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Occupational Injury and Fatality Investigations: The Application of Forensic Nursing Science

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ABSTRACT

The forensic evaluation of trauma in occupational injuries and fatalities can provide the benefit of a more thorough analysis of incident causation. Forensic nursing science applied during workplace investigations can assist investigators to determine otherwise unknown crucial aspects of the incident circumstances that are important to event reconstruction, the enforcement of occupational health and safety requirements, and the direction of workplace prevention initiatives. Currently, a medical and forensic medical knowledge gap exists in the subject-matter expertise associated with occupational accident investigations. This gap can be bridged with the integration of forensic nursing in the investigation of workplace fatalities and serious injuries.

KEY WORDS:

death investigation; forensic; forensic nursing; injury interpretation; occupational accident investigation; occupational injuries; trauma evaluation

The International Labour Organization (ILO) and the World Health Organization estimate that 1.2 million work-related deaths and 250 million accidents occur worldwide each year. Around 4% of the world's gross domestic product is lost through various direct and indirect costs of occupational accidents, including compensation, medical expenses, property damage, lost earnings, and replacement training (ILO, 2002). In Canada (population: 34.7 million), approximately three occupational fatalities occurred each day of the year in 2008, and workers' compensation boards paid $7.67 billion in benefits for time-loss injuries or fatalities and $2.03 billion for healthcare and vocational rehabilitation (Human Resources and Skills Development Canada, 2008). Including these costs, the total direct annual costs of occupational injuries and fatalities to the Canadian economy were approximately $7 billion (Human Resources and Skills Development Canada, 2008).

An occupational accident is defined as an unexpected and unplanned event arising out of or in connection with work, disrupting the work process and resulting in or having the potential to cause injury, occupational disease, or death (Jovanovic, Arandelovic & Jovanovic, 2004). Accident causation is commonly divided into categories, such as unsafe practices or procedures, unsafe situational factors, and unsafe environmental factors. Multiple factors and risks—for example, hazardous exposures, workplace and process design, work organization and environment, economics, and other social factors—contribute to traumatic injuries. All accidents are potentially preventable. If an accident happened once, it will most likely happen again unless steps are taken to alter at least one of the factors contributing to the accident (Haney, 2003).

Occupational accident investigations are conducted for many reasons, including the prevention of future similar accidents, regulatory compliance, and quality improvement. The results of investigations must be detailed enough to allow agencies mandated to address work-related injuries and deaths to analyze the information, understand the circumstances leading to the accident, and take the necessary remedial steps to prevent a recurrence in the future (ILO, 2002). The considerations in occupational accident investigations are quite different from those in most death

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investigations, criminal investigations, or the triage of injuries for treatment. The coroner or medical examiner is primarily concerned with the cause of death related to any trauma, the law enforcement is concerned with identifying any criminal intent, and the medical practitioner is concerned with the treatment required for that trauma. The occupational accident investigator is concerned not only with the cause of the accident but also with the mechanism of injury. The biomechanics of the injury may help to determine the position of the worker, what the worker may have been doing at the time of the incident, what type of equipment the worker might have been using, and the work process itself. Neither the coroner or medical examiner nor the police are particularly interested in any of these factors in isolation. However, to the occupational accident investigator, this type of information may help to identify violations of occupational health and safety regulations, leading to the prevention of future injuries.

Little research has been done on workplace incident investigation. A search of common medical and academic search engines returned numerous articles referencing both the forensic assessment of injuries related to death investigations in general and the investigation of motor vehicle crash dynamics, but little is related to traumatic occupational injuries. All articles retrieved on searches related to injury in the occupational setting involved musculoskeletal injuries, such as sprains and strains. No literature was available on the forensic evaluation of traumatic injuries sustained in occupational injuries or fatalities. Clearly, the forensic evaluation of traumatic occupational injuries is lacking; at the very least, the application of this expertise is not being shared in applicable journals or discussed in academic literature.

Using workplace accident investigation in British Columbia, Canada, as an example, this article examines how forensic nursing science may be applied to the investigation of work-related injuries and fatalities, ultimately improving the outcomes of those investigations.

Forensic Evaluation of Traumatic Injuries in Occupational Accident Investigations

Forensic means pertaining to law (Venes, 2010) and refers to the application of a broad spectrum of scientific methods and techniques to establish facts in association with legal issues. Forensic sciences include a wide variety of disciplines under which the facts regarding an event or artifact are deemed to be accurate to prove or disprove difficult legal arguments and determine the truth. In the context of healthcare, forensics focuses on those areas in which medicine and human behavior have an interface with the law (Hammer, Moynihan & Pagliaro, 2013). Forensic medicine interprets or establishes facts in relation to civil or criminal law. The most well-known application of forensics in medicine is forensic pathology, which is solely concerned with the investigation of death. However, not all victims of trauma, assault, or other injuries with legal implications sustain fatal injuries. Clinical forensic medicine (Lynch, 2011a) is the application of forensic practices previously reserved for the pathologist at autopsy to living patients in a clinical setting. Living forensic patients include survivors of traumatic injuries. Forensic medical expertise can therefore be used outside the traditional setting of fatal incident investigations—for example, in investigations of nonfatal traumatic occupational injury incidents.

As in a criminal investigation, all available evidence must be identified, preserved, and collected from the start of an occupational accident investigation. No evidence should be ignored or overlooked. What might not seem relevant initially, including injury interpretation, may become highly relevant as the investigation progresses. Examining the information and circumstances associated with the accident—to the exclusion of any medical or pathological information about traumatic injuries—would be a disservice to the injured worker and his or her family, coworkers, and employer. Occupational accident investigators must identify and examine all possible evidence, including the forensic evaluation of injuries and any pathophysiology associated with the seriously or fatally injured worker, to achieve the best possible outcome.

Injury results from an exchange of physical force, whether from the rapid deceleration of a fall to the forward deceleration of an automobile collision or the impact on the body from a moving object (Sheridan & Nash, 2007). Kinetic energy—the type of force involved in explosions, crashes, falls, and blunt or penetrating trauma—is the most common cause of injury (Lim & Rehmar, 1997). Injury caused by the impact of an object is related to several factors, including the shape and size of the object, the energy delivered by that object at impact, and the properties of the impacted area (Kieser, Taylor & Carr, 2013). Identifying injury causation requires a thorough understanding of the multiple characteristics of blunt and sharp force injuries and wounds and the ability to predict the types of mechanical forces that might have caused them, including the wounding object or instrument. Injury characteristics may provide information such as the exact site of contact, the direction of the impact force, whether it is a pattern injury, and the nature and shape of the injury object. The forensic evaluation of injuries also requires the use of internationally accepted definitions in describing and documenting injuries. However, incorrect terminology is commonly found in the medical documentation of injuries. In clinical practice, health professionals often misuse common forensic terms and confuse such injuries as lacerations and cuts (Sheridan & Nash, 2007).

Trauma physicians in emergency departments are frequently involved in the assessment and treatment of patients injured in occupational accidents. Any patient admitted to the hospital with liability-related injuries must be considered as a clinical forensic patient (Lynch, 2011a). However, unless they have received forensic training, most physicians and nurses, even in the emergency department setting, lack the knowledge and ability to both distinguish the forensic characteristics of injuries and successfully document them properly from a legal perspective (Dougherty, 2011). Medical records often include numerous entries about an injury and the required treatment but fail to specify injury characteristics that may be of great forensic importance, such as size, appearance, and location on the body (Besant-Matthews, 2011). A physician's early subjective statements have often been proven to be incorrect during subsequent investigations and/or court testimony (Sharma, 2006). Carmona and Prince (1989) reported that most of the cases they reviewed from level one trauma centers showed significant forensic medical deficiencies, primarily in the areas of documentation and/or handling or securing evidence.

Given their lack of forensic training, therefore, hospital physicians cannot necessarily be relied upon to provide occupational accident investigators with accurate injury analysis or forensic evaluation of trauma. If the occupational accident investigator depends on the average healthcare professional to provide this crucial information, his or her ability to determine causation is severely limited.

Errors in interpreting injuries may result not only from inadequate or incorrect injury description but also from erroneous medical knowledge or by trying to fit the findings to the injury history and bias. Although an error in interpreting injuries may be insignificant in the context of therapeutic treatment, in the medico-legal setting, such an error can have considerable ramifications. In a criminal investigation, injury misinterpretation could lead to the wrong weapon being identified and inadmissibility of evidence. In an occupational accident investigation, injury misinterpretation could result in wasted investigative resources as officers proceed down an incorrect investigative pathway.

Occupational Accident Analysis

Accidents are processes that culminate in an injury or illness. An accident may be the result of various simultaneous factors—interconnected or cross-linked events that have interacted in some dynamic way. An effective accident investigation will involve three levels of cause analysis. Injury analysis focuses on trying to determine how the energy transfer caused the injury. Event analysis determines the hazardous conditions and unsafe behaviors that dynamically interact to produce the injury, often pointing to specific causes of inadequate safety policies, programs, plans, processes, or procedures. Systems analysis identifies the root causes of the accident. Root causes often preexist causes identified in the event analysis and point to systemic poor design that allows, promotes, encourages, or even requires systems that result in hazardous conditions and unsafe behaviors (Oregon Occupational Safety and Health Division, 2012).

Occupational accident investigators are often able to determine the force that caused the injury (e.g., mechanical, thermal, or electrical) but miss the injury analysis that drills down to the positional, directional, and patterned or pattern injury or the identification of blunt or sharp force trauma. Analysis of this information in relation to occupational health and safety regulations may help investigators understand what object impacted the body, from what direction, where the worker was located, and what he or she was doing during the work process. This may also determine whether a piece of equipment was faulty or unguarded, training or supervision was lacking, or other infractions of occupational health and safety regulations were present. This scrutiny is particularly helpful when witness accounts of an incident conflict, especially in cases of unwitnessed incidents, when the results of this analysis may be the only information that can reveal what happened. Moreover, it can play an important role in formulating prevention initiatives.

Forensic Nursing and the Investigation of Occupational Injuries and Fatalities

The history of forensic nursing can be traced back to Alberta, Canada, and the forensic nurse death investigator (Lynch, 2011b), a registered nurse who applies the nursing process to death investigation across the life span. In 1975, based on a 5-year study, the Chief Medical Examiner of Alberta concluded that the registered nurse had the qualities essential for the investigation of death (Lynch, 2011b). Nurses began to take on the role of death investigators in the United States in the late 1970s in a program established by the Dade County Medical Examiner's Office in Miami, Florida (Lynch & Burgess, 1998). The nurse death investigator model has since spread internationally, blending nursing science with medicine, law, and criminology.

Death investigators have traditionally had a background in law enforcement (Lynch, 2011b). The nurse who is cross-trained in forensic science and legal issues provides a collaborative practice approach that benefits from their strong background in anatomy and physiology, psychology, pharmacology, medical terminology, and knowledge of communicable and natural disease processes. Without this knowledge base, nonmedical death investigators may fail to recognize medical evidence, miss crucial patterns of injuries, and have difficulty interpreting medical records and communicating in medical language. Charles Petty, Chief Medical Examiner for Dallas County, Texas, explained that it was more

advantageous to use individuals with a medical background and train them in investigative techniques than it was to teach a police officer/criminal investigator about medical knowledge and techniques (Lynch, 2011b).

Forensic nursing has evolved from the forensic nurse death investigator to various roles in clinical forensic practice or living forensics. The International Association of Forensic Nurses defines forensic nursing as the global practice of nursing where healthcare and legal systems intersect (American Nurses Association and International Association of Forensic Nurses, 2009). The forensic nurse now applies concepts and strategies of the forensic sciences in specialty practices beyond sexual assault nurse examiners and death investigation to specialties such as incidents of child or elder abuse, interpersonal violence, correctional nursing, risk management, prosecutorial agencies, legal nurse consulting, and other areas where the interpretation, assessment, and documentation of injuries is important (Lynch, 2011a). The transfer of these skills to the investigation of traumatic occupational injuries is one more step in the application of forensic nursing expertise to a new patient population: the seriously or fatally injured worker.

Workplace Accident Investigations in British Columbia, Canada

In British Columbia, Canada's westernmost province, the Workers' Compensation Board of BC (WorkSafeBC) is the agency mandated to investigate workplace injuries and fatalities. WorkSafeBC has dedicated investigating officers in the Fatal and Serious Injury (FSI) e.g. Investigation section. When a worker is fatally injured in an occupational accident, the coroner also investigates to determine the worker's identity, when and where the worker died, and the cause and manner of death (BC Coroners Service, 2013a). However, coroners are limited in their ability to provide the information required by occupational accident investigators in determining the mechanism of injury and incident causation.

During the 5-year period from 2006 to 2010, 264 deaths—or an average of 52 deaths per year—were classified as occupational accidents in British Columbia (BC Coroners Service, 2013b). The deaths occurred in a wide range of occupational categories coded by the BC Coroners Service, with the majority in the construction, forestry, and industrial categories (BC Coroners Service, 2013b). Because the coroner does not assume jurisdiction until a death is reported, not all fatality scenes are visited by the coroner; if a seriously injured worker is transported to hospital and dies later, the incident scene may therefore not have been examined. Between 2006 and 2010, the coroner did not attend the scene of accidental occupational deaths on an average of 30% of the time (BC Coroners Service, 2013b). If the coroner attends the accident scene and the cause of death is obvious upon the examination of the body or the cause of death can be determined by subsequent medical documentation and history, an autopsy may not be needed. Between 2006 and 2010, in accidental occupational deaths, autopsies were not conducted on an average of 35% of the time (BC Coroners Service, 2013b). Occupational accident investigators without medical or forensic medical knowledge may not thoroughly understand when an autopsy is or is not necessary, or be able to articulate to the coroner the reason why it may be required as part of the investigation.

Coroners in British Columbia are not required to have medical education but obtain basic knowledge through training and experience of multiple death investigations. Coroners typically do not have any formal forensic education but rely on the forensic pathologist for this expertise. The forensic pathologist determines the cause of death for the coroner, who then completes the certification of death (Spitz, 2006). Although the forensic pathologist will document the injuries to the occupational accident investigator, the injuries themselves may be of more importance than the cause of death in understanding the incident. WorkSafeBC fatal and serious injury investigators indicated in a survey that 89% of investigators either never or seldom attended autopsies or discussed the scene circumstances with the forensic pathologist (WorkSafeBC, 2012). This is a crucial omission. Because injured workers may be taken from the scene of an occupational accident and die later in hospital, and the incident is not reported to the coroner until the death occurs, the coroner would not have had the opportunity to examine or understand the circumstances of the accident and may not have examined the body. As a result, the forensic pathologist receives only general details of the incident on the authorization for postmortem examination and is unable to provide detailed injury identification to WorkSafeBC investigators or describe any relationship between any injuries and what the worker was doing.

The autopsy is not conducted in a vacuum: death is a functional event, not an anatomical event (Spitz, 2006). The cause of death is not always revealed by structural changes detected at autopsy. In addition, postmortem findings sometimes only exclude possible scenarios and do not provide a definitive answer. Only a detailed scene examination analyzed in conjunction with the autopsy findings and any toxicology will provide an accurate cause of death. Dr. Carol Lee, a forensic pathologist at the Vancouver General Hospital, believes that the scene findings and autopsy findings go hand-in-hand in piecing together what happened in an incident. The characteristics of injuries, such as location and dimensions, can provide information that is useful in scenario reconstructions. Measurements taken at autopsy can be correlated with instruments or structures at the scene. However, the forensic pathologist must receive direction as to what needs to be evaluated and/or measured and needs to understand the scene circumstances in order evaluate the findings (Dr. Carol Lee, personal communication,

October 22, 2012). Without an occupational accident investigations officer either in attendance or in consultation, the opportunity to obtain what may be crucial data for incident reconstruction may be lost. Having a forensic pathologist involved does not preclude the need to collaborate in the common goal of understanding the cause of death.

If the coroner did not attend the scene or did not appreciate the significance of the intricacies of the work process in combination with the forensic evaluation of the various injuries and crucial information about scene circumstances is not conveyed to the forensic pathologist, no understanding of the injury and event and no system analysis will be provided for the occupational accident investigation. Furthermore, if the coroner determined that an autopsy was not necessary and the occupational accident investigator was depending on the forensic pathologist's findings to help in determining the mechanism of injury, he or she may lose the opportunity to obtain crucial wound and injury information that should have been collected as part of the investigation at the scene.

The coroner investigation may have further limitations in the context of prevention of workplace fatalities. There may be a lack of knowledge of injury prevention; a lack of time, expertise, and the resources required to examine potential implications for similar workplace incidents; and an inability to evaluate contributory factors, system failures, and effective countermeasures. As a result, injury determinants will not be systematically identified from the investigation (Bugeja, Ibrahim, & Brodie, 2010).

To summarize, when a worker is fatally injured in an occupational accident, the coroner may not attend the scene if the worker dies in a hospital, and important evidence from the scene can be lost. If the cause of death is fairly obvious, no autopsy may be performed, and therefore, no forensic evaluation at all may occur. If an autopsy is performed, it may be conducted by a pathologist, who is not forensically trained and will focus on the cause of death to meet the coroner's mandate, rather than forensically evaluating all the injuries. As a result, in many cases, occupational accident investigators often do not receive the information they need about the accident scene, the injuries, or the relationship between the injuries and what the worker was doing at the time of the accident. Therefore, it is important that an investigator with forensic expertise (i.e. forensic nursing) be involved in the investigation from scene attendance/consultation to the forensic evaluation of traumatic injuries.

WorkSafeBC's FSI Investigation section historically has not availed itself of in-house medical or forensic medical expertise in the investigation of occupational accidents, despite the inclusion of many other subject-matter experts, including engineers, human factor specialists, industry-specific specialists, legal experts, and others. Up to this point, no one with any medical or forensic medical education or experience (e.g. a forensic nurse) has been included either as a resource or as part of the investigations team. Virtually, every conceivable angle related to the investigation of an occupational accident by the FSI section is covered by individuals such as engineers, legal services, human factors specialists, and others providing subject-matter expertise—except from within the field of medicine or forensic medicine.

Clearly, if occupational accident investigations are to succeed in determining corrective actions for the employer and preventing the occurrence of similar events in the future, two changes are needed. The first is for fatal and serious injury investigations to stand alone. Investigations officers should not assume that other individuals or agencies will collect evidence that will assist their investigations but may not be needed to meet that agency's own mandate. The second is to have an occupational accident investigator with forensic nursing expertise evaluate the scene and the injuries, attend the autopsy, and share information with the forensic pathologist. The application of forensic nursing science would be especially valuable when a forensic pathologist is not involved and when autopsies are not completed.

It should be noted that WorkSafeBC investigations' officers also investigated 237 serious injuries and potential for serious injury cases of traumatic occupational accidents between 2008 and 2012 (WorkSafeBC, 2013). Because these were nonfatalities, eliminating coroner or forensic pathologist involvement on an average of 47 cases per year during this period did not have the benefit of any kind on the forensic evaluation of injuries assessment. In these cases, the application of forensic nursing science could have assisted in determining the mechanism of injury and reconstructing the incident events, thereby raising the quality of investigative outcomes.

Implications for Clinical Forensic Nursing Practice

Although the forensic evaluation of wounds and injuries is commonplace in the death investigation field, the use of these techniques in the context of both fatalities and survivors of trauma in workplace accidents is a relatively new application of clinical forensic medicine. Dr. Patrick Bessant-Matthews, a former forensic pathologist with the Armed Forces Institute of Pathology and a former Deputy Chief Medical Examiner for Dallas, Texas, believes a successful outcome in an occupational accident investigation must include a thorough understanding of the multiple characteristics of blunt and sharp force injuries or wounds to predict the type of mechanical force that might have caused them (personal communication, October 25, 2012). Dr. Besant-Matthews believes that, although this is relatively new territory, circumstantial, positional, and directional information about wounds and injuries is highly relevant and quite often essential in determining causation in cases of

both serious injury and fatalities (Dr. Besant-Matthews, personal communication, October 25, 2012). The forensic evaluation of wounds and injuries in the occupational accident setting can determine the mechanism of injury, facilitate event analysis and reconstruction, assist in the evidentiary requirements pertaining to legal proceedings, identify violations of occupational health and safety regulations, and direct targeted prevention initiatives.

The ideal professional to provide this information, based on forensic medical applications, is a nurse with forensic training. A forensic nurse has the ability to evaluate both medical information and physical injuries, describing the scientific relationships between the injury and evidence and interpreting the factors that influence them. A forensic nurse who is cross-trained in occupational injury and fatality investigations is uniquely positioned to integrate nursing science with principles from forensic science, medicine, occupational health and safety, public health, and criminal justice. Forensic nursing expertise can help determine the mechanism and causation of injuries and provide a clearer understanding of the worker's position, what he or she was doing, the equipment that was being used, and the work process. This is particularly valuable in unwitnessed incidents or when conflicting recollections of incident events exist and can aid in the enforcement of occupational health and safety requirements.

In the context of an agency like WorkSafeBC, forensic nursing expertise could be used in a consultation and/or an application role at applicable points in the investigation, from the initial scene assessment through the investigative process to the file's conclusion. The forensic nurse/investigations' officer could attend all appropriate forensic autopsies to share scene information with the forensic pathologist; photograph, evaluate, and document injuries; and gain a shared understanding of the pathology and mechanism of injury. The forensic nurse could also interpret autopsy findings and any toxicology results and describe the relationship to the incident circumstance. Injury interpretation, from the first scene response to the initial stages of the investigation, could also help to direct a previously unidentified investigative pathway or identify an occupational health and safety violation; at the same time, more accurate determination of incident causation without proceeding down multiple exploratory pathways could lead to decreased investigative time and more expedient file closure. The forensic nurse/investigations' officer could interpret pathophysiology to help determine if a natural event precipitated a fatal workplace accident or speculate on the impact of any toxicological analysis. He or she could also review medical records and liaise with the coroner or other medical professionals, potentially gleaning information that the nonmedical investigations officer may not realize as relevant. At the end stage of the investigation, the input of medical or forensic medical expertise could lead to a better understanding of injury causation and, therefore, an increased opportunity to prevent similar incidents in the future. At the very least, a forensic nurse could be used in a consultative capacity to fill the gap in incident evidence collection and analysis and as a resource in the forensic evaluation of occupational trauma, analysis of incident causation, and forensic education of investigations staff. Forensic nursing involvement could be tracked in conjunction with the resulting positive outcomes to show the evidence of the effectiveness of this application of both medical and forensic medical expertise. Further research could be conducted to provide empirical evidence of the effectiveness of expanding the application of forensic nursing science in occupational fatalities and serious injury investigations.

References

American Nurses Association and International Association of Forensic Nurses. (2009). *Forensic nursing: Scope & standards of practice*. Silver Spring, MD: Author.

BC Coroners Service. (201a). *Coroners service*. Retrieved from http://www.pssg.gov.bc.ca/coroners/index.htm

BC Coroners Service. (201b). *Accidental occupational deaths* [Unpublished raw data].

Besant-Matthews, P. (2011). Blunt, sharp and firearm injuries. In Lynch V. & Barber Duval J. (Eds.), *Forensic nursing science* (2nd ed., pp. 290–313). St. Louis, MO: Elsevier Mosby.

Bugeja, L., Ibrahim, J., & Brodie, L. (2010). Occupational death investigation and prevention model for coroners and medical examiners. *Injury Prevention*, *16*, 2–6. http://dx.doi.org/10.1136/ip.2009.021808

Carmona, R., & Prince, K. (1989). Trauma and forensic medicine. *Journal of Trauma*, *29*(9), 1222–1225.

Dougherty, C. (2011). Evidence collection in the emergency department. In Lynch V. & Barber Duval J. (Eds.), *Forensic nursing science* (2nd ed., pp. 155–167). St. Louis, MO: Elsevier Mosby.

Hammer, R., Moynihan, B., & Pagliaro, E. (2013). *Forensic nursing: A handbook for practice*. Burlington, MA: Jones & Bartlett Learning.

Haney, L. (2003). A primer for effective accident investigation. *American Association Of Occupational Health Nurses Journal*, *51* (4), 180–186. Retrieved from http://search.proquest.com/index

Human Resources and Skills Development Canada. (2008). *Occupational injuries and diseases in Canada, 1996–2008: Injury rates and cost to the economy*. Retrieved from http://www.hrsdc.gc.ca/eng/labour/publications/health_safety/oidc/pages02shtml#highlights

International Labour Organization. (2002). *Recording and notification of occupational accidents and diseases and ILO list of occupational diseases* [Report 90th session]. Retrieved from http://ilo.org/public/english/standards/relm/ilc/ilc90/rep-v-1.htm

Jovanovic, J., Arandelovic, M., & Jovanovic, M. (2004). Multidisciplinary aspects of occupational accidents and injuries. *Working and Living Environmental Protection*, *2*, 325–333. Retrieved from http://facta.junis.ni.ac.rs/walep/walep2004/walep2004-12.pdf

Kieser, J., Taylor, M., & Carr, D. (2013). *Forensic biomechanics*. West Sussex, UK: Wiley-Blackwell.

Lim, J., & Rehmar, S. (1997, March). Assessment of the trauma victim in the occupational setting. *American Association of Occupational Health Nurses Journal*, *45*(3), 137–145. Retrieved from ProQuest online library

Lynch, V. (2011a). Evolution of forensic nursing science. In V. Lynch & Barber Duval J. (Eds.), *Forensic nursing science* (2nd ed., pp. 1–9). St. Louis, MO: Elsevier Mosby.

Lynch, V. (2011b). Forensic nurse examiners in death investigation. In V. Lynch & Barber Duval J. (Eds.), *Forensic nursing science* (2nd ed., pp. 195–211). St. Louis, MO: Elsevier Mosby.

Lynch, V., & Burgess, A. (1998). Forensic nursing. In Burgess A. W. (Ed.), *Advanced practice psychiatric nursing* (pp. 473–490). Stamford, CT: Appleton & Lange.

Oregon Occupational Safety and Health Division. (2012). *Conducting an accident investigation*. Retrieved from http://www.cbs.state.or.us/osha/educate/training/pages/102xm5.html

Sharma, B. (2006). Clinical forensic medicine in the present day trauma-care system—An overview. *Injury*, *37*(7), 595–601.

Sheridan, D., & Nash, K. (2007). Acute injury patterns of intimate partner violence victims. *Trauma, Violence & Abuse*, *8*(3), 281–289.

Spitz, W. (2006). *Medicolegal investigation of death: Guidelines for the application of pathology to crime investigation* (4th ed.). Springfield, IL: Charles C Thomas.

Venes, D. (2010). *Taber's cyclopedic medical dictionary* (21st ed.). Philadelphia, PA: FA Davis.

WorkSafeBC. (2013). *Number of fatalities and serious injuries* [Unpublished raw data].

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