

DEAD WEIGHT: AN EXAMINATION OF THE MENTAL AND PHYSICAL RISKS
TO FUNERAL SERVICE PROFESSIONALS

A Dissertation

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“To the world we dream about... And to the one we live in now.”

- Orpheus, *Hadestown*

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Glossary

Due to industry-specific language in both the funeral service industry and the field of human factors/ergonomics, definitions for commonly used terms are included below:

- Call Volume – A measure of activity for a funeral home; the number of deaths a funeral home interfaces with on a per-year basis.
- Death Call – A term for initiation of contact with a funeral home after someone has died. See also: First Call.
- Decedent – A human being who is no longer alive.
- Embalm – The process of injecting a chemical solution into a deceased human body in an effort to restore a life-like appearance and stall decomposition.
- Embalmer – An occupational title for a person who embalms deceased human beings. This term encompasses only a portion of a funeral service professional's duties, and may be licensed on a separate basis depending on location.
- First Call – Another term for the initiation of contact with a funeral home after someone has died. See also: Death Call.
- Funeral Director – An occupational title for a person who coordinates funeral activities and goods. This term encompasses the other aspect of a funeral service professional's duties, and may be licensed separately.
- Trade Embalmer – An embalmer who works on a contractual basis with other funeral homes.
- Trade Service – A business that provides trade embalmer services.
- Transfer – Taking a decedent from their place of death and into the care of a funeral home/funeral director. Sometimes, this task is referred to as a "removal."
- Musculoskeletal – Concerning the body's synergistic relationship between bones, muscles, and joints.

Chapter 1. Introduction

The funeral service profession is centuries old, though much has changed in the profession as society itself has progressed. Once the role of the funeral director became more established in the United States, the tasks performed have gradually become something of a mystery to the outside world. In turn, this has meant that there is very little scientific understanding of many aspects of the occupation, including the musculoskeletal and mental risks that these professionals face while performing their duties. The research contained in this dissertation directly addresses this question through several different studies.

The first of these is a series of semi-structured interviews conducted with actively licensed funeral service professionals (FSPs) in both Minnesota and Wisconsin. The findings from this research were used to formulate the second study: a survey of FSPs in the upper Midwest in order to determine and describe their symptoms – both physical and mental. Third, video analysis of postures frequently used while working was performed to analyze musculoskeletal risk during specific work tasks. The final chapter summarizes innovative solutions to lifting challenges this group frequently faces when performing one of their most difficult job tasks: removing decedents from residential homes.

Findings from these studies show that FSPs are subject to some of the same challenges that more well-studied professions encounter, such as lower back, neck, and shoulder pain. This is likely due to postures undertaken in the course of their work, a lack of appropriate equipment, and workplace accidents, causing injury. Furthermore, their unique position as an occupation adjacent to healthcare requires them to be able to interface with healthcare professionals, while simultaneously being overlooked by these very same individuals.

Understanding the risks of this occupation is an important first step in eliminating those very same risks. The findings contained herein show the need for improved conditions across all levels of this profession, especially when considering the physical demands placed on its practitioners.

Chapter 2. Literature Review

1. The Funeral Service Profession

a. Occupational Overview

It is said that there are two unavoidable truths found in the human experience: death and taxes. And while one of these topics is the source of great discussion on a yearly cycle in the United States, death – and those who are closest to it – are seldom discussed in academic and scientific circles. More specifically, the physical symptoms that result from the handling of decedents are poorly understood at best. Understanding where in the body funeral service professionals (FSPs) experience symptoms is scientifically relevant, as it can inform future research into improving decedent handling methods and tool design. Even more simply, this knowledge gives us the ability to educate this important population of professionals on how best to protect themselves from harm.

While death has been an omnipresent fact since the beginning of biological life, the role of the FSP is a relatively new one. Prior to their creation, the care of the dead fell to the family of the decedent and other immediate individuals close to them. Funerary behaviors have been documented going back thousands of years (Gee-Mascarello, 2022). However, it was the United States Civil War and the death of President Abraham Lincoln that brought about the creation of the modern funeral director. During the war, undertakers (as they were known at the time) were able to hone their skills on the countless bodies left on battlefields. This expertise, along with a growing willingness to allow strangers to handle deceased loved ones, caused the occupation triggered the emergence of the role of the funeral director (Laderman, 1996).

Today, the modern FSP's daily tasks can be split into two general categories: funeral directing and embalming. The former of the two primarily encompasses the emotional and personal aspects, focusing on planning and coordinating the funeral event at the behest of the bereaved family. Embalming, however, is both a science and an art in its own right. The primary goal of the embalming process is to temporarily halt decomposition via the use of chemicals injected into the decedent's body. These chemicals, while primarily acting as preservatives, can also restore the decedent's body

by raising (or lowering) moisture content, decreasing swelling, and restoring complexion (Gee-Mascarello, 2022). It is because of these practices that Union soldier's bodies were prevented from decomposing and eventually returned to their families, allowing for burial rituals to take place that were previously impossible due to biological processes and transportation constraints (Laderman, 1996).

While previously known as undertakers, today, these professionals are known as funeral directors, or even funeral service professionals (FSPs). This catch-all term is used as a way to identify those who work within a funeral home setting in a specialized fashion, and excluding those who are unlicensed support staff, such as administrators, funeral attendants, assistants, etc. These individuals are beyond the scope of the research found here. Additionally, while embalming and funeral directing are considered separate task types, it is important to know that they are frequently referred to under the singular umbrella term "funeral service professional" unless explicitly stated.

It is also important to note that this occupation varies widely throughout the United States. Licensing is a nuanced affair, and requirements can change dramatically from one state to another. For example, Minnesota and Ohio have some of the highest requirements to be an FSP. A bare minimum of a bachelor's degree is required by both in order to practice within state lines. However, where Ohio licenses funeral directors and embalmers separately, Minnesota licensees are combined, meaning practitioners are authorized to perform both task types (The International Conference of Funeral Service Examining Boards, 2022). These nuances can make studying this population difficult.

The United States government has divided FSPs into several job categories. These are dictated by the Executive Office of the President and the Office of Management and Budget and can be found in the Standard Occupational Classification (SOC) Manual. Each occupation is assigned a code therein. Additionally, each job is also assigned a North American Industry Classification System (NAICS) code, though due to the methods employed by the United States Census Bureau, all FSP roles of interest to this research fall under the "Other Services (except Public Administration)" category (code 812210) (U.S. Census Bureau, 2022).

Table 1. Federal classifications for FSP-related jobs, and their national employment estimates as of May 2024. Estimates do not include self-employed workers.

Job Title	SOC Code	National Employment Est.
Funeral Home Managers	11-9171	13,120
Funeral Service Workers (Broad Category)	39-4000	62,630
Embalmers	39-4011	3,420
Crematory Operators	39-4012	2,950
Funeral Attendants	39-4021	30,560
Morticians, Undertakers, and Funeral Arrangers	39-4031	25,700

According to the SOC manual, all funeral service-related roles fall under SOC major group code 39-0000 “Personal Care and Service Occupations.” This group also includes occupations such as “Animal Care and Service Workers; Entertainment Attendants and Related Workers; Baggage Porters, Bellhops, and Concierges; and Tour and Travel Guides.” The exception to this is the funeral home manager role (see Table 1). This role lies under the “Management Occupations” major group code 11-0000 due to the fact that this role is primarily concerned with the management of the funeral home itself and not with any decedent care tasks (U.S. Office of Management and Budget & U.S. Executive Office of the President, 2018). This role and its associated tasks will not be discussed here.

While the remaining five roles are more closely aligned with the research found in this thesis, only two of these categories are truly relevant. These are embalmers (39-4011) and morticians, undertakers, and funeral arrangers (39-4031). The argument could be made to include crematory operators in this research. However, due to limits of scope, they are not explicitly included here. With that being said however, there is likely overlap between licensed FSPs and licensed crematory operators. Findings of this research may yet prove relevant to this other population.

The mortician's role includes "...various tasks to arrange and direct individual funeral services, such as coordinating transportation of the body to [the] mortuary..." (U.S. Office of Management and Budget & U.S. Executive Office of the President, 2018). While only implied here, this includes the mortician fetching the body themselves, indicating the need for manual handling. Embalmers must perform manual handling activities by default due to the need of manipulating decedents during the embalming process. Excluding the categories not of interest in Table 1, the United States Bureau of Labor Statistics (BLS) estimates that there are 29,120 funeral service professionals in the United States that likely perform some kind of manual handling with decedents (U.S. Bureau of Labor Statistics, 2024).

It is important to note that this count is at least somewhat flawed due to the nature of how the BLS captures data. Self-employed individuals are not included in BLS data, meaning that any count displayed likely represents an underestimation of the true number of individuals in that field. This is particularly true with the funeral service industry. According to the National Funeral Directors Association (NFDA), approximately 95% of funeral homes are independently owned and operated (National Funeral Directors Association, 2023).

In this dissertation, healthcare and funeral service are frequently compared to each other. For example, the BLS estimated that there were almost 9.6 million individuals in the major group code of "Healthcare Practitioners and Technical Occupations (29-0000)." This category includes registered nurses, midwives, physicians, surgeons, dentists, etc. Additionally, when another major group, "Healthcare Support Occupations (31-0000)" is considered, the total number of individuals working within the healthcare industry climbs over 17 million. This second category includes necessary groups such as nursing assistants, orderlies, personal care aides, and others (U.S. Bureau of Labor Statistics, 2024). This disparity between healthcare and FSP staffing levels draws attention to the enormous differences in human resources that each industry faces.

It is no secret that funeral service occupies an unusual place in the professional world, making it difficult to categorize. However, when considering the similarities it shares with other forms of healthcare occupations, it seems that classifying it as simply a

type of “personal service” may be an oversimplification. From the manual handling practices alone, which mirror those used by healthcare workers, the field may warrant a revisiting of its current classification. In its current state, it is all too likely that issues such as personal injury can be lost in the confusion and lack of oversight.

b. Existing Occupational Research

It is well documented that research on the physical health needs of FSPs has been limited at best (Cegelka et al., 2020; Kelly & Reid, 2011). Much of the health research in existence is in the mental health space. Specifically, PTSD (Van Overmeire et al., 2022), stress (Afifi et al., 2023; Kroshus & Swarthout, 1995), death anxiety (Sliter et al., 2014), and burnout (Guidetti et al., 2021) have all been studied previously, particularly after the COVID-19 pandemic, which had enormous impacts on the funeral service industry.

However, the physical needs of FSPs must not be overlooked. As stated previously, FSPs engage in similar mass handling techniques that many other occupations do, such as those seen among nurses, emergency medicine technicians/paramedics, etc. However, while the physical aspects of these occupations have been studied previously, FSPs have not had the same luxury, particularly those found in the United States.

Table 2. Incidence rates of nonfatal occupational injuries/illnesses. From the Survey of Occupational Injuries and Illnesses (SOII) (U.S. Bureau of Labor Statistics, 2023).

Industry	NAICS code	Total Recordable Cases	Cases with days away from work	Cases with days of job transfer or restriction	Total	Other Recordable Cases
Death						
Care Services	8122	1.4	0.5	0.2	0.7	0.7

Some of the available data comes from the Survey of Occupational Injuries and Illnesses (SOII) survey. This data indicates that for every 100 full-time employees (FTE)

(40 hours per week, 50 weeks per year), 1.8 total recordable injuries/illnesses were recorded in 2023 for FSPs. Meanwhile, “Nursing and residential care facilities” reported 6.4/100, “ambulance services” reported 7.4/100, and “hospitals” reported 5.2/100 (U.S. Bureau of Labor Statistics, 2023).

The discrepancy between occupations would seem to undermine the need for additional scrutiny for FSPs. If FSPs are experiencing an incidence rate of approximately 2/100 FTE, which is significantly less than the incidence rates reported by similar occupations, then it may seem that the problem is not severe enough to warrant additional attention. However, additional factors mean further consideration is warranted.

In some studies, it has been shown that nurses are less likely to report injuries to their supervisors if certain conditions are present, such as if the injured party felt like the report would not be acted upon (Brown et al., 2005). Therefore, it should be considered that due to the private nature of funeral service, the small employee pools found within most funeral homes, and the tight financial constraints that they operate under, that employees may follow a similar injury reporting pattern - and reluctance to report injuries - as other occupations such as nursing. Additionally, the financial resources available to each group differ dramatically. While the funeral service industry’s estimated revenue is approximately \$20.8 billion (Tang, 2025), healthcare and social assistance’s revenue is estimated around \$4.1 trillion (Brocker, 2025).

There is also the variable of work culture, and while this is largely beyond the scope of this research, harassment and discrimination have been noted, particularly with female FSPs (Goldenhar et al., 2001). This alone may hint at a group within funeral service where injuries are underreported.

In general, according to one study of United States FSPs, “30% reported not having good physical health in the last 30 days,” with 23% indicating that their poor physical/mental health kept them from engaging in not only work behaviors, but self-care and recreation behaviors as well. Furthermore, 21% are not engaging in any form of exercise. Of the reasons cited for why this was the case, pain/discomfort was one of them (Cegelka et al., 2020). This could indicate a higher injury prevalence in this population than what is federally reported.

c. Topics Not Discussed

While there are many topics related to funeral service that warrant discussion, many are beyond the scope of this research. Primarily, while the subjects of formaldehyde and bloodborne pathogen exposure are certainly of concern to FSPs the world over (Kelly & Reid, 2011), these topics have been addressed in other pieces of literature (Allen et al., 2022; Davidson & Benjamin, 2006; Gershon et al., 1998; Korczynski, 1994). While these topics may be mentioned in passing, they are ultimately beyond the scope of the research found herein.

2. Analogous Occupations

a. Healthcare Workers (Nurses, CNAs, etc.)

Patient-facing clinical staff, such as nurses, CNAs, etc., are responsible for the care of patients within clinic, hospital, and long-term care settings. This care includes - but is not limited to- the movement of patients throughout the infrastructure of the facility itself, including those patients who may not be able to adequately ambulate themselves. These tasks are generally described as patient handling, or sometimes manual handling (Lee & Lee, 2017).

Patient handling has been the topic of a significant amount of research (Davis & Kotowski, 2015; Pompeii et al., 2009), indicating a widespread acknowledgement of the problem's existence, to the point that entire books have been written on just this topic alone (A. L. Nelson et al., 2009). In one study, 72.5% of nurses reported some form of musculoskeletal disorder (either symptom or case), with 47.0% reporting back/spine symptoms or injuries in the past year (Trinkoff et al., 2002). Another study indicated that patient handling accounted for 31% of injuries over a seven-year period. Furthermore, the same study indicated that the greatest burden of patient handling injury fell on nurses, nurse's aides, and radiology techs (Pompeii et al., 2009).

Patient handling can take several forms, determined primarily by the care setting, the needs of the patient, and the patient's anthropometry (height, weight, etc.). Solutions have attempted to address these problems from a variety of angles. Perhaps the most obvious solution lies in the use of lifting devices. These devices, either through friction

reduction or through mechanical intervention, lessen or remove altogether the forces on healthcare workers and allow them to maneuver patients while limiting potential harm to themselves (Fray & Davis, 2023; A. L. Nelson et al., 2009).

Additionally, transfer, lifting, and repositioning (TLR) programs have proven successful in mitigating injury in the healthcare sector. These programs place a greater emphasis on education, including hands-on activities to better understand how - and when - to use mechanical intervention. Furthermore, they also educate students the mechanics of how injuries occur, the anatomy involved, and ways to safely lift when needed. Implementation of these programs have shown to improve injury rates dramatically in direct healthcare workers, indicating their utility in this environment (Black et al., 2011). Additionally, nurses with available lift teams have been found to have significantly lower odds of lower back pain than those without. Protective effects have even been noted amongst those with the best team availability, and, with regards to shoulder pain, among those with ceiling lifts specifically (S.-J. Lee et al., 2022).

To some extent, lifting devices have been implemented in the funeral service industry, as many would consider the movement of decedents similar, if not the same, to the movement of living patients. This is only partially true. Simply put, while the tasks are similar, it is not the same and cannot be treated entirely as such. While there is no concern for causing pain to the decedent, steps must still be taken to prevent damage to the body itself. Furthermore, a decedent may be more pliable or more rigid than a living human, and if a decedent is decomposing, tissue degradation and fluids may affect how a decedent is moved (Fox et al., 2022). Additionally, the availability of additional staff, equipment, and finances mean that it is difficult, if not impossible, for FSPs to truly match the capabilities of clinical healthcare environments. The upgrade cost for the equipment alone can represent a significant investment.

Many funeral homes use some form of lift within their facility to assist in the movement of bodies. Two of the most common are ceiling lifts and Hoyer style lifts. Most frequently, these are used in the casketing process, or the process of placing a dressed decedent into a casket or coffin. Lifts are often implemented at this stage, as the embalming process stiffens the decedent, making decedent movement more

straightforward than if the decedent was unembalmed and therefore more flexible, as this could risk the decedent falling out of the lift. Hoyer-type lifts range from \$1,000 to almost \$4,000, while ceiling lifts can cost \$8,435 or more (Affordable Funeral Supply, 2025; Mortuary Mall, 2025). For a hospital or healthcare system, these costs are trivial. However, for a small business, it can be prohibitively expensive.

In transfer situations, healthcare workers and FSPs mimic each other closely when the patient/decedent is being transferred from one flat surface to another (such as a bed to a gurney.) The method used for this type of movement between parallel surfaces is known as a “lateral transfer.” This handling method puts practitioners at risk due to push/pull forces, awkward positions due to leaning, and twisting motions. These factors can be ameliorated through the use of additional tools, such as slide sheets. It is recommended that one to three individuals perform these types of maneuvers together, depending on the patient’s needs. (A. L. Nelson et al., 2009). With regards to FSPs, this is an achievable benchmark, and the tools used in these movements is attainable. This type of lift is performed by FSPs most often in nursing homes, morgues, nursing homes, and other clinical spaces where the decedent has passed in their bed. Yet this has not yet been established or noted in the academic record.

Another type of transfer method that both groups experience is the floor transfer. This type of transfer is used in situations where a patient has fallen and cannot return to their prior state (bed, chair, standing, etc.) In the case of funeral service, it means an individual has died on the floor. The remedy to this situation is significantly different between FSPs and healthcare staff. Per some sources, two to three individuals should assist, and a mechanical or air-assisted rescue device should always be employed by default, to limit the forces on the healthcare worker’s body (A. L. Nelson et al., 2009).

However, when considering FSPs, a typical maximum of two individuals will be able to perform this type of handling at a given time, as this is the maximum number of individuals who respond to a “standard” death call. The primary exception to this is in situations where the decedent is considered bariatric, at which point different techniques need to be used, including calling for additional help. It is well known that handling obese patients poses a higher risk to healthcare workers (A. Nelson et al., 2003), and this

risk certainly carries over to FSPs as well. In these instances, it is simply not safe to implement a two-person lift (Eitzen & Byard, 2013). This raises the question: in a situation where mechanical intervention is unavailable, and standard lifting practices are unsafe, what can be done?

b. Emergency Medical Services (Paramedics, EMTs, etc.)

Emergency medical services (EMS), including emergency medical technicians (EMTs) and paramedics, occupy a unique role in the caring of patients as they are taken to the hospital. They are the first point of contact in emergency situations requiring medical intervention, but are not considered equivalent to physicians or nurses. Instead, they are licensed through separate pathways altogether.

However, EMS also perform a great deal of patient handling. They are especially relevant in the discussion regarding FSPs, as both perform patient [or decedent] handling tasks at residential sites. It has been noted that the highest number (62.4%) of back injuries occurred at the scene of response for EMS staff (Hogya & Ellis, 1990), indicating that clinical spaces are not the source of the majority of injuries for this population. Instead, it is the uncontrolled residential environment that results in the highest number of back injuries. As with healthcare workers, while not entirely the same, it can be argued that if this trend exists with EMS, it may exist for FSPs, as both will encounter patients/decedents that are in basements, on upper floors, in bathtubs, etc. In these situations, these patients/decedents must still be attended to in the relevant manner, but patient handling becomes extremely difficult.

36% of injuries reported in one EMS system were classified as being due to lifting, with the primary cause for low back strain attributed to “lifting of patients or equipment” (31%) (Hogya & Ellis, 1990). Other studies have noted that sprains, strains, and tears as the leading cause for injuries for EMS (Maguire et al., 2005; Maguire & Smith, 2013). Additionally, situations where the patient requires assistance from EMS are another leading source of injury cases, with the back being the most frequently injured body part (Maguire et al., 2005).

Each of these findings can be traced to a similar factor for FSPs with regard to task and/or exposure to risk. FSPs are lifting and handling decedents in similar

circumstances (i.e. residential environments), a known risk factor for higher injury rates in the EMS population. This risk was found to be present irrespective of age or years of experience, though female EMS staff have a slightly higher injury rate than males (Hogya & Ellis, 1990). This is especially salient, given the changing demographics of the funeral service industry, which has steadily become more female dominated than in previous years (Jo, 2021; Shaffrey, 2021).

Additionally, while EMS are concerned with patient comfort (and FSPs are more concerned with dignified transport), both are trained to perform similar handling techniques using similar equipment. Both use some variety of stretcher, and both use scoop or “slide” boards to assist in moving patients/decedents out of spaces cots cannot access. Handling patients with these pieces of equipment has been indicted as sources of high biomechanical forces and/or cumulative damage in paramedics (Armstrong et al., 2020). This indicates that FSPs could be exposed to similar forces and risks.

However, while training is absolutely imperative, it is necessary to acknowledge that training cannot reflect any and all real-life scenarios that either group will encounter. This variability is difficult to account for in a programmatic environment, such as a professional course or university classroom. However, this does not mean it cannot be addressed via other methods.

In one study, 101 paramedics were observed as they performed their relevant workplace tasks. A primary finding of this study indicated classroom training does not always offer transferrable knowledge. Rather, educating EMS students about potential musculoskeletal disorders (MSDs) and general safety principles to prevent them, empowered workers to make decisions in real-time that both addressed the situation in as well as keeping them safe (Larouche et al., 2019). This empowerment offers latitude to the worker to compromise and apply skills learned to where they are most useful. In situations where patient/decedent handling is difficult, both EMS and FSPs can benefit from having this additional knowledge that allows them to make appropriate and safe decisions for themselves.

c. Surgeons

Another occupation that bears resemblance to FSPs – specifically embalmers – is that of the surgeon. While surgeons do not handle patients the way that other healthcare workers might, this does not mean they are immune to work related musculoskeletal injury. Self-reported data by surgeons indicate that these injuries are attributed to “sustained static and/or awkward posture” (Szeto et al., 2009). Furthermore, literature reviews indicate that work-related musculoskeletal disorders (wMSDs) are prevalent in several different types of surgery (open, laparoscopic, robotic, and vaginal) (Catanzarite et al., 2018).

As it relates to embalmers, open surgery is the most similar, given its functionally identical posture and tool use. Both embalmers and surgeons stand at the edge of a table, look down, and use tools to modify the patient (or decedent’s) body. It is this posture that likely leads to surgeons reporting symptoms in the neck (82.9%), low back (68.1%), shoulder (57.8%), and upper back (52.6%) (Szeto et al., 2009). In another study, 84% of surgeons felt the primary posture during surgery (i.e. standing) was painful, experiencing symptoms in the head, neck, back, shoulders, and upper arms (Matern & Koneczny, 2007).

It is important to note that ergonomic risk is not evenly placed on both men and women. Rather, female surgeons were found to be at twice as much risk of musculoskeletal pain as their male counterparts. This could be to do “ergonomic disadvantage”, meaning that traits such as a shorter height could put individuals at higher risk (S. R. Adams et al., 2013). Additionally, many surgical tools are not designed to fit more than one hand size, despite the fact that hand size varies significantly across race and sex (Hallbeck & Lal, 2022). This is salient, especially with the changing demographics of the funeral service industry as it shifts from being primarily male to female (Shaffrey, 2021). This ergonomic disadvantage is furthered by funeral service’s lack of financial flexibility, meaning that female embalmers will continue to work with tools and equipment that places them at a disadvantage simply because the funeral home may not have the capital needed to replace working (albeit uncomfortable) equipment for some of its staff.

It is acknowledged that while surgeons are likely the least analogous occupation of the four included here, their experience at the operating table is vital to understanding the challenges that embalmers face in their work, given the uniqueness of their work.

d. Morgue Staff

Due in no small part to the COVID-19 pandemic, interest in how decedents are handled in morgues has increased (T. Lee et al., 2022). The primary - and most obvious - task in common between morgue staff and FSPs is the handling of decedents, as they are the only analogous occupation included here that makes this task a regular part of their workload. However, it is important to note that the aforementioned handling differs in significant aspects. Primarily, the context in which the handling takes place.

Morgue staff work in clinical or clinically-adjacent settings, typically as part of a hospital. They are often a member of facilities that perform autopsies, either for determining the cause of death, and/or for medicolegal purposes (Burton & Rutty, 2010). Excluding the removal of decedents from their place of death, morgue handling is done in clinical settings, and with all the benefits of this context. Access to lifting aids, such as ceiling lifts, additional staff, etc. is possible. However, this does not mean this task is simple or without risk.

During the COVID-19 pandemic, the second most reported injury type of decedent handlers in a hospital setting was strains and sprains (the most frequent was respiratory illness). Furthermore, the most frequently injured part of the body by this group was the spine and/or lower back, and the act of lifting decedents was considered to be “difficult” or “very difficult” by a larger number of respondents (de Swardt & Fouché, 2017).

In another study, morgue and decedent care technicians were found to experience an injury incidence rate of 2.2/100 FTEs. While lower compared to other findings in the same paper (EMTs: 10.3/100, nurses’ aides: 8.8/100), the authors also acknowledged that the morgue/decedent care technician occupational groups lacked the same body of scientific literature the other groups benefited from, and therefore their risks were not well understood (Pompeii et al., 2009).

In one hospital setting, decedent-handling injuries that led to a “strain/sprain or tear” cost over 1.4 million dollars in worker’s compensation claims. Additionally, these injuries caused over four thousand lost work days during the eight-and-a-half years studied. On a per injury basis, these injuries cost an average of \$35,000 and 102 lost work days, respectively (T. Lee et al., 2022).

All of these studies prove that decedent handling is not without risk, but the generalizability to private FSPs is limited.

3. Ergonomic and Anatomical Considerations

When considering wMSDs, it may be simple to assume that injury occurs after a single traumatic event. However, in reality, the more likely situation is that of repeated exposure. This can occur when an individual performs an action repeatedly with no symptoms or pain, but the body’s ability to recover from the trauma is diminished with each repetition, leading to eventual injury (S. M. McGill, 1997).

Additionally, a factor often overlooked that may have a causal relationship with FSPs and their experience with wMSDs is that of timing, specifically when considering the spine. During sleep, the intervertebral discs of the spine swell, causing the discs to increase in size. This increase causes discs to be more resistant to loading forces, such as flexion, leading them to rupture (Andersson & Schultz, 1979). While the extra fluid will disperse as the individual moves throughout the day’s normal activities (M. A. Adams et al., 1987), this leaves individuals vulnerable to damage during the first few hours immediately after waking.

All of these factors indicate that FSPs may be uniquely vulnerable to injuring their spines. When a death occurs and the family of the decedent initiates contact with a funeral home, it can be at any hour of the day or night. This means that an FSP may be asleep, summoned, and then perform a floor-to-cot transfer at three in the morning, 30 minutes after they have awoken. Depending on the family’s wishes, they may go on to perform a series of lateral transfers at the funeral home to prepare the body embalm the decedent, further stressing an already stressed system. Additionally, there is evidence that psychosocial stress can further exacerbate low back discomfort, though the relationship is

a complex pathway that includes the unique personality and physical traits (Marras et al., 2000).

4. Human Factors

When considering the funeral service profession from a human factors point of view, it is important to consider how the different perspectives from which the work is perceived. In Hagberg et al. (1995), three types of factors are identified:

Work Organization: how the work itself is structured and supervised within a specific workplace.

Psychosocial Factors: how subjective factors found within the work are perceived by not only the workers, but also their supervisors.

Behavioral Factors: how workers within a workplace complete assigned tasks, absent of any judgement of how “well” or “poorly” those tasks are performed (Hagberg et al., 1995)

One aspect that makes funeral service difficult to assess from scientific and academic perspectives is the variety of approaches to the industry found throughout the country. While funeral homes employ an average of four full-time licensed employees (National Funeral Directors Association, 2023), larger firms may employ many more, and others may be single individual operations. This disparity means that it is difficult to compare funeral homes, and their respective FSPs, to each other.

While a wMSD in an individual may not affect a larger organization in its day-to-day function, a single injury will be deeply felt by a smaller one. If a firm only employs four full-time FSPs and one becomes injured to the point of requiring time off, 25% of the work must now be dispersed among the remaining staff. Additionally, this also includes on-call shifts, increasing the number of nights and weekends worked. This may encourage a culture of underreporting injury, as workers may not want to become a burden on their fellow FSPs, damaging interpersonal and supervisor-employee

relationships. Supervisor incivility has been linked to emotional exhaustion in this population previously (Guidetti et al., 2021).

In the model proposed by Smith & Sainfort (1989) known as the “Balance Theory,” they suggest work -of any kind- imposes a certain “stress load” on the worker. This can manifest in both physiological and psychological effects, both positive and negative. Yet this theory takes the entirety of the work into consideration and considers if any of the five elements (technology, organization, task, environment, and individual) are potential areas of undue load on an employee. This expands the understanding of work from what happens inside the four walls of the workplace, to the more subtle and pervasive aspects of the work itself.

This is exceptionally important when considering factors such as the cell phone. While this technology has revolutionized the world, it has led to FSPs taking their work home with them. It is well known that FSPs expect to be contact at all hours of the day and night, given the nature of working with something so unpredictable as death. This means that nights and weekends are often interrupted with phone calls and text messages, many of which require immediate responses, such as the case for a death call. This blurring of the lines between work and home needs to be considered as an aspect of the work system (Carayon, 2007).

5. Conclusion

It is not feasible to answer every question raised by viewing the funeral service industry through the lens of human factors, nor is it possible to fully understand the industry through any singular lens. In addition to this, it is not possible to answer all of these inquiries in one dissertation. However, the beginnings of understanding this occupation can come through a holistic, well-rounded approach. This includes understanding jobs that are analogous, if only in form and not function. Through this, trends between funeral service and these similar roles can be drawn, making the work more relatable and less esoteric to outsiders. Understanding risk also comes from the knowledge of the anatomy of the worker, as well as their environment, their behavior, and their mental status. Knowing both the internal and external stressors that affect

individuals can only help to describe the challenges such a misunderstood occupation may face.

By recognizing that an occupation so poorly understood faces challenges both comfortably similar and wholly unlike others, this thesis aims to offer insights that can help preserve practitioner's bodies and improve working conditions for a deeply needed profession.

Chapter 3. Pilot Interview Study

Synopsis: Ten funeral service professionals were interviewed about their work experiences. Specific attention was given to injuries or symptoms that developed in the course of their work, as well as their mental stress and general perspectives on the industry itself.

Background: Ritualized burial and care of the dead has been documented as far back as the time of the Neanderthal, making it one of the oldest rituals observed by the human species, and a vital one at that (Gee-Mascarello, 2022). However, as civilization has progressed, the death care industry has changed dramatically, as have its primary practitioners. Detailed experiences and perspectives from professionals in the funeral service industry have largely been absent from scientific literature. These critical insights into social challenges, mental health stresses, and musculoskeletal symptoms, are vital to not only understanding the experience of this population, but also for identifying potential ways to improve the working lives of funeral service professionals.

Objective: To identify areas in need of further research in the funeral service profession.

Methods: Ten funeral service professionals licensed in Minnesota and/or Wisconsin were interviewed for approximately one hour each. These semi-structured interviews included questions about current or past workplaces, injuries, mental stresses, and opinions about the industry in general. Qualitative analysis was done via hybrid methods, including both deductive and inductive codes.

Results: 37 different injuries, symptoms, and diagnoses were self-identified by the ten interviewees over the course of their careers, which ranged from six to 39 years in length at the time of interviewing. Ten categories – nine with regards to bodily regions, and one regarding the whole body – were identified. These categories mimic those identified by the Nordic Musculoskeletal Questionnaire (NMQ), a tool used in a later portion of this

research (Kuorinka et al., 1988). Four additional categories were also identified. These include categories such as needlesticks, falls, and other miscellaneous injury categories. The average stress score for participants was 8.74 on a Likert scale of 10, with women indicating a slightly higher score than men.

Conclusions: Multiple injuries were identified that related to decedent handling, and a sizeable portion were attributed to accidents that occurred during decedent transfer tasks. This highlights an area in need of further research. Additionally, extremely high levels of stress were reported in this small population, indicating another area that could benefit from further examination.

Keywords: Funeral Director; Injuries; Stress; Interview

1. Introduction

In order to understand the musculoskeletal challenges faced by the funeral service industry, it is important to hear detailed experiences directly from the practitioners themselves. Nuanced conversation with funeral service professionals (FSPs) have rarely been published in the academic record until this point in time. Rather, surveys describing behavior patterns, mental health symptoms, and other quantifiable data points have largely been the focus of the scientific community. For example, one study specifically described health behaviors in funeral service professionals across the United States. It was found that 23% of FSPs reported physical or mental health so poor it kept them from performing their daily activities (Cegelka et al., 2020). Another study identified that female FSPs may be especially vulnerable to psychosocial work stress due to harassment and discrimination behaviors above and beyond what male FSPs experience (Goldenhar et al., 2001). Finally, a third study of morgues, crematoria, and funeral agencies in Northern Italy revealed that job demands, supervisor incivility, and negative work-to-family spillover can lead to a significant effect on job burnout, while work meaningfulness and positive family-to-work spillover may actually have a positive countereffect on burnout symptoms (Guidetti et al., 2021).

In all of these studies, researchers acknowledged the demanding nature of this work on its professionals. However, these same researchers have not acknowledged how physically demanding funeral service can be, nor did they broach the topic of physical injury. The most salient study in this area was done by Kelly & Reid, in which they studied safety risks to Irish funeral industry workers. Unfortunately, the only primary finding about injuries experienced by this population was that 15% of survey respondents reported a back or neck injury (Kelly & Reid, 2011). This is intriguing; however, this does not account for any detail, such as circumstances the injury occurred under.

Therefore, it was prudent to begin this thesis by consulting with individual FSPs who could explain their experiences more thoroughly than any other sources had done to date, with a specific focus on their musculoskeletal and mental symptoms.

2. Methods

In this study, 10 licensed funeral service professionals (FSPs) from Minnesota and Wisconsin were recruited and interviewed. These interviewees were required to have an active FSP license. However, they were not required to be currently practicing in order to participate. Intern FSPs were not included.

Participants were recruited through a variety of sampling methods. Due to an initial lack of industry inroads, participants were recruited in part through convenience sampling via existing professional connections. These individuals were contacted via direct email or in-person conversation. This allowed participants to signal to others that the intention behind the research was genuine. After several interviews occurred, new participants showed interest in taking part in this study after hearing about the experience from their fellow professionals. Further recruitment was accomplished via a series of recruitment emails sent to funeral homes across Minnesota and Wisconsin, and efforts ended when these recruitment efforts could no longer be sustained.

Interviews took place exclusively on Zoom at the convenience of the interviewee. Questions included basic demographic questions regarding age, years of experience, and anthropometry. Additional questions were asked regarding their work experiences (whether past or current), their experiences with musculoskeletal symptoms, and their mental health in the context of their work. A full list of questions can be found in Appendix A. Interviews were recorded and automatically transcribed via Zoom's native transcription software. I then reviewed and cleaned the transcripts. I then anonymized the transcripts of identifying information, including names of employers, acquaintances, and identifying locations. No incentive was provided for participation in this study.

Finally, I coded the transcripts using thematic coding and a hybrid approach. Deductive codes (demographic data, injury type(s), stress scores, etc.) were established based on the interview question list created at the study's inception. Inductive codes were identified after deductive analysis, looking at themes identified across interviewees. Inductive codes were then built from the thematic analysis, marking patterns or topics that interviewees repeated.

Summary statistics, such as means, were used to describe quantitative data elements, where relevant. This study was reviewed by the University of Minnesota

Institutional Review Board (IRB) and found exempt for being less than minimal risk to research participants.

3. Results

a. Demographic Findings

Ultimately, ten FSPs were recruited in approximately one year's timeframe. Six respondents were female, with an average age of 42.2 (± 12.3) years old. The remaining four respondents were male, with an average age of 53.5 (± 16.3) years old. Collectively, respondents had an average of 22.6 years licensed, with males being licensed longer than females (30.0 vs. 17.7, respectively).

Eight of the respondents were unrelated, while two had an ongoing employer/employee relationship. Six were actively performing FSP duties at the time of their interview. One of these individuals reported owning two funeral homes. Of the four individuals not actively working in funeral service, three were working in a funeral service - adjacent or supportive industries full-time. One individual worked in both an active funeral home setting and in an adjacent industry. Only one interviewee was no longer involved in funeral service in any capacity, but still maintained their license.

b. Injuries & Symptoms

In total, the interviewees reported a total of 37 different injuries, diagnoses, or symptoms with an average of 3.7 identified signs, symptoms, or diagnoses per person (range 1-7). Women reported a slightly higher number of these signs than men (4.17 and 3.0, respectively), though this difference was not statistically significant. Some injuries were directly attributed to the workplace by the interviewees, citing specific events that led to their symptoms. Others cited more generalized causes, and others mentioned no discrete cause whatsoever. While it is important to acknowledge that causality cannot be truly established between events and injuries in this study, it is vital to explore the embodied knowledge that these professionals contain, as valuable insights can be gleaned even without fully establishing causal pathways.

Injuries and symptoms reported by interviewees were divided into three primary categories: regional, other, and uncategorized. The regional category is further split into ten smaller categories. This categorization was done to align more closely with the categories found in the Nordic Musculoskeletal Questionnaire (NMQ), a tool that is also used later in this dissertation (Kuorinka et al., 1988). Note that the elbow and upper back categories found in the NMQ are excluded from the following sections, as no symptoms/injuries were reported for those areas. Additional categories, such as “Back – Middle” and “Back – Unspecified” were added due to identified injuries/symptoms from the participants, as well as “Strains, Sprains, and Aches (Unspecified)”. These categories are not found in the NMQ.

Additional categories were added for injuries that occurred under specific circumstances, such as falls, needlesticks, and infections. Finally, one additional category was added to encompass “uncategorized” injuries that could not be placed into the existing categories. Here, the regional categories will be presented first, followed by the remaining categories.

i. Regional Findings

Table 3. Injuries and symptoms by anatomical region, treatment(s) received, and perceived causes.

<i>Region</i>	<i>Specific Injury/Symptom</i>	<i>Care Received?</i>	<i>Cause (if specified)</i>
<i>Neck (1)</i>	<i>Neck Pain - Generalized</i>	<i>Chiropractic Care</i>	<i>General Work</i>
<i>Shoulder (4)</i>	<i>Pulled Ligaments/Tendons</i>	<i>Physical Therapy *</i>	<i>Decedent Handling Accident</i>
	<i>Shoulder Pain – Generalized</i>	<i>Unknown</i>	<i>General Work</i>

	<i>Rotator Cuff Symptoms</i>	<i>Physical Therapy</i>	<i>Decedent Handling Accident</i>
	<i>Frayed Supraspinatus</i>	<i>Physical Therapy, Chiropractic Care</i>	<i>Decedent Handling Accident</i>
<i>Hands/Forearms (4)</i>	<i>Crush Injuries from Handling Caskets</i>	<i>None</i>	<i>General Work</i>
	<i>Numb Fingers, Forearm</i>	<i>Unknown</i>	<i>Embalming Tasks</i>
	<i>Worsening Grip/Dexterity</i>	<i>Unknown</i>	<i>Embalming Tasks</i>
	<i>Carpal Tunnel Symptoms – Temporary</i>	<i>None</i>	<i>Embalming Tasks</i>
<i>Back (Mid) (1)</i>	<i>Herniated Disc – Thoracic</i>	<i>Physical Therapy</i>	<i>Decedent Handling Accident</i>
<i>Back (Low) (4)</i>	<i>Lumbar herniation/Sciatic Nerve Aggravation – Previous injury</i>	<i>Physical Therapy</i>	<i>Decedent Handling - General</i>
	<i>Low Back Pain – Generalized</i>	<i>Chiropractic Care</i>	<i>General Work</i>
	<i>Low Back Pain</i>	<i>Physical Therapy</i>	<i>Decedent Handling Accident</i>
	<i>Low Back Injury – Unspecified</i>	<i>Chiropractic Care</i>	<i>Decedent Handling Accident</i>
<i>Back (Unspecified) (4)</i>	<i>Strained Back</i>	<i>Unknown</i>	<i>Unknown</i>
	<i>Pinched Nerve</i>	<i>Medication</i>	<i>Decedent Handling - General</i>

	<i>Arthritis</i>	<i>Unknown</i>	<i>Unknown</i>
	<i>Strained Back</i>	<i>Medication</i>	<i>Decedent Handling - General</i>
<i>Hip (1)</i>	<i>ASIS Muscle Attachment Tear</i>	<i>Physical Therapy*</i>	<i>Decedent Handling Accident</i>
<i>Knees (2)</i>	<i>Arthritis</i>	<i>Unknown</i>	<i>Unknown</i>
	<i>Knee Bruise/Patellar Dislocation</i>	<i>None</i>	<i>Decedent Handling Accident</i>
<i>Ankles/Feet (2)</i>	<i>Ankle Break/Sprain</i>	<i>Treatment Received</i>	<i>Cemetery Accident</i>
	<i>Plantar Fasciitis</i>	<i>Treatment Received</i>	<i>General Work</i>
<i>Strains, sprains, aches (unspecified) (2)</i>	<i>Muscle Sprain – Unspecified</i>	<i>Unknown</i>	<i>General Work</i>
	<i>Minor Joint Pain</i>	<i>Unknown</i>	<i>Cemetery Accident</i>

*An asterisk * indicates an injury where treatment was recommended, but not received.*

The most frequently identified regions were “Shoulder,” “Back (Low),” “Back (Unspecified),” and “Hands/Forearms.” Each of these regions had four identified injuries/symptoms, meaning 16 of the 25 injuries/symptoms (64.0%) occurred in these four anatomical regions. These findings align with those seen in nurses (Trinkoff et al., 2002), surgeons across multiple disciplines (S. R. Adams et al., 2013; Cavanagh et al., 2012), and in EMS staff (Hogya & Ellis, 1990).

In total, 25 of the reported injuries/symptoms were classified into regional categories. 11 (44.0%) of these were attributed to decedent handling, either generally or in specific instances. Eight of these (72.7%) were attributed to accidents involving decedents. Usually, these accidents occurred when being manually handled, such as in a lateral transfer from surface to surface. However, at least one accident occurred when a mortuary cot carrying a bariatric decedent began rolling down a hospital ramp. In this instance, the FSP chose to prevent the cot from rolling away, colliding with a car, and likely tipping over entirely, but this decision came at the expense of their shoulder.

Instead of allowing the cot to roll away, the FSP lunged and grabbed onto the cot with one hand a metal railing with the other. The speed at which the decedent/cot was rolling, combined with the decedent's weight, meant that the forces acting on their shoulder were extreme, tearing their rotator cuff. Another decedent handling accident is shown in the "Laceration" category (see Table 2), but is not included in these aforementioned figures. In this situation, a respondent was transferring a decedent, slipped, and collided with a metal table, cutting their head.

While 11 of the injuries identified in Table 1 are attributed to decedent handling, eight of these events were due to accidents occurring during the decedent handling process. This begs the question: is decedent handling in of itself the problem, or does the risk lie in what can go wrong during said task? Furthermore, these figures do not address the "general work" attribution category. Those injuries can – and may – be the result of decedent handling practices, but may be not immediately clear to the individual that this specific task is the source due to factors such as recall bias.

ii. Other Categories

While needlesticks and infections are not the focus of this dissertation, they were identified by several interviewees and are listed in Table 4. Even so, it is interesting to note that 60% of needlestick events, and 50% of infections reported by respondents in this study, came specifically from accidents that occurred while suturing decedents. This may indicate that this task is particularly dangerous for FSPs. What is not clear is whether a certain suture task might be the primary culprit behind these injuries, such as the cranial autopsy suture.

Table 4. Other Categories, primarily consisting of acute injuries (lacerations, needlesticks) and systemic injuries, like infections.

<i>Infections (2)</i>	<i>Infection in Palm/Forearm</i>	<i>Treatment Received</i>	<i>Suturing Accident</i>
	<i>MRSA Infection</i>	<i>Treatment Received</i>	<i>Decedent Transfer</i>

<i>Needlesticks (5)</i>	<i>Cranial Suture Accident</i>	<i>Treatment Received</i>	<i>Suturing Accident</i>
	<i>Clean S-Curve Needle Accident</i>	<i>None – Needles Were Clean/Unused</i>	<i>Needle Storage Accident</i>
	<i>Hypodermic Needle Accident</i>	<i>At-Home Treatment</i>	<i>Suturing Accident</i>
	<i>Clean Needle Accident</i>	<i>None – Needles Were Clean/Unused</i>	<i>Needle Storage Accident</i>
	<i>S-Curve Needle Accident</i>	<i>Treatment Received</i>	<i>Suturing Accident</i>
<i>Laceration (1)</i>	<i>Fell/ Hit Table, Causing Laceration</i>	<i>At-Home Treatment</i>	<i>Decedent Handling Accident</i>

iii. Uncategorized

Three events (Table 5) failed to fit within any of the previous categories. It is difficult to determine how frequently these types of illnesses/injuries occur, but including them articulates the full experience of FSPs. These three injuries defy characterization in Table 3 and Table 4, due to their uniqueness. While an argument could be made to include the crematory burn injury into Table 4 as a type of acute injury, it was received when handling crematory equipment, which was not the focus of this research. However, the incidence of heavy metal poisoning was also attributed to crematory operation, indicating that this specific occupation [crematory operator] may benefit from similar research to what is found here.

Table 5. Uncategorized Injuries, their circumstances, and the treatment received.

Heavy Metal Poisoning	Interviewee attributed illness to working in crematory in addition to standard FSP tasks.	Treatment received.
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Crematory Burn	Interviewee burned self by handling metal “catch box” used for moving cremated remains from retort to processing area.	No treatment was mentioned
Embalming Material in Eye	Interviewee reported not wearing appropriate PPE, specifically on their face/head, while embalming an autopsied individual. While suturing, a piece of Viscerock (a granular powder laced with preservative chemicals(The Dodge Company, 2014)) bounced and landed in their eye.	Treatment received

c. Mechanical Lift Use

All participants interviewed indicated that they had access to mechanical lifting aids of different types, including ceiling lifts, casket jacks, and Hoyer-style lifts. Additionally, all participants reported using these devices, either presently or in their previous work environments.

Interestingly, several participants indicated that lifting devices were often only used on embalmed individuals. The primary reason for this limitation was strictly practical: embalmed individuals are more rigid. This means that they are less likely to bend when lifted by a device. An unembalmed body is more likely to “fold” and collapse out of a lifting device’s straps, making lateral transfers and manual maneuvers the more desired approach.

d. Stress

While what is considered stressful can change from individual to individual, it is important to discuss both mental and physical health in this population, as the two are intrinsically tied. In addition to injury data, participants were asked to score how stressful

they felt their job was, with 1 being “not stressful at all” and ten being “the most stressful”. All ten interviewees responded to this question. Male participants reported an average score of 7.34, while female participants reported an average score of 9.67. This difference is near-significant ($p=0.055$), implying there may be a meaningful difference in how stressful this occupation is perceived by both its male and female professionals.

Many factors were cited as to why this role is so stressful. Interestingly, these reasons largely centered around meeting the needs of the living, rather than time spent with the dead. It’s this collision of “front of house” and “back of house” demands that puts FSPs in an unusual and pressurized position. This was especially noted in Bartlett & Riches’s 2007 paper. While UK-based, much of the observed sentiment still stands in the US: the high pressure of performing what could be described as “magic,” and “for the magic to work, the audience must ignore or overlook the machinery that makes it work” (Bartlett & Riches, 2007). This means that the public must ignore – or choose to ignore – the reality of death, causing friction between the FSP who tries to be empathetic and meet their needs, but also work around the very real concerns of human body restoration and disposition.

This pressure of performing herculean efforts, only for them to be largely overlooked, was noted by interviewees in this study. Additionally, multiple participants felt that no one outside of the funeral service industry understood what they do on a day-to-day basis. This had widespread ramifications. Some FSPs felt extremely isolated, feeling as though therapists and physicians were not qualified or uncomfortable discussing the details of funeral service work. A particularly poignant example of this was cited by one participant:

“If they’re a police officer and you go in for a physical, they’re going to talk to you about your mental health. They’re going to talk to you about the wear and tear on your body.

It’s not the same for funeral directors. We live in a society through the entire United States... that doesn’t want to talk about death. So even talking to a physician [and telling them] that you work in death care, it’s like, I’ve had physicians turn up their noses and say “Why would you do that?” and that’s the kind of judgment I would get and not the

support for. “’Kay [sic], how do I deal with this? I buried three kids this week. I am not okay.” “Well, you should probably take some deep breaths.” That’s... that’s not gonna [sic] cut it today.”

Another participant shared a similar perspective:

“As we already discussed, nobody actually understands what we do... ‘Oh, I watched Six Feet Under, so I know what you do.’ No, you don’t. No, and I think within funeral service we might, like, lean on each other, you know, or tell our horror stories in order to get them off our chests. But even within funeral service, you know, what do you do?... I mean we self-medicate with alcohol and drugs... I think we’re kind of alone. We’re left to figure this out on our own.”

Other participants expressed annoyance at physicians for not respecting the time or work of FSPs. For example, in Minnesota, cremation authorizations must be signed by a decedent’s physician before the cremation itself can take place. Interviewed FSPs cited arguments with physicians who refused to sign these authorizations in a timely manner, delaying the cremation, and downstream of this, the funeral event itself.

[Responding to the question ‘Do you think anybody understands what you do?’] “No! And then they treat us like money-hungry bastards as well. I’ve had more than one physician tell me I need to slow down on trying to get the death certificate, because they know that we don’t get paid until that gets issued. And I’m like, ‘Actually no, I want them fucking cremated.’ ... because the family actually wants to have a service. And I actually want to have them not decomposing in my prep room... So no, there’s no respect for us, period. From any, you know, healthcare professional that I’ve actually had to interact with.”

Returning to Bartlett & Riches’s paper, it is moments like this that the family may glimpse the inner machinery of this occupation, potentially causing distress for all parties.

With experiences such as these, it is no wonder that FSPs report extremely high levels of stress, especially when they are caught between the gears of a family deep in their grief and the slow-moving bureaucracy of healthcare and government systems (Bartlett & Riches, 2007).

e. Supervisor & Coworker Incivility

At least seven interviewees reported hostility and/or incivility in the workplace. This issue has been previously noted within the funeral service industry, leading to higher levels of burnout. Supervisor incivility was also found to be positively correlated with emotional exhaustion (Guidetti et al., 2021). In another study, incivility was found to be indirectly associated with insomnia symptoms. These effects could be moderated by engaging in psychological detachment and relaxation behaviors, but that if these behaviors were not performed, negative strain outcomes may occur (Demsky et al., 2019).

“It was just a very toxic environment to be in in general. I said my manager was a great person. Not a great manager. He would never put a stop to any kind of like, talking behind people’s backs... he almost like, encouraged this culture of like, pitting each other, putting ourselves against each other.”

“Like, I know how it was if my coworkers called in sick... so we would have a meeting every morning, and it would be like, ‘Oh, so-and-so called in. They better... have a good reason.’ ... Like, it was always just those little comments by the management... It was more so the staff I would say, but that is also led by management.”

Two female individuals specifically mentioned hostile commentary as related to their biological sex. This is not a new issue in funeral service (Goldenhar et al., 2001), yet these findings indicate this form of hostility is still an issue within the funeral service industry.

“There was constant sexism, there was [sic] constant put downs, there was constant undermining of my authority. If I was the lead funeral director, [supervisor] would come in after the fact like literally shoo me off to the side. I felt unseen, unheard, undervalued entirely, and yet didn’t know how to get better.”

f. Foregoing Care & Sacrifice

60% of interviewees cited the necessity of sacrificing themselves for the sake of their job, either through putting themselves in harm’s way, or by foregoing their needs for the sake of their work. Frequently, individuals cited that they either had so many work responsibilities that they could not leave to receive care, or they were shamed or even prevented from seeking the care they needed, for both mental or physical health. In one instance, an individual reported a now lifelong condition caused by a decedent transfer task. The individual remarked how they felt the injury occur immediately, but they were forced to wait almost three months before they could get time off to see a physician to even determine what type of treatment was needed. By that point, the only possible treatment was physical therapy, which the individual could not schedule. Had they been seen sooner, pharmaceutical treatment may have prevented inflammatory damage, but the window for that treatment had long passed, leaving them entirely without treatment.

This same individual explained a different decedent transfer event where a nearly 500lb decedent needed to be moved from the vehicle they were transported in to the preparation room in the funeral home. At some point, the interviewee’s assistants left them completely alone to manage this situation with not only a bariatric decedent, but also with broken equipment, as the mortuary cot had broken sometime during the removal. The interviewee explained how they managed to accomplish this feat, simply saying “I didn’t have an option to not do it.” In this case, another injury was acquired, and while immediate care was demanded (and received), the interviewee now suffers a lifetime of nerve blocks, corticosteroids, and back pain.

In these instances, foregoing care comes in the form of supervisors not accommodating the medical needs of their staff. Instead, the industry seems to demand self-sacrifice and the abandonment of individual needs for the sake of others, regardless

of the cost to their staff. As one interviewee stated, these medical needs are seen as “not [management’s] problem,” and therefore staff are not given the time or space to access treatment in a convenient manner.

In a variation of this theme, another individual reported that their spouse needed to be taken to the hospital, but this emergency conflicted with a funeral that was occurring that same day. Their supervisor, instead of allowing the interviewed FSP to care for their spouse, insisted the interviewee handle the funeral and instead asked another FSP take the spouse to get care.

In terms of sacrifice, several individuals reported not having time -or very little time- to tend to daily tasks such as grocery shopping, cleaning, or exercising. This meant that, in the majority of cases, maintenance tasks for the home and the individual were relegated to one day every few weeks. It is obvious why this would be a difficult lifestyle to function in, and that is not considering the other complexities that come from working in such a niche – and stigmatized – industry.

4. Discussion

In this study, ten licensed FSPs were interviewed in an effort to understand their experiences. Specifically, they described any musculoskeletal symptoms or disorders they acquired during the course of their work. Of the 37 injuries, symptoms, and/or events recorded, 11 were attributed to decedent handling, and eight of these occurred directly due to an accident while performing a decedent handling task. This alone indicates that this specific task puts FSPs into a significant level of danger, warranting further research.

While decedent lifting devices are present in the market, many of them do not truly meet the needs of FSPs, or only meet a fraction of them. Knowing this, it is not out of the realm of possibility to wonder whether these existing devices could be redesigned, or at the very least retrofitted, to suit the needs of their population more thoroughly. Even when considering that the rate of cremation has increased multiple years in a row due to factors such as cost, environmental considerations, and weakening religious preferences (National Funeral Directors Association, 2025), the need for lifting devices remains.

Embalming is not required prior to cremation, yet nearly 25% of cremations are preceded by a public viewing (National Funeral Directors Association, 2025), meaning that at least some portion of cremations are also embalming cases. Nuance such as this may be missed by those outside of the industry, who may see the downturn of embalming as a sign to divest from lifting devices. However, now more than ever, it is important to invest in this industry, as aging populations 65 years old and above are slated to account for 74.1% of the funeral service industry's revenue (National Funeral Directors Association, 2025), meaning an uptick in the volume of deaths in the United States is expected.

5. Limitations

A causal pathway cannot be established by this study – or by any of the three studies included herein. To achieve this, a lengthy longitudinal study would be required, and this is well beyond the limits of this doctoral thesis. However, understanding the embodied knowledge, perspectives, and experiences of FSPs is vital to formulating further research. It was this idea that galvanized this study's creation.

These findings come from workers who chose to self-report their subjective experiences. This introduces elements such as recall bias, especially in instances where the interviewee chose to report on events that occurred years prior to the interview. While this cannot be avoided in studies such as this one, it is important to note the presence of this effect. Other biases that may play a role in the findings of this study include survivorship bias (Elston, 2021a), wherein individuals who may have experiences of interest have “fallen out” of this population. This may come in the form of individuals who were once FSPs, but left the industry and allowed their license to lapse entirely, making them difficult to find and include. This in turn removes their unique experiences from this research. Based on industry findings, this bias is likely to be significant, as the attrition rate for FSPs has been estimated anywhere between 28 to 53% (Fritch & Steward, 2021).

6. Conclusion

In conclusion, this study represents a first look at the lived experiences of funeral service professionals with a focus on their musculoskeletal symptoms and mental states. Additionally, this study has also helped to describe the factors that surround these experiences, ranging from supervisor incivility to practitioner mental health. Findings from this study will be useful for future researchers attempting to detail the nuanced experience of this group. This, in turn, will elucidate the risks associated with this work to medical professionals treating this population, as well as policy makers, academics, and other FSPs.

Chapter 4. FSP Survey Study

Synopsis: Detailed data regarding musculoskeletal symptoms (MSS) for funeral service professionals (FSPs) is absent from the literature. In an effort to describe and characterize the type and severity of MSS in this population, a survey was sent to 800 licensed FSPs in the upper Midwest region of the United States.

Background: The Nordic Musculoskeletal Questionnaire succinctly captures musculoskeletal symptoms, and has been used across a vast number of occupations since its creation (Kakaraparthi et al., 2023). However, funeral service professionals have not been studied using this widely-cited tool until this study, and differences between men and women in this occupation are not well understood. Additionally, a short mental distress questionnaire called the Kessler 6 (K6) was also included to examine potential relationships between nonspecific mental distress and physical symptoms, alongside questions about perceived workplace and education quality.

Objective: Quantify and describe the severity and type of MSS experienced, and to examine levels of nonspecific mental distress in FSPs in the upper Midwest United States. Additionally, examine protective and risk factors, such as age, anthropometry, etc.

Methods: An information document, a consent form, a five-page survey, and a return envelope were sent to eight hundred licensed FSPs in North Dakota, South Dakota, Minnesota, and Wisconsin in fall 2023. The survey used two existing tools: the Nordic Musculoskeletal Questionnaire (Kuorinka et al., 1988) and the Kessler 6 Non-Specific Distress Scale (K6) (Kessler et al., 2002). These surveys were returned to the researcher, digitized, and the results were examined for any correlations or trends.

Results: 201 surveys were returned, for a response rate of 27.47%. The most frequently cited area(s) of MSS were the lower back, the neck, and the shoulders, with the most severe pain noted in the lower back, the knees, and the shoulders. A very mild negative

correlation was found between taller FSPs and the number of symptomatic regions identified, and a mild positive correlation was found between Body Mass Index (BMI)(Center for Disease Control, 2022a) and the number of symptomatic regions identified. Time spent embalming was also correlated with the number of symptomatic regions identified. Additionally, participants were asked about their mental health and the general perception of quality of their work. Female FSPs were found to score higher in categories of “nervousness” and “restlessness” compared to male FSPs in this sample. Additionally, they also scored higher when asked whether they found their work to be physically taxing as compared to male FSPs.

Conclusions: Much of the data in this study represents a first-of-its-kind look at this occupation in the human factors and ergonomics space. While the data set itself is small, results show that symptom patterns mimic those found in analogous occupations such as nurses, surgeons, etc. These observed trends observed here will hopefully prove useful in guiding future research projects, job interventions, and policy.

Keywords: Musculoskeletal symptoms, NMQ, Pain, Mental Health, Funeral Service Professional

1. Introduction

Musculoskeletal symptoms (MSS) have been studied for many years and across many different disciplines and occupations, with healthcare receiving a substantial amount of this attention. Gynecologic surgeons reported a high prevalence of back pain, both upper and lower (61.6% and 75.6%, respectively), as well as pain in their neck (72.9%) and shoulder (66.6%) (S. R. Adams et al., 2013). In another study, otolaryngologists reported significant amounts of pain in their lower back (41.09%) and neck (32.87%), and attributed sustained and awkward postures as the two leading causes (Dabholkar et al., 2017). The prevalence of these symptoms extends into other disciplines beyond physicians as well. Medical lab technicians (Maulik et al., 2014), nurses (Trinkoff et al., 2002), nurse aides, and other specialized hospital technicians (radiology, operating room, emergency medicine, etc.) (Pompeii et al., 2009) have all reported appreciable levels of musculoskeletal injury, usually attributed to patient handling practices or static or awkward postures.

However, only a limited amount of research had been devoted to “last responders”, or those devoted to caring for the dead. These studies focused largely on hospital or morgue employees, and how these individuals can leverage the use of equipment in clinical settings to minimize risk (Fox et al., 2022), or suggest methodology for hospital systems to manage mass-fatality events (Suresh et al., 2024). Precious little research has been done, or even called attention to, the physical challenges experienced by private funeral service professionals (Van Overmeire & Bilsen, 2020).

In the research of this occupation that exists, a frequent aspect of comparison is that of gender. As the gender makeup of the funeral service industry is changing from male to female (Jo, 2021; Shaffrey, 2018), the exact gender split is unclear. This is due to the fact that only total employment numbers for “embalmers, crematory operators, and funeral attendants” and “morticians, undertakers, and funeral arrangers” are available from federal databases. Any discrete data regarding gender is unavailable due to not meeting publishing requirements (U.S. Bureau of Labor Statistics, 2025).

However, differences between male and female FSPs have been noted. In one study by Goldenhar et al., female FSPs were subject not only to the stressors typically

associated with this occupation (healthcare-type stressors and funeral service industry-specific stressors), but that they were also vulnerable to stressors associated with “non-traditional” roles. Specifically, they were subject to harassment and discrimination, including sexual advances as well as verbal and physical abuse due to the fact the role of a FSP was traditionally more male (Goldenhar et al., 2001).

In this study, FSPs in the Upper Midwest region of the United States were asked to describe their MSS, as well as answer questions about their mental states. This information was then compiled and analyzed for any potential trends and relationships.

2. Methods

Using stratified random sampling (SRS), 800 licensed FSPs were selected from license rosters obtained in Minnesota, Wisconsin, North Dakota, and South Dakota. These license rosters were obtained either from lists maintained by the state itself, or from state-associated funeral service boards (Minnesota Department of Health, 2022; D. G. Niewoehner & A. Kahlert, personal communication, June 21, 2023; *SD Funeral Service Board - Roster of Licensees - SD Dept. of Health*, n.d.; Wisconsin Department of Safety and Professional Services (DSPS), 2023). In total, 3,151 FSPs were listed between the four obtained rosters. In each of these states, name, license number, and an address (either of residence or of a place of work) is available, either for free or a small cost. It is important to note that at the time of this study, Wisconsin licensees were not obligated to list their address publicly. Luckily, the SRS proportion for this state aligned with the number of available addresses (272 vs. 274). Individuals whose names were randomly selected twice, such as in the case where an individual is licensed in both Minnesota and Wisconsin, were deleted from the state with more available individuals and their spot was refilled.

Two existing tools formed the primary foundation for this survey. The first is the Nordic Musculoskeletal Questionnaire (NMQ). This questionnaire was designed to standardize musculoskeletal symptom analysis in order to make comparison between studies easier (Kuorinka et al., 1988). The second tool used was the Kessler 6 Non-specific Distress Scale (K6), which was designed to discern the presence of DSM-IV

cases and non-cases (Kessler et al., 2002). In addition to these tools, other questions regarding individual's workplace experience, demographics, anthropometry, and occupation quality were asked. In total, the survey included 44 total questions. A full copy of the survey can be found in Appendix B.

Participants were mailed an envelope containing an information sheet, survey, an entry card for a participation prize, and a postage paid return envelope. Paper surveys were chosen in lieu of digital surveys due to lack of known contact emails available on the licensed practitioner lists. The first 80 surveys were mailed in September 2023. After reviewing the returned survey data, slight adjustments were made to the survey question order and wording, but no substantive changes were made. Upon IRB approval, the remaining 720 were mailed in November 2023. The original 80 surveys were kept

Returned surveys were coded to ensure anonymity during analysis, but also to create a system where it would be possible to identify and remove an individual's data, should the need arise. The paper surveys were transcribed into a digital format for analysis. After a time, all of the paper surveys were shredded in a secure, HIPAA compliant manner.

Due to the use of a paper survey, some responses could not be analyzed as received. For example, this could mean that an individual reported they were not actively working, but included data about their workplace, or their general arithmetic was incorrect when reporting time spent on tasks. In these cases, the former situation was remedied by not including their workplace data, while in the latter case, the provided percentage data was proportionally corrected to equal 100.

In the entire dataset, only a total of 53 individual datapoints were missing (approximately .25% of the dataset). No single variable was missing more than four values. After assessing the dataset, it was determined that the data was missing at random (MAR). Missing values were then replaced with that variable's mean (if continuous, such as age), median (if an ordinal variable, such as a K6 value), or dummy coded to 0 (equaling "no") if a question was binary. In instances where individuals provided a range for a response, the mean of their range was used.

Findings were analyzed via basic statistical descriptors as well as non-parametric tests, including the Mann-Whitney U test and Spearman's rho. These tests were chosen due to the non-normal nature of the response data, and more fundamentally, due to the fact the data itself was primarily nominal/categorical or ordinal. An additional post-hoc model was done to test for risk and protective factors in both the demographic and anthropometric data.

3. Results

Of the 800 surveys sent, 203 were returned completed, resulting in a response rate of 27.5%. Two of the returned responses were discarded due to illegibility, resulting in a final response rate of 25.1%. This is comfortably within the range of response rates for this population that are found in existing literature, which range between 16.5% (Cegelka et al., 2020) to 57.5% (Kroshus & Swarthout, 1995).

Table 6. Sample proportion and response rate by state.

	Percentage Sampled	Surveys Sent	Number of Responses (Percentage)
Minnesota (n=1,126)	.3573	286	85* (29.7%)
Wisconsin (n=1,074)	.3399	272	63 (23.2%)
North Dakota (n=319)	.1012	81	15 (18.5%)
South Dakota (n=632)	.2006	161	38* (23.6%)
Total (n = 3,151)	.999	800	201 (27.47%)

** Indicates state where one response was removed.*

Of the states sampled, Minnesota had the highest response rate, and North Dakota the lowest (Table 6). However, it was made clear early on in this study that regional data would not be easily studied. While individuals may have been listed as being licensed in one state, they may have mailing addresses in another, or even be employed across a state border. Further complicating the analysis, some individuals were found to be living across the country in states completely out of the area of study. This made studying state-based data unhelpful. In future research, a different approach will need to be taken in order to be able to accurately study the geographical effects related to this occupation.

a. Demographics

Over twice as many male FSPs responded to the survey as females (see Table 7). On average, male respondents were older, and were licensed and working in funeral service longer than female respondents. This is expected, as funeral service has experienced an increase in more female practitioners in the 21st century has progressed (Jo, 2021). However, despite this, no statistically significant relationship was found between the number of symptomatic regions and both years licensed or years working.

Table 7. Demographic results.

	Female (62)	Male (138)
Age (yrs)	40.42	54.5
Years Licensed	14.06	28.63
Years Working	13.74	28.90
Weight (lbs.)	175.68	214.43
Height (in.)	65.78	71.07

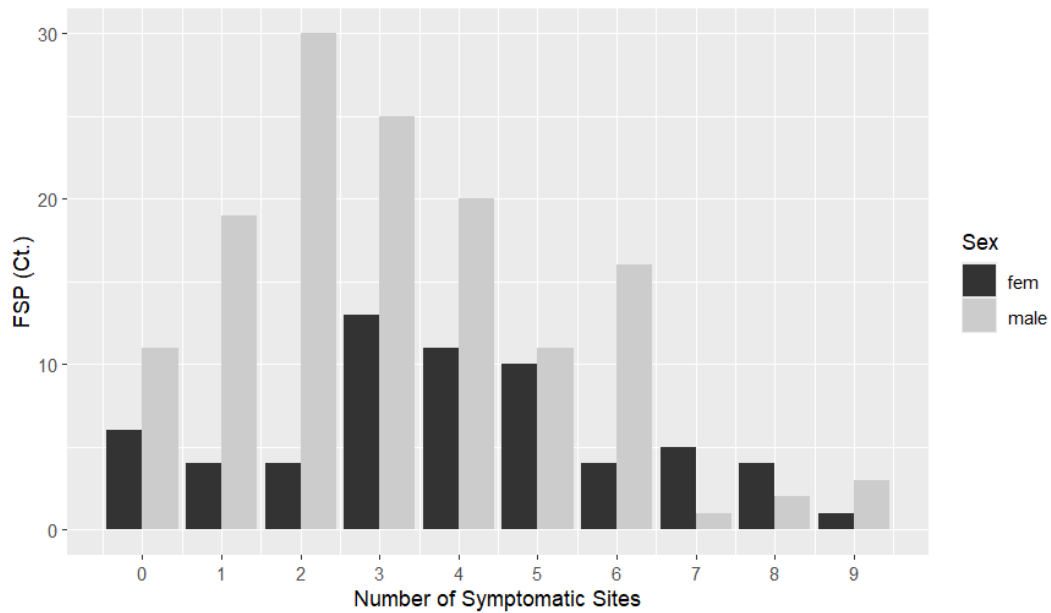
Note: One respondent declined to include their sex.

The NMQ is divided into nine separate anatomical regions. In this research, these regions are referred to symptomatic regions. Male FSPs reported an average of three (3.15) symptomatic regions; female FSPs reported an average of four (3.95.) Using the Mann-Whitney U test, a statistically significant difference was identified between these

two groups ($p = 0.012$). Currently active FSPs reported an average of three ($n = 162$, 3.302) symptomatic regions, while nonworking FSPs ($n = 39$) reported an average of four regions (3.821), though this difference was not statistically significant.

On its face, it appears female FSPs may be more prone to developing symptomatic regions. In one study, it was discovered that female pediatric otolaryngology practitioners are more likely to report pain and/or discomfort in the context of their work than their male counterparts. The study noted that this could be due to differences in the perception of advocating for their health, and even seeking healthcare for themselves. The study also posited that these differences may be due simply to height, as the female respondents to this study were significantly shorter than their male counterparts (Cavanagh et al., 2012).

Figure 1. Number of symptomatic regions reported, split by sex.



In this study, female FSPs were also found to be both shorter and lighter than their male counterparts. Height was found to be one of the factors that had any kind of correlation with the number of symptomatic regions identified ($p\text{-value} = 0.033$, $\rho = -0.15$). This negative correlation could indicate that height may have a kind of

“protective” effect against symptoms in this population. Or, it could also indicate that there is an inherent issue in the equipment used in this occupation. It has been noted that surgeons who are short (less than 66” tall) are at a greater risk of pain in their neck, shoulders, and back, though it is important to note this study found that male surgeons were more likely to report pain (Stewart et al., 2022). This finding is noteworthy, as it points less to a potential bias in equipment design when considering women, but instead to one that affects shorter individuals in general. Therefore, this correlation may be less about the protective nature of height, and more about having equipment that is better suited to a wider range of user anthropometry.

With regards to weight alone, no statistically significant relationship was identified. However, when calculating Body Mass Index (BMI)(Center for Disease Control, 2022a), a significant relationship was noted ($p\text{-value} = 0.0066$, $\rho = 0.1919$). This finding somewhat contradicts the previous findings regarding height, as this correlation is positive, meaning the higher the BMI, the more symptomatic regions are reported. Given that BMI is calculated using both height and weight, it appears that some kind of interplay between height and weight together may lead to a higher prevalence of symptomatic regions.

Finally, FSP age was assessed and was not found to be meaningfully correlated with the number of symptomatic regions identified.

b. Education

Table 8. Educational breakdown of respondents by sex.

	Female (62)	Num. Symptomatic Regions (median)	Male (138)	Num. Symptomatic Regions (median)
Some	0	0	4	3.5
Associates	17	3	40	3
Bachelors	42	4	83	3

Masters	2	5	10	3.5
Doctorate	1	5	1	4

Dramatic educational differences in mortuary science education requirements exist across the United States. For instance, Wisconsin requires two years of higher education plus an additional nine months in an American Board of Funeral Service Education (ABFSE) accredited program. North Dakota requires an associate's degree or diploma in mortuary science, plus 60 additional semester hours, while South Dakota requires 90 credit hours and a degree or certification from an ABFSE program. Minnesota's requirements are one of the highest in the country. The minimum educational requirement is a bachelor's degree (or equivalent aggregate hours) (Minnesota Funeral Directors Association, 2026). These requirements are likely why the vast majority of respondents reported an education level equivalent to either an associates or a bachelor's degree (see Table 8). Despite these stark differences, no statistically significant relationship was found between education and symptoms.

c. NMQ Regions & Pain Severity

By using the NMQ, a picture of symptomatic regions throughout the entire body has been painted for this population. While only a small sample of the whole, this is the first time this type of research has been done in order to describe the musculoskeletal experiences of this group. A full account of all of the NMQ regions can be found in Table 11.

In addition to the boilerplate NMQ format, three other questions were added for each of the nine anatomical regions. Two questions were added to inquire about any medical care sought for that specific region. These will be described in part e. Healthcare. The third question added to the NMQ used a Likert scale and asked "On a scale of 1 to 7, please rate the severity of your trouble (ache, pain, discomfort) in this region. 1 = Not severe at all, 7 = Extremely severe." This was asked to gain a better understanding of the

severity of symptoms experienced. Table 9 lists the results for both the original NMQ questions as well as these three additional questions.

Both male and female participants identified the same three regions most frequently, though frequency within these regions varied to some extent. Male participants reported the highest prevalence of symptoms in the lower back (70.19%), the neck (44.2%), and the shoulder (40.58%). Female respondents however noted symptoms most frequently in the neck (70.97%), with the lower back and shoulders being equal in prevalence (69.35%).

Interestingly, there is only some small overlap between the most frequent regions identified and the most painful regions identified. Males scored low back pain as being the most painful (4.06, on average), followed closely by knees (3.7) and hips/thighs (3.67). Female respondents reported that “knees” were the most painful region (4.0), followed by the shoulder (3.81), then hips/thighs (3.75). Therefore, it appears that while symptoms may be spread over the entire body, many of the most painful regions appear to be concentrated in the lower half of the body. However, no statistical significance was found between male and female respondents and their reported pain scores.

Three regions in the NMQ are further detailed by including the option to select either left, right, or both sides as symptomatic. Handedness was recorded for all respondents as well. 84.6% of respondents reported they were right-handed, which is slightly less than right-handed population estimates in other studies (Papadatou-Pastou et al., 2020).

Table 9. Handedness and symptom prevalence in wrists, elbows, and shoulders.

	Left-Handed (n = 21)	Right-Handed (n = 170)	Ambidextrous (n = 9)
Wrist Symptoms (%)	8 (38.1%)	50 (29.4%)	4 (44.4%)
Left	2 (25.0%)	6 (12.0%)	1 (25.0%)
Right	1 (12.5%)	15 (30.0%)	1 (25.0%)
Both	5 (62.5%)	29 (58.0%)	2 (50.0%)

Elbow Symptoms (%)	4 (19.0%)	24 (14.1%)	2 (22.2%)
Left	1 (25.0%)	10 (41.7%)	1 (50.0%)
Right	3 (75.0%)	10 (41.7%)	0 (-)
Both	0 (-)	4 (16.7%)	1 (50.0%)
Shoulder Symptoms (%)	13 (61.9%)	82 (48.2%)	5 (55.6%)
Left	2 (15.4%)	6 (7.3%)	2 (40.0%)
Right	1 (7.7%)	26 (31.7%)	1 (20.0%)
Both	10 (76.9%)	50 (61.0%)	2 (40.0%)

The prevalence of shoulder symptoms was greater than both wrist and elbow symptoms, regardless of handedness (see Table 9). Additionally, participants noted symptoms in both shoulders with greater frequency than just one shoulder (40.0% - 76.9%). This pattern is also present in wrist symptoms as well. This could be partially due to standard embalming practices.

For example, embalmers frequently work around the right shoulder region when embalming. This is due to the presence of both the right carotid artery and the right jugular vein, two of the primary vascular access points for embalming fluid injection. These are found under the right clavicle (Gee-Mascarello, 2022). Therefore, FSPs are likely using the same postures and gestures, regardless of handedness, in order to access these vessels. While we cannot truly say at this time whether or not this leads to a greater risk of symptoms, future research should consider these postures when assessing risk.

d. 12 Month Activity & Seven Day Symptom Presence

The second question in the NMQ inquires whether participants had been prevented from performing their “normal activities (at work or outside of work)” due to their symptoms. Percentage of individuals experiencing symptoms ranged from 16.13% to 50%, with the highest proportion found in the categories of “Knees” (50.0%), Feet & Ankles (48.89%), and Lower Back (33.33%).

Interestingly, both the knees and the feet/ankles are actually two of the lowest categories in terms of prevalence of symptoms themselves. However, it appears that

despite this low prevalence, when symptoms are present in these specific regions, they are severe enough that day-to-day activity is affected. Indeed, when comparing pain scores, the knee region had the second highest rating (3.70); feet/ankles had the fifth highest pain score (3.47).

Participants were also asked whether they had experienced any symptoms within the last seven days. Responses ranged from 25.97% to 56.0%. The regions of highest symptom presence in the last seven days include Hips/Thighs (56.0%), Shoulder (49.0%), Knees (46.0%).

e. Healthcare

Two questions were added to the boilerplate NMQ, both of which enquire about healthcare-seeking behavior. One asks “Have you seen a doctor, nurse practitioner, or other healthcare provider for this trouble?”; the other asks “Have you seen a chiropractor, massage therapist, or other alternative medicine practitioner for this trouble?” The primary reason for this delineation is due to findings from Chapter 3. Multiple interviewees sought chiropractic care in addition to (or instead of) physician care.

As shown by this study, this pattern holds true for two-thirds of the listed NMQ region. Only three regions reported more visits to western medicine doctors than alternative medicine practitioners: wrists, knees, and feet/ankles. All other regions saw alternative medicine being the preferred care type. However, when examining how male and female FSPs preferred care, these three regions are divided. Even in these three regions, female FSPs still preferred alternative medicine over western medicine, whereas male FSPs were the opposite. In all other categories, male and female FSPs were aligned in preference.

These findings beg multiple questions. Why is there overwhelming preference for alternative medicine, and why do women fully commit to these practices even when male FSPs decide to defer to western medicine? One aspect may be simply due to scheduling challenges. FSPs’ time is at the mercy of death’s timing, and therefore their schedules are often deeply unpredictable. This makes traditional clinical scheduling practices difficult to engage with, and even punitive in the case of last-minute cancellation penalties.

Therefore, alternative medicine practices, who may offer more flexible scheduling, weekend appointments, or after-hours visits are more appealing, if not simply more accessible.

Table 10. NMQ Findings for respondents.

Anatomical Region	Percent Reported Symptoms (n)	12 Month Activity (n)	Symptoms in Prior Seven Days (n)	Symptom Severity Score (mean $\pm$ sd)	Percent Sought Medical Care (n)**	Percent Sought Alternative Medical Care (n)**
Neck	53% (106)	17.92% (19)	34.91% (37)	3.20 ($\pm$1.42)	33.02% (35)	57.55% (61)
<i>Male</i>	44.20% (61)	52.63% (10)	48.65% (18)	3.10 ($\pm$ 1.29)	62.86% (22)	49.18 (30)
<i>Female</i>	70.97% (44)	47.37% (9)	51.35% (19)	3.36 ($\pm$ 1.59)	37.14% (13)	50.82 (31)
Shoulder*	50% (100)	20.0% (20)	49.0% (49)	3.69 ($\pm$1.39)	33.00% (33)	52.00% (52)
<i>Male</i>	40.58% (56)	45.0% (9)	44.90% (22)	3.57 ($\pm$ 1.94)	60.60% (20)	44.23% (23)
<i>Female</i>	69.35% (43)	50.0% (10)	55.10% (27)	3.81 ($\pm$ 1.53)	39.39% (13)	53.85% (28)
Elbow*	15% (30)	23.33% (7)	26.67% (8)	2.53 ($\pm$1.33)	20.00% (6)	26.67% (8)
<i>Male</i>	15.94% (22)	71.43% (5)	37.5% (3)	2.64 ($\pm$ 1.29)	50.00% (3)	50.00% (4)
<i>Female</i>	12.90% (8)	28.57% (2)	62.5% (5)	2.25 ($\pm$ 1.49)	50.00% (3)	50.00% (4)
Wrist*	31% (62)	16.13% (10)	38.71% (24)	3.08 ($\pm$1.58)	25.81% (16)	19.35% (12)
<i>Male</i>	27.54% (38)	50.0% (5)	50.0% (12)	3.16 ($\pm$ 1.42)	68.75% (11)	25.00% (3)
<i>Female</i>	38.71% (24)	50.0% (5)	50.0% (12)	2.96 ($\pm$ 1.83)	31.25% (5)	75.00% (9)
Upper Back	38.31% (77)	19.48% (15)	25.97% (20)	3.23 ($\pm$1.43)	24.68% (19)	54.55% (42)
<i>Male</i>	31.88% (44)	60.0% (9)	40.0% (8)	3.34 ($\pm$ 1.29)	68.42% (13)	47.62% (20)
<i>Female</i>	50.00% (32)	40.0% (6)	60.0% (12)	3.13 ($\pm$ 1.62)	31.58% (6)	52.38% (22)
Lower Back	70.5% (141)	33.33% (47)	37.59% (53)	3.84 ($\pm$1.77)	34.04% (48)	56.03% (79)

<i>Male</i>	70.19% (97)	74.47% (35)	62.26% (33)	4.02 (± 1.74)	79.17% (38)	67.09% (53)
<i>Female</i>	69.35% (43)	27.27% (12)	37.74% (20)	3.49 (± 1.76)	20.83% (10)	32.91% (26)
Hips/Thighs	37.5% (75)	26.67% (20)	56.0% (42)	3.67 (± 1.54)	28.00% (21)	50.67% (38)
<i>Male</i>	36.96% (51)	80.0% (16)	66.67% (28)	3.63 (± 1.62)	85.71% (18)	57.89% (22)
<i>Female</i>	38.71% (24)	20.0% (4)	33.33% (14)	3.75 (± 1.36)	14.29% (3)	42.11% (16)
Knees	25% (50)	50.0% (25)	46.0% (23)	3.70 (± 1.81)	40.00% (20)	24.00% (12)
<i>Male</i>	28.26% (39)	80.0% (20)	73.91% (17)	3.62 (± 1.86)	75.00% (15)	41.67% (5)
<i>Female</i>	17.74% (11)	20.0% (5)	26.09% (6)	4.0 (± 1.67)	25.00% (5)	58.33% (7)
Feet & Ankles	22.5% (45)	48.89% (22)	44.4% (20)	3.47 (± 1.88)	47.62% (20)	39.53% (17)
<i>Male</i>	21.01% (29)	63.64% (14)	55.5% (11)	3.41 (± 1.80)	70.00% (14)	47.06% (8)
<i>Female</i>	25.81% (16)	36.36% (8)	45.5% (9)	3.56 (± 2.06)	30.00% (6)	52.94% (9)

****Note:** totals may not sum due to one participant not identifying their sex.

f. Multi-Variable Model

As all of these variables were assessed independently, a robust post-hoc Poisson model was created to assess their effects in one multivariable model (Table 11).

Ultimately, sex, years working, handedness, and body mass index (BMI) (Center for Disease Control, 2022b) were included. Ethnicity was not included due to homogeneity of data (of 201 responses, only five reported an answer other than “white”). Education level was removed for similar reasons. The years licensed variable was removed for two reasons; first, it was very strongly correlated with the “years working” variable; and second, it is possible for an FSP to be licensed but not work in the industry. The author of this dissertation is an example of this. Therefore, it was determined that “years working” should be included instead, as it is a better measure of exposure. The dependent variable is the number of symptomatic sites (0-9).

Table 11. Post-hoc Poisson model coefficients.

	Estimated Risk Ratio	Robust Standard Error	Lower	Upper
Intercept	1.97	0.33	1.03	3.76
Sex (Male)	0.76	0.10	.62	0.93
BMI	1.03	0.01	1.01	1.04
Years Working	1.00	0.00	0.99	1.01
Handedness (Left)	1.14	0.29	0.65	2.01
Handedness (Right)	0.93	0.26	0.56	1.55

As seen in Table 11, there is a strong gender effect, as male FSPs have a risk ratio (RR) less than 1. This means that male FSPs are at least somewhat protected from increased numbers of symptomatic sites. This aligns with findings earlier in this chapter indicating that male FSPs had slightly lower total symptomatic site counts than female FSPs.

BMI presented a small -yet positive- RR, aligning with factors identified earlier in this chapter. Left-handed individuals were also found to have elevated RR compared to right-handed individuals. As stated previously, this may be due to standardized methods

of embalming forcing all individuals to work in similar patterns, regardless of hand dominance.

g. Workplace Factors

i. Community Types

Funeral homes are found in all types of communities, including deeply rural and urban environments. While it is understood that self-reported judgements on rurality do not necessarily align with Rural-Urban Commuting Area (RUCA) classifications (Castle & Tak., 2021; Onega et al., 2020), FSPs were asked to define how they felt their yearly call volume was divided between urban, suburban, and rural areas. These community type perceptions from respondents are detailed in Figure 2.

Figure 2. A box and whisker plot depicting the breakdown of community types served.



On average, 50.04% of calls were reported to be in rural areas. Suburban call proportions were approximately 26.79%, with urban calls making up the rest at 23.16%.

Using Spearman's correlation (ρ), no statistically significant relationship was identified between the proportion of each community type and the number of symptomatic regions identified by respondents. This indicates that, based on this sample,

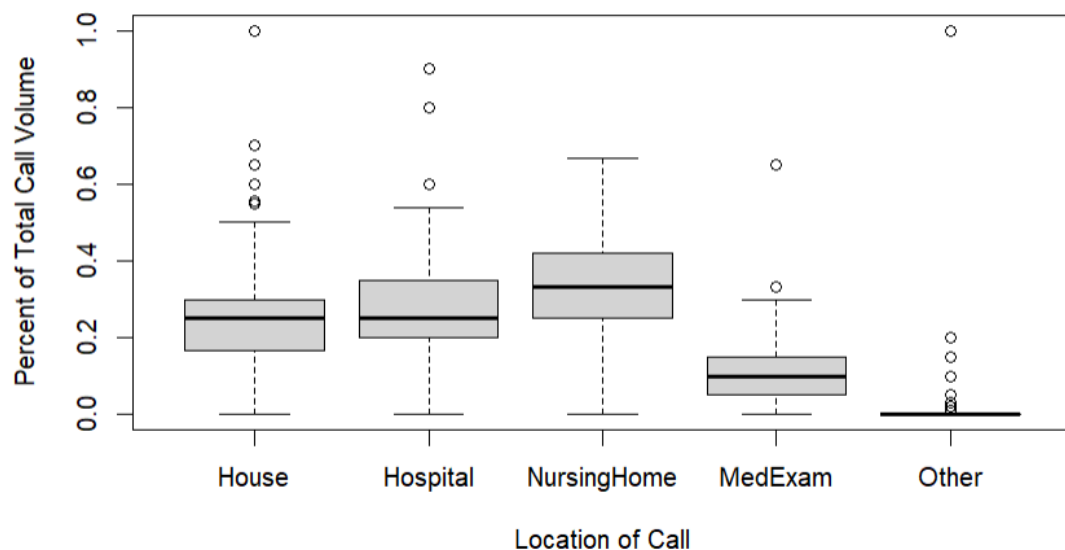
rurality of calls does not correlate to a higher number of symptomatic regions; the same is true of urban and suburban areas as well.

ii. Call Location Types

There are multiple locations that an FSP may be called to move or transfer a decedent from. These call locations are somewhat dependent on geographic location, as urban centers are more likely to be near hospitals and/or medical examiner facilities. Even so, respondents were asked to approximate the proportion of their call volume from each of the most common locations of death.

The largest proportion came from nursing homes, which accounted for an average of 35.26% of calls. This was followed by hospitals (27.76%), house calls (25.32%), and finally the medical examiner (10.45%). Other unspecified locations accounted for less than 0.6%.

Figure 3. A box and whisker plot of call type proportion.



While it could be assumed that more house calls could lead to more injuries due to unpredictable lifting conditions, stairs, etc., and therefore more symptomatic regions, no statistically significant relationship between any call location type and the number of

symptomatic regions identified. It is unclear if a larger sample may lead to different findings.

iii. Trade Service

A previously undiscussed nuance in the funeral service industry is the role of what is called “trade service,” often referred to as “trade embalmers,” or more simply, “trade.” This is a type of subcontractor in the funeral service industry. They may or may not have their own brick-and-mortar location. Instead, they frequently use the facilities of those that pay for their services.

For instance, a trade embalmer might be called to remove a decedent from a hospital, transport them to a specific funeral home, and embalm them on site. A trade embalmer will do this and then repeat this pattern in another funeral home. This means that trade embalmers are working across larger geographic areas, in multiple unrelated funeral homes, and are often doing more “back of house” tasks (i.e. those that do not interface with grieving families).

What makes this distinction more complex is that there are FSPs who will do trade work as a way to earn supplemental income. This can be within the funeral home itself, if the funeral home is part of a larger network, or it can be a completely “on the side,” fully removed from daytime employment. In this study, this nuance was difficult to capture due to the structure of the survey. Two questions allowed respondents to indicate they owned or worked for a trade service. If in either question, a respondent indicated they owned or worked for a trade service, they were categorized as “trade embalmers,” where relevant.

Trade embalmers were identified as having an average of four symptomatic regions, whereas all other active FSPs reported 3.28 symptomatic regions. However, this difference was not found to be statistically significant.

iv. Call Volume, Coworker, and Facility Count

All actively working respondents were asked a series of questions to describe their current workplace. Questions included facility “call volume,” which is a frequently

cited metric used to measure how active a funeral home is. Respondents were also asked about their personal call volume, the number of coworkers who share similar responsibilities to them, and the number of facilities the respondent actively worked out of. These factors were combined to create a ratio that better encapsulates the workload an individual FSP might encounter. Table 12 details these measures and ratios fully.

Table 12. Mean call volumes (total and personal) and call volume/coworker/facility ratios.

	Own/Work for Trade Service (10)	All Other FSPs (149)	Trade Use = Yes (49)	Trade Use = No (102)
Total Call Volume (tCV)	2071	467.09	645.82	381.24
Personal Call Volume (pCV)	182	123.79	149.73	111.33
Staff (S)	5.1	3.32	4.01	2.99
Facility Number (FN)	31.7	2.69	3.12	2.49
tCV/(S+1)	414.95	105.37	118.48	99.29
tCV/(S+1)/FN	343.21	61.73	70.14	57.69

Clearly, FSPs who own (or are employed by) trade services have higher ratios of both calls-to-staff (tCV/S+1) and calls-to-staff per facility (tCV/(S+1)/FN). In fact, trade service employees are reporting ratios 3.9 to 5.6 times higher than ratios reported by non-trade service FSPs. This is expected, as trade embalmers are handling tasks more associated with decedent care, and less of the actual funeral event planning, which is left to the funeral home (and staff) that hired them originally. None of the above ratios had statistically significant correlations to the number of symptomatic regions identified.

On its face, these ratios measurements may be valuable indicators an FSP's workload, but they do not capture the full nuance of an individual's experience; they lack the whole "picture" of decedent care. If an FSP is only handling a portion of the tasks associated with a funeral, but they're doing that for many funeral homes, are they just as busy as the FSPs who are only handling a fraction of these calls, but instead doing all of the tasks from death to disposition? More research is needed to fully grasp the difference between FSPs whose primary duties are decedent-focused and those that are funeral-focused. Fritch & Steward (2021) remarked at the stark difference between demands on FSPs in United Kingdom funeral homes, even to the point where researchers had difficulty reconciling the shift in persona in individuals who handled both "sides" of the work (Bartlett & Riches, 2007).

41.72% (63) of respondents reported a trade service existed in their area, but only 32.45% (49) reported using these services. 58.28% - over half of respondents – reported no access to trade services in their area. However, neither trade service use or availability had any statistically significant relationship to the number of symptomatic regions identified, nor were these groups significantly different from each other.

Additionally, the average number of hours worked per week (49.41 ± 17.51) was not significantly correlated with the number of symptomatic regions identified.

v. Task Types

Table 13. Main task types, and average time spent on each.

Task Types	Proportion of Time (%)	StanDev ($\pm$)
Decedent Transfers	16.55	15.32
Embalming	13.30	10.29
Dressing & Cosmeticizing	10.94	8.69
Meeting with Families	27.02	18.35

Conducting Funeral	20.79	13.98
Services		
Other Tasks	10.81	19.24

Respondents were asked to consider the past year and divide their time spent on the main tasks associated with funeral service (Table 13). They were asked to do this by assigning percentages to each category. “Meeting with Families” was identified as the most time-consuming task, taking up almost 30% of an FSP time on average. This was followed by “Conducting Funeral Services” (20.79%) and “Decedent Transfers (16.55%).

Interestingly, it is not these leading categories that correlate with symptomatic regions. Instead, time spent embalming (approx. 13.30%) is the only task category significantly correlated with the number of symptomatic regions identified by respondents ($p\text{-value} = 0.02048$, $\rho = 0.1825$). This aligns with findings in literature regarding surgeons, who represent a close analogue for embalmers, identify “static or awkward posture during surgery” as a leading cause for discomfort (Szeto et al., 2009). This indicates that elements of this task could be leading to increased symptoms, something that will be explored in Chapter 5.

h. Mental Health

i. Methods

Per guidelines, the survey’s Likert scales were presented with the highest frequency first (4 = All Days) and decreasing to the lowest frequency (0 = “None”) (Kessler et al., 2002). An additional option of “I don’t know” was added following the option of “None”. These were classified as missing values, of which there were eight. These were later changed to a result of zero to accommodate analysis. Non-parametric tests such as the Mann-Whitney U test were used due to the ordinal nature of the responses.

ii. Results

Per scoring recommendations, the standard cut-off score for classifying serious mental illness is 13 or higher (Kessler et al., 2003). Nine total FSPs had scores above the serious mental distress threshold, five female and four males (Figure 4).

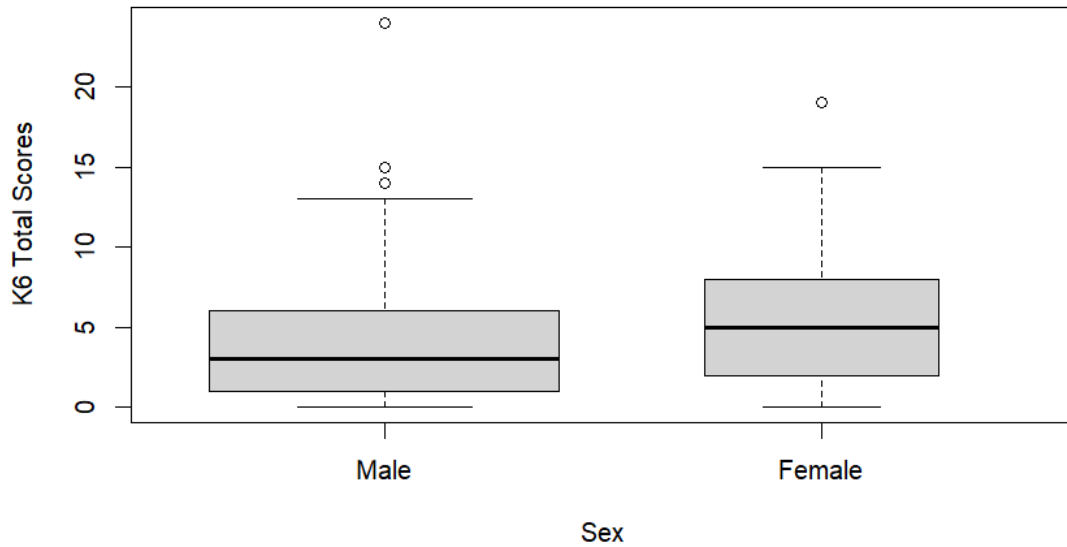
When comparing male and female FSPs via the Mann-Whitney U test, there was a borderline statistically significant difference between male and female total K6 scores (p-value = 0.068). However, there were significant differences found between these two groups when comparing the symptoms “nervousness” and “restlessness.” Male FSPs reported an average nervousness score of 1.0, female FSPs reported a nervousness score of 1.53. When considering restlessness, males reported a score of 1.11, and females a score of 1.5. There were no statistically significant differences in total K6 scores. Table 14 details mean scores for all K6 questions.

Table 14. Mean K6 Scores for Male, Female, and All groups.

<i>n = 200</i>	Male (138)	Female (62)	All (200)
Depressed	0.54	0.47	0.51
Effort	1.01	1.24	1.08
Hopeless	0.30	0.37	0.32
Nervous**	1.00	1.53	1.16
Restless**	1.11	1.50	1.22
Worthless	0.29	0.35	0.31
Total	4.24	5.47	4.60

***Indicates statistically significant difference between male and female respondents.*

Figure 4. Distribution of total K6 score frequency.



As to why this difference occurs, it has been noted that the physical environment correlated strongly with both depression and anxiety symptoms in female FSPs (Goldenhar et al., 2001). As stated previously, in the analogue field of surgery, female surgeons reporting on their musculoskeletal symptoms were identified as being vulnerable to a type of “ergonomic disadvantage” due to their shorter heights (Cavanagh et al., 2012). Knowing this, the same sort of ergonomic disadvantage could also extend into the funeral home and affect female FSPs in a similar manner, causing both musculoskeletal symptoms and mental stress, potentially leading to anxiety and restlessness.

i. Quality Assessment Questions

Finally, seven questions were included near the end of the survey. These were focused on the perceived quality of the work itself as well as the quality of education that FSPs received. These seven questions – and respondent results – can be found in Table 15. Answers were scored via a Likert scale, with “1 – Strongly Disagree” and “7 – Strongly Agree.” These questions were included to describe the general opinion of their

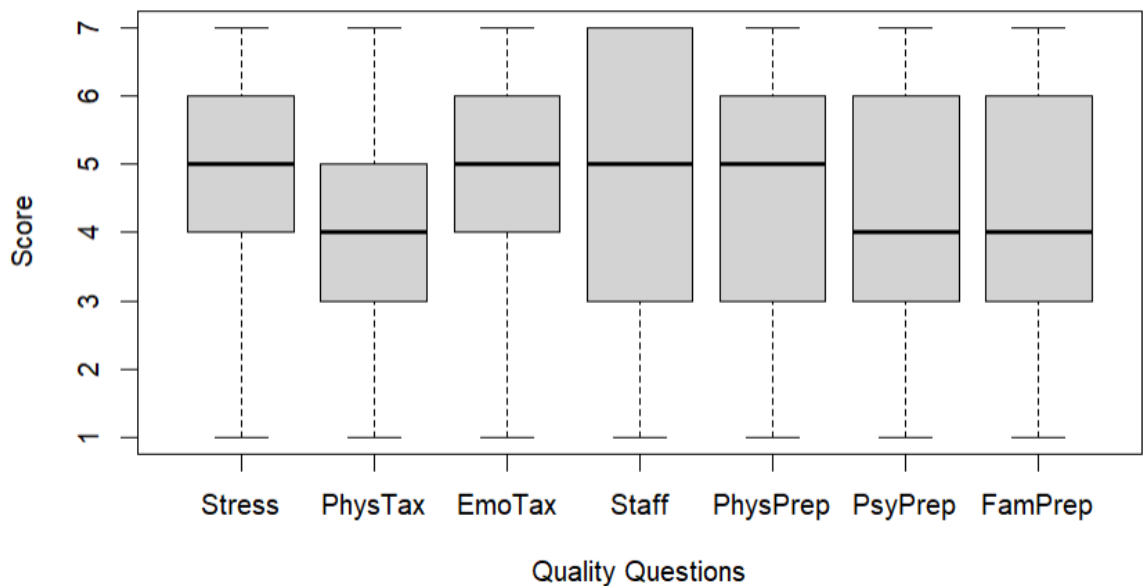
experience in the funeral service profession with the hope that findings may point to future areas of potential research.

Table 15. Quality Assessment Question Results. Analysis was carried out on currently working individuals only.

Questions	Mean (sd)
“I find my work to be stressful” (161)	4.69 (±1.61)
<i>Male (109)</i>	4.66 (±1.56)
<i>Female (52)</i>	4.76 (±1.74)
“I find my work to be physically taxing.”	4.26 (±1.62)
<i>Male</i>	4.11 (±1.63)
<i>Female</i>	4.58 (±1.59)
“I find my work to be emotionally taxing.”	4.71 (±1.74)
<i>Male</i>	4.61 (±1.75)
<i>Female</i>	4.94 (±1.73)
“I feel my facility is adequately staffed to handle our current call volume.”	4.58 (±2.13)
<i>Male</i>	4.52 (±2.18)
<i>Female</i>	4.69 (±2.054)
“My training adequately prepared me for meeting the physical demands my work requires.”	4.86 (±1.90)
<i>Male</i>	4.83 (±1.904)
<i>Female</i>	4.92 (±1.90)
“My training adequately prepared me for meeting the psychological demands my work requires.”	4.30 (±1.86)
<i>Male</i>	4.303 (±1.83)
<i>Female</i>	4.31 (±1.94)

“My training adequately prepared me for effectively	
handling the emotional responses of the bereaved family	4.45 (± 1.75)
and/or relatives of the deceased.”	
<i>Male</i>	4.47 (± 1.81)
<i>Female</i>	4.404 (± 1.63)

Figure 5. Box-and-whisker plots of the quality assessment questions.



Interestingly, despite prior findings from this survey indicating female FSPs scored higher in categories like “nervousness” and “restlessness”, female and male FSPs did not have statistically significant differences in scores when asked if their job was stressful. However, a statistically significant difference was found when comparing scores between male and female FSPs about whether the job is physically taxing (p -value = 0.0095).

As stated in the previous section, FSPs who are shorter in height may be operating with a type of ergonomic disadvantage, making work more difficult. Additionally, lifting capabilities themselves must be considered. When strength is mismatched between lifting

partners, the lifting capabilities are defaulted to the weaker member of the team, putting those individuals at higher risk (T.-H. Lee, 2016; Rice et al., 1995). This may indicate that female FSPs are bearing a higher burden of risk in this occupation, and aligns with the findings that female FSPs report more musculoskeletal symptoms.

4. Limitations

Self-reported data always brings a certain element of uncertainty, as this type of data can usher in a certain degree of bias. However, no self-reported research is immune from this, and it does not mean the findings contained herein are not valuable. The NMQ used in this study has been used across a wide variety of occupations since its creation, including medicine (López-Aragón et al., 2017), and has proven to be a valuable screening tool for musculoskeletal symptoms. Survivorship bias, as mentioned in Chapter 2, likely also impacts the findings from this study, as individuals who have left the industry and let their license lapse are not included in state rosters. This means that individuals who may have experienced symptoms during their practicing years have not been included. Therefore, if future research could assess this portion of the population in some manner, the prevalence of symptoms would likely be higher than the sample studied here.

Additionally, the use of a paper survey brings with it some degree of error as well. With a paper survey, administered via mail, individuals can (and did) input some data incorrectly. While some of these errors could be massaged to facilitate analysis, some instances were not. Specifically, complete omission (i.e. “skipped questions”) cannot always be assessed, especially when looking at data regarding workplace factors. This occurred several times. Using digital surveys could ameliorate this issue in the future, as digital surveys can be structured to prevent individuals from inputting erroneous data, or skipping questions altogether. It is recommended that future research use this modality, both for these functions and to eliminate the time needed to transcribe paper surveys to a digital format.

A final, yet impactful, limitation of this research is the sample size. While a response rate of almost 28% is positive, this still leaves only 201 individuals to analyze.

Future studies should endeavor for larger sample sizes so as to ensure meaningful models may be generated, as their descriptive findings may bring further insights to the risk factors experienced.

5. Conclusion

In summation, this research represents a first-of-its-kind look at the musculoskeletal symptoms found in the funeral service industry. Significant results regarding the protective effect of height and the detrimental effect of BMI indicate that FSP anthropometry may inform risk when considering musculoskeletal symptoms. The significant difference between male and female FSPs and the number of symptomatic regions experienced may indicate that female FSPs are more at risk for symptom development, though whether this is primarily due to their differing anthropometry instead of another unidentified factor necessitates further study. The lower back, neck, and shoulders were identified as the most prevalent regions for symptoms, something which both male and female FSPs mirrored. Healthcare preferences were also similar between these two groups, with most preferring to receive care in alternative medicine practices instead of the more standard Western medicine.

Additionally, workplace factors, such as call type and location, were evaluated for significance, but the only variable found to be significant was time spent embalming, which was positively correlated with the number of symptomatic regions identified. Finally, female FSPs reported slightly higher scores than male FSPs when asked about their general mental state, specifically for factors such as “nervousness” and “restlessness.” Female FSPs also reported that they found their work to be more physically taxing than male FSPs.

While many elements examined in this study ultimately proved to be unrelated to musculoskeletal symptom presence, this is the first study of its kind to detail this occupation in such a granular manner. Ultimately, while more sophisticated data analysis could not be accomplished with this data set, the identified findings pave a clear path forward for further research in this space.

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Chapter 5. Postural Analysis Study

Synopsis: In an effort to more thoroughly understand the postures used by FSPs in the course of their work tasks, FSPs were filmed while performing or mimicking certain tasks unique to their industry. These videos were then analyzed using commercially available ergonomic analysis software in order to better understand postures and further describe the musculoskeletal risks they may be subjected to.

Background: While postures used during patient handling techniques have been studied in other healthcare and medical providers, once again FSPs have been largely excluded from this research. Multiple tools have been created to analyze posture, but due to the behind-the-scenes work of FSPs, none of them have been applied in this context, primarily due to privacy concerns and a desire to keep the more publicly upsetting aspects of the work hidden.

Objective: The objective of this study was to analyze typical postures used by FSPs in the course of their work, specifically when embalming, or when they are performing decedent handling activities. The main decedent handling activity of interest was the floor-to-cot lift, which is required when a decedent has been found on a floor and must be lifted onto a collapsed mortuary cot.

Methods: Participants were split into two categories: the embalming cohort and the transfer cohort. Three individuals were recruited into the former category, while five teams of two individuals were recorded for the second cohort (ten participants total). All participants were asked to use a lifelike (5'5", 200lbs) mannequin to simulate their assigned cohort work tasks. Videos were taken, edited, and then analyzed by TuMeke Ergonomics, a posture analysis tool.

Results: Several risky postures were identified for both cohorts. In the embalming cohort, the lateral transfer was identified as the highest risk posture used by participants, followed by undressing the decedent and suturing cranial incisions. In the transfer cohort,

the riskiest posture was found while rolling decedents during the process of shrouding, specifically at roll initiation.

Conclusions: While more research is needed, this pilot study highlights postures that are considered risky by commonly used posture measurement tools. While some of these postures can be prevented by adjusting equipment – such as the height of adjustable tables – some of the postures are due to a lack of useful equipment in the first place. More research is needed to fully understand these risks. Devices designed specifically for this population are also recommended.

Keywords: Posture, Funeral Director, Embalmer, Injury, Lifting, Manual Handling

1. Introduction

Handling living patients has been rigorously studied, especially when considering nurses and emergency medical services (EMS) (Armstrong et al., 2020; Larouche et al., 2019; S.-J. Lee et al., 2015; S.-J. Lee & Lee, 2017; Pompeii et al., 2009). Research on those who handle decedents has traditionally been limited to healthcare settings and the individuals found therein, such as morgues and the staff employed there, respectively (T. Lee et al., 2022; Molewa et al., 2021; Suresh et al., 2024). Similarly, nurses and other healthcare professionals (HCPs) are well known for having low back pain due to their work. In one literature conducted by authors Davis and Kotowski, low back pain prevalence in nurses and nurse aides was estimated to be between 51-57% in the United States alone, with this prevalence significantly higher in places like Australia and the Philippines (71%) (Davis & Kotowski, 2015). In another study, this prevalence was estimated even higher (72%) (Nourollahi et al., 2018). In another study, 15.5% of injuries to hospital workers were attributed to transferring patients from a bed to a chair, bed, or stretcher, while 24.9% were attributed to lifting the patient. This means that at least 40% of injuries in this study were the result of moving a patient significantly versus a simple adjustment (Pompeii et al., 2009). While similar, the interests of this research lie specifically with the handling of deceased individuals.

When considering decedent handling, Suresh et al. found that the spine and lower back was the most frequently injured body part in HCPs, followed by the wrist, arms, and elbows. Sprains and strains were the most frequent injury type behind respiratory illness, though due to the fact this study was performed during the COVID-19 pandemic, this is unsurprising. This same study also noted that moving decedents was considered especially difficult from a physical standpoint, indicating that the level of exertion needed to perform the task is quite high (Suresh et al., 2024). Interestingly, a different study noted that morgue staff were at a lower risk for decedent handling injuries in hospital settings when compared to other HCPs (Pompeii et al., 2009). However, when considering environments, morgue staff are not being asked to carry decedents up and down stairs, or even being asked to carry them at all. This alone makes comparison between the groups difficult.

Adding to this complexity, FSPs have additional pressure to handle decedents with a specific sensitivity given the circumstances. In one study by Cowley and Leggett, they noted that FSPs will usually place care and dignity of the decedent ahead of their own safety, making prior training difficult to implement (Cowley & Leggett, 2011). Finding and using measures that are “culturally acceptable” can be challenging as well (Roche et al., 2024), as what is deemed appropriate for one group, or even just an individual family, may not be seen in the same manner by another.

Decedents can be found in a wide variety of locations. While many FSPs can tell tales of the uniquely challenging locations they have removed decedents from, one of the more frequent situations FSPs encounter is when a decedent is found on the floor. This particular situation requires FSPs to lift a decedent and place them onto a collapsed mortuary cot. If the decedent is an average adult in the United States, that may mean shifting and lifting an average of 171 to 200lbs, if not more (National Center for Health Statistics, 2023), if not more. To prepare for this lifting task, they must shroud the decedent, usually with a simple sheet. This means rolling the decedent, placing the sheet beneath them, and then wrapping them entirely.

It is at this point the decedent must either be lifted to the cot, or the decedent must be transferred to a flexible stretcher. These are usually made with vinyl and are given structure with a series of hardwood slats that run the length of the device. However, with this structure comes a small cost: the weight lifted will increase. Fortunately, this increase is relatively minor, with the weight of the stretcher used in this study equaling only 16lbs (Ferno, 2026b). Another advantage to using a flexible stretcher are the handles sewn into its edges. These allow for FSPs to have somewhere to grip when lifting.

The embalming process involves multiple steps, but it must always begin with the same task: transferring the decedent from a mortuary cot to an embalming table. After this transfer, multiple tasks take place in quick succession, including undressing, bathing, and assessing the decedent’s condition. It is at this point the embalmer will “set features,” or close the eyes, nose, and mouth and restore a neutral expression. The embalmer follows this by selecting the arteries with which they will inject the decedent with embalming fluid. An incision is made in the skin, and blunt dissection is performed until

the appropriate vessels are identified and brought to the surface. This process is known as “raising vessels.”

Once vascular injection of embalming fluid has occurred, the vessels are tied off and the incisions are sutured closed. After the final step of aspiration – the process in which any remaining fluids found in the hollow organs are removed via suction – the embalming process is largely complete. However, if the decedent has been autopsied, then this final step is skipped. Instead, additional suturing of the autopsy incision (i.e. the Y-incision) on the abdomen and the cranial incision on the head are done (Gee-Mascarello, 2022).

It is these two types of scenarios – decedent transfer and embalming – that are the primary interest of this study. While there has been prior research on decedent handling, typically in morgue settings (T. Lee et al., 2022; Molewa et al., 2021; Suresh et al., 2024), no research has been done to date on the postures used by privately employed FSPs. This research gap is important to address because FSPs are reporting musculoskeletal symptoms (see Chapter 4 of this dissertation). It imperative that potentially risky postures are identified, which may lead to redesigning these tasks to be safer for practitioners.

2. Methods

The study was split into two cohorts: an embalmer cohort and a transfer cohort. All respondents were recruited via convenience sampling through individuals in my network, or were referred via other participants. Both cohorts required significantly different circumstances in which to be studied and filmed. As a working funeral service professional would likely be very reluctant to allow filming within the funeral home itself due to privacy and scheduling concerns, the University of Minnesota’s Anatomy Bequest Program (University of Minnesota: Twin Cities, 2026) offered one of their prep rooms for the duration of the study. This allowed for the embalming cohort volunteers to use a dedicated prep room, similar to what would be used in a private funeral home.

For the transfer cohort, recruitment was a concern due to the unpredictable schedules of potential volunteers. In an effort to ease this concern, contact was made with

a local trade service, Metro First Call (MFC) (Metro First Call, 2026), who generously offered their facility. As stated in Chapter 4, trade services function as independent contractors in the funeral service industry. They are often hired by other funeral homes to pick up, transport, and sometimes embalm and/or cremate decedents for a cost. By filming at MFC, recruitment was made simpler as individuals employed at MFC could take part, and other FSPs did not have to travel to Minneapolis. Instead, they could travel a shorter distance to MFC, and even time their volunteering to coincide with official business.

Multiple posture measurement tools have been created, including the Rapid Entire Body Assessment (REBA) (Hignett & McAtamney, 2000), Rapid Upper Limb Assessment (RULA) (McAtamney & Nigel Corlett, 1993), the revised NIOSH Lifting Equation (RNLE) (Center for Disease Control, 2024), and others. In this pilot study, REBA was chosen due to its particular focus on capturing the unpredictable and dynamic postures, like those found in healthcare settings (Hignett & McAtamney, 2000).

REBA was originally designed to be a cost-effective method to analyze posture using only a pen and paper, while quantifying overall postural risk into an easy-to-understand score. Postures are measured by assessing the degree of flexion/extension in two separate groups: A and B.

Group A consists of the trunk, the neck, and the legs, with a total of 60 possible combinations that reduce down to nine possible scores, plus a modifier for “load/force.” This addresses the weight of the object being handled, and whether or not is lifted quickly.

Group B consists of the upper arm, lower arm, and wrist, with a total of 36 combinations. These combinations also reduce to nine possible scores. This group is further modified via a “coupling” score, or how easily an individual can handle an object.

Each region is scored individually based on predetermined levels of flexion. The respective group score is found using these regional scores, modifiers are added, at which point an overall score can be determined. This score can be further modified based on certain activities, such as whether a posture is held static for a long period of time (>1 minute) or whether an activity is considered repetitive. This ultimate score corresponds to

a determined risk level, ranging from “negligible” to “very high”, and also correlates with a level of action required (“none necessary” to “necessary now”). Total scores can range from 1 to 15 (Hignett & McAtamney, 2000).

The postures selected for analysis in this research represent the “most severe” postures used during that task, or in lieu of any severe moments, represented the clearest view of the task. The researcher did not change any of the posture readings, but did select coupling, load, and repetitive elements used in scoring.

A Simulaid's Rescue Randy (125lbs) (AED Superstore, 2026) mannequin was used to simulate a decedent for both cohorts. The mannequin was fitted with additional weight via sandbags, which were attached to the mannequin's legs and torso, to bring the total weight up to 200lbs. Both teams also used the same mortuary cot – a Ferno Model 24. The Model 24 weighs 54lbs and can collapse to a height of 9.25”(Affordable Funeral Supply, 2026a; Ferno, 2026a). Both teams were filmed using Canon PowerShot G7 X Mark III cameras.

The embalmer cohort consisted of licensed FSPs who mimicked the embalming process using the mannequin. The process began with laterally transferring the mannequin from the cot to the embalming table. The mannequin was then undressed. The volunteers were then asked to use real embalming equipment to pantomime the embalming process as best as they were able. This cohort was filmed from multiple angles. This was done to ensure that if a posture or task went out of video frame or was otherwise unable to be analyzed, another view could be used. However, this proved to be unnecessary for this cohort, and only one angle was used. Additionally, time taken per task was not recorded with this cohort due to the limitations presented by using a mannequin.

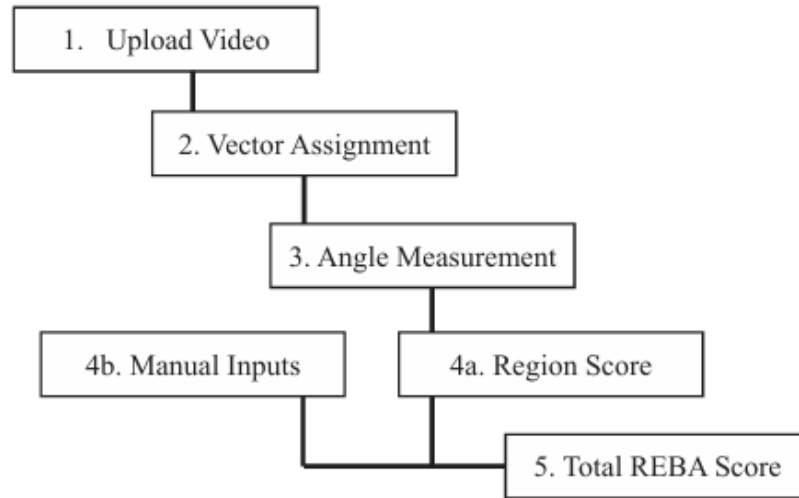
The transfer cohort focused solely on posture(s) used during a specific decedent handling scenario: a floor-to-cot transfer. This group consisted of ten FSPs – five teams of two – who demonstrated their techniques for handling this situation. These teams were provided with the Model 24 cot, mannequin, shrouding sheets, and a flexible stretcher. Pairs were filmed from three separate angles to ensure postures were captured.

All videos were analyzed using TuMeke Ergonomics, an AI-assisted software platform (TuMeke Ergonomics, 2024). This software uses computer vision trained on a dataset of 3.6 million human poses (Human3.6M) (Ionescu et al., 2014) to measure postures in uploaded video, and quantifies the musculoskeletal risk for each posture selected. This risk profile reported is determined by the measurement tool selected, such as REBA, RULA, NIOSH Lifting Equation, and Snook Tables. Regarding accuracy, and the angle error for each anatomical region ranged between 3.4 - 9.3 degrees at the 90th percentile (Sundareshan, 2024).

TuMeke operates by aligning a local coordinate system with the camera's coordinate system (x-axis to the right, y-axis posteriorly, and z-axis upward). As the software is trained on human posture, it identifies humans within uploaded video and interprets their posture in 3D space. These positions are then converted into mathematical vectors, at which point the angle of a specific region can be measured. For example, when measuring the trunk, a vector is established between the center pelvis and the center of the shoulder girdle. Once normalized, this vector is then compared against that of the z-axis (0,0,1), at which point the angle of trunk flexion can be determined (Sundareshan, 2024).

Certain elements of posture cannot be interpreted by TuMeke Ergonomics from video alone. Instead, these factors are input manually. Three aspects required this: coupling between the subject and the object being handled; load size; and activity score, which measures whether a behavior is repetitive, static, or causes large postural changes. Figure 6 describes how the final REBA score is calculated from both these manual inputs and the values determined by the software itself.

Figure 6. Flowchart for postural analysis process.



Participants from both cohorts were each given a \$150 Visa gift card in appreciation for their time.

3. Results

a. Embalming Cohort

The embalming cohort was comprised of two females and one male volunteer, with an average age of 44.3 years and an average of 21.7 years of experience.

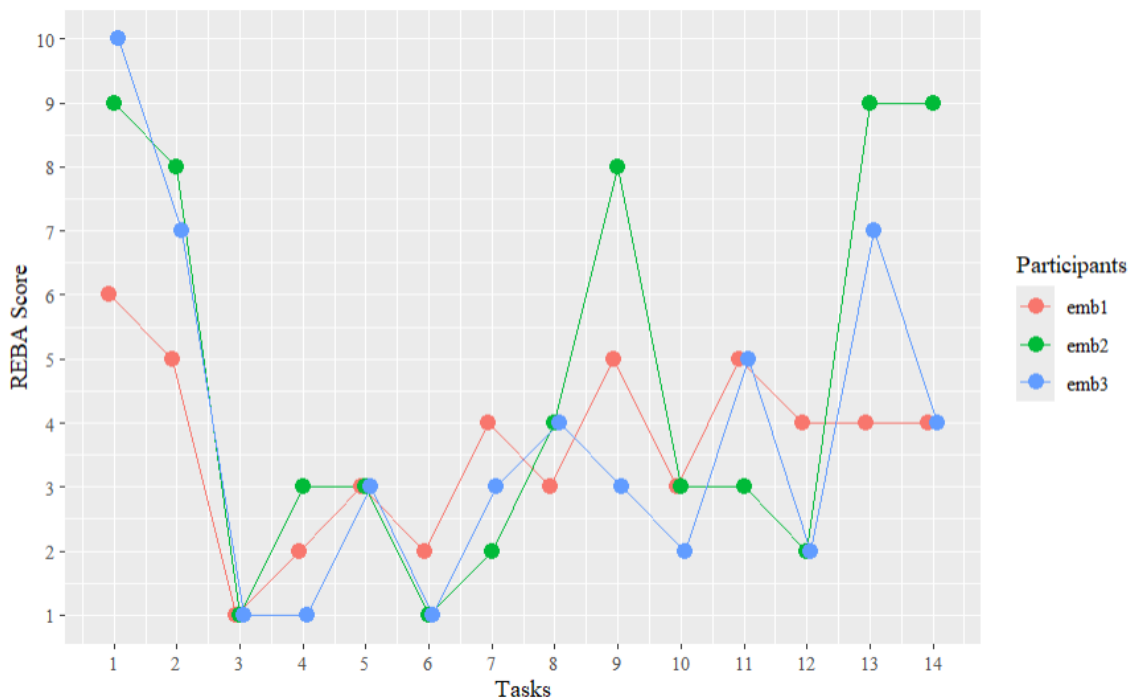
Posture analysis of this cohort indicated multiple tasks that may place practitioners at risk. REBA scores were found to be highest for the lateral transfer task across all three participants, with a median total score of 9 (see Table 16). This is considered high risk, and per REBA action levels, requires intervention in the near future. Other tasks with elevated scores were undressing the decedent (median total score 7), suturing the cranial incision (median total score 7), and suturing both the femoral and tibial incisions (median total score 5). Per REBA guidelines, these scores fall within the “medium” risk category, but even so, require eventual intervention to correct (Hignett & McAtamney, 2000).

Table 16. Procedures assessed in the embalmer cohort, their median regional scores, and median total score.

	Med. Neck Score (1- 3)	Med. Trunk Score (1- 5)	Med. Legs Score (1- 4)	Med. Upper Arm Score (1- 6)	Med. Lower Arm Score (1-2)	Med. Wrist Score (1- 3)	Med. Total Score (1-15)
1. Lateral Transfer	1	3	1	5	2	1	9
2. Undressing	1	2	1	2	1	2	7
3. Set Features	1	2	1	2	1	1	1
4. Raise Carotid Artery	1	2	1	2	2	1	2
5. Suture Carotid Incision	1	2	1	2	2	1	3
6. Raise Radial Artery	1	2	1	1	1	1	1
7. Suture Radial Incision	1	3	1	2	1	1	3
8. Raise Femoral Artery	2	3	1	3	1	1	4
9. Suture Femoral Incision	2	3	1	3	1	1	5
10. Raise Tibial Artery	1	2	2	2	1	1	3
11. Suture Tibial Incision	1	3	1	2	1	1	5
12. Suture Autopsy "Y" Incision	1	1	1	2	1	1	2

13. Suture Cranial Incision	2	3	1	5	2	1	7
14. Aspirate	1	3	1	5	1	2	4

Figure 7. Total REBA scores plotted across all tasks for each participant.



See Table 16 for list of individual tasks.

In Figure 7, each individual's REBA scores are mapped sequentially. While the order of tasks does not mimic the embalming process exactly, charting it in this manner allows for easier comparison between tasks and individuals. As seen in Figure 7, the lateral transfer task (task 1) is one of the highest scoring tasks. Still images of this task in the moment it was measured by TuMeke Ergonomics can be seen in Figures 8, 9, and 10.

Emb1 experienced the lowest score for the lateral transfer task, and received no extreme score spikes after this task. In fact, their score never exceeded their initial total score of 6 across all tasks. This meant their scores never exceeded the “medium” risk level. Even so, this level does warrant intervention according to REBA guidelines. Interestingly, Emb1 is also the tallest of the three embalming participants, a factor which was identified in Chapter 4 as being mildly protective against musculoskeletal symptoms.

Figure 8. Participant “Emb1” performing a lateral transfer.

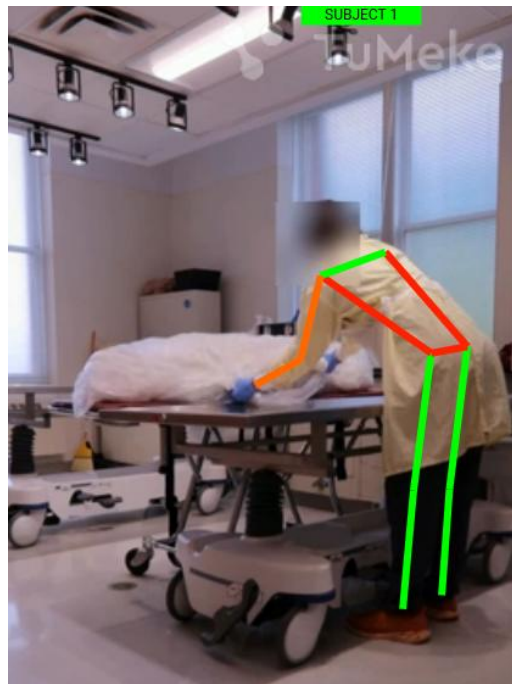


Figure 9. Participant “Emb2” performing a lateral transfer.

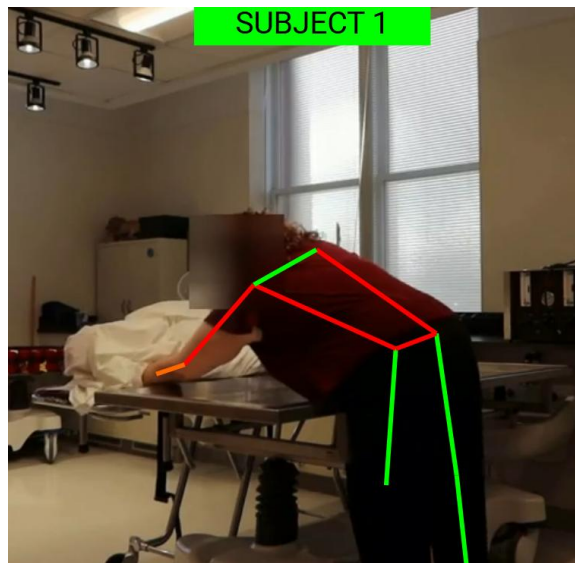
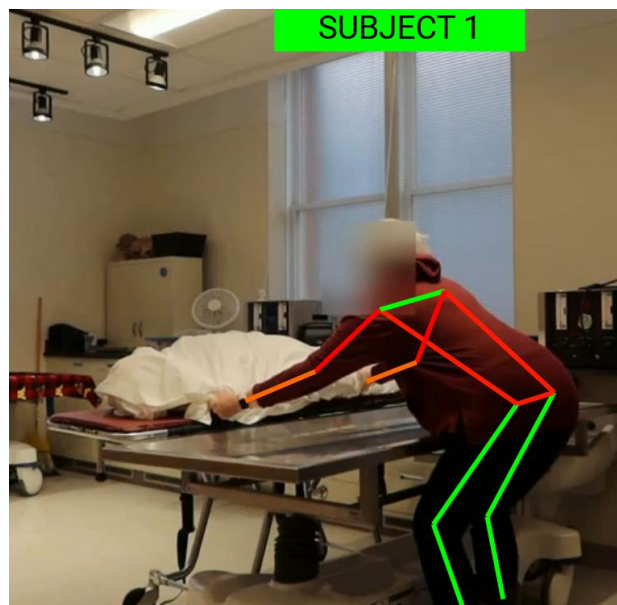


Figure 10. Participant “Emb3” performing a lateral transfer.



Only two tasks were penalized for coupling: the lateral transfer task and the undressing task. The former was assigned a coupling score of “poor: hand hold not

acceptable but possible (+2)”, while the latter was assigned a score of “Unacceptable: no handles, awkward, unsafe with any body part (+3).” This is due to the fact a rudimentary handle could be fashioned from the sheet shrouding the mannequin as it was transferred to the embalming table. However, when undressing, most participants chose to insert their forearm under the decedent’s neck and lift upward in order to remove the decedent’s shirt, as no handles were available and no true handholds were either. These two tasks were also the only tasks penalized for increased force/load, as the weight of the decedent far exceeded REBA’s upper limit of 22lbs. All suturing tasks received an addition +1 to their score for repetitive actions.

Scores increased slightly as participants raised arteries and sutured incisions on the upper half of the body (tasks 4 – 7) as compared to incisions on the lower half of the body (tasks 8 – 11). The exception to this is task 13: suturing the cranial incision (see Figures 11-13).

Figure 11. Emb1 Performing the cranial suture task.



Figure 12. Emb2 performing the cranial suture task.

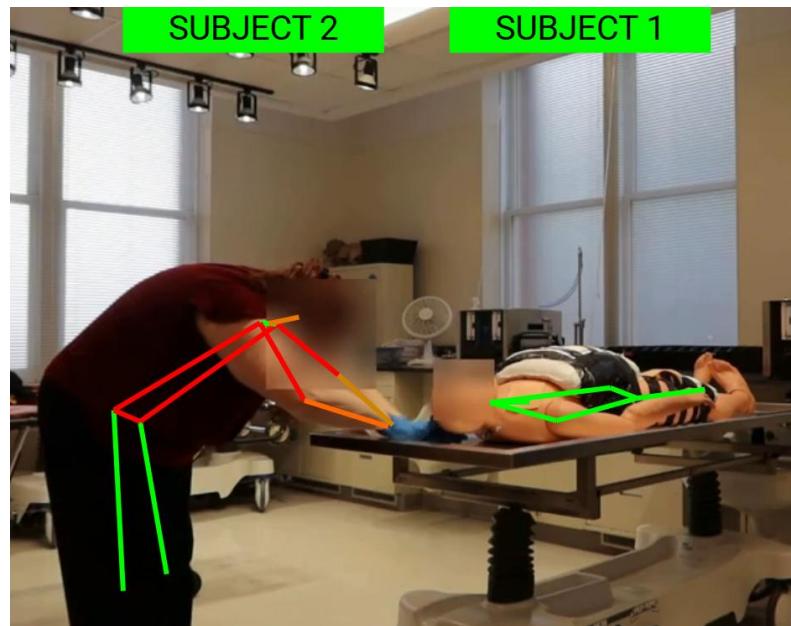
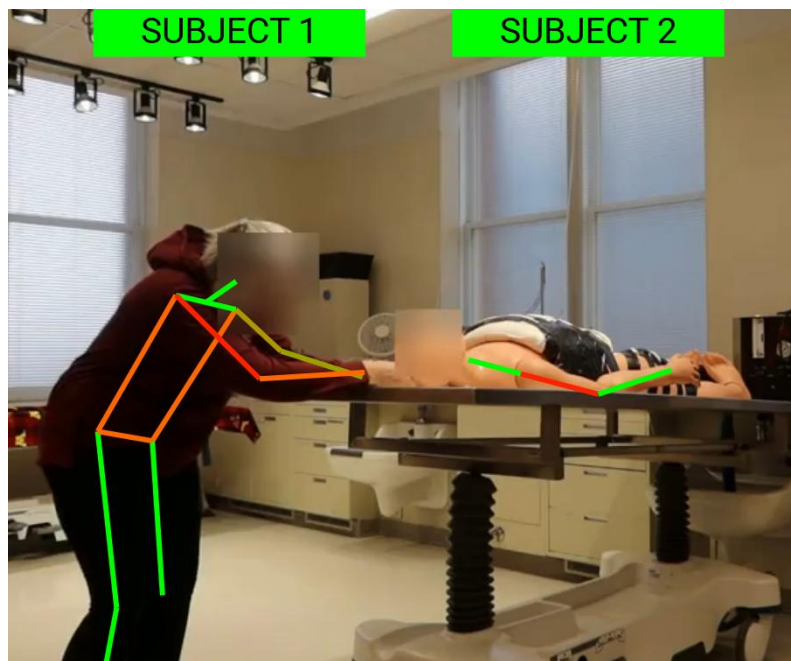


Figure 13. Emb3 performing the cranial suture task.



Both Emb2 and Emb3 experienced strong spikes in their scores when performing the cranial suture task (9 and 7, respectively). Elevated postures were identified in both

the trunk and the upper arm, but these postures were likely exacerbated by the embalming table's height. As seen in Figure 12, Emb2 did not raise their table, resulting in a trunk posture score of 4. However, the remaining participants did raise the table prior to suturing, and received scores of either 2 or 3.

b. Transfer Cohort

The transfer cohort was overwhelmingly male (90%), with an average age of 42.3 years. The transfer cohort, similar to the embalming cohort, was well experienced, with an average of 18.5 years. All teams elected to use a flexible stretcher when lifting the decedent.

Table 17. Average time taken during each task in the decedent transfer process.

Task Type	Avg. Task Time (seconds)
Lower Mortuary Cot	3.2
Shroud	41.8
Place Stretcher	26.2
Lift	4.2
Raise Cot	16.2

The most time-consuming task for FSPs in this study was the process of shrouding, or wrapping the decedent in a sheet (see Table 17). This took an average of 41.8 seconds. In actuality, decedents are shrouded multiple times over with several materials, including with plastic, though this was not required in this study. The second most time-consuming task was placing the decedent on the flexible stretcher (26.2 seconds). Both of these tasks involve rolling the decedent onto their side in order to push either a sheet or a stretcher as far under the decedent as possible. The decedent was then lowered back to the floor into the supine position. Finally, the decedent was either rolled the other direction to continue pulling the material through, or the material was tugged into place without additional rolling.

Almost all task scores were penalized with at least “poor” or “unacceptable” coupling as most tasks had no easy ways in which to grip the decedent. “Good” coupling was assigned to tasks with dedicated handles, such as raising and lowering the mortuary cot and lifting the decedent, as the stretcher was equipped with handles.

Penalties for loads exceeding 22lbs were assigned for almost every task except lowering the cot itself. This could be argued, as the cot itself weighs 54lbs. However, as this task was performed with two people, and the lowering task had them engaging the mechanism and gently guiding the cot to its lowered position, they were not penalized for increased loading for this specific task.

Table 18. Transfer cohort tasks and their median regional and total scores.

	Med. Neck Score (1- 3)	Med. Trunk Score (1- 5)	Med. Legs Score (1- 4)	Med. Upper Arm Score (1-6)	Med. Lower Arm Score (1-2)	Med. Wrist Score (1-3)	Med. Total Score (1- 15)
1. Lower Cot	1	3	3	3	2	1	6
2. Roll Decedent (Start)	1	3	3	3	2	1	10
3. Roll Decedent (End)	1	3	2	3	2	1	7.5
4. Place Stretcher	1	3	2	3	2	1	8
5. Lift Decedent	1	3	2	3	2	1	8
6. Raise Cot	1	3	2	3	2	1	8

Only two body categories did not experience increased median scores from baseline (1): the neck and the wrist. All other categories saw elevated scores.

Specifically, the trunk, upper, and lower arm scores were all consistently elevated, with the lower arm consistently meeting the upper limit for that region.

Figure 14. Team Four preparing to roll the decedent.

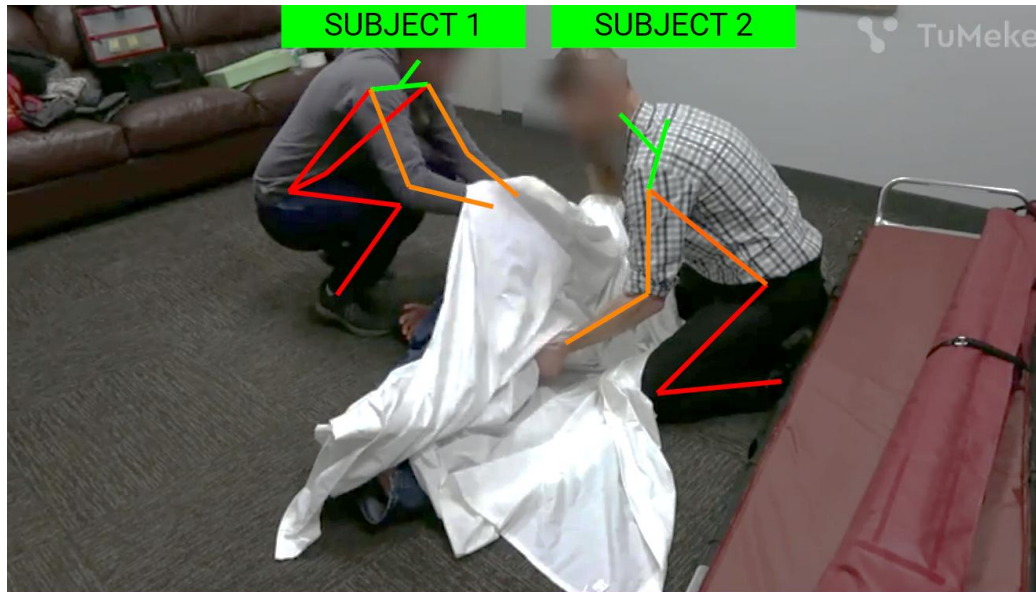
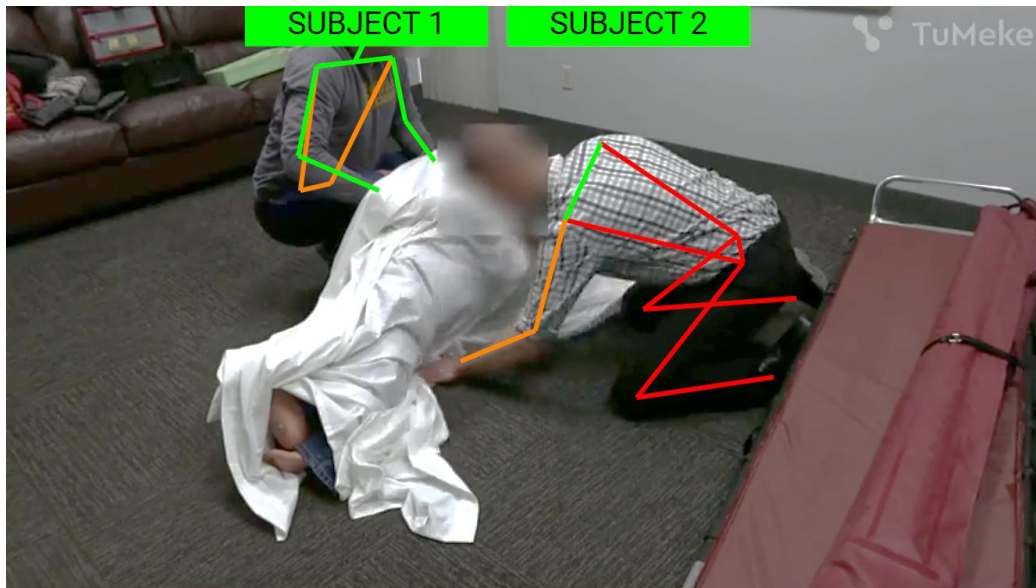


Figure 15. Team Four completing the process of rolling the decedent.



During the rolling process, technique varied between teams in one of two ways. Teams 2 and 3 chose to roll the decedent unilaterally, where both individuals roll the decedent from one side and then reach over the decedent to pull the sheet and/or stretcher

into place before lowering the decedent back to the ground. The remaining three teams (1, 4, and 5) chose a slightly different approach, where one individual rolled (pulled) the decedent towards themselves and the other pushed the sheet and/or stretcher into place from the opposite side. Additionally, one team (Team 2) chose to combine shrouding and stretcher placement tasks into one.

Figure 16. Transfer Team 1 total REBA scores.

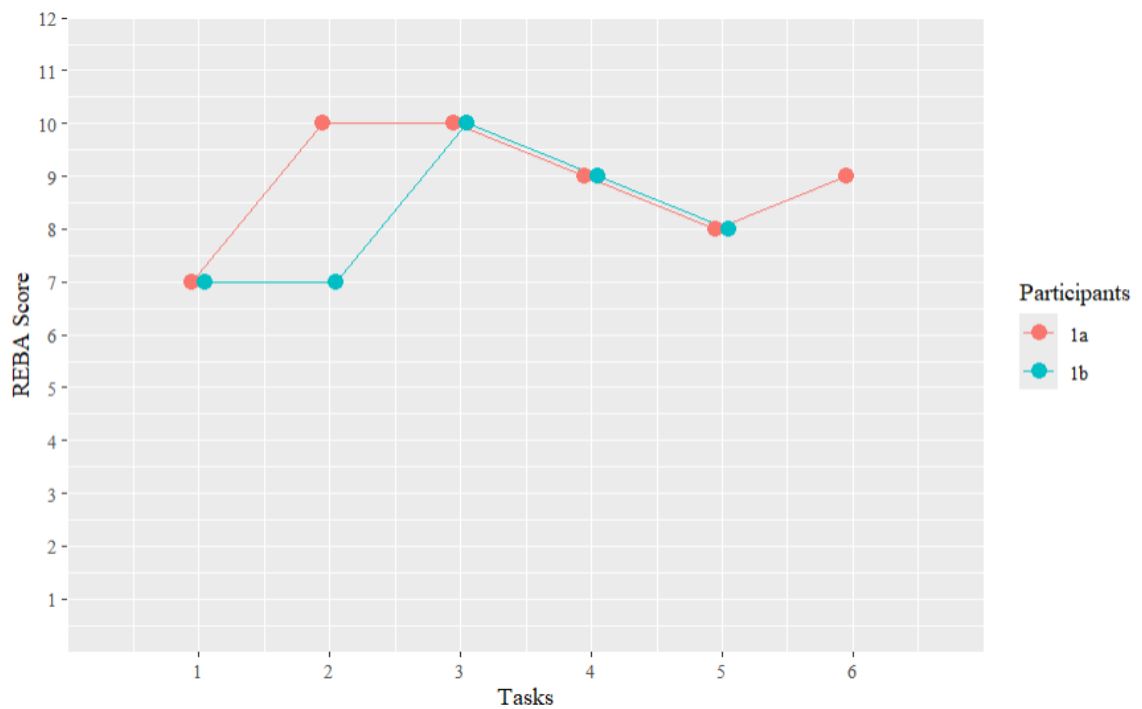


Figure 17. Transfer Team 2 total REBA scores. The gap is due to how this team combined shrouding the decedent (tasks 2 and 3) with shrouding the decedent (task 4).

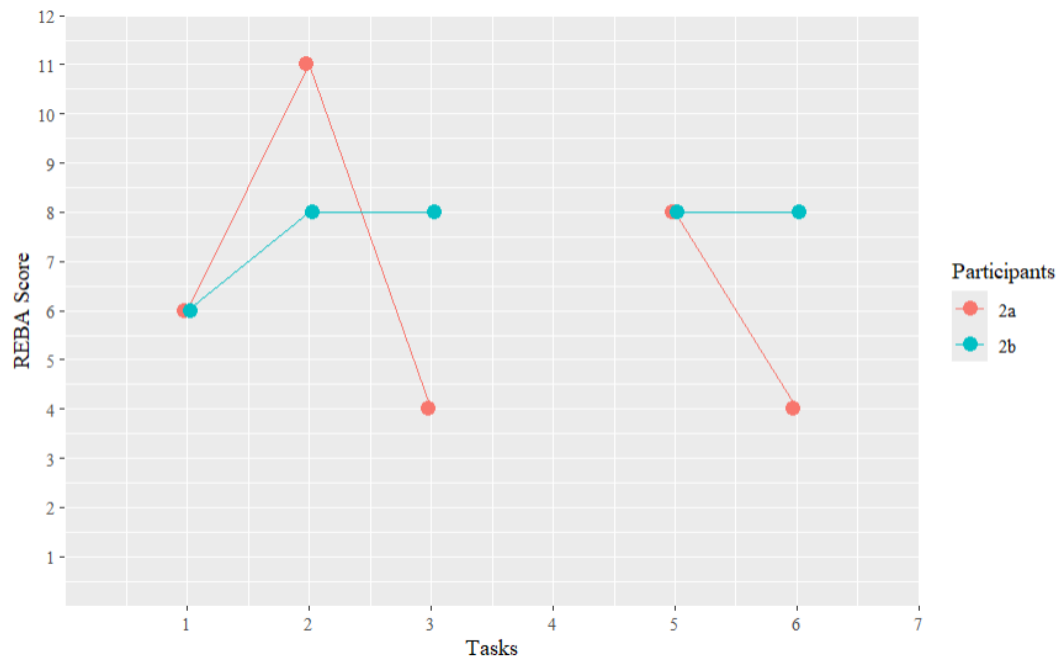


Figure 18. Transfer Team 3 total REBA scores.

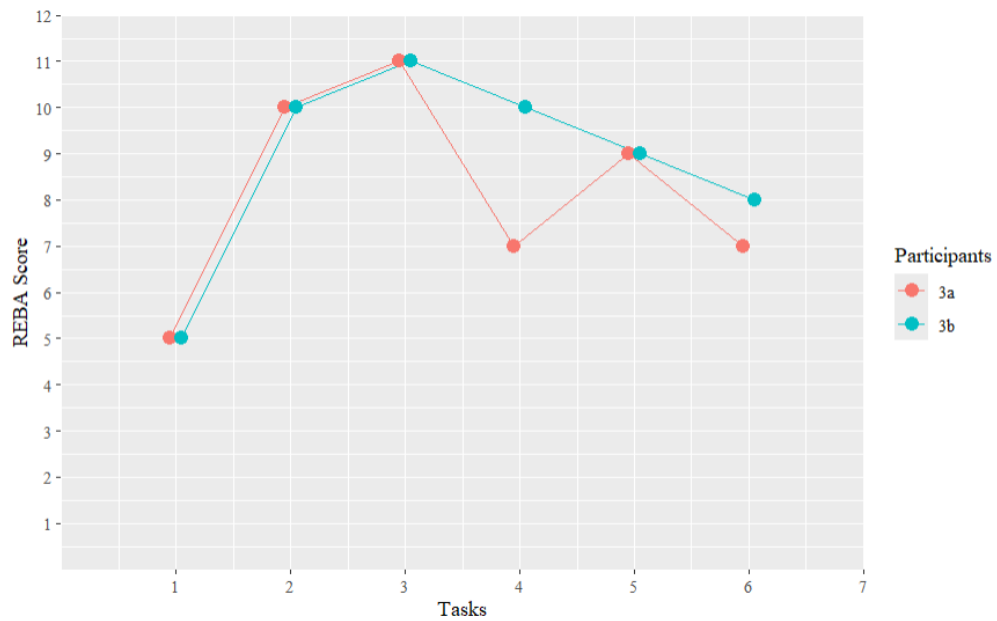


Figure 19. Transfer Team 4 total REBA scores.

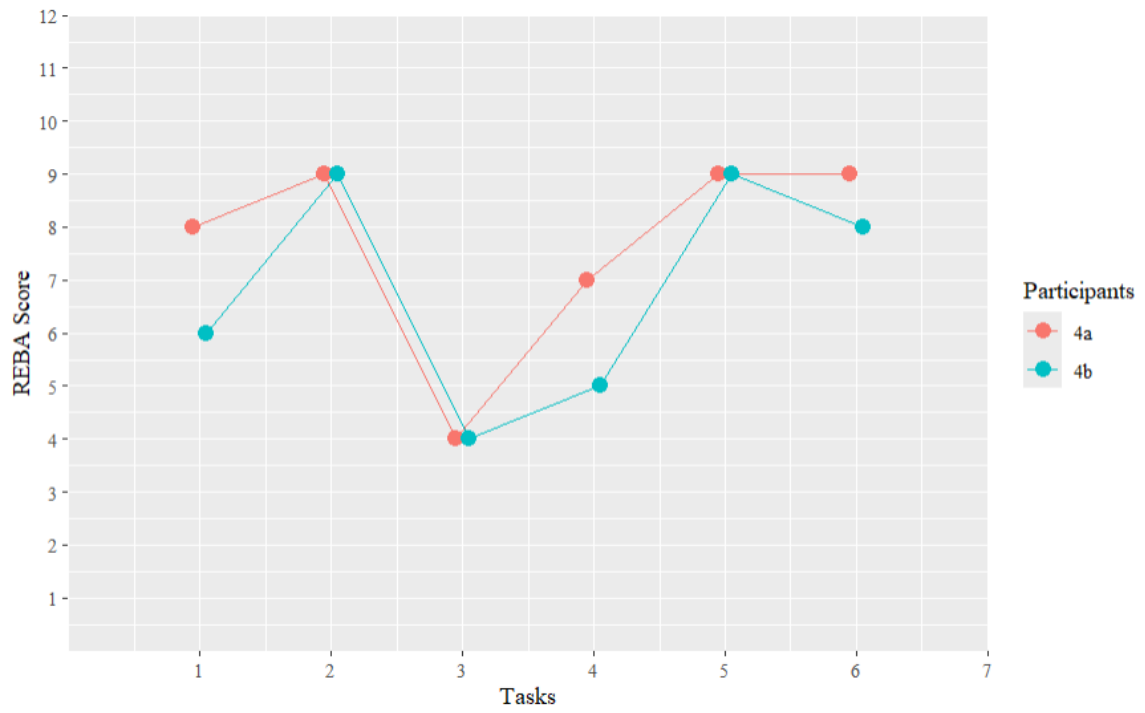
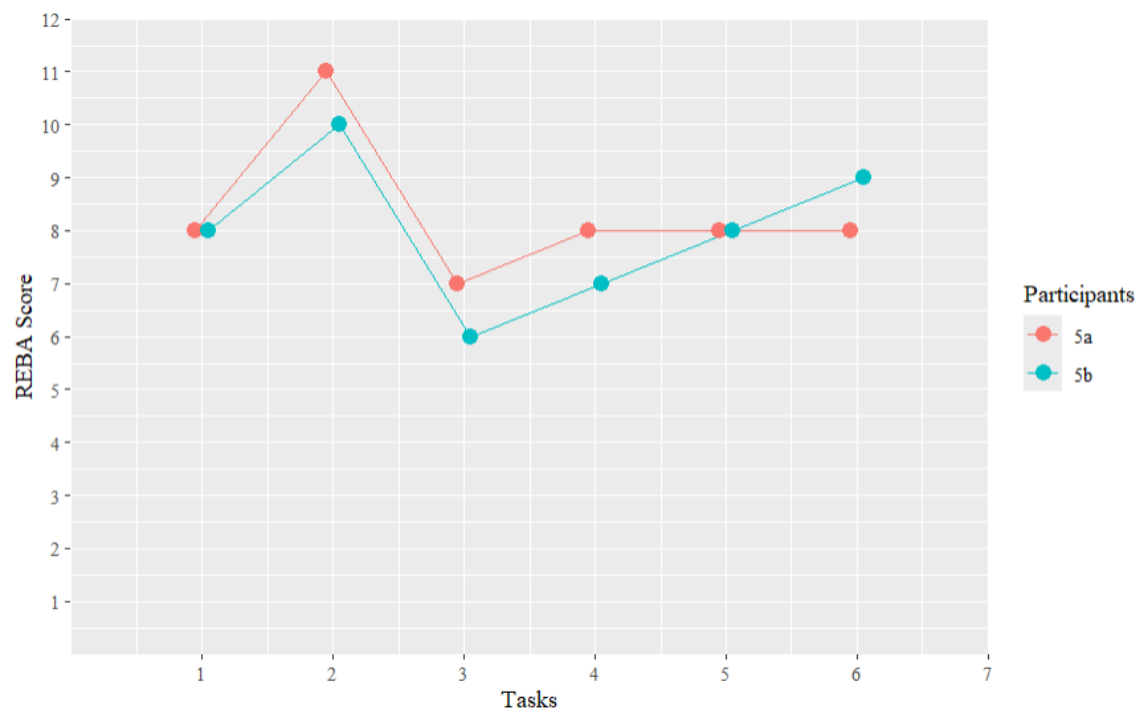


Figure 20. Transfer Team 5 total REBA scores.



Most teams saw elevated scores with the “Roll Decedent (Start)” task in at least one of the participants (task 2) (Figures 16-20). This is likely due how individuals are reaching over the decedent to grab ahold of the decedent’s opposite side or arm to roll them onto their near side. This is further corroborated by the fact that scores dropped from “High” or “Very High” risk levels down to “Medium” risk when the rolling task ended (task 3) in two teams (Figures 19 and 20). Scores for the stretcher placement task (task 4) were similar to rolling task scores. Across these three tasks, individuals are frequently in positions of high knee flexion (crouched, kneeling), a factor which has been correlated with chronic knee pain in men (Herquelot et al., 2015).

The lifting task (task 5) saw REBA scores between 8-9 across all teams, or “High” risk. Due to the use of the stretcher, coupling was not penalized due to the presence of handles. However, lifting 200lbs from floor height is simply risky from a postural standpoint regardless of handle availability. Even so, to the credit of the participants, posture scores for the lifting task never exceeded the scores received for the rolling task. This suggests that the MSD risk for FSPs may not be fully attributable to lifting tasks alone, and that riskier postures are being adopted in other areas.

4. Discussion

All postures measured in the transfer cohort are considered risky per REBA guidelines, though the magnitude of this risk is not uniform across all tasks. Rolling patients to shroud them appears to carry the highest risk, with lifting decedents follows close behind. While technique varied among the teams assessed, both styles of shrouding led to similarly risky postures. This indicates that the task as a whole should be redesigned in some capacity to limit the level of postural risk imparted on FSPs.

In the embalming cohort, the lateral transfer task was found to have the highest REBA scores, followed by undressing the decedent, cranial suturing, and the suturing of lower body incisions (femoral, tibial). One factor identified that may improve posture is the use of adjustable tables for embalming, specifically raising them to taller heights in order to limit trunk flexion. However, it is unclear if this would benefit the postures used

for suturing incisions on the legs, as embalmers angle their table downward at the foot-end to facilitate fluid drainage. Therefore, they may not be able to raise the table to the height they may require.

5. Limitations

Multiple limitations affected this study. As the software is relatively new, many issues were discovered in the process of analysis. In one instance, I was unable to assign postures due to an error in the software's code, which mistakenly believed I had assigned more postures than I had. However, TuMeke Ergonomics was supportive and worked diligently to remedy these issues when they were identified. Furthermore, the benefits of AI-assisted software are disputed. There is always a question of how to approach data analysis if the researcher believes a mistake has been made by the program itself. I did not validate my own series of REBA scores against TuMeke's REBA scores because this was not written into the IRB protocol. Additionally, using only one set of human-determined scores to validate the software's scores would not be enough. Rather, multiple individuals would need to measure posture manually in order to prove – or disprove – the validity of TuMeke's outputs, and this study did not budget for additional researchers to do this. While no body position inputs were changed in this research, I believe further study should investigate the accuracy of this program's scoring as compared to the original pen-and-paper method employed by REBA users.

It was discovered that personal protective equipment (PPE) made it more difficult for the software to determine the posture of participants. While only one participant wore full PPE (emb1), this individual's scores may be inaccurate when compared to other participants. Unfortunately, "emb1" was unavailable for refilming.

Other equipment failures occurred as well, including the mannequin, which broke on the final day of filming. Thankfully, another mannequin was available courtesy of MTC, though it weighed slightly less than the original mannequin (185lbs vs. 200lbs) and was slightly taller (6ft vs. 5ft5in).

Beyond equipment challenges, this study is naturally subjected to other forms of bias that most research is vulnerable to. Due to the fact that filming occurred in controlled

environments, using a mannequin, the authenticity of behaviors observed is questioned. However, this is the first time these professionals have been studied in this manner, meaning no comparative baseline exists. Only future research will be able to judge the accuracy of these observations.

Finally, it is important to acknowledge that participants may have used better posture and technique due to the fact they were being observed. This is known as the Hawthorne Effect (Elston, 2021b). Furthermore, the staff at MFC are performing these lifting behaviors more often than other FSPs, as they are a trade service and not a fully-functioning funeral home. Therefore, transferring decedents makes up a larger portion of their work. This could imply they are more experienced than the average FSP, and place a higher emphasis on good lifting behavior. More research is suggested in order to determine if the individuals assessed in this study are representative of the wider FSP population.

6. Conclusion

As noted in the 2011 study by Cowley and Legget, “[Funeral] staff will generally place client care and dignity above their own safety” (Cowley & Leggett, 2011). While the tasks studied here may be short in duration, these behaviors can and will add up over time as they are repeated, potentially resulting in future injury.

Future study of both cohorts is recommended. Additionally, the opportunity to study work behavior in real-life situations would be extremely beneficial, though logistically challenging.

While this is only a small pilot study, these findings show that FSPs put themselves at risk for MSDs due to the postures used during some of their most commonplace tasks. It is the author’s hope that these findings galvanize changes in policy for FSPs, or at the very least spur innovation in both task redesign and the creation of devices specifically designed for this population’s use.

This study was funded in part by the Midwest Center for Occupational Health & Safety (MCOHS) Pilot Project Grant.

Chapter 6. Lifting Device Design

Synopsis: As research progressed in this space, it was made apparent that there was a need for a lifting device specifically designed and produced for funeral service professionals (FSPs). This device would be functionally similar to lifting devices used by healthcare professionals, but with more consideration for the unique needs that FSPs might have, including reduced noise during operation, space constraints, and the lack of assistance by external power sources. Specifically, the device is required to assist an FSP to lift a decedent from the floor to the height of a collapsed mortuary cot.

Background: FSPs must frequently perform mass handling techniques similar to those used by healthcare professionals (HCPs). While multiple lifting devices have been created to assist HCPs perform these tasks, very little attention has been paid to FSPs in the same circumstances.

Objective: The primary objective was to iteratively test and design decedent lifting devices specifically built for FSP use in house call settings where a decedent is on the floor and needs to be lifted onto a mortuary cot.

Methods: Three different student design groups were asked to develop a prototype device that could lift up to 400lbs. Students were given a list of design requirements, but they were left to make their own decisions on form factor, provided the project sponsor felt their design was feasible for FSPs to use.

Results: Three devices were designed by three separate student groups. Only prototype v.2 was unable to be built due to time constraints. While user testing is currently not scheduled, future research will examine how FSPs respond to these prototypes.

Conclusions: Three prototypes have been developed to solve the issue of floor-to-cot lifts. Two of these prototypes were built at full-scale, though user testing was not possible

at this time. Future experiments will help determine which of the three versions is best suited for FSPs.

Keywords: Lifting Device, Funeral Service Professional, Mechanical Engineering, Design

1. Introduction

Previous research has been done to explore the challenges experienced by HCPs lifting both living (S.-J. Lee & Lee, 2017; Pompeii et al., 2009) and deceased patients (Suresh et al., 2024), with one study attributing patient handling for 31% of musculoskeletal injuries reported in a seven-year period (Pompeii et al., 2009). Clearly, patient handling does not come without risks to those who must perform such a task. However, decedent handling has received significantly less attention, despite its reputation for being a particularly onerous work task (Suresh et al., 2024).

Previously, there have been significant efforts to ameliorate this issue in HCPs, including the creation of safe lifting practices and devices to assist HCPs with lifting. However, it is important to note that training alone is not the most effective way to encourage safe lifting behavior (Larouche et al., 2019; A. Nelson et al., 2003). Research shows that while some mechanical interventions may be beneficial in reducing spinal loading on HCPs, these same devices may also increase spinal exposure due to prolonging the time needed to engage in the task itself. This is especially true when flexed-trunk postures are required for device operation. Even so, having the option for mechanical intervention is a valuable asset for HCPs even if it is not appropriate or useful in every situation (Daynard et al., 2001). However, even with these solutions, there are still challenges with getting HCPs to use these devices, especially when HCPs are not involved in the selection/purchasing process (A. Nelson et al., 2003).

As death can occur anywhere at any time, a decedent can also be found in any number of locations. In these non-clinical situations, FSPs resort to simple “man power.” Furthermore, FSPs are likely to place the decedent’s dignity and care ahead of their own needs (Cowley & Leggett, 2011), which can translate into riskier lifting behavior. This same effect has been noted in paramedics as well (Larouche et al., 2019). Additionally, FSPs are reluctant to use devices that may make noise, as it can upset the family and may be considered offensive. There is also the issue of whether a power outlet is available near to where a decedent has been found. Therefore, while options like HoverMatts exist in clinical spaces, their noise level and demand for external power make them unlikely candidates for adoption for FSPs (HoverTech, 2026). As of now, there are currently no

portable lifting devices designed for FSPs to use in house call settings. This means all of these factors align to create an unmet need due to an unsafe practice and injury potential.

The technology available to FSPs is limited at best. Primary tools available include low friction slide boards, stretchers, and scoops/sleds (Affordable Funeral Supply, 2026c; Mortuary Mall, 2026a). Slide boards are used as assistive devices when performing lateral transfers, as their low friction allows decedents to slide more easily than they might on other surfaces. However, research found that despite the benefits provided by the boards themselves, practitioner posture was still vital to lowering the risk of spine loading, meaning that the boards do not fully solve this issue (S. McGill & Kavcic, 2005). Stretchers, scoops, and sleds are designed for a somewhat similar use. Their primary goal is to transfer decedents short distances from areas where it would be difficult to take a mortuary cot. This may include outdoor locations, areas of high elevation, up/down staircases, etc. None of these devices contain any form of assistive mechanisms, meaning once again these are used solely under user-generated power. This is also true for the primary tool of the FSP's arsenal: the mortuary cot (Affordable Funeral Supply, 2026b; Mortuary Mall, 2026b). These cots, while collapsible, do not contain any internal power mechanisms, once again relying on the user's strength to disengage the locking mechanism and raise/lower the cot, loaded or otherwise. However, these devices are wheeled, allowing them to be rolled from place to place.

One of the only examples of a mechanized device for FSPs comes in the form of "The Stretcher-Stepper." This device is designed to eliminate several of the highest effort maneuvers of a house call. This device is able to "walk" down stairs on its own, eliminating the need for FSPs to carry a cot or stretcher as well as a decedent while navigating stairs. This solution does solve some of these lifting challenges. However, it does not eliminate the initial lift required to get a decedent off the floor and onto the cot. Furthermore, the Stretcher-Stepper also does not collapse any lower than a traditional mortuary cot, and it costs significantly more (\$12,500 vs. \$3,644) (Affordable Funeral Supply, 2026a; Mortuary Lift Company, 2026). This means FSPs are still required to perform a floor-to-cot lift.

As funeral homes are often small businesses, cost can be a major factor when considering new equipment (Cowley & Leggett, 2011). This may mean that selection is based almost entirely on what can be afforded versus what would work best for the FSPs performing the tasks. Therefore, much like with HCPs, this could lead to a reluctance to adopt this new equipment, resulting in no change in risk.

Given the large gap in the funeral service space for mechanized assistive devices, it seemed to be a good problem for student design teams to examine. The project was then pitched to the Mechanical Engineering Senior Design course, where it was accepted for two rounds of student work, and then later used as a project in the Advanced Mechanisms course, both at the University of Minnesota: Twin Cities.

2. Methods

Three teams of students – two undergraduate, one graduate - each set out non-simultaneously to create a decedent lifting device based on a series of 12 design requirements (Table 17). These requirements were created based on feedback from users interviewed in the project's earliest days, and were distilled from conversations with relevant stakeholders and experts. Additional requirements, such as manufacturing costs and final cost to consumers were also considered. All three groups were presented with the same task: device a device suited to the needs of an FSP who needs to move a decedent from the floor to their collapsed mortuary cot. A detailed description of this issue and the demands it places on the body can be found in Chapter 5.

All groups were given the same design brief and guidelines, but were encouraged to decide what they felt was the most optimal design, regardless of any prior team's outcomes. As no group was working at the same time, each team was provided with all of the previous team(s) notes, documents, and digital design files. They could choose to improve on existing designs, or take their prototype in an entirely new direction.

Table 19. A list of the design requirements each team received.

Design Requirements
1. The device must not weigh over 50lbs.
2. Device needed to lift a decedent from floor height to 12in.
3. The device could require no more than two operators/users.
4. The device needed to serve an individual up to 400lbs.
5. The device must be able to lift an individual of height (75in)
6. The device needed to be relatively quiet.
7. The device's visual appearance cannot be offensive.
8. The device cannot harm the decedent.
9. The device must be easily stored/transported via a standard first call vehicle.
10. The device should be powered internally or by human effort, but should not rely on power found on-site (i.e. wall outlets.)
11. Time operating the device should be limited.
12. The device must be reusable.

Prototypes v.1 and v.2 were each given approximately three and a half months (one college semester) to design and build their respective prototypes. Prototype v.3 was developed for the purposes of a master's level project, and therefore was completed over a two-year period. I supervised all three of these teams throughout the project's duration, and offered feedback where appropriate.

3. Results

a. Prototype v.1 - Spring 2023

i. Design

The first prototype developed was a team of four undergraduate mechanical engineers: Ryne Juidici, Grant Silewski, Chloe Kutulas, and Gabe Nelson. This group had the greatest challenge of all three, as they were the first, and therefore needed to lay the foundation of research with which to build their prototype without referencing what anyone else had done prior.

Figure 21. A digital rendering of prototype v.1.



This team settled on a system that uses four mechanical subsystems: the board (blue), the scoop, the screw mechanism, and the frame connection modules (See Fig. 21). The board is the simplest aspect, with the design not being markedly different from the slide and backboards previously discussed. The remainder of the device consists of two halves, with each including an L-shaped scoop, a lead screw and handle assembly, and a frame that connects it to the other portion of the device. Turning the handle on both sides raises the scoop, and therefore raises the board, whereupon a collapsed mortuary cot can be rolled underneath. The decedent and board can then be lowered onto the cot, and the device is disengaged. The device is powered via human effort by turning the respective cranks on each side. Table 18 lists design requirements and their respective outcomes for the first team.

Table 20. A list of the design requirements and their outcomes for design v.1.

Design Requirement	Target Value	Real Value	Pass / Fail / In Progress / Unknown
1. Weight Limit	50 lbs	49.4 lbs	Pass
2. Lifting Height	12 in	12 in	Pass
3. User Count	2 Users	2 Users	Pass
4. Lifting Capacity (Wt.)	400 lbs	405 lbs	Pass
5. Decedent Length	75in	68in	Fail
6. Noise Level	40 dB	62.98 $\pm$ 5.59 dB	Fail
7. Visual Appearance	85% Approval	86% Approval	Pass
8. Harm Capability	No	No	Pass
9. Easily Transportable	Yes	Yes	Pass
10. Power Source	Internal/Human	Human	Pass
11. Operating Time	≤ 300 s	244 $\pm$ 15 s	Pass
12. Reusable	Yes	Yes	Pass

This design was very successful; only two of the design requirements were not met. Even so, with regards to the noise level requirement, this may have been due to a testing error, as the ambient volume in the room where testing occurred was around the same level with and without device operation. Therefore, it is unclear whether the device actually failed this test. Additionally, when considering decedent height, the length of the board may not preclude its ability to accommodate a decedent longer than itself. It is possible to bend the knees of a decedent in order to “shorten” them, making it possible that the board length (currently 68in) might be long enough for the vast majority of the population.

Overall, this design fit the design requirements well. While this design may have areas that could be finessed, it was an excellent first attempt at a novel concept.

ii. Opinion

This design, while quite complex, is very well thought out. By using a crank mechanism, the lifting capabilities can be tightly controlled by the operators, who can lift the decedent incrementally without any sudden movements. With this control however, comes the expense of time. This device takes a significant amount of time to extend, estimated at approximately 244 seconds, or about four minutes. Comparing this to the length of time it takes to manually lift a decedent (4.2 seconds, as found in Chapter 5), which is 52 times as long. This may lead to a hesitance to adoption by users, especially if they feel the extra time does not justify the safety advantage.

Additionally, in order to crank the device, FSPs will need to stand in a flexed posture to turn the handle/screw mechanism. Similar to observations found in HCPs, lifting devices can cause more spinal loading because of the flexed postures they demand. Furthermore, the use of assistive devices can actually increase exposure to problematic postures due to the additional time and behavior(s) it takes to use an assistive device (Daynard et al., 2001).

An aspect that should be investigated more thoroughly is whether this device can be made lighter. Currently, it is only .6lbs below the target value of 50lbs. This target value is the upper end of tolerability, as this device needs to be easily transported via car, carried into homes, used, and removed, without being a nuisance. A related aspect not examined in this project was how best to transport this device. It was understood that this device would need to fit in a first call vehicle (typically a Chrysler Town & Country van, or something similar). The board itself could easily be stored and carried on the mortuary cot. However, the rest of the device would be cumbersome, as components do not nest or stack well. There may be concern from users if the device is simply placed in the back of the van with no security or padding, as device could tip over in transit and hit the decedent, causing damage.

The device itself, while not inherently offensive looking, is also not necessarily the most attractive. Exposed mechanical aspects can lend an industrial feel to the device, a fact which was noted by the design team in their final report. Early pilot data indicates that the survey data, while positive, was primarily from others in the mechanical engineer

space and not FSPs, meaning that the data is likely skewed more positively. The device, therefore, may not be well received by FSPs, and by extension, their client families in its current state. Future iterations of the device should be engineered to either minimize this aspect, or include a cover to encase the mechanical components as much as possible. The use of covers for certain pieces of equipment is not new to funeral service; mortuary cots can be fitted with covers to “soften” the appearance of a decedent on a cot. These covers can range in appearance from solid colors, flags, or even quilts (Affordable Funeral Supply, 2025; Mortuary Mall, 2026a).

All of these points, while important, do not ultimately detract from what is a solid first attempt at designing a novel lifting device. Much of the feedback centers around aesthetics and the device’s appearance, not the mechanical function. In my opinion, this design could be refined into a viable product for this industry.

b. Prototype v.2 (Fall 2023)

i. Design

The second prototype was developed by another team of undergraduate mechanical engineers: Lukman Al-Sulaimi, Annah Anderson, Dalia Garas, Hendrie Grant, and Paul Schmitter. The prototype consists of three primary parts: a linear actuator, a slider-crank mechanism, and a parallelogram mechanism (Figure 22). A bottle jack functions as the primary power source. Similar to prototype v.1, an additional transfer board is mandatory for use. To operate, a decedent is shrouded and laterally transferred onto a transfer board mounted on the lifting forks. The device is then activated via the handle which pumps the bottle jack, raising the decedent to the appropriate height for another lateral transfer onto a lowered mortuary cot. This removes the need for FSPs to perform a floor-to-cot lift. The device can then be lowered by releasing the bottle jack valve, whereupon the device will lower with minimal effort.

Figure 22. A digital rendering of prototype v.2 in the lowered position.

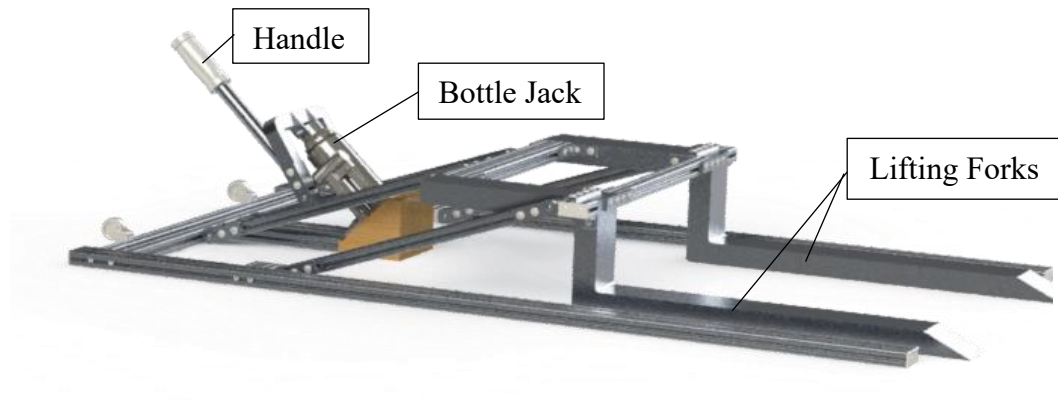
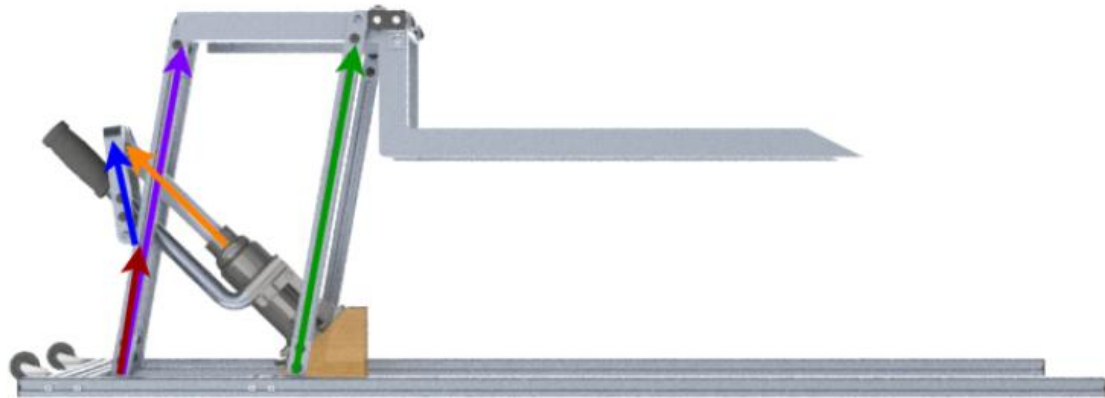


Figure 23. Digital rendering of prototype v.2, raised position. The colored arrows indicate different components of the device (crank (red), connecting rod (blue), slider (orange), driver (purple), follower (green)).



Ultimately, this prototype was not constructed outside of a digital setting, as the team did not have enough time to complete this task. Therefore, this device has only been tested in the digital space via finite element analysis (FEA). Therefore, all testing with this device was done in the digital space, not in a hands-on manner. Prototype v.2 passed seven of the twelve design requirements set. As with prototype v.1, the decedent length

requirement, while technically failed, may not be an issue. However, hands-on testing is required to confirm this.

Table 21. Prototype v.2 design requirement results.

Design Requirement	Target Value	Real Value	Pass / Fail / In Progress / Unknown
1. Weight Limit	50 lbs	48.38 lbs	Pass
2. Lifting Height	12 in	12.43 in	Pass
3. User Count	2 Users	2 Users	Pass
4. Lifting Capacity	400 lbs	400 lbs	Pass
5. Decedent Length	75 in	72 in	Fail
6. Noise Level	60 dB	Unknown	Unknown
7. Visual Appearance	80% Approval	95.8% Approval	Pass
8. Harm Capability	No	Unknown	Unknown
9. Easily Transportable	Yes	No	Fail
10. Power Source	Internal/Human	Internal	Pass
11. Operating Time	30 s	Unknown	Unknown
12. Reusable	Yes	Yes	Pass

ii. Opinion

As this prototype failed two design requirements outright and was not able to confirm results for three others, it is difficult to truly verify exactly how effective this device truly is in performing its assigned tasks.

The aesthetics of the device suffer some of the same issues as the first: a largely mechanical appearance that may not be inoffensive enough to be used in sensitive situations. Approval ratings for this device are actually higher than prototype v.1. However, without seeing it in person, it is possible that users may feel differently when the device is actually in front of them. Visual appearance was measured via survey during the student's final design showcase for both prototype v.1 and v.2, meaning individuals

were rating appearance in a positive atmosphere and not in a more emotionally charged environment like what might be found in a home after a loved one has passed.

An aspect of this device that is a detractor is the fact that the device does not come apart. While the total weight is 1.02lbs lighter than prototype v.1, it is all one component compared to prototype v.1, which is made up of two halves. This allows the weight to be split between the pieces, facilitating easier transport. Prototype v.2 unfortunately was not designed to come apart in any fashion. Furthermore, during the design process, the size of the prototype grew larger than anticipated, leading to an even more unwieldy device.

Finally, compared to the first prototype, the manner in which a decedent is loaded onto a mortuary cot has shifted significantly. Where the first prototype allowed users to directly lower a decedent onto the cot itself, this prototype asks users to laterally transfer decedents from the device's elevated position onto a collapsed mortuary cot. This may be a negative feature depending on how stable the device is when fully loaded.

However, one aspect of loading that is a positive change is the ability to place a mortuary cot lateral to the device instead of coronally. This leaves more room to maneuver placement, and likely easing transfer from the device itself.

c. Prototype v.3 (2024-2026)

i. Design

The third and final prototype was designed by Kate Huelskamp. The mechanism employed by this device is a six-bar linkage. This system is connected to a series of gears and pulleys to increase the mechanical advantage, allowing it to lift a 400lb decedent 15 inches into the air with only 14 pounds of force. Similar to prototype v.2, a handle is used to apply leverage to raise the decedent, at which point a mortuary cot can be placed beneath the decedent. This removes the need for manually lifting the decedent.

Figure 24. Prototype v.3 in the lowered position.



Figure 25. Prototype v.3 in the raised position.

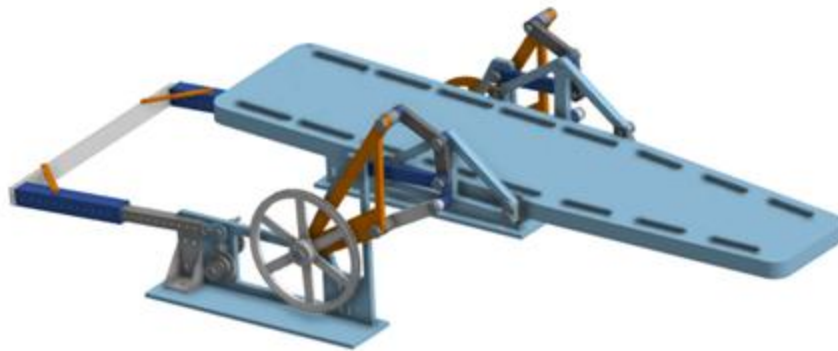


Table 22. Prototype v.3 design requirement results.

Design Requirement	Target Value	Real Value	Pass / Fail / In Progress / Unknown
Weight Limit	50 lbs	49.3 lbs.	Pass
Lifting Height	12 in	15 in	Pass
3. User Count	2 Users	1 User	Pass
Lifting Capacity	400 lbs	400 lbs	Pass
Decedent Length	75 in	72 in	Fail
Noise Level	60 dB	Unknown	Unknown
Visual Appearance	80% Approval	Unknown	Unknown
Harm Capability	No	Unknown	Unknown
Easily Transportable	Yes	Yes	Pass
Power Source	Internal/Human	Internal	Pass
Operating Time	30 s	Unknown	Unknown
Reusable	Yes	Yes	Pass

At the time of writing, this device was undergoing construction and was therefore unavailable for user feedback. However, based on digital analysis, the device seems to pass seven out of the twelve design requirements, with the four remaining elements unknown.

ii. Opinion

Similar to prototype v.2, it is difficult to fully examine the efficacy of this device in performing its designated tasks. Once again, the aesthetics are a concern, perhaps even more so due to the exposed gears on each side. There is also a question of whether having these gears uncovered will pose a risk to a decedent, though this can only be confirmed via testing, and may be ameliorated via a cover. This will be designed at a later date.

One improvement in this iteration versus prototype v.2 is that it can separate into three pieces, making transport easier even though it is slightly heavier. Another

improvement is the larger bar/handle to facilitate raising the decedent. Additionally, similar to prototype v.1, the decedent is only laterally transferred once with this prototype, and lowered into place onto a collapsed mortuary cot. This removes at least one instance of a task [lateral transfer] that is risky to those that perform it.

One potential negative of this device is that prototype v.3 now requires the FSP to place the mortuary cot coronally instead of laterally as was done in prototype v.2. This may allow FSPs to work in more constricted spaces, but it may also be more difficult to place the mortuary cot beneath the device. If this task is too difficult, it may inhibit users from adopting the device.

This device pulls some of the wisest design choices made by other teams together, creating something that may very well be suitable to real-world situations FSPs find themselves in. While user testing is not possible at this time, it is my hope that testing can occur in Fall of 2026.

4. Conclusion

Due to the hard work of several student groups, three feasible prototypes have been created that directly solve a vexing issue for FSPs: that of a decedent who has been found on the floor. Lifting decedents from the floor to the mortuary cot has been shown to be challenging (see Chapter 5). If this process can be made easier via the use of a device, then it is possible to limit exposure to harmful lifting behaviors.

While the form factor differs slightly, these prototypes are all capable of lifting 400lbs twelve inches into the air. This would allow a mortuary cot to be placed under them, eliminating the need to perform this kind of lift manually except in the most extreme cases.

Each of these prototypes still require user testing with FSPs to test feasibility and decide on the specific form factor that is the most appealing. However, regardless of the success of one prototype over another, each of these devices represent a new step into solving a currently unmet need for the funeral service industry.

Chapter 7. Conclusion

The primary goal of this body of research was to describe both the musculoskeletal risks and mental challenges faced by funeral service professionals in the context of their work. This was done through three different methods: semi-structured interviews, a multi-state survey, and postural analysis while performing workplace tasks. Additional research was done in an attempt to create a device that solves some of the problems identified herein.

Future research is needed to bolster the findings contained in the previous chapters. One of the greatest barriers to all of the research projects included here was recruitment. I am thankful for all of the participants who generously gave their time to further this research.

While the sample sizes in this research were smaller than what was hoped for, even these initial findings have something to offer, and that is a much-needed examination of a sorely misunderstood occupation. To the author's knowledge, the results found herein represent a first look at this profession, including quantifying where musculoskeletal symptoms are most prevalent – and most painful. The low back region scores the highest in both of these categories, not unlike what is found in the nurse population. Furthermore, understanding the reluctance to seek healthcare, both mental and physical, creates an opportunity for healthcare professionals to do better by those that care for their patients after the end of their life. Additionally, newly available software accommodated analysis of previously misunderstood needs. This allowed for better understanding of the physicality this occupation demands, and in turn will inform future design decisions as new lifting prototypes are developed for this industry.

The results contained in the last chapters will hopefully shed light on a misunderstood occupation. It is this author's hope that highlighting the work aspects studied herein, others may follow and build upon these findings, furthering our understanding of this deeply important occupation.

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Appendix A. Pilot Interview Study Questions

- Are you currently a licensed funeral service professional?
- What states are you a licensed in?
- How long have you been licensed?
- What gender do you identify as?
- What is your age?
- How would you characterize the community you serve? Urban? Rural?
- On average, how many calls does your facility handle on a per-year basis?
- If multiple locations, can you explain your personal involvement in other locations or how work is divided among the staff?
- Roughly, how many calls would you say the divide is between house calls, hospital calls, etc.?
- On any given first call, how many individuals travel to take the body into the funeral home's care?
- Does this number change with the location of the decedent? (Home, hospital, etc.)
- What circumstances does this number change (if at all)?
- Does your facility use a trade service?
- If yes, under what circumstances?
- If no, why not?
- Have you ever been acutely injured due to your work? (Such as a needle strike, laceration, etc.)
- Would you be willing to explain the circumstances that led to your injuries?
- Did you seek medical intervention?
- Did you report the injury to your supervisor?
- Have you experienced long-term injury from your work? (Such as back pain, joint pain, etc.)
- If back pain is present, where? (Cervical, thoracic, lumbar?)
- Where you feel this pain came from?
- How long have you had this pain?

- Has this pain affected your ability to perform your work?
- Have you had any medical intervention for your pain?
- Is your supervisor aware of your injury/pain?
- What accommodations were made to help you after you began experiencing this pain?
- Does your facility use any aids to help lift/handle human remains?
- What devices are available?
- Do you personally use them?
- Do you find your job to be stressful?
- On a scale of 1 – 10 (from no stress to extreme stress), how would you rate it?
- Do you feel your mental health has been or continues to be affected by your work?
- Can you explain what aspects of your work you feel affect your mental health?
- What kind of debriefing or support does your facility offer?
- Have you sought any professional or medical support for your mental health?
- What barriers prevent you from accessing support (if any)?
- Do you feel there is adequate support for this occupation, as a whole?
- This could mean physical, mental, social, etc. Essentially do you feel as though this occupation has all of the tools it needs to allow its professionals to be successful, healthy, and happy individuals in both the long and short-term?

Appendix B. Midwest Survey Study Questionnaire

Musculoskeletal Pain & Stress Questionnaire (MN)

Prior to taking this survey, please read the “Information Sheet for Research” document enclosed with this survey. Thank you!

In this survey, you will see the acronym *FSP*. This is shortened from “Funeral Service Professional.” Due to differences in licensing across states, this term is used to accommodate all individuals, regardless of whether they have a combination license or are only licensed as an embalmer or funeral director. Please answer every question to the best of your knowledge.

Demographic Questions	
This section asks basic questions about you, including your age, your height, and your education level. Please answer everything to the best of your ability.	
1. What is today's date?	____ / ____ / ____ Month Day Year
2. Sex	☐ Female ☐ Male ☐ Prefer not to answer
3. What is your age (in years)?	____ Years
4. Ethnicity (Choose all that apply)	☐ Asian/Pacific Islander ☐ Native American/ Alaskan Native ☐ Black/African American ☐ Caucasian/White ☐ Hispanic/Latino ☐ Other (write in) ☐ Prefer not to answer
5. What is your level of education?	☐ Some college, no degree ☐ Associate's Degree (2 years of college) ☐ Bachelor's Degree (4 years of college) ☐ Master's Degree (6 years of college) ☐ Doctorate Degree or higher
6. Using your best guess, how long have you been licensed as an FSP?	____ Years
	____ Years

7. Using your best guess, how long have you been working as an FSP?	
8. How much do you weigh?	_____ Pounds
9. How tall are you?	_____ Feet + _____ Inches
10. Are you left-handed, right-handed, or ambidextrous?	☐ Right-Handed ☐ Left-Handed ☐ Ambidextrous

Professional Questions This section asks questions regarding your <i>current</i> roles and responsibilities.	
11. Which state(s) are you licensed in? Choose all that apply	☐ Minnesota ☐ Wisconsin ☐ North Dakota ☐ South Dakota ☐ Other (Please specify) _____
12. Is your current job role in a funeral home, trade service, or cremation facility? If you have selected "No," please skip to question number 23.	☐ Yes ☐ No
13. In the past year , what percentage of your time was spent performing the following tasks ? Please make sure your percentages total to 100 when added together.	_____ % Removals/Transfers _____ % Embalming _____ % Dressing & Cosmeticizing _____ % Meeting with Families _____ % Running Funeral Services _____ % Other (Please specify) _____

14. How many facilities/locations do you actively work out of? If you are a trade embalmer, how many facilities do you service?	_____ Facilities
15. At your location(s), how many other FSPs share similar daily responsibilities to you? If you are a trade embalmer, how many other FSPs share similar responsibilities to you?	_____ Individuals
16. On average, what is your yearly call volume for your location(s)?	_____ Calls per Year
17. Of the previous number, approximately how many calls did you handle personally? Please state this as a number, not a percentage.	_____ Calls
18. Using your best guess, what percentage of your personal yearly call volume took place in the following community types?	_____ % Urban Areas _____ % Suburban Areas _____ % Rural Areas
19. Using your best GUESS, what percentage of each of the following categories best describes your personal yearly call volume?	_____ % House Calls _____ % Hospital Calls _____ % Nursing Home/Hospice Calls _____ % Medical Examiner Calls _____ % Other
20. Do you have a dedicated Trade Service in your area? <i>Trade Service:</i> A business that offers licensed individuals to transfer, deliver, and/or embalm decedents to contracted funeral homes for a fee.	☐ Yes ☐ No ☐ I don't know ☐ I own/work for a trade service

21. Does your facility use a trade service ?	☐ Yes ☐ No ☐ I don't know ☐ I own/work for a trade service
22. On average, how many hours per week do you work?	_____ Hours per Week

Emotional State Questions						
This section asks questions about your emotional state in the last 30 days.						
	All	Most	Some	A Little	None	I Don't Know
23. In the last 30 days, about how often did you feel so depressed that nothing could cheer you up ?	☐	☐	☐	☐	☐	☐
24. In the last 30 days, how often did you feel hopeless ?	☐	☐	☐	☐	☐	☐
25. In the last 30 days, how often did you feel restless or fidgety ?	☐	☐	☐	☐	☐	☐
26. In the last 30 days, how often did you feel everything was an effort ?	☐	☐	☐	☐	☐	☐
27. In the last 30 days, how often did you feel worthless ?	☐	☐	☐	☐	☐	☐

28. In the last 30 days, how often did you feel nervous ?	☐	☐	☐	☐	☐	☐
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Trouble with the Locomotive Organs					
This section asks questions regarding your experiences with “trouble” (ache, pain, discomfort) in different areas of your body.					
Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in any of the following regions?	To be answered only by those who have had trouble (marked “yes”) in a specific region				
	Have you at any time during the last 12 months been prevented from doing your normal activities (at work or outside of work) because of this trouble?	Have you had trouble at any time during the last 7 days ?	On a scale of 1 to 7, please rate the severity of your trouble (ache, pain, discomfort) in this region. 1 = Not severe at all 7 = Extremely severe	Have you seen a doctor, nurse practitioner, or other healthcare provider for this trouble?	Have you seen a chiropractor, massage therapist, or other alternative medicine practitioner for this trouble?
29. Neck ☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
30. Shoulders ☐ No ☐ Yes, in the right shoulder ☐ Yes, in the left shoulder ☐ Yes, in both shoulders	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
31. Elbows ☐ No ☐ Yes, in the right elbow ☐ Yes, in the left elbow ☐ Yes, in both elbows	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
32. Wrist/Hands ☐ No ☐ Yes, in the right wrist/hand ☐ Yes, in the left wrist/hand ☐ Yes, in both wrists/hands	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
33. Upper Back ☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes

34. Lower Back (small of the back) ☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
35. One or both hips/thighs ☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
36. One or both knees ☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes
37. One or both ankles/feet ☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	1 2 3 4 5 6 7	☐ No ☐ Yes	☐ No ☐ Yes

Quality Assessment Questions	
This section poses a series of statements regarding your occupation. Please circle the number that you feel best describes your feelings in response to each statement.	
1 = Strongly Disagree 7 = Strongly Agree	
38. I find my work to be stressful .	1 2 3 4 5 6 7
39. I find my work to be physically taxing .	1 2 3 4 5 6 7
40. I find my work to be emotionally taxing .	1 2 3 4 5 6 7
41. I feel my facility is adequately staffed to handle our current call volume .	1 2 3 4 5 6 7

42. My training adequately prepared me for meeting the physical demands my work requires.	1 2 3 4 5 6 7
43. My training adequately prepared me for meeting the psychological demands my work requires.	1 2 3 4 5 6 7
44. My training adequately prepared me for effectively handling the emotional responses of the bereaved family and/or relatives of the deceased.	1 2 3 4 5 6 7

Wrap-Up Questions (Optional)

Do you have any additional comments about your work in funeral service? If so, please write them here:

Do you have any additional comments about this survey? If so, please write them here:

This page is intentionally left blank.

Please write your name here: _____

As a thank-you for taking part in this survey, you are eligible to be entered into
the drawing for
one of four \$25.00 Amazon gift cards!

If you would like to be a part of the drawing, please include your email address
below.

This is optional.

Email address: _____

Note: This page will be separated from the rest of your survey upon receipt by the study team. Your response and your name/email will only be linked via a randomized identifier and used by the study team for reference.
Your name and email will never be shared, and this information will be deleted from our records at the end of the study.

Please mail your completed survey back to the research team in the provided preaddressed envelope (it should be included in the same envelope this survey came in.)

Thank you very much for your response!