The financial cost of sharps injuries

Hambridge, Kevin; Endacott, Ruth; Nichols, Andrew

Published in:
British Journal of Healthcare Management

DOI:
10.12968/bjhc.2020.0052

Publication date:
2020

The financial cost of sharps injuries

Abstract

Background

Research into sharps injuries has concentrated on the volume of incidents, and to a smaller degree the psychological impact. A topic worthy of exploration is the financial cost of sharps injuries reported by various countries worldwide.

Aims

To synthesise the existing literature with the aim of identifying the financial cost of sharps injuries worldwide

Method

A narrative literature review was conducted. This involved a search of 13 electronic databases (and grey literature) with no date limits set. It was completed in June 2019.

Findings

Direct and indirect costs were identified. From the data which was identified, sharps injuries costs a vast amount of money in many countries worldwide each year.

Conclusion

Identifying ways of reducing sharps injuries would be beneficial to help with the psychological as well as the financial cost and impact

Occupational accidents, predominantly those encompassing cutting and piercing instruments among healthcare workers, have been a cause of growing concern due to the prevalence of diseases and infections caused by the Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV) and the Hepatitis C virus (HCV) (Tonarelli, 2016). Sharps injuries are one of the leading categories of accident sustained by healthcare workers and have been described as an "important public health concern" (Pathak et al., 2012 p.639).

Sharps injuries can be defined as

> *"…skin penetrating stab wounds caused by a sharp instrument and accidents in a medical setting."* (Centers for Disease Control and Prevention (CDC), 2008)

As well as being labelled penetrating stab wounds, sharps injuries have also been described as lacerations or puncture wounds (HSE, 1995); piercings of the skin (Hersey and Martin, 1994) and cuts and pricks (RCN, 2013). Within medical and nursing literature it is also defined as a percutaneous injury (HSE, 2016). Definitions of sharps within healthcare are wide and varied (Hersey and Martin, 1994), but can include: needles (Muralidhar et al., 2010); razors (RCN, 2013); lancets and scalpels (WHO, 2003); broken glass and scissors (RCN, 2013).

The 'Eye of the Needle' report (PHE, 2014) highlighted that between 2004 and 2013, there were 4,830 occupational exposures to blood or other high-risk body fluids in the UK. Of these exposures, 3,396 were due to a sharps injury. Nurses and healthcare assistants accounted for 42% of all reports, while doctors and dental professions accounted for 41% and 5% respectively. Disturbingly, ancillary

healthcare workers devoid of direct patient contact were also injured by incorrect disposal of sharps (PHE, 2014).

Various psychological impacts can occur following sharps injuries within healthcare workers. These have been reported as post-traumatic stress disorder (Naghaviet et al., 2013); anxiety (NHS Employers, 2013); depression (McDowell, 2012) and insomnia, loss of appetite, sleeplessness and crying (Gershon et al., 2000).

Legislation introduced in the UK since 1974, supplemented by EU Directives, HSE guidelines, WHO-approved publications and other guidelines have consistently highlighted the responsibilities of employers and employees in relation to the safe working environments and the safe use of sharps within healthcare (Health and Safety at Work Act, 1974; European Agency for Safety and Health at Work, 2018c; World Health Organisation, 2003). Yet evidence suggests that there are still health and safety breaches regarding sharps within many healthcare settings and non-compliance with sharps regulations (HSE, 2015; 2016).

These aspects of sharps injuries have been explored within the literature, yet an under-researched area and further consequence of sharps injuries is the financial cost. To explore this topic, a narrative literature review was conducted exploring the costs of sharps injuries reported by various countries worldwide.

Method

A narrative literature review was conducted by searching the following electronic databases: AMED, BMJ Journals collection, CINAHL Plus with Full Text (EBSCO),

Clinical Evidence, Cochrane Library (Wiley), Internurse, Medline (EBSCO), NICE Evidence, PubMed, PubMed Central, PsycArticles, PsycINFO, and ScienceDirect. Finally, Google Scholar was targeted to search for grey literature to ensure that all relevant published papers on the topic areas were identified and not missed.

The search was limited to publications in the English language only and there was no time limit set. This was to ensure an historical context was achieved. The process for the literature review followed four stages: 1) using search terms to search relevant databases; 2) in the results list produced, the titles and abstracts were screened. Those deemed relevant were saved as a file; 3) the full texts of the relevant articles were retrieved, read and relevant data extracted; and 4) relevant papers found within bibliographies were also identified. Articles without an abstract or full text were excluded. The extracted data was then scrutinized and grouped into relevant sections, such as ‘direct and indirect costs’; ‘monetary costs’ and ‘reports from individual countries’.

Search terms included the keywords: cost, money, financial, sharps, needlestick, injury, inoculation, percutaneous, nurse, healthcare worker, policy, guideline, seroconversion. These keywords were used in combination to narrow the searches. The Bolean operator “AND” was utilised to expand the search.

Findings

The literature review identified the direct and indirect cost, and the overall monetary cost of sharps injuries reported by various countries around the world.

The direct and indirect costs

The CDC (2008) defined the direct and indirect costs for healthcare organisations when a sharps injury involving a needle occurs. Direct costs related to baseline and follow-up laboratory testing; PEP and the potential PEP side-effect management and workers compensation. Indirect costs related to time and wages diverted to receiving or providing exposure-related care; lost productivity associated with reporting and receiving initial and follow-up treatment; healthcare provider time to evaluate and treat an individual; healthcare provider time to evaluate and test the source and staff absence. Additional indirect costs could also include disability of the individual concerned (Sharma et al., 2010) and the potential economic impact on the individual (Trueman et al., 2008). Lee (2005) reported the humanistic impact and psychological effects of sharps injury involving needles on lost productivity in a study of 110 US nurses who had suffered a sharps injury. Seventy-seven days were missed, 10 due to seeking and receiving medical attention, and six due to the side effects of HIV prophylaxis treatment. Sixty-one days were lost due to the emotional distress and anxiety created. A study of nurses in 13 European countries and Russia (n=634) showed that following a sharps injury involving needles, 12.3% changed their working habits or department and 2.4% stopped working (Costigliola et al., 2012).

The monetary cost

Mannocci et al (2016) conducted a systematic review to explore the cost of an individual sharps injury that appears to give the most up-to-date data. Fourteen relevant studies were identified from eight countries across the world, namely USA, Spain, France, Sweden, Chile, Belgium, Korea and Italy. Based upon modelling and data divulged within individual studies, the aggregate direct and indirect cost of a

sharps injury was calculated as being between $650-750. This figure though did not take into account litigation or compensation.

Various figures have been attributed to the cost of sharps injury within many countries. In the USA, O'Malley et al (2007) analysed the cost of the management of occupational exposures to infection in four healthcare facilities. The mean cost following exposure to HIV infected source patients was $2456, whilst exposure to source patients with unknown or uninfected patients was $376. The management of personnel exposed to source patients infected with HCV cost $650. The range of costs was calculated to be from $71-$4838. Similarly in the USA, Leigh et al (2007) investigated the cost of sharps injuries involving needles and found the average cost to be $596 ($339 direct medical costs and $257 lost work productivity costs).

In Europe, Solano et al (2005) conducted a cost analysis of HBV, HCV and HIV follow-ups in healthcare workers accidently exposed to blood and body fluids in Spain. The cost was calculated to be €1502 for incidents involving source positive for HCV and HIV and €172 for instances of source negative for all three viruses. In cases of HBV the mean cost was €388, with the main cost of the follow-up being serological tests and PEP. Wittman et al (2007) found the cost of a sharps injury involving needles in Germany to be €490, whilst Trueman et al (2008) investigated the cost of sharps injuries involving insulin needles in the UK and found the direct cost to be £362 per injury. In Sweden, Glenngård and Perrson (2009) found the direct costs of sharps injuries to be €272. Hanmore et al (2013) estimated the direct cost of sharps injuries in Belgium to be between €210-950 and the indirect costs to be between €63-844.

In South Korea Oh et al (2008) analysed the costs of sharps injuries within healthcare workers by exploring data produced by 34 hospitals. The costs involved included pharmacy ($129); laboratory tests ($70); medical services ($28) and medical treatment ($10). The mean cost of each sharps injury was estimated to be $125.

The total cost of sharps injuries per annum have been estimated within certain countries worldwide. Leigh et al (2007) found the cost of sharps injuries involving needles in the USA to be $188.5 million per annum within the range of $118–$591 million in the USA proposed by Saia et al (2010). Trueman et al (2008) found the cost to the NHS in the UK to be approximately £600,000 related to sharps injuries involving insulin administration needles alone. Meanwhile the RCN (2008) estimated the annual cost of sharps injuries involving needles to the NHS in the UK to be £500,000 per Trust. The estimated annual costs for tests and treatments for sharps injuries involving needles was estimated to be $6.1 million in France (Saia et al., 2010), whilst Glenngård and Perrson (2009) found the total cost to be €1.8 million per year in Sweden. In South Korea, Oh et al (2008) estimated the cost to be $884,385 per year based upon an estimation of 7057 sharps injuries occurring nationwide.

As can be seen, many countries worldwide have reported the costs of sharps injuries. Due to the different population sizes; diverse healthcare settings, and various legislations and policies within these countries, it is difficult to make direct comparisons regarding the cost per injury or annually.

Conclusion

Costs are challenging to enumerate because of the emotional cost related with fear and anxiety from worrying about the potential consequences of an exposure; the direct and indirect costs associated with drug toxicities and time absent from work, and the societal cost associated with an HIV, HBV or HCV seroconversion. This includes the likely loss of a worker's services in patient care, the cost of medical care, and the charge for any litigation. Taking this into account, it can be seen that the financial cost of sharps injuries within the UK and worldwide is large and potentially underestimated. An identification of the reasons why sharps injuries continue to occur, especially in the next generation of nurses, may help to reduce these unnecessary costs.

References

Centers for Disease Control and Prevention (2008) *Workbook for designing, implementing and evaluating a sharps injury prevention program.* Available at: https://www.cdc.gov/sharpssafety/pdf/sharpsworkbook_2008.pdf (Accessed: 23 June 2019).

Costigliola, V., Frid, A., Letondeur, C., Strauss, K. (2012) 'Needlestick injuries in European nurses in diabetes', *Diabetes and Metabolism*, 38, Suppl. 1: S9-14.

European Agency for Safety and Health at Work (2018c) *Directive 2010/32/EU Prevention from sharps injuries in the hospital and healthcare sector.* Available at: https://osha.europa.eu/en/legislation/directives/council-directive-2010-32-eu-prevention-from-sharp-injuries-in-the-hospital-and-healthcare-sector (Accessed: 4 February 2018).

Gershon, RR., Flanagan, PA., Karkashian, C., Grimes, H., Wilburn, S., Frerotte, J., Guidera, J., Pugliese, G. (2000) 'Health care workers' experience with postexposure management of bloodborne pathogen exposures: a pilot study'*, American Journal of Infection Control*, 28(6), pp. 421-8.

Glenngård, AH., Persson, U. (2009) 'Costs associated with sharps injuries in the Swedish health care setting and potential cost savings from needle-stick prevention devices with needle and syringe', *Scandinavian Journal of Infectious Diseases*, 41(4), pp. 296–302.

Hanmore, E., Maclaine, G., Garin, F., Alonso, A., Leroy, N., Ruff, L. (2013) 'Economic benefits of safety-engineered sharp devices in Belgium - a budget impact model', *BMC Health Services Research*, 13, p. 489.

Health and Safety at Work Act (1974) Available at: http://www.legislation.gov.uk/ukpga/1974/37/introduction (Accessed: 12 April 2018).

Health and Safety Executive (1995) *Advisory Committee on Dangerous Pathogens. Protection against bloodborne infections in the workplace: HIV and Hepatitis.* London: HMSO.

Health and Safety Executive (2015) *Prevention of sharps injuries: Inspection of NHS organisations by occupational health inspectors - 2014/15. Appendix 3 Enforcement Action taken by HSE in Health and Social Care on the management of sharps injuries.* Available at: http://www.hse.gov.uk/foi/internalops/og/og-00060.htm (Accessed: 7 February 2018).

Health and Safety Executive (2016) *Prevention and management of sharps injuries: Inspection of NHS Organisations Report of an inspection initiative 2015/16.* Available at: http://www.hse.gov.uk/healthservices/needlesticks/prevention-management-sharps-injuries.pdf) (Accessed: 4 February 2018).

Hersey, JC., Martin, LS. (1994) 'Use of infection control guidelines by workers in healthcare facilities to prevent occupational transmission of HBV and HIV: results from a national survey', *Infection Control and Hospital Epidemiology,* 15(4), pp. 243-52.

Lee, JM., Bottleman, MF., Xanthakos, N., Nicklasson, L. (2005) 'Needlestick injuries in the United States. Epidemiologic, economic and quality of life issues', *American Association of Occupational Health Nurses*, 53(3), pp. 117-133.

Leigh, JP., Gillen, M., Franks, P., Sutherland, S., Nquyen, HH., Steenland, K., Xing, G. (2007) 'Costs of needlestick injuries and subsequent Hepatitis and HIV infection', *Current Medical Research and Opinion*, 23(9), pp. 2093-105.

Mannocci, A., De Carli, G., Di Bari, V., Saulle, R., Unim, B., Nicolotti, N., Carbonari, L., Puro, V., La Torre, G. (2016) 'How much do needlestick injuries cost? A

systematic review of the economic evaluations of needlestick and sharps injuries among healthcare personnel', *Infection Control and Hospital Epidemiology*, 37(6), pp. 635-46.

McDowell, CL. (2012) 'First Hand: The surgeon and hepatitis C', *Journal of Hand Surgery*, 37(8), pp. 1693-4.

Muralidhar, S., Singh, PK., Jain, RK., Malhotra, M., Bala, M., Muralidhar, S., Singh, PK., Jain, RK., Malhotra, M., Bala, M. (2010) 'Needle stick injuries among health care workers in a tertiary care hospital of India', *Indian Journal of Medical Research,* 131(3), pp. 405-10.

Naghavi, SH., Shabestari, O., Alcolado, J. (2013) 'Post-traumatic stress disorder in trainee doctors with previous needlestick injuries', *Occupational Medicine*, 63(4), pp. 260-5.

NHS Employers (2013) *Workplace health and safety standards.* Available at: http://www.nhsemployers.org/-/media/Employers/Publications/workplace-health-safety-standards.pdf (Accessed: 5 January 2018).

Oh, HS., Yoon Chang, SW., Choi, JS., Park, ES., Jin, HY. (2008) 'Costs of postexposure management of occupational sharps injuries in healthcare workers in the Republic of Korea', *American Journal of Infection Control*, 41(1), pp. 61-5.

O'Malley, EM., Scott, RD., Gayle, J., Dekutoski, J., Foltzer, M., Lundstrom, TS., Welbel, S., Chiarello, LA., Panlilio, AL. (2007) 'Cost of management of occupational exposures to blood and body fluids', *Infection Control and Hospital Epidemiology*, 28(7), pp. 774-82.

Pathak, R., Kahlon, AS., Ahluwalia, S., Sharma, S., Bhardwaj, R. (2012) 'Needle stick injury and inadequate post exposure practices among health care workers of a tertiary care centre in rural India', *International Journal of Collaborative Research on Internal Medicine and Public Health*, 4(5), p. 639.

Public Health England (2014) *Eye of the needle. United Kingdom surveillance of significant occupational exposure to bloodborne viruses in healthcare workers.* London: Public Health England.

Royal College of Nursing (2008) *Needlestick injury in 2008. Results from a survey of RCN members.* London: Royal College of Nursing.

Royal College of Nursing (2013) *Sharp safety. RCN Guidance to support the implementation of The Health and Safety (Sharp Instruments in Healthcare Regulations) 2013.* London: Royal College of Nursing.

Saia, M., Hofmann, F., Sharman, J., Abiteboul, D., Campins, M., Burkowitz, J., Choe, Y., Kavanagh, S. (2010) 'Needlestick injuries: incidence and cost in the United States, United Kingdom, Germany, France, Italy, and Spain', *Biomedicine International*, 1, pp. 41-9.

Sharma, R., Rasania, SK., Verma, A., Singh, S. (2010) 'Study of prevalence and response to needlestick injuries among health care workers in a tertiary care hospital in Delhi, India', *Indian Journal of Community Medicine*, 35(1), pp. 74-7.

Solano, VM., Hernández, MJ., Montes, FJ., Arribas, JL. (2005) 'Update of the cost of needlestick injuries in hospital healthcare personnel', *Gaceta Sanitaria*, 19(1), pp. 29-35.

Tonarelli, L (2016) *Sharps injuries: Strategies and solutions to protect healthcare workers* Available at: https://www.nhsconfed.org/blog/2016/12/sharps-injuries-strategies-solutions-to-solve-the-problem (Accessed: 27 August 2019).

Trueman, P., Taylor, M., Tweena, N., Chubb, B. (2008) 'The cost of needlestick injuries associated with insulin administration', *British Journal of Community Nursing*, 13(9), pp. 413-7.

Wittmann, A., Hofmann, F., Kralj, N. (2007) 'Needle stick injuries - Risk from blood contact in dialysis', *Journal of Renal Care*, 33(2), pp. 70-3.

World Health Organisation (2003) *Sharps injuries: Global burden of disease from sharps injuries to healthcare workers.* Geneva: WHO.