Health Hazard Evaluation

Menard Correctional Center

Illinois Occupational Injury/Illness Prevention Program

Division of Environmental and Occupational Health Sciences

UIC UNIVERSITY OF ILLINOIS AT CHICAGO Great Lakes Center for Occupational and Environmental Safety and Health
SCHOOL OF PUBLIC HEALTH

Investigators

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The **Illinois Occupational Injury/Illness Prevention Program** at the UIC School of Public Health, Division of Environmental and Occupational Health Sciences, is funded, in part, by the National Institute for Occupational Safety and Health. Its objective is to control and prevent workplace injuries and illnesses in Illinois in partnership with State agencies, business, labor, and community based organizations.

Background

Problem

In December of 2010, a story broke in the Belleville News Democrat describing a high number of workers' compensation claims from Menard Correctional Center employees for carpal tunnel syndrome and other upper extremity musculoskeletal disorders. This has led to a payout of millions of dollars in workers' compensation for medical care, temporary total disability, and permanent partial disability within a two year period. Since that time, the same newspaper published some 25 additional reports; the story has been picked up by other newspapers in the State, as well as many online blogs. Since these workers are employees of the State of Illinois, the Attorney General's office represents the State in workers compensation arbitration.

As partners through the federally funded Illinois Occupational Illness and Injury Prevention Program, the Illinois Workers' Compensation Commission (IWCC) requested that faculty experts at the University of Illinois at Chicago School of Public Health, Division of Environmental and Occupational Health Sciences (UIC) review a sample of records from Menard employees who had filed workers' compensation claims for repetitive strain injuries of the upper extremity--arm/wrist/hand. We engaged in an informal discussion of medical aspects of the cases, as well as potential workplace hazards that could have led to these injuries. Following this discussion, UIC received a call from Mr. Don Williams (Interim Division Manager, Risk Management Division, Illinois Department of Central Management Services) requesting that UIC conduct a walk-through of the facility to evaluate the physical tasks of correctional officers (COs), the job title with the greatest number and rate of repetitive strain injuries. We assembled as much data as possible related to these injuries, facilitated an interagency agreement between UIC and the Illinois Department of Central Management Services (CMS), and conducted a pilot ergonomics assessment of the Menard Correctional Center on July 17, 2012.

Opening Meeting

The team from UIC met in the Menard Correctional Center (MCC) Warden's Office with personnel from MCC, from the Attorney General's Office, and from Illinois Central Management Services. We discussed the problem from each entity's perspective; we further clarified the objectives and end-product of the investigation.

Attendance at the Opening Meeting

Menard Correctional Center

Kelly Moeller, Administrative Assistant to the Warden

Major James Brown, Chief of Security at MCC

Kim Butler, Assistant Warden of Programs

Central Management Services

Don Williams, Interim Division Manager Risk Management Division, Illinois Central Management Services

Attorney General's Office

Kenton Owens, Assistant Attorney General

Aaron Wright, Assistant Attorney General

Team from the University of Illinois at Chicago

Lisa Duran, BS. Environmental and Occupational Health Sciences, School of Public Health, UIC

Linda Forst, MD, MPH. Environmental and Occupational Health Sciences, School of Public Health, UIC

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Supriya Sen, MS, OTR/L. Clinical Assistant Professor, Department of Occupational Therapy UIC

Documents provided at the visit

Ms. Moeller provided a notebook binder labeled, Menard Correctional Center Workers' Compensation Repetitive Motion Information. This binder contains information about job titles, the number of employees in each job title, the number of repetitive motion claims filed by job title, month, and year; dates and job titles of staff claiming repetitive motion injuries (with names deleted) as they changed over time; and job descriptions for Correctional Officer, Correctional Sergeant, Food Supervisor, Maintenance, Supply Supervisor, Counselors, Correctional Nurses and Correctional Medical Technicians.

Discussion in opening meeting

We were introduced to the problem of the large number of workers' compensation claims that had been filed for carpal tunnel syndrome and cubital tunnel syndrome over the prior 2-3 years. The vast majority of claimants are Correctional Officers (COs); CO is the most common job title in the facility. It was pointed out that people hire in as COs and move up into other positions with seniority. It can take 15 years to be promoted into a different job title; most all of the claimants with job titles different than CO started out as CO.

The job tasks described as most hazardous for the upper extremities are: percussing a steel bar over the cell bars, which is done at the beginning of each shift (twice during a shift if overtime is involved); opening and closing individual cells with Folger Adam keys; cranking open multiple cells (in the low security area) at one time; installing and removing steel meal slide boxes; hand cuffing and escorting prisoners.

Aside from biomechanical hazards for the upper extremities, Menard personnel reported that there is a large number of assaults—inmates on COs and inmates on other inmates-- that are broken up by COs; there are occasional fatalities from violence. An assault generally leads to a lockdown of the facility. There are also slips, trips, falls, strains/sprains, and lifting injuries, with many of these injuries affecting the back and shoulder.

Although the majority of workers' compensation cases are among COs, a much smaller subset of workers, those providing health care services, also filed workers' compensation claims for upper extremity musculoskeletal disorders. Exposure hazards for this group were not delineated in the meeting.

There is great concern about the number of workers' compensation cases. This is unprecedented in the history of the facility: it puts a large financial burden on the State; it also burdens other workers who work a significant amount of mandatory overtime when their co-workers are off of work over a period of months for surgery, recuperation, and rehabilitation. There is concern that a single attorney is doing the vast majority of soliciting cases, referring to surgeons, and representing claimants in the workers' compensation system for these upper extremity injuries. There is also concern that the workers are "scamming" the system. It has been noted that they come to work talking about having used their settlements to pay off their mortgages, buy cars, and cover other large expenses that would take more time to cover on their usual salaries. There is also a feeling that perhaps the doctors are doing too much surgery, given that there has never been a problem like this before--job tasks have not changed very much in more than a century. Also, the injured employees eventually come back to their usual jobs without restrictions; it seems more likely that they would have trouble with the work

that caused these problems in the first place, but that does not appear to be the case. The fact that each injured employee has two to four different operations on dominant plus non-dominant hand/arm was questioned as being atypical.

"Management" recently negotiated with the union to create light duty jobs to bring injured employees back to work earlier. This approach was begun in the past year. The general perception is that the COs consider this work "too limited"—it is mostly in the mail room--and their return to full duty is expedited by having them start earlier in a limited duty job.

The job tasks that the COs do was described in the opening meeting: moving inmates from place to place, guarding them, bringing food to inmates in the segregation cells. Most COs have a high school education and live close to the facility. CO is considered a good job, mainly because of benefits and the opportunity to make a good salary with overtime pay. The COs frequently work mandatory overtime. In the past, mandatory overtime shifts were eight hours long; now these mandatory overtime shifts do not exceed four hours.

Description of the Menard Workforce

According to documents provided, there were 823 employees at Menard on July 7, 2012; 64 employees were on leave of absence and 44 on temporary assignments (light duty). By far, the most common job title is Correctional Officer (CO), with 534 employees being in that position on July 7, 2012. As described in the opening meeting, many of the other positions are filled by individuals that started as Correctional Officers and placed into those positions by seniority.

Review of Workers Compensation Data

Data was provided from both the Illinois Workers Compensation Commission (IWCC) and from the Menard Warden's Office. Data from 1981 through 2007 was extracted for Menard from the IWCC database that contains all claims in the State. We selected "Menard" as the "facility; "cases" were selected on the following basis:

- Nature=Carpal Tunnel Syndrome **or**
- Nature =multiple sprain, strain or injury; or nerves or tendonitis or nonclassifiable **+ (plus)**
  Accident type descr = overexertion **or** nonclassified **or** injured during course of employment **or** repetitive trauma **+(plus)**
  Part = hand **or** wrist **or** arm **or** elbow **or** upper extr **or** multiple body parts

Data for 2008-2011 comes from a dataset that was freshly assembled by IWCC in response to the concerns raised about the high number of claims at Menard. The

following chart was made by combining “claims” data from the original, IWCC dataset (i.e., investigators extracted the Menard cases) and the freshly assembled dataset to better inform consideration of claims from Menard workers. Figure 1, below, shows the number of repetitive strain injury claims from Menard workers by year, from 1981 through 2011.

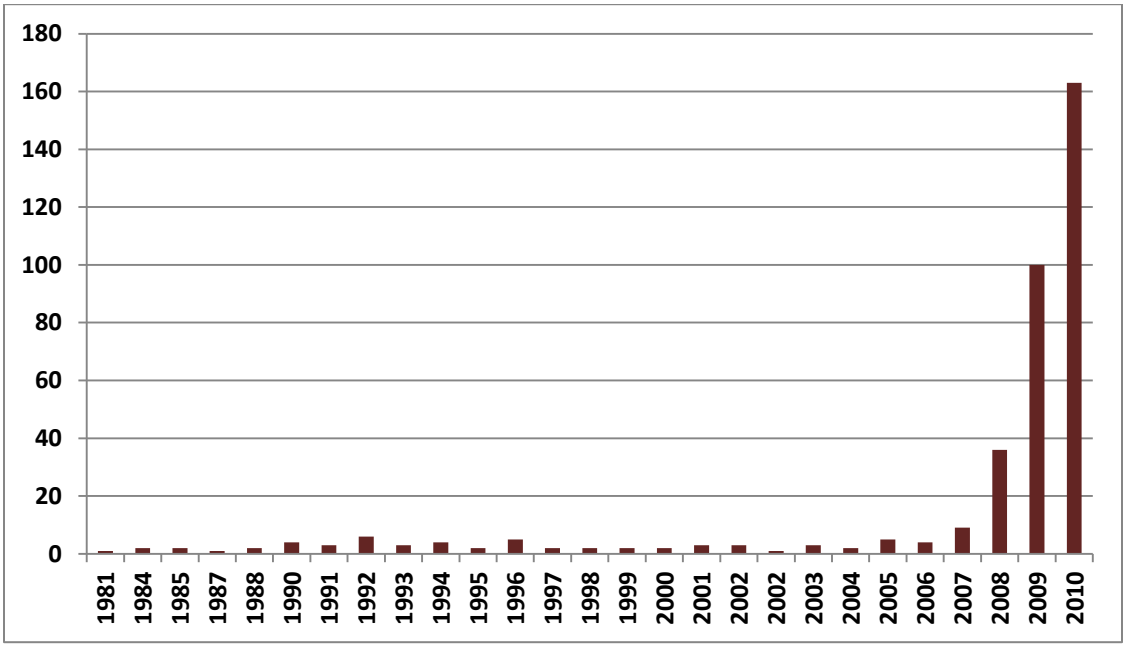


Figure 1. Number of Repetitive Strain Injury Claims at Menard Correctional Center, 1981-2011

Figure 2, below, shows the number of claims filed for repetitive strain injuries, by month from January 2009-June 2012. This chart was constructed using data provided at the opening meeting of the site visit. Claims rose from middle 2009 through early 2011, then tapered off.

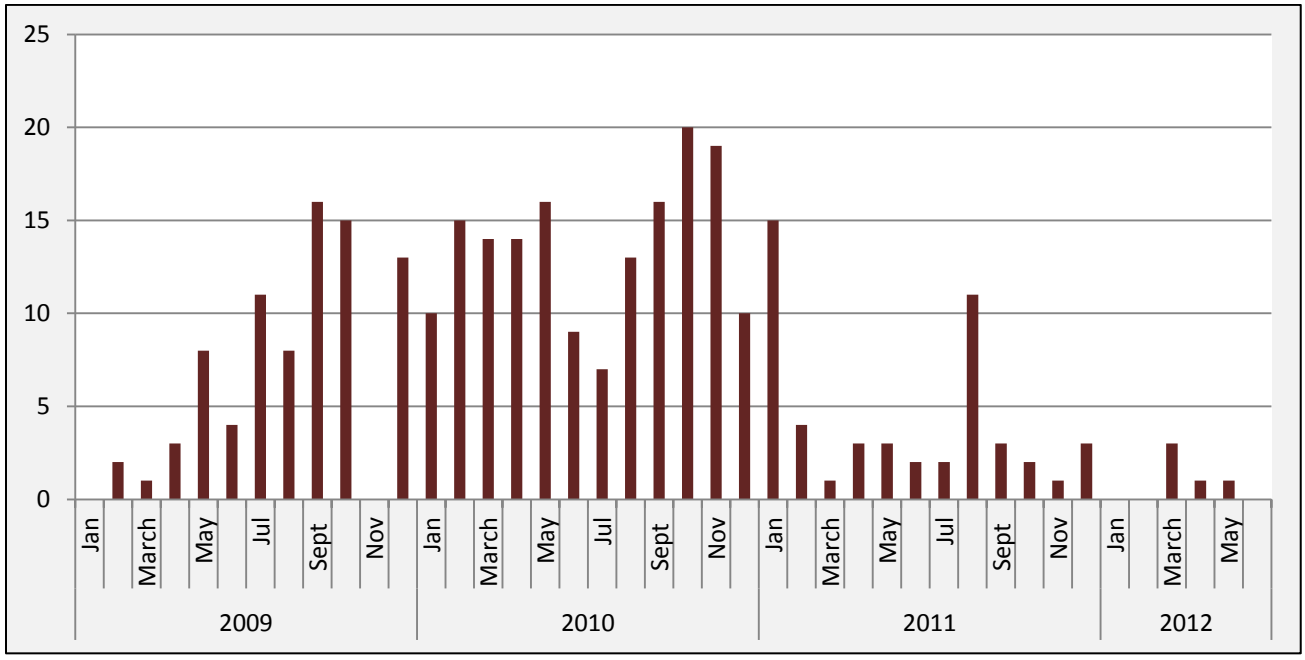


Figure 2 Total claims for repetitive strain injuries at Menard Correctional Facility by month, January 2009 to June 2012.

Table 1 shows the number of Menard claims from January 2009 through June 2012 by job title; this was assembled from data provided at the opening meeting. The third column shows the number of individuals that were employed in each job title in July of 2012. The fourth column shows the proportion of employees in each job title that have filed claims. Given that the turnover is reportedly very low, the proportion in each job title filing claims should approximate the true proportion. The smaller box, below the table, lists the job titles with only one worker filing a claim. Rates were not calculated for these job titles due to the likely instability of these numbers.

Table 1. Number and proportion of workers submitting claims for upper extremity musculoskeletal disorders by job title.

Job title	**# Claims**	**# employees in this job title in July 2012**	**% filing claims**
Correctional Officer	213	534	39.9%
Correctional Food Service Supervisor I, II,III	18	37	48.6%
Correctional Lieutenant	15	32	46.9%
Correctional Sergeant	9	54	16.7%
Correctional Medical Technician	6	21	28.6%
Correctional Supply Supervisor II/III	6	8	75%
Correctional Counselor I/II	6	13	46.2%
Correctional Nurse II	5	16	31.3%
Correctional Maintenance Craftsman	4	9	44.4%
Office Assistant	3	3	100%
Office Coordinator	2	1	200%?
Shift Supervisor (assumed the same as shift commander)	2	7	28.6%
Job titles with one claim, each (rates not calculated): correctional utility operator - director of nurses – electrician - health care unit administrator – health information technician - information services specialist II – plumber			

In order to contextualize the workers compensation claims from the Menard facility, data was assembled from all correctional facilities in Illinois. Table 2 shows workers' compensation data on all jails and prisons in Illinois, 1981-2007. These numbers come from UIC's extraction of cases from the entire IWCC dataset. This table includes all diagnoses (not only upper extremity, repetitive strain injuries). More recent data is unavailable for this report. The number of workers at each facility is unknown, so claims rates were not calculated. We also did not have data on the size of the facilities or the inmate census. According to these data, between 1981 and 2007 Menard ranked 11th of 31 facilities (from largest to smallest) in both the mean ($12,514.77) and median ($6000.00) total compensation; it ranked only 21st in the mean number of weeks of

temporary total disability and 13th for mean permanent partial disability percent. Again, data are not available to us for 2008-2012, the time period of increased upper extremity claims.

Prison/Jail	Number of Cases	Total WC Compensation ($) Mean	Total WC Compensation ($) Median	Total TTD in Weeks Mean	Total TTD in Weeks Median	Total PPD (%) Mean	Total PPD (%) Median
Big Muddy	103	$18,597.02	$13,024.02	7.52	0.19	17.3%	15.0%
Centralia	331	$9,933.28	$4,279.26	4.64	0.00	9.9%	4.0%
Cook County	1124	$8,257.08	$3,327.62	9.83	1.43	9.0%	3.5%
Danville	88	$11,653.55	$5,039.34	3.39	0.00	11.4%	3.5%
Decatur	18	$31,857.96	$2,1186.70	51.44	12.29	14.5%	15.0%
Dixon	182	$9,805.70	$4,695.53	4.63	0.00	11.6%	7.3%
Dwight	249	$7,874.23	$4,186.40	7.45	0.00	10.4%	4.0%
East Moline	53	$13,223.79	$7,493.55	10.40	0.00	15.0%	7.9%
Graham	142	$12,429.81	$5,060.40	5.91	0.00	11.4%	6.0%
Hanna City	31	$5,798.52	$750.00	4.14	0.00	6.1%	0.0%
Henry Hill	175	$10,338.54	$5,500.00	3.39	0.00	11.1%	5.0%
IYC	179	$12,095.03	$5,517.35	7.30	0.00	11.7%	4.7%
Jacksonville	47	$12,800.64	$3,399.13	7.18	0.00	15.2%	9.0%
Joliet	794	$8,731.28	$3,956.78	7.25	0.00	10.7%	4.9%
Lawrence	31	$21,838.22	$11,881.51	10.23	0.65	11.9%	6.3%
Lincoln	75	$10,545.59	$4,357.95	5.19	0.00	9.4%	5.0%
Logan	231	$6,724.43	$10,18.93	7.61	0.00	8.2%	0.0%
Menard	709	$12,514.77	$6,000.00	3.72	0.00	11.9%	5.0%
Pinckneyville	104	$19,538.40	$7,311.76	3.06	0.00	11.0%	5.0%
Pontiac	539	$10,138.41	$5,000.00	5.27	0.00	9.2%	4.0%
Robinson	40	$17,082.78	$7,397.13	2.17	0.00	11.7%	5.0%
Shawnee	248	$17,614.40	$8,632.47	8.70	0.00	12.6%	7.5%
Sheridan	151	$13,612.51	$5,000.00	4.81	0.00	12.5%	6.5%
Southwest	48	$6,852.01	$5,240.81	0.77	0.00	7.1%	3.1%
State of Illinois (unspecified)	1355	$10,683.49	$4,872.28	6.82	0.00	10.0%	4.9%
Stateville	893	$6,431.63	$3,165.05	4.34	0.00	8.3%	3.1%
Tamms	62	$14,785.66	$10,032.75	7.77	0.00	13.5%	5.5%
Taylorville	38	$13,206.43	$7,500.00	1.84	0.00	12.1%	8.5%
Vandalia	130	$14,280.88	$6,095.20	5.84	0.57	14.0%	7.5%
Warrenville	19	$12,193.22	$7,965.77	4.16	0.70	7.3%	5.0%
Western Illinois	34	$10,930.19	$6,199.70	2.44	0.00	9.6%	5.0%

Table 2. All workers compensation claims filed through the Illinois Workers Compensation Commission by employees of Illinois correctional facilities, 1981-2007

Description of walk-through

Narrative

The UIC team was led on a tour by Major Brown and another officer to the areas of the facility considered to be at highest risk for upper extremity musculoskeletal disorders--the work areas of employees who had filed workers' compensation claims. We viewed cell blocks in several areas including, the segregation unit; the crank cage; the medical unit; and the kitchen. In each of these areas, we observed a variety of job tasks, demonstrated by correctional officers and one nurse. We discussed and observed these tasks, took photographs, and made measurements of reach distances, height/level of task, weight, and force/torque; we qualitatively tested potential substitute props that could be used in the requisite tasks. Measurements are shown, below.

Ergonomic Screenings

The work activities of three positions were examined for equipment and techniques during the visit:

- Correctional Officer
- Food Supervisor
- Medical Technician

Correctional Officer

As a result of the review of background material and discussion with staff prior to the tour, three work activities were seen to be potentially problematic regarding repetitive stress:

- Unlocking / opening of cell doors
- "Bar rapping" during security checks
- Placement / removal of meal pass-thru boxes

A Correctional Officer is assigned to one or two galleys. Each galley has 55 cells; if a Correctional Officer is monitoring two galleys, 110 cells are involved.

Unlocking / opening of cell doors

Two techniques are used when grasping the Folger Adam key and turning it: (1) holding the key in the center of the hand; (2) holding the bottom of the key handle with the fingers and pressing downward with the thumb.

Figure 3. Typical Folger Adam key

A lever was attached to the handle of the key, and a digital scale was attached to the lever 2.75 inches away from the midline of the key; force measurements were taken during the unlocking activity. Maximum force required to unlock the door occurred at the extreme end of the counter-clockwise rotation. Required torque to open the lock is displayed in Table 3.

Required force (lb)	Distance from midline (in)	Required torque (in-lb)
6.6 (min)	2.75	18.2
10.0 (max)	2.75	27.5

Table 5. Torque required to open a cell with a Folger Adam key.

Box 1. Preliminary Recommendation for Unlocking Cell Doors

Regarding the first of the two techniques described above--holding the key in the center of the hand--the use of gloves may assist in reducing the stress on the hand when grasping the full key handle. Regarding the second of the two techniques, there is concern about the amount of force which must be repeatedly generated through the thumb, as it is positioned only 0.75 inches from the center of the key handle. As a result, a force of as much as 36.7 lb is required. Avoiding the second technique--holding the bottom of the key handle with the fingers and pressing downward with the thumb—is recommended. ***Note: these recommendations should be reviewed, tested, and evaluated by personnel doing these tasks in order to assure feasibility.***

Opening/closing Cell Door

The force required to pull and push each cell door was measured in the section North 2.

The correctional officer (CO) unlocks the cell door and 'pushes' the sliding cell door to the right, with forces distributed through the elbow and wrist (from flexed to extended elbow), as the door slides open to the right. The force required to do this task was measured at 15 lbs. Of note is that this task is done with one hand while the CO torques the Folger Adam key with the other hand].

To close the cell door, the CO grabs the vertical bars with one or both hands and slides the cell door back to the left, closing position. The force required to do this was measured at 40 lbs.[Again, this task is done with one hand while the CO torques the key with the other hand].

The body mechanics used for opening versus closing were quite different and possibly resulted in the large differences in force measurements. When **opening** the sliding cell door, the CO used the upper extremities, and he used body weight in the direction of the motion; when **closing** the sliding cell door, the CO used his upper extremities only, without the addition of body weight.

Box 2. Preliminary Recommendation for Opening and Closing Cell Doors

The recommendation for **closing** the cell door would be to move to the other side of the sliding door--e.g. if the door is being slid open from left to right, the CO should walk over to the right side of the now open door and push the sliding cell door left using his/her upper extremities and body weight to shut it into locking position. Additionally, avid maintenance and lubrication of sliding parts would decrease the force required to move the cell doors. ***Note: these recommendations should be reviewed, tested, and evaluated by personnel doing these tasks in order to assure feasibility.***

Bar Rapping

At the beginning of each work shift, the correctional officer takes a solid, cylindrical steel bar in one hand and drags it across each of the vertical bars comprising the cell door and the fixed panel next to the door. No gloves are worn during this activity. The specific dimensions of the rapping bar used by the CO are shown in Table 4.

Material	Steel
Diameter	0.75 in
Length	15 in
Weight	1.9 lb

Table 4. Dimensions of the “rapping bar” used to check integrity of cell door bars.

Each cell door has six (6) rows of vertical bars, and five (5) bars across each row. Each fixed panel has six (6) rows of vertical bars, and six bars across each row. Therefore, for each cell, contact is made with a total of 66 vertical bars (a total of 3,630 bars for one galley; 7,260 bars for two galleys). The Correctional Officer is checking for the integrity of the bar, from the standpoint of the sound upon contact and tactile feedback.

Figure 4. Typical cell door, fixed panel.

The specific dimensions of the cell door and cell fixed panels are shown in Table 5.

Material	Steel
Diameter	0.75 in
Length	11.5 – 12.0 in

Table 5. Dimensions of the cell door and fixed panels

Two equipment interventions were tested to determine if the Correctional Officer received the same feedback regarding the integrity of the cell door and fixed panel bars. Steel bars were equipped with rubber handles [Figure 5], each with a different hardness value. Additionally, two commercially-available pairs of anti-vibration gloves were used [Figure 6, Figure 7]. COs were asked to rap the cell bars with the usual hand-tool bars, as well as the damped hand-tool bars. They did this barehanded, and additionally wearing the each of the two pairs of gloves [Figures 6 & 7], shown below.

Figure 5. Modified steel bars.

Figure 4. Anti-vibration glove A
(Youngstown Glove 03-3200-78)

Figure 5. Anti-vibration glove B
(ProFlex 9200)

The different combinations--or single trials--are summarized in Table 6, below.

Trial	Condition	Sound and tactile feedback adequate?
1	Bare steel bar, bare hand	Yes
2	Steel bar w/ handle, 30 Shore A durometer, bare hand	Yes
3	Steel bar w/ handle, 50 Shore A durometer, bare hand	Yes
4	Bare steel bar, anti-vibration glove A (Youngstown Glove 03-3200-78-XL-XT Performance Glove, 20 Shore A durometer)	Yes
5	Bare steel bar, anti-vibration glove B (ProFlex 9200 Anti-Vibration Glove, 35 Shore A durometer)	Yes

Table 8. Bar-rapping trials to determine tactile feedback, using bare hands, different gloves, and different bars.

Box 3. Preliminary Recommendation for Bar Rapping

This qualitative study indicates that a single or combination of equipment interventions can be used and still enable the Correctional Officer to obtain the feedback required to determine the integrity of the cell bars. Further study is required to quantify the actual reduction in vibration coming into the hand. These measurements should be taken per protocols of ISO Standards to measure hand vibration due to non-powered hand tools (ISO, 2012). ***Note: these recommendations should be reviewed, tested, and evaluated by personnel doing these tasks in order to assure feasibility.***

Placement / removal of meal pass-thru boxes

Meal pass-thru boxes are hung on the cell doors of inmates who are residing in isolation cells. The boxes are fabricated of steel, and are either 27 or 56 lbs in weight, depending on whether the box is designed to transport one or two meal trays. These are slid/jiggled into place. The frequency of the installation or removal of the boxes, and how many different personnel undertake this task, are not known to us.

Box 4. Recommendations for Managing Carrying/Inserting/Removing Meal Pass-Through Boxes

Lighter metal and non-metal materials that retain the integrity (hardness) of the existing boxes should be fabricated and substituted for the meal pass-thru boxes. In addition, lubrication might reduce the force required to insert the boxes. ***Note: these recommendations should be reviewed, tested, and evaluated by personnel doing these tasks in order to assure feasibility.***

Food Supervisor

The Food Supervisor is responsible for **unlocking the gate at the entrance to the kitchen, and opening this gate to allow workers into the area**. The gate is unlocked using the standard Folger Adam key (Figure 3), using a technique identical to the abovementioned technique of Correctional Officers. Opening of the gate takes place as the Food Supervisor pushes open the gate at a vertical bar approximately 12" from the latch side of the gate; this minimizes the required opening force. During two trials, the required opening force was measured to range from 3.9 lb to 4.5 lb. These forces are much lower than those in the cell blocks. **No changes are recommended for this task.**

Medical Technician

A significant portion of Medical Technician duties include identification of medication to be taken by inmates, removal of medication from blisterpacking, placement of pills into individual envelopes, delivery of medication to galleys, distribution to individual inmates, and verification (direct observation) of the taking of the medication. The removal of medication from the blisterpacking was estimated to take up to four hours of continuous work.

Medication blisterpacking is comprised of paper / plastic sheets with pills in a row / column arrangement. The paper / plastic sheets are taken by hand, with fingers holding the left and right sides. The thumbs are used to push the pills through the paper backing and onto the countertop. Figure 8, below, shows this activity.

Figure 8. Technique to remove medication from blisterpacking.

Once medication has been allocated, it is loaded into a hand-held plastic bin, possibly augmented by a cloth tote bag. The bins may weigh up to 10 lb when loaded with medication. Dimensions of the bins are 18”-long x 13”-wide x 5”-deep. The central handle is approximately 1”-wide, and has a rounded profile on the bottom. The loaded bins are then taken to a specific galley for issuance. Use of a cart is not possible, as many galleys are on the 2nd floor of a given building, and no elevators exist in most buildings.

Box 5. Recommendations for reducing repetition strain in removing medication from blisterpacking

Pills could be received in different packaging, so that they are loose (not fixed in blisterpacking). If blisterpacking is still the preferred packaging, a modified pill-opening device is recommended. Several of these devices exist for small blisterpacks: one of these devices would need to be held in place on a base, to properly position blisterpackage under the press. A lever is attached to move the biomechanical operation away from bilateral thumb movement (currently used) to wrist and elbow movement. ***Note: these recommendations should be reviewed, tested, and evaluated by personnel doing these tasks in order to assure feasibility.***

Ambient Environment

There is a considerable body of research that evaluates the impact of the ambient environment on worker health and safety. The UIC team did not undertake a purposeful evaluation of these factors, however we observed the following potential ergonomic hazards.

Heat. The ambient temperature was over 95 degrees Farenheit on the day of this assessment. There were large fans blowing down long corridors for cooling. Attention to ventilation and cooling, including consideration of installing air conditioning, is important to reducing risk of heat related illness among workers (OSHA, 2012).

Noise. There is ambient noise in the cell blocks and kitchen. This noise seems to be caused, mainly, by fans and by talking/shouting with significant echoes. Although we did not measure it, most of the noise levels are likely to be below the limit for causation of noise-induced hearing loss. However, even at lower levels, noise is associated with changes in heart rate, blood pressure, attention/awareness/concentration, and stress.

Lighting. The lighting in the cell block areas was low on the day of this evaluation. This could impact visual acuity. In addition, there is a body of research on the impact of lighting on mental health.

Psychosocial stressors. There is a body of literature on psychosocial stressors in the workplace. On walking around the facility, one gets a strong sense of tension in the environmental; “comportment” and behavioral controls seem to be part and parcel of work in correctional facilities. Studies of work-related musculoskeletal disorders have shown an interaction with stress.

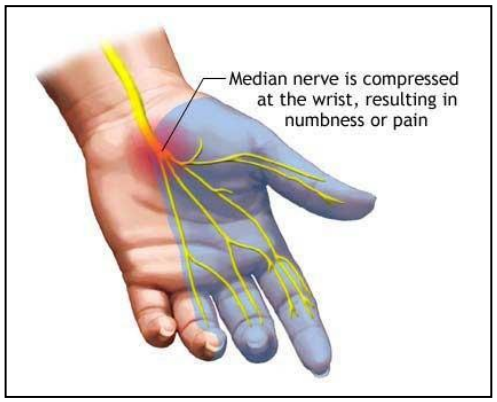
Box 6. Recommendations for Improving the Ambient Environment

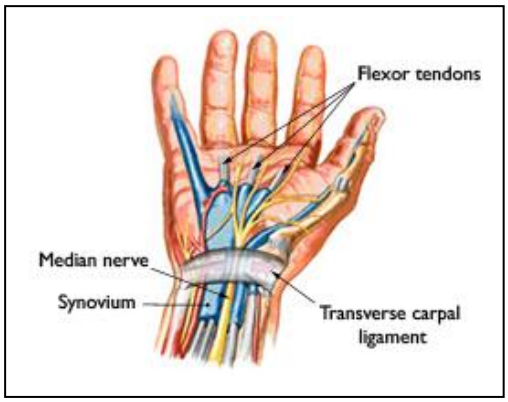
The UIC team did not undertake an evaluation of exposure hazards in the ambient environment during this investigation. Given the potential for these factors to pose a risk to employees—some related to upper extremity musculoskeletal disorders and some to other adverse health outcomes—further study could assist in designing interventions to promote worker health and safety and prevent illnesses and injuries among employees at Menard.

Summary of Findings

Diagnosis of Carpal Tunnel Syndrome and Cubital Tunnel Syndrome

Carpal Tunnel Syndrome (CTS) describes compression of the median nerve as it courses underneath a ligament across the wrist into the hand; it resides on the palmar aspect of the hand. Individuals with CTS develop numbness and tingling in any of these digits: thumb, forefinger, middle finger, and half of the ring finger on the palmar side. Over time, the numbness sensation may progress to weakness in hand grip. This corresponds with decrease in the "health" of the median nerve over time.

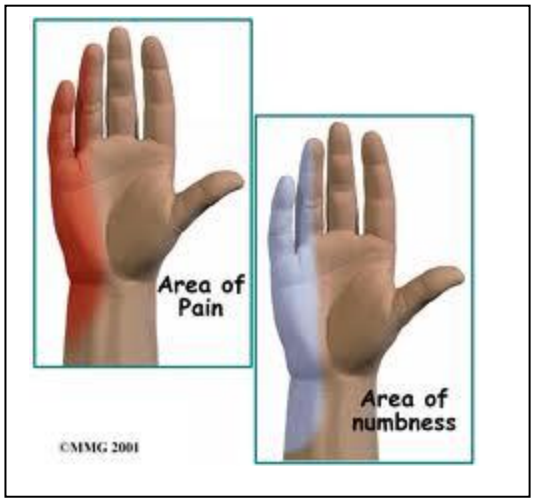




Carpal Tunnel Syndrome

Cubital Tunnel Syndrome (CUTS) describes compression of the ulnar nerve as it courses through a groove in the elbow and down into the ring and pinky fingers of the hand. Individuals with this syndrome feel numbness and tingling in the fourth and fifth fingers and, over time, may lose grip strength--forceful flexion of the 4th and 5th fingers. This corresponds with decrease in the "health" of the ulnar nerve over time.

Cubital Tunnel Syndrome



There is a lack of consensus on diagnostic criteria for both Carpal Tunnel and Cubital Tunnel Syndromes. In general, these diagnoses are entertained if the individual has hand symptoms in the distribution of the median or ulnar nerves, as described above. Physical examination maneuvers can elicit symptoms consistent with these disorders, sometimes in normal volunteers; these "provocative maneuvers" are operator dependent and may have substantial inter-examiner variability, although CTS is more reproducible than CUTS. Electrodiagnostic testing is not the accepted "gold standard" in either disorder; patients often have classic symptoms and an abnormal physical examination in the face of normal electromyography and nerve conduction velocity testing. Furthermore, electrodiagnostic testing is somewhat dependent on who is conducting it. There is a very limited role for imaging with xray, CT scan, or Magnetic Resonance Imaging, and these are generally not done. Treatment with surgery is based on the surgeon's clinical judgment regarding the probability of the disorder.

Risk Factors for Carpal Tunnel Syndrome

The relationship between Carpal Tunnel Syndrome with work activities has been extensively studied, though there are many questions that are still unanswered. Occupational risk factors for CTS that have been demonstrated in multiple investigations include: forceful use of the upper extremity, repetitive tasks, vibration, use of hand tools, work in awkward postures, and combinations of these factors (e.g., force and repetition) (Bernard, 2007; vanRijn, 2009). There are certain occupations that are more strongly associated, as well. There are also non-occupational risk factors, which include female gender, increased body mass index, smoking, level of education, sporting activities, hobbies, previous fracture of or around the wrist, pregnancy, diabetes, hypothyroidism and hypertension. There may be some degree of synergy between occupational and non-occupational risk factors.

Based on the epidemiologic studies reviewed by NIOSH, especially those with quantitative evaluation of the risk factors, it is likely that exposure to a combination of the job factors present at Menard Correctional Center (repetition, force, use of hand tools, awkward posture, vibration) is sufficient to increase the risk for CTS. We did not observe hand activities over time or conduct a quantitative assessment that would allow us to comment, in detail, about ways to remediate risk factors. Furthermore, we were not asked to study medical records or conduct interviews of workers to determine the relative contribution of "work" to their diagnoses, treatment, impairment, or long-term disability. Our recommendations are based on observations and limited measurements made during a ½ day walk-through of the facility.

Recommendations

Both our review of the “repetitive strain” epidemic and our investigation of ergonomic aspects of work at Menard Correctional Facility were limited in nature. The reality of risk factors for upper extremity musculoskeletal disorders and the diagnoses of carpal tunnel syndrome and cubital tunnel syndrome among MCC employees are clearly suggestive of a need to conduct a more extensive analysis and implement a prevention program.

Short-term solutions should include altering tasks to avoid repetition, prolonged applied force, fixed body positions, and rapid pace of work requiring repetition of the same movements over and over again. There is a widely accepted hierarchy of controls for managing ergonomic risk

Engineering Controls

The most effective way to reduce risk is to engineer out the problem. If new facilities are being designed or new activities are being implemented, attention can be paid to assuring proper horizontal reaches, grip diameters, work station heights, and other ergonomic parameters. This can be done by purchasing new equipment or retrofitting old equipment. As described in the preliminary recommendations (Boxes 2, 3, 4), above, lubricating the opening mechanisms of the cell doors, changing the rapping bars to include a damping handle, re-fabricating lighter meal boxes, and either using different packaging or getting a tool that can punch pills out of blisterpacking (Box 5) are engineering controls that seem relatively easy to implement.

Administrative Controls

If engineering controls cannot be implemented, administrative controls are recommended. These emphasize minimizing the operator's exposure to risk rather than trying to minimize the amount of risk present. Some administrative control tactics may include designing a job rotation schedule, decreasing the frequency of certain movements by adding more operators to a particular job, or changing job processes to lessen the biomechanical strain. Recommended administrative controls include changing the way the cells are opened (Box 1, 2), requiring and training on new techniques and use of personal protective equipment, implementing job task rotations, and reducing overtime in order to limit exposure to ergonomic hazards.

Personal Protective Equipment (PPE)

PPE is generally the least preferred method to reduce ergonomic risk, as it may be cumbersome or uncomfortable to use and workers may avoid using it. The use of gloves to damp the bar rapping is an example of PPE. As described in each of the

recommendation boxes, it is particularly important to involve workers in decisions about PPE in order to determine feasibility and willingness to use it.

Summary of Short-Term Solutions to Reduce Biomechanical Hazards

Reduce torque required when using Folger Adam keys

- Issue a modified glove

Change factors related to opening and closing cell doors

- Change position of the CO while performing this task
- Institute preventive maintenance program, including lubrication of locks and sliding parts

Reduce weight of food tray boxes for isolation cells

- Fabricate boxes of aluminum or polyethylene

Reduce the vibration into the hand when rapping bars

- Issue steel bars with rubber handles
- Issue anti-vibration gloves

Alter operation of the crank to open cells

- Change the height of the worker (promote operation from higher position),
- Modify handle with lever extension

The effectiveness of the interventions and the buy-in from labor and management dictate that these potential changes be explored with the workforce; those who will be making the changes should assure the feasibility, and efforts should be made to incorporate practical solutions. See Appendix A for a description of "participatory ergonomics."

Once decisions are made about changes, communication and training will assure compliance by the affected workers. Evaluation of interventions dictate that a system of metrics (both qualitative and quantitative) prior to implementing the changes; pre- and

post-intervention assessments will allow determination of the effectiveness of the interventions.

For longer term action to reduce ergonomic risks, we recommend a more extensive and careful job analysis of the various tasks that CO's undertake, risk factor assessments, and task re-design trials to identify potential work-related risks and develop controls--engineering controls, administrative controls, and personal protective resources --to mitigate the likelihood of injuries. Both the Occupational Safety and Health Administration (OSHAb) and the National Institute for Occupational Safety and Health (NIOSH, 2012) have recommended programs to analyze workplaces for the purpose of reducing ergonomic hazards.

Other workplace hazards were noted in this report, including heat, light, noise, and psychosocial stressors. These should be incorporated in the overall risk mitigation plan with the goal of promoting health among the employees at Menard.

Finally, Menard Correctional Center is a very old facility that uses materials and mechanisms from a much earlier time. The ability to retrofit the prison to be more ergonomically friendly is limited.

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Appendix A. Participatory Ergonomics

Participatory Ergonomics, is a method in which the end-users of ergonomics (Correctional Officers) could take an active role in the identification and analysis of the ergonomic risk factors as well as the design and implementation of ergonomic solutions. It includes ergonomic training of the work force, information exchange between ergonomic experts and individual employees, employee participation in decision making about ergonomic design changes and participation in the implementation and evaluation of these changes (Henning et al., 2009). The authors cite several systematic reviews of the ergonomic intervention literature that have identified a common set of elements contained in the concept “employee involvement.” These include employee participation in and ownership of the following elements:

1. Identifying problems:

(a) Passive surveillance: analysis of administrative data relating to health and productivity

(b) Active surveillance: surveys and interviews of employees to identify problems.

2. Identifying possible solutions

3. Evaluating, piloting, and refining solutions

4. Implementing tested solutions

5. Evaluating effectiveness, conducting cost assessments

6. Developing a long-term, sustainable program via an iterative approach:

(a) Identifying the next problem focus and next cycle of improvement

(b) Getting involved with medical management, early reporting, etc.

(c) Disseminating changes to new departments/facilities.