (BLS) stated the number of carpal tunnel injuries involving days off work in private industry in 2006 was 13,010, and CTS ranked approximately eighth among the non-fatal injuries. This represented 1.1% of the non-fatal occupational injuries and illnesses in the United States.<sup>8</sup>

Angela Booth-Jones, Senior Outcomes Coordinator at Cincinnati Children’s hospital, et al. cited statistics showing carpal tunnel syndrome represented 1.7% of the cases for 2001 with sprains and strains heading the list at 43.6%. CTS was listed as number one for injuries and illnesses accounting for the most severe work loss. CTS ranked at 25% with sprains and strains at 6%.<sup>9</sup> In addition, the number of cases of CTS was at 26,522 and sprains and strains at 399,722.<sup>10</sup> Booth-Jones, et al. reported, “CTS involved a median of 25 days lost from work compared to a median of six days for all nonfatal injury and illness cases [BLS 2003a].”<sup>11</sup> CTS is a major problem facing the country, but the statistics do not answer the question about libraries.

Joyce Thornton, Associate Dean for faculty Services, Texas A&M University Libraries, stated, “[C]arpal tunnel syndrome (CTS) has reached epidemic proportions and has been called the technological disease of the ‘90s.” She continued, “CTS is the most commonly

reported of the CTDs [cumulative trauma disorders], and recent information suggests libraries are one setting where employees are sustaining an increasing number of CTS injuries.”<sup>12</sup> Epidemic proportions of CTS, however, could not be verified by this author. Perhaps, she was referring to the statistics about “ergonomic disorders.” That is not the same as CTS.

Booth-Jones, et al. (2004) reported CTS as the sixth most common ailment after sprains and strains, bruises and contusions, cuts and lacerations, fractures, and multiple injuries.<sup>13</sup> Whether dealing with definitions, symptoms, or statistical information concerning CTS, there is confusion. Defining and categorizing CTS are two of the more confusing issues.

In Thornton’s large university library of 200 employees, they had 27 (13.5%) of their personnel diagnosed with or showed symptoms of CTS. [Showing symptoms, however, is not the same as having been diagnosed.] These findings spurred Thornton’s interest in the subject, and later she surveyed ARL library directors about the problem. In 1995-1996, she surveyed 72 ARL library directors. Forty-one libraries reported they had 277 CTS injuries. The libraries numbers, however, were reported inconsistently and sometimes they bordered on guesses. Slightly over 3% of the 16,463 employees were diagnosed with CTS. Library staff size averaged 229, and the average number of per-campus diagnosed CTS cases was slightly over seven. Thornton did make a good case, however, to take action against a tide of cumulative trauma disorder complaints. Thornton reported many the libraries had already implemented measures to counter the problems of CTS.<sup>14</sup> Many CTS cases in her study, however, needed to be more carefully diagnosed and reported. It is important to note if some cases of CTD are not diagnosed correctly, undue suffering may result.

As reported in a 1994 document from the National Center for Health Statistics, there were 849,000 new cases of carpal tunnel syndrome.<sup>15</sup> However, Ulla de Stricker (MLS) Careers Chair for the Toronto Chapter of the Special Libraries Association, wrote that in 1997, “The American Academy of Family

Physicians (AAFP) estimates some 200,000 people are affected by CTS each year ...”<sup>16</sup> Estimates are not the same, however, as particular numbers, and in this context, what does *affected* mean? Does it mean diagnosed? Why is there a difference of 649,000 cases reported between 1994 and 1997? All these numbers are important, but again accurate numbers of CTS from the library literature and elsewhere are few-and-far between, and they are often vague or contradictory.

Samuel J. Haraldson, MD, Sports Medicine Fellow (UT), and Barbara J. Blasko, MD, Clinical Assistant Professor, Department of Emergency Medicine, (UC) at Irvine College of Medicine, reported, “The most common types of repetitive motion injuries are tendinitis and bursitis.”<sup>17</sup> Their article does not mention CTS as a repetitive motion injury. Still, the authors credited carpal tunnel syndrome as “the most common compression nerve disorder.”<sup>18</sup>

By erroneously using terms and phrases possibly related to CTS such as overuse syndrome, cumulative trauma disorder, repetitive stress injury, repetition strain injury, and repetitive motion injury, it is easy to see why confusion exists about the terminology, which confuses other issues such as numbering the injuries.

Kusack noted the BLS reported 73,000 “repetitive motion injuries” [not just CTS] during 1987. In addition, he mentioned one study’s results that used 38 large public libraries; each had over 500,000 patrons. The study showed 49 CTS injuries in 17 libraries. Keyboarding was assumed to be a major factor in developing the injuries. Interestingly, many cases could not be traced to keyboard use, and, in fact, many injuries may have been related to other library work, outside work, or “non-work related factors.”<sup>19</sup>

Thornton (1995) cited Roberta Furger and Steve Fox, both PC World editors, estimate of 23,000 annual cases of repetitive motion injuries (RMI), perhaps, to support the idea of wide-ranging CTS among library workers. Furger commented that the number of RMIs have been increasing because of the increase and use of work-related computers.<sup>20</sup> There was, however, nothing in the Furger/Fox

PC World article substantiating the increase in work-related computer injuries.<sup>21</sup>

Beginning in January of 1991, Thornton described the formation of a Texas A&M library advisory committee to study RMIs. Seventy-seven participants returned questionnaires. Results showed that from January, 1991 until November, 1992 there were 20 employees diagnosed with CTS. After five months of deliberation, ergonomic steps were undertaken to combat the injuries. The implementations ranged from ergonomic keyboards to adjustable chairs and desks for those afflicted with inflammations. Reportedly, there were important and positive results for the participants.<sup>22</sup>

Atkinson noted the BLS reported nearly 28,000 cases of CTS in 1999, costing an average of \$13,000 for each case. Atkinson continued by adding that over half the CTS reported cases were misdiagnosed and that many were not work-related. This article and Thornton’s, called CTS an *epidemic*. In a 1998 study, IPS Physician Services, a workers’ compensation medical management and cost containment company in Jackson, Tennessee, showed 15% of newly hired workers had prior median nerve compression damage, which made them more susceptible to CTS. Other reports showed 70 percent of CTS cases involved women mainly of menopausal age, obese, diabetic, or who were smokers.<sup>23</sup>

Frans Bongers, MD, professor of general practice, Department of General Practice, Vrije University, Amsterdam, et al. in the *Dutch National Survey of General Practice* found there has not been much of an increase in CTS from 1987 through 2001. The increase was 1.5 higher in 2001, but this was not considered statistically significant.<sup>24</sup> Certainly a serious problem exists when considering the population numbers of CTS, but it may be questionable to cite them as epidemic.

The literature from librarians, medical personnel, occupational rehabilitation experts, and other researchers agree that there is a significant problem with carpal tunnel syndrome. But there is disagreement about how widespread the injury has become. Even the diagnosis of CTS has been questioned.

## Causes

There are numerous assumptions about the cause of carpal tunnel syndrome. Many authors suggest CTS is closely related to keyboarding. For example, John Gehner, MLIS and Adult Services Librarian at the Urbana Free Library, wrote, "If repetition is the culprit and cause of lasting CTS injuries, reducing unnecessary keystrokes from tasks is likely to reduce the likelihood of future pain, lost workdays, and medical expenses."<sup>25</sup> Notice the conditional *if* and the implication that keyboarding causes carpal tunnel syndrome. Often information science/library literature implies keyboarding is the cause of CTS.

Steve Levinson from the English Department of City college of San Francisco asked his higher education listserv about cases of CTS and keyboarding. The responses reinforced the idea of a direct link between CTS and keyboarding. He wrote, "[R]eplies rightly pointed out carpal tunnel injury was only one of many injuries that resulted from the repetitive strain in using computers."<sup>26</sup> In addition, Stricker added that the American Academy of Family Physicians reported, "[A]ny kind of repetitive hand/forearm motion can cause swelling and pressure on the median nerve entering the hand through the tunnel formed by the carpal bones and transverse carpal ligament in the wrist." Stricker continued to the list causes: "Rowing, using power tools, and, of course, keyboarding and mousing ..."<sup>27</sup> "Keyboarding and mousing" appeared an editorial comment by the author since a citation was not given for the earlier statement nor any evidence reported showing keyboarding or mousing as causes of CTS. It should be noted, however, mousing is being currently studied as a possible link in developing CTS.

It is *commonly accepted* keyboarding may irritate the condition once it has been diagnosed, but statistics do not show keyboarding causes the syndrome. Gummesson Atroschi, et al. from the Department of Orthopedics, Kristianstad hospital, Sweden, made an important contribution through their study. The authors randomly surveyed 2,003 people between the ages of 25-65. Three hundred and one

people reported symptoms of numbness and tingling. Eighty percent were asked to take clinical exams. Ten of these were eliminated because they had had previous injuries, and 11 had no symptoms in the median nerve area. Of the remaining 219, all but 97 subjects were eliminated for other clinical reasons. Those reporting recurrent conditions related to CTS were given physical examinations and nerve conduction tests. The result of the investigation was surprising: "Subjects who reported intensive [+4hrs/day] keyboard use were significantly less likely to have CTS than those who reported little [+1hr/day] keyboard use."<sup>28</sup>

*Neurology* reported, "The American Academy of Neurology led a study conducted by Mayo Clinic (Scottsdale), which evaluated the link between keyboarding and CTS. They found no evidence spending even seven hours a day keyboarding will lead to CTS." In a separate study, a physical therapy executive stated, "... prolonged computer use can, indeed, lead to a lot of musculoskeletal problems, but CTS is not one of the common ones."<sup>29</sup> Christopher Reed in *Harvard Magazine* quotes Barry Simmons, MD, associate professor of orthopedic surgery at Harvard Medical School and chief of the hand/upper extremity service at Brigham and Women's Hospital, explicitly stating that computer use neither causes CTS nor is there evidence suggesting computer use makes CTS worse.<sup>30</sup>

There are opponents. Though this article is from the AFL-CIO, it cites some interesting observations. The authors stated that there are industry leaders and others who dispute the Mayo findings as flawed. For instance, the article stated there was no control group, etc. in the Mayo study, and it included only the current staff. There were only nine CTS cases found, meaning that if just three workers were out of work because of CTS, the study was short in identifying one third of the cases. The Fact Sheet used to obtain the information in this article was provided by Robin Herbert, MD, Medical Co-Director, Mount Sinai Center for Occupational and Environmental Medicine, and Laura Punnett, ScD, Professor, Department of Work Environment, University of Massachusetts Lowell.<sup>31</sup>

If keyboarding is not the cause, what is? Atkinson suggested a genetic disposition to CTS. He mentioned around 70 percent of the cases are with women especially of menopausal age and those who are obese. He quoted a report suggesting middle-aged women are more susceptible probably because of hormonal changes. In addition, the shortage of vitamins B1, B6, and C could be partly responsible for the syndrome. Those who are diabetic, have rheumatoid arthritis, hypothyroidism, or smoke are also susceptible.<sup>32</sup> Barry Simmons, editor of an important Harvard Medical School report, gave a list of contributing ailments that can cause CTS. Autoimmune diseases such as lupus and connective-tissue disorders, previous bone fractures, pregnancy, and obesity can all lead to CTS. Supporting Atkinson's comments about genetic disposition, Simmons reported, "Genes deserve the blame for about half the incidence of carpal tunnel syndrome."<sup>33</sup> Piazzini, et al., found vitamin B oral supplementation ineffective as well as *botulinum toxin B injection*.<sup>34</sup>

Besides the already mentioned genetic/health relationships to carpal tunnel syndrome, what else is involved in causing this debilitating ailment? Bongers, et al. concluded from their findings of two professional reports that CTS has been connected to jobs that require taxing, quickly recurring hand movement.<sup>35</sup> However, Reed's article added, "The disease is more common in people who do fairly forceful assembly-line work. But about two-thirds of people whose carpal tunnel syndrome was presumed to be occupational in origin have been shown to have other medical conditions capable of causing the disease, Hands reports."<sup>36</sup>

According to Monika Szunejko, Manager, State Library of Western Australia Perth Cultural Centre, repetitive strain injuries (RSI) are caused by computer keyboarding and other causes. She speculated that before the computer, the typewriter allowed the typists to use the carriage return and paper feed on the machine, thereby, allowing more variety in their tasks and avoiding RSIs. Since the invention of the computer, however, the repetitive nature and speed-typing while using the keyboard can cause RSI. Another aggravating cause of RSI

Szunejko alluded to is the use of computer mice and trackballs.<sup>37</sup>

*The New York Times* reporter, Ingfei Chen, interviewed Dr. David M. Rempel, an occupational medicine physician, about updating information related to computer-related aches. Rempel answered the question, "What is known about carpal tunnel syndrome and computer use?" He said controversy exists concerning keyboarding as the cause for CTS. Then he made this poignant observation: During the last few years, he responded, there has been mounting evidence that using a computer mouse over 20 hours per week may put you at risk of carpal tunnel syndrome.<sup>38</sup> In addition, the Johns Hopkins' article alluded to scientists thinking that those "who consistently use computer mice and trackballs may also have an increased risk of carpal tunnel syndrome."<sup>39</sup>

Therefore, if keyboarding is not the cause for CTS and mice/trackballs are only recently suspected, what are some of the known causes besides the genetic/health propensity for the syndrome? Maher mentioned some jobs are more susceptible to carpal tunnel syndrome. Jobs requiring repeated use of the hands and fingers, those jobs with minimal breaks or changes in work routine, requiring odd positions, or requiring forceful movement can bring on CTS.<sup>40</sup> Bongers, et al. wrote, "For women in unskilled and semiskilled job categories, the risk of acquiring carpal tunnel syndrome was 1.5 times higher than for women grouped in the 'higher job' category." Similar results were found throughout the study when considering age categories from 15 to 65, but there was no similar relationship with men. Speculating about the reasons for differences in CTS rates, the authors concluded possible factors were: that women often perform most hand-intensive work in their homes, and their jobs may have required more use of the hand and wrist than the men. But they conceded more study is needed.<sup>41</sup>

Szunejko wrote RSIs are often associated with jobs such as assembly-line workers, manufacturers, processors [Eg meatpackers], and cleaning jobs, some sports, and musicians.<sup>42</sup> The National Institute of Neurological Disorders and Stroke (NINDS) said contributing factors to

acquiring CTS may include congenital factors such as the size of the carpal tunnel, swelling caused by trauma or injury to the wrist, an overactive pituitary gland, thyroid problems, arthritis, physiological problems with the wrist, work-related stress, use of vibrating hand tools [Eg jackhammers, dental tools], fluid retention while pregnant or during menopause, or from a tumor or cyst in the canal. The “most likely” cause is the congenital link.<sup>43</sup>

### **Prevention**

Most literature seems to discuss measures taken to relieve carpal tunnel syndrome rather than preventing it. Discovering areas of agreement in what to do to prevent CTS is sparse. Much literature in the medical field and a few articles from library science discuss ergonomic measures, but again these are often carried out after the syndrome appears wide-scale. Nonetheless, there are considerations for those interested in preventing CTS.

Ergonomics play a big part in relieving stress on the hands and wrists of library employees. But the question is whether all the efforts pay dividends especially as applied to prevention. Kusack’s article mentioned that CTS, awareness and prevention of injuries are the best strategies for prevention. Awareness of the first symptoms, if possible, may stave off a full-blown case of carpal tunnel syndrome. In addition, he mentioned the need to purchase ergonomic furnishings, changing tasks frequently, perhaps, even changing jobs, and taking breaks.<sup>44</sup>

Susan Lang Senior Science Writer at Cornell University quoted Cornell University research that showed lowering the “keyboard holder on a preset tilt away from the user” can help prevent CTS. Using this device during typing and resting between tasks keeps the wrist in a neutral position, a low-risk position. Their system is designed to adjust for people of different sizes. Another Cornell study showed no differences between using a fixed-angle split keyboard and a traditional one. Lang emphasized, “Keeping the wrists in a neutral posture while typing will help to prevent CTS.”<sup>45</sup>

The Johns Hopkins article mentioned there are other options to the tilted keyboarding rest. They suggest an alternative, a cushioned

wrist rest that will keep the wrist in a neutral (straight) position. They do, however, accept split computer keyboards and others that form into a *tent shape* as potentially preventative.<sup>46</sup> Cornell’s study, as mentioned earlier, did not fully accept the ergonomic keyboards as preventative for CTS. Perhaps since Lang’s article was written in 1995, the Johns Hopkins article (2001) may have updated the information.

Levinson reported Pepperdine University provided employees with fact sheets about CTS, prevention, and exercises to relieve symptoms. They offered free wrist rests to each of their workers. The cost of the rests to the university was only \$5.00 each. This simple act almost eliminated RSI complaints from mouse use. Such a simple solution has paid big dividends. Since implementing this procedure, over the past five years, there have only been three payment claims.<sup>47</sup>

Atkinson’s wrote prevention might be as simple as taking vitamins B1, B6, and vitamin C [although experts disagree about the efficacy of vitamin therapy]. In addition, Atkinson suggested being overweight may be a contributing cause of CTS. If these possibilities are correct, it is highly likely exercising and losing weight to near normal could be preventative. Psychological reasons have also been postulated as a cause of CTS. Receiving counseling to develop a more positive and adventuresome outlook has also contributed to lessening of CTS symptoms.<sup>48</sup> But whether vitamin therapy, weight loss, or psychological therapy is sought, it is always wise to check with a professional before starting a program.

Maher noted Simmons’ and Bosch’s findings that keeping the hands in a neutral position while working is important, and keeping them in a similar position while sleeping can help prevent CTS. In addition, she mentioned keeping tools close to the body to avoid overextension of the arms and keeping computer screens at eye level or below with adjustments for glasses wearers should help. If keyboarding, the forearms should be parallel with the floor, and there should be good lower back support. It was even recommended that employees should stand frequently, walk every hour, and use “micro-pauses” to stretch

or flex their bodies especially the hands and shoulders.<sup>49</sup> Robert E. Kaehr, Director of Library Services, Huntington University, suggested exercise might be one of the common-sense approaches to prevention but also warned not to start exercises until one has consulted a doctor. Sometimes the results can be dramatic. Meatpackers who implemented such preventative exercises in an Oklahoma-based company found a significant drop in the number of CTS cases.<sup>50</sup> As mentioned earlier, others have suggested exercises, but most exercises have not proved effective, except yoga, in dealing with CTS.

Of course, the ultimate prevention for computer keyboarding complaints is taken from the technology of tomorrow. It is already available today, but it needs to be refined before it will be widely distributed. Voice recognition technology (VRT) is coming to your nearby office *soon*. Joseph Zumalt, Assistant ACES Librarian, Isaac Funk Family Library, University of Illinois at Urbana-Champaign, wrote that it may be a while into the future before voice recognition catches typing skills; but technology is continuing to improve. For instance, Zumalt mentioned software is now capable of filtering excessive *ohs* and *ahs* when dictating. And though one of the complaints about voice recognition software is it is much slower than the average typing speed, the author challenged the idea. He wrote that average dictation speed is around ninety to one hundred words a minute while the average typing speed is around 40 words per minute. Zumalt used Dragon Naturally Speaking (DNS) or Microsoft Office Speech Recognition to test his theories. When testing DNS in an academic setting, the person with faster typing skills could enter more documents per hour than using VRT. Nonetheless, the article concluded VRT may be helpful to those with disabilities allowing them freedoms never before possible. The slow typist may use this technology to speed their data entry. Finally, Zumalt sees the technology as alleviating much of the CTS in the white-collar professions.<sup>51</sup>

### *Diagnosis*

If prevention does not work and you find yourself with undiagnosed wrist pain, then what needs to be done? Begin by getting a

proper diagnosis. Before considering the various treatments that are available it is crucial to get a proper diagnosis.

According to Daniel Miller, a Aon (risk management service) consultant and an expert in disability management, about one-half the people diagnosed with CTS do not have it. In the same article by Atkinson, Miller detailed that over 50 percent of people reporting CTS have surgery and that it is necessary for only five percent. In fact, it was concluded that either the patients did not have CTS or could have been treated by less invasive means. The reasons for these unnecessary surgeries may have been varied, but many patients were hurriedly diagnosed, and the doctors missed the cause(s) for the symptoms such as bursitis or arthritis.<sup>52</sup>

According to the National Institute of Neurological Disorders and Stroke (NINDS), to avoid permanent harm to the median nerve, early diagnosis needs to be considered. More than the wrist is involved. Examination of the hands, arms, shoulders, and neck is important; as such observations can help determine the cause of the patient's complaints. The wrist needs to be examined, and each of the fingers needs to be tested for sensation. Hand strength needs to be considered in conjunction with lab tests and x-rays, which may diagnose diseases such as diabetes, arthritis, and fractures. In addition, physical tests such as the Tinel and Phalen tests are used to measure tingling, numbness, or pain. Sometimes electrodiagnostic tests are used to confirm CTS. Ultrasound imaging and Magnetic resonance imaging can also be helpful.<sup>53</sup>

Getting an accurate diagnosis before progressing to treatment cannot be overemphasized. Bongers, et al wrote regarding CTS, "[T] here is no gold standard for its diagnosis."<sup>54</sup> Interestingly, Dr. Nerys Williams (2007), former general practitioner, Solihull, England, contradicted Bongers et al. about a "gold standard" not being available. After giving numerous informational tidbits about CTS, Williams said, "... the gold standard for diagnosis is nerve conduction tests."<sup>55</sup> Nonetheless, regardless of the differences in opinion, early diagnosis is necessary for a corrective outcome especially before undergoing surgery.

The experts occasionally seem to quibble a little in determining the diagnosis of a classic case of CTS. For instance Dr.'s Thomas R. Hales (1992<sup>56</sup> and J. Katz (1992)<sup>57</sup> seem to disagree whether carpal tunnel is better diagnosed by testing for symptoms in one or two fingers. All agree, however, on the most basic symptoms and the fact that CTS can become debilitating, and it needs to be diagnosed carefully.

### *Treatment*

Thornton's literature search, though sparse, frequently mentioned ergonomics as a method to combat CTS.<sup>58</sup> From her findings of a questionnaire to ARL library directors, she concluded that using ergonomics as a preventative would be the best approach in fighting CTS. Thornton recommended "proactive ergonomics programs." She solicited staff input about ergonomic solutions. She recommended providing guidelines to report CTS, brought in expert consultants from on and off-campus, and stressed preventative measures for employees to employ. She stressed the importance of investigating ergonomic problems right away, the importance of providing multiple tasks for computer-related work, and reviewing web sites that reference a variety of CTS issues.<sup>59</sup> Thornton's early work deserves much credit for bringing CTS to the forefront of the library world and for the efforts her work and study accomplished in fighting CTS among library workers.

Kusack said if injuries are found early, they frequently "respond to rest, heat and cold treatment, physical therapy, and anti-inflammatory drugs." In addition, he mentioned stretching exercises, wrist splints or braces, steroid injections, and finally as a last resort, surgery.<sup>60</sup> Dr. Rempel contradicted Kusack's point about heat and cold treatments by saying, "There's not much data to support physical therapy modalities such as hot and cold treatments and stretching maneuvers for carpal tunnel syndrome."<sup>61</sup> Supporting Rempel's comment about stretching exercises, Piazzini, et al found exercise ineffective in helping CTS but thought that yoga has had some benefit.<sup>62</sup>

The Johns Hopkins' *Patient Care: Health Information Library* mentioned wrist splints

are efficacious especially if worn at night. In addition, cortisone injections may reduce swelling, and if CTS is related to edema, diuretics may be of help. Lastly, it was suggested that surgery may be needed in a small number of patients who do not respond to more conservative treatments.<sup>63</sup>

William Cromie, Harvard News Office, concurred with Johns Hopkins that steroid [corticosteroids] injections into the carpal tunnel may give relief, particularly in younger patients who do not have advanced cases. Some long-term reports, however, speculate the relief is not long-lived. Pain may return within two to four months. From research conducted in 2005, Cromie reported that for the first three months, steroid injections proved more effective than surgery. However, after about a year, both were equally effective.<sup>64</sup>

The NINDS suggest alternative therapies have been found helpful in treating CTS. Patients have benefited from acupuncture and chiropractic, but they admit more study needs to be done. In addition, yoga has helped in relieving pain and improved grip strength for CTS sufferers (NINDS). Concurring with the Piazzini, et al, the NINDS article concluded yoga has potential in being helpful in treating CTS.<sup>65</sup>

Surgery should be the last choice for treatment unless it is obvious to the physician that surgery is urgent. Surgery cuts the supporting tendon next to the carpal tunnel allowing more room for the median nerve and relieving any undue pressure. Though the choice of last resort in most situations, it is important not to let the CTS persist over a long period. Williams wrote that "if the nerve remains under pressure for a long time, then – even when the pressure is released – there is a risk of ongoing nerve symptoms."<sup>66</sup>

Success rates for CTS surgery results are wide ranging. Balance Systems, Inc, *a leader in developing therapeutic products for the prevention and rehabilitation of upper extremity disorders*, gave the following statistics about CTS surgical results:

*ONLY 23% of all carpal tunnel syndrome patients returned to their previous professions following surgery ... (par 23).*

*Carpal tunnel surgery has about a 57% failure rate following patients from 1-day to 6-years. At least one of the following symptoms re-occurred during this time: Pain, Numbness Tingling sensations (par 24).*

*The fail rate for carpal tunnel surgery is over 50%. Many times I meet women who have undergone multiple surgeries, still unable to work and struggling with chronic pain (par 39).*

*Oftentimes, the surgery fails to produce any lasting help. A published study by Dr. Strasberg, at the Washington University School of Medicine, reported some startling results. This study, involving patients requiring a second surgery for CTS, revealed that only 53% of the patients showed significant improvement in their symptoms (par 43).<sup>67</sup>*

Atkinson cited one study showing that over 50-percent of those who report CTS conclude their treatments with surgery. Of those, he stated that only five percent needed surgery. The other 45 percent could have been treated conservatively without surgery.<sup>68</sup> The Mayo Clinic, however, reported that their surveys of patients who underwent carpal tunnel release showed 70% of their respondents “completely or very satisfied” with their results.<sup>69</sup>

Success rates for something as significant as surgeries must be considered by each individual. Thoroughly discuss such issues with your physician. Ask about their success rate, and ask them to define what they mean by success. Ask about complications years down the road. Ask about the percentage of former patients who go back to work, and how long before they could return. If after asking these questions and others, you are not satisfied, it might be time for a second opinion.

### **Conclusions and recommendations**

Reviewing literature about carpal tunnel syndrome pointed to considerable confusion. Its definition, breadth of the problem, diagnosis, preventative measures, and the treatment all had conflicting, incomplete, or insufficient information. So, what is a librarian to do? There are items of agreement in combating CTS. There is a serious need for proactive

intervention in the workplace and certainly in libraries. Prevention or some relief may be possible by using ergonomics, yoga, some exercises, vitamin therapy, and alternative medicines such as chiropractic. Proactive preventative measures may stave off the onset of CTS. If symptoms are minor, workers may be able to alleviate wrist pain by using wrist splints at night while sleeping and wrist pads while working at computer stations. It might also be helpful to take frequent breaks or to change work routines. Generally it is best to get a correct diagnosis quickly before beginning therapy.

If these measures do not work and CTS develops, there are many things to do before electing surgery, but do not wait too long. Remember conservative treatments have their proponents and opponents. Some of the more effective treatments are rest or cortisone injections. As previously mentioned, preventative measures used in treating CTS may be the best approach. Ergonomic modifications to the workplace, yoga, acupuncture, and chiropractic all may offer effective treatments. If these options do not help, surgery is a possibility. Surgery or any of the other treatments, however, need to be weighed carefully because of the considerable controversy as to their effectiveness. Surgery can be effective, but it can also be ineffective or cause serious side complications leading to more surgeries. Nonetheless, discussing any or all of these options with your doctor is wise and may prove effective in treating CTS.

Nothing the author of this article has written should be interpreted as medical advice. The information provided is a summary of findings and opinions taken from literature related to carpal tunnel syndrome. Before considering any diagnoses, therapies, or treatments mentioned in this article, consult qualified medical personnel. †

## REFERENCES

- Atkinson, William. "Carpal tunnel syndrome." Risk Management 49, no.7 (2008): 18-24. *Business Source Premier, EBSCOhost* (accessed Nov 14, 2008).
- Atroshi, I., Gummesson, C., Ornstein, E., Johnsson, R., and Ranstam, J. "Carpal tunnel syndrome and keyboard use at work: a population-based study." Arthritis and Rheumatism 56, no.11 (2007 Nov): 3620-3625. *MEDLINE, EBSCOhost* (accessed Dec 16, 2008).
- "Balance Systems, Inc." Balance Systems, Inc. 2006. <http://www.repetitive-strain.com/national.html> (accessed Dec 16, 2008).
- Bongers, Schellevis, F., van den Bosch, W., & van der Zee, J."Carpal tunnel syndrome in general practice. The British Journal of General Practice: (1987 and 2001): incidence and the role of occupational and non-occupational factors." *The Journal of the Royal College of General Practitioners* 57, no.534 (2007 Jan): 36-39. *MEDLINE, EBSCOhost* (accessed Nov 21, 2008).
- Booth-Jones, Angela, John P. Sestito, Toni Alterman, Robert Harrison, Jennifer Flattery. (2004, September). Department of Health and Human Services. [NIOSH] Worker Health Chartbook, 2004. <http://www.cdc.gov/niosh/docs/2004-146/pdfs/2004-146.pdf> (accessed Dec 12, 2008).
- "Carpal Tunnel Syndrome." *Johns Hopkins Medicine: Patient Care: Health Information Library*. [http://www.hopkinsmedicine.org/health\\_information\\_library/index.html?ArticleID=20015](http://www.hopkinsmedicine.org/health_information_library/index.html?ArticleID=20015) (accessed December 2, 2008).
- Chen, Ingfei. "Health guide: Expert ! & A: The Latest thinking on computer-related pain." *The New York Times*.Com. 19 Sep 2008. <http://health.nytimes.com/ref/health/healthguide/esn-repetitivestrain-expert.html?print=1> (accessed Dec 19, 2008).
- Cromie, William J. "Computer use deleted as carpal tunnel syndrome cause." *Harvard University Gazette*: [Harvard News Office] 31 Jan 2006. <http://www.hno.harvard.edu/gazette/daily/2006/01/31-carpal.html> (accessed Dec 8, 2008).
- de Stricker, Ulla. "Carpal tunnel and me: Ergonomic advice the hard way." *Searcher* 5, no.9 (October 1997): 8. *Library, Information Science & Technology Abstracts, EBSCOhost*. (accessed November 18, 2008).
- Furger, Roberta, and Steve Fox. "Danger at your fingertips." *PC World* 11, no.5 (May 1993): 118. *Academic Search Premier, EBSCOhost* (accessed November 21, 2008).
- Gehner, John. "Repetitive strain injuries, ergonomics regulation, and catalogers." *Progressive Librarian* (Spring, 2004): 1-9.
- Hales, Thomas R. Defining carpal tunnel syndrome: Letters to the editor. *American Journal of Public Health* 82, no.3 (March 1992): 466. *MEDLINE, EBSCOhost* (accessed November 14, 2008).
- Haraldson, Samuel J., and Barbara J. Blasko. "Information and resources: Repetitive motion injuries." *WebMD*. <http://www.webmd.com/a-to-z-guides/repetitive-motion-injuries> (accessed December 2, 2008).
- Herbert, Robin, and Laura Punnett. "Mayo Clinic CTS Study Flawed." *AFL-CIO*. [http://www.aflcio.org/issues/safety/ergo/ergo\\_ctsstudy.cfm](http://www.aflcio.org/issues/safety/ergo/ergo_ctsstudy.cfm) (accessed December 5, 2008).
- Kaehr, Robert E. 2009. "What Do Meatpackers & Librarians Have in Common?" *Christian Librarian* 52, no. ½: 24-27. *Library, Information Science & Technology Abstracts, EBSCOhost* (accessed November 14, 2008).
- Katz, J. Katz responds: Letters to the editor. *American Journal of Public Health* 82, no.3 (March 1992): 466-467. *MEDLINE, EBSCOhost* (accessed November 14, 2008).
- Kusack, James M. THE LIGHT AT THE END OF THE CARPAL TUNNEL. *Library Journal*, 115, no 12 (July 1990): 56-59. *Library, Information Science & Technology Abstracts, EBSCOhost* (accessed November 14, 2008).
- Lang, Susan S. Carpal tunnel syndrome protection. *Computers in Libraries*, 15, no. 2 (February 1995): 10, 11. *Library, Information Science & Technology Abstracts, EBSCOhost* (accessed November 12, 2008).
- Levinson, Steve. Institutional response to computer-related repetitive strain injury. *Campus-Wide Information Systems*, 16, no. 1 (1999): 27-29.
- Maher, Helen K. "Carpal tunnel syndrome: an update." *AAOHN Journal* 55, no. 5: 216-216. *CINAHL Plus with Full Text, EBSCOhost* (accessed November 14, 2008).
- Mayo Clinic Staff. "Carpal tunnel syndrome." MayoClinic.com. Mayo Foundation for medical Education and Research. <http://www.mayoclinic.com/print/carpaltunnelsyndrome/DS00326/METHOD=print&DSECTION=all> (accessed December 17, 2008).
- U.S. National Library of Medicine and the National Institutes of Health. "Repetitive motion related occupational injuries and illnesses involving days away from work, 2006." *Medline Plus*. [Table 3 Source: Bureau of Labor Statistics.] (19 Nov 2008): <http://www.nlm.nih.gov/medlineplus/carpaltunnelsyndrome.html> (accessed Dec 12, 2008).
- National Institutes of Health: National Institute of Neurological Disorders and Stroke. "Carpal tunnel syndrome fact sheet." (November 2002): paragraphs 4, 5, and 11-13. [http://www.ninds.nih.gov/disorders/carpal\\_tunnel/detail\\_carpal\\_tunnel.htm](http://www.ninds.nih.gov/disorders/carpal_tunnel/detail_carpal_tunnel.htm) (accessed November 18, 2008).
- "Carpal Tunnel Syndrome Fact Sheet," NINDS. Publication date November 2002. NIH Publication No. 03-4898 paragraphs 4, 5 and 11-13.
- Piazzini, D.B. et al. "A systematic review of conservative treatment of carpal tunnel syndrome." *Clinical Rehabilitation* 21, no. 4 (April 2007): 299-314.
- Reed, Christopher. "Qwerty acquitted: Of mice and hands." *Harvard Magazine*. 108, no. 5 (May/June 2006): 14, 15. Catherine A. Chute, Publisher. <http://harvardmag.com/pdf/2006/05-pdfs/0506-14.pdf> (accessed Dec 1, 2008).
- Szunejko, Monika Halina. "Managing Repetitive Strain Injuries in Bibliographic Services Departments." *Technical Services Quarterly*. 18, no. 1 (2000): 33-45.
- Thornton, Joyce K. "Battling Carpal Tunnel Syndrome through ergonomics." *Computers in Libraries* 15, no. 8 (September 1995): 22, 23.
- Thornton, Joyce K. "Carpal tunnel syndrome in ARL libraries." *College & Research Libraries* 58, no. 1 (January 1997): 9.
- Williams, N[er]ys. "10 tips on ... Carpal tunnel syndrome." *Practice Nurse* 33, no. 1 (2007 Jan 12 2007): 23. *CINAHL Plus with Full Text, EBSCOhost* (accessed January 7, 2009).
- Zumalt, Joseph R. "Voice Recognition Technology: Has It Come of Age?" *Information Technology & Libraries* 24, no. 4 (December 2005): 180-185. *Library, Information Science & Technology Abstracts, EBSCOhost* (accessed December 15, 2008).

NOTES

1. William Atkinson. "Carpal Tunnel Syndrome." *Risk Management* 49, no 7 (2002): 18-24. Available: <http://www.rmmag.com/MGTemplate.cfm?Section=RMMMagazine&NavMenuID=128&template=/Magazine/DisplayMagazines.cfm&MGPreview=1&Volume=49&IssueID=165&AID=1541&ShowArticle=1> (accessed Nov 14, 2008).
2. Mayo Clinic Staff. "Carpal Tunnel Syndrome. MayoClinic.com: Tools for Healthier Lives: c 1998-2008 Mayo Foundation for Medical Education and Research. [Online] <http://www.mayoclinic.com/print/carpaltunnelsyndrome/DS00326/METHOD=print&DSECTION=all> (accessed December 17, 2008).
3. Atkinson. (2002): 18.
4. Christopher C. Reed. "Qwerty Acquitted: Of Mice and Hands." *Harvard Magazine* 108, no 5 (2006): 14. <http://harvardmagazine.com/2006/05/0fmice-and-hands.html> (accessed Dec 1, 2008).
5. Helen K. Maher. "Carpal Tunnel Syndrome: An Update." *AAOHN Journal* 55, no 5 (2007): 216.
6. James M. Kusack. "The Light at the End of the Carpal Tunnel." *Library Journal* 115, no 12 (1990): 57.
7. Diana Barbara Piazzini, et al. "A Systematic Review of Conservative Treatment of Carpal Tunnel Syndrome." *Clinical Rehabilitation* 21, no. 4 (2007): 300.
8. "Repetitive Motion Related Occupational Injuries and Illnesses Involving Days Away from Work, 2006 (Bureau of Labor Statistics) links to PDF taken from (*Medline Plus: Carpal Tunnel Syndrome: Statistics: (Table 3, p. 3.)* <http://www.nlm.nih.gov/medlineplus/carpaltunnelsyndrome.html>).
9. Angela Booth-Jones, John P. Sestito, Toni Alterman, Robert Harrison, Jennifer Flattery. *Fatal and Nonfatal Injuries, and Selected Illnesses and Conditions: Chapter Two: Carpal Tunnel Syndrome*. Department of Health and Human Services. [NIOSH] *Worker Health Chartbook*, 2004 (2004): 27, 28. <http://www.cdc.gov/niosh/docs/2004-146/pdfs/2004-146.pdf> (accessed Dec 12, 2008).
10. Ibid, 59.
11. Ibid, 64
12. Joyce K. Thornton. "Carpal Tunnel Syndrome in ARL Libraries." *College & Research Libraries* 58, no 1 (1997): 9, 10.
13. Angela Booth-Jones, et al. (2004): 27.
14. Thornton (1997): 13-16.
15. Balance Systems, Inc. "National & International Statistics for Carpal Tunnel Syndrome and Other Associated Repetitive Strain Injuries of the Upper Extremity." 2006. par. 6 <http://www.repetitive-strain.com/national.html> (accessed Dec 16, 2008).
16. Ulla de Stricker. "Carpal Tunnel and Me: Ergonomic Advice the Hard Way." *Searcher* 5, no.9 (October 1997): par 9. <http://web.ebscohost.com/ehost/detail?vid=12&hid=103&sid=bac205d1-d2684973a6fb2e41d0f6a165%40sessionmgr107&bdata=jmxxvZ2lucGFuZT1sb2dpbi5hc3Amc2l0ZT1aG9zdC1saXZl#db=lxh&AN=9710293287> (accessed November 18, 2008).
17. Samuel J. Haraldson and Barbara J. Blasko. "Information and Resources: Repetitive Motion Injuries." (par 3) *WebMD*. <http://www.webmd.com/a-to-z-guides/repetitive-motion-injuries> (accessed December 2, 2008).
18. Ibid. (par 11).
19. Kusack (1990): 56-58.
20. Joyce K. Thornton. "Battling Carpal Tunnel Syndrome through Ergonomics." *Computers in Libraries* 15, no. 9 (1995): 22.
21. Roberta Furger and Steve Fox. "Danger at Your Fingertips." *PC World* 11, no.5 (May 1993): 118-124. *Academic Search Premier. EBSCOhost* (accessed November 21, 2008).
22. Thornton. (1995): 22, 23.
23. Atkinson. (2002): 18-20.
24. Frans JM Bongers, et al. "Carpal Tunnel Syndrome in General Practice. *The British Journal of General Practice: (1987 and 2001): "Incidence and the Role of Occupational and Non-Occupational Factors." The Journal of the Royal College of General Practitioners* 57, no.534 (2007): 36, 37.
25. John Gehner. "Repetitive Strain Injuries, Ergonomics Regulation, and Catalogers." *Progressive Librarian* (Spring, 2004): 7.
26. Steve Levinson. "Institutional Response to Computer-Related Repetitive Strain Injury." *Campus-Wide Information Systems*, 16, no. 1 (1999): 27.
27. Ulla de Stricker. (1997): 8.
28. Isam Atroshi, Christina Gummesson, Ewald Ornstein, Ragnar Johnsson, and Jonas Ranstam. "Carpal Tunnel Syndrome and Keyboard Use at Work: A Population-Based Study." *Arthritis and Rheumatism* 56, no.11 (2007): 3622.
29. Atkinson. (2002): 21, 22.
30. Christopher Reed. "Qwerty Acquitted: Of Mice and Hands." *Harvard Magazine*. 108, no. 5 (2006): 14. Catherine A. Chute, Publisher. <http://harvardmag.com/pdf/2006/05-pdfs/0506-14.pdf> (accessed Dec 1, 2008).
31. Robin Herbert and Laura Punnett. "Mayo Clinic CTS Study Flawed." *AFL-CIO*. (par 1). [http://www.aflcio.org/issues/safety/ergo/ergo\\_ctsstudy.cfm](http://www.aflcio.org/issues/safety/ergo/ergo_ctsstudy.cfm) (accessed December 5, 2008).
32. Atkinson (2002): 19.
33. Reed (2006): 15.
34. Diana Barbara Piazzini, et al. "A Systematic Review of Conservative Treatment of Carpal Tunnel Syndrome." *Clinical Rehabilitation* 21, no. 4 (2007): 312.
35. Bongers, et al. (2007): 37.
36. Reed. (2006): 14.
37. Monika Halina Szunejko. "Managing Repetitive Strain Injuries in Bibliographic Services Departments." *Technical Services Quarterly*. 18, no. 1 (2000): 35.
38. Ingfei Chen. "Health Guide: Expert ! Q & A: The Latest Thinking on Computer-related Pain." *The New York Times. Com.* (2008): 1. <http://health.nytimes.com/ref/health/healthguide/esn-repetitivestrain-expert.html?scp=1&sq=%22the%20latest%20thinking%20on%20computer-related%20pain%22&st=cse> (accessed Dec 19, 2008).
39. "Carpal Tunnel Syndrome." *Johns Hopkins Medicine: Patient Care: Health Information Library*. (par 7). [http://www.hopkinsmedicine.org/health\\_information\\_library/index.html?ArticleID=20015](http://www.hopkinsmedicine.org/health_information_library/index.html?ArticleID=20015) (accessed December 2, 2008).
40. Maher. (2007): 216.
41. Bongers, et al. (2007): 37, 38.
42. Szunejko. (2000): 35.
43. National Institute of Neurological Disorders and Stroke (NINDS). National Institutes of Health. "Carpal Tunnel Syndrome Fact Sheet." (2002): par 4. [http://www.ninds.nih.gov/disorders/carpal\\_tunnel/detail\\_carpal\\_tunnel.htm](http://www.ninds.nih.gov/disorders/carpal_tunnel/detail_carpal_tunnel.htm) (accessed November 18, 2008).
44. Kusack (1990): 57.
45. Susan S. Lang. "Carpal Tunnel Syndrome Protection." *Computers in Libraries*, 15, no. 2 (1995): 10, 11.
46. "Carpal Tunnel Syndrome." (2001): par 7.
47. Levinson (1999): 28.
48. Atkinson (2002): 20.
49. Meher (2007): 216
50. Robert E. Kaehr. "What Do Meatpackers & Librarians Have in Common? Library Related Injuries and Possible Solutions." *The Christian Librarian*, January 2009, [to be published].
51. Joseph R. Zumalt. "Voice Recognition Technology: Has It Come of Age?" *Information Technology & Libraries* 24, no. 4 (December 2005): 182-184.
52. Atkinson (2002): 18-24.
53. National Institute of Neurological Disorders and Stroke. (2002): par's 11-13.
54. Bongers, et al. (2007): 36.
55. Nerys Williams. "10 Tips on ... Carpal Tunnel Syndrome." *Practice Nurse* 33, no. 1 (2007): 23, 25. *CINAHL Plus with Full Text, EBSCOhost* (accessed January 7, 2009).
56. Thomas R. Hales. Defining Carpal Tunnel Syndrome: Letters to the Editor. *American Journal of Public Health* 82, no.3 (1992): 466. CIN
57. Katz, J. "Katz Responds: Letters to the Editor. *American Journal of Public Health* 82, no. 3 (1992): 466-467.
58. Thornton. (1997): 11, 12.
59. Thornton. (1997): 17.
60. Kusack. (1990): 57.
61. Chen. (2008): 5<sup>th</sup> question/answer.
62. Piazzini, et al. (2007): 312.
63. "Carpal Tunnel Syndrome." *Johns Hopkins ...* (nd): par. 9.
64. Cromie. (2006): par. 15.
65. National Institute of Neurological Disorders and Stroke. (2002): par 15.
66. Williams. (2007): 25.
67. Balance Systems. (2006): par's 23, 24, 39, 43.
68. Atkinson. (2002): 20.
69. Mayo Clinic Staff. (2007): par 34.