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Evaluating the Relationship Between the Use of Unapproved Fuels in Live-Fire Training and Carcinogen Exposure

POSTER PRESENTATION

OCTOBER 1, 2020

WALDEN UNIVERSITY

Author

Christina Spoons, Ph.D.

Contributing Faculty

School of Public Policy and Administration

Christina.spoons2@mail.waldenu.edu

Abstract

This is a continuation of previous research, which revealed the use of fuel has played a significant role in each of the firefighter fatalities that happened during live fire training that has taken place in the U.S. since *NFPA 1403, Standard on Live Fire Training Evolutions* was first published in 1986. With the more recent focus on carcinogen exposure and cancer rates in the fire service, this new study was designed to further examine the reasons behind the continued use of fuels unapproved under NFPA 1403 for live fire training despite the higher rate of carcinogens in those fuels. This was accomplished through purposeful sampling of key informants regarding the use of fuels in live fire training and an online survey of training officers of career fire departments in U.S. cities with populations of 100,000 or more.

Completed Research

Problem

There has been a growing focus on **carcinogen exposure** to personnel in the fire service and how that exposure is linked to higher cancer rates (Bolstad-Johnson, et al., 2020; Smith, 2017; Stec, et al, 2018).

While personnel cannot control which fuels will be burning in a fire they respond to, they can control the fuels burned during live-fire training.

Live fire training is important for practicing necessary skills (Bjorge, 2019), but it does not need to be inherently hazardous (Avsec, 2016; van der Feyst, 2013).

NFPA 1403, Standard on Live Fire Training Evolutions, is a national standard that outlines how to conduct live fire training in as safe a manner as possible, including the fuels to use to best reduce exposure to carcinogens.

Despite this standard, some fire departments continue to use fuels linked to greater carcinogen exposure during live-fire training.

Purpose

The purpose of this mixed-methods study was to examine the reasons behind the continued use of fuels unapproved under NFPA 1403 for live fire training despite the higher rate of carcinogens in those fuels.

Significance

This study provides insight into the participants' attitudes and perceptions about the use of unapproved fuels for live fire training.

Fire departments continue to use these fuels despite the knowledge that the use of such fuels not only increases exposure to carcinogens, but also have played a role in every live fire training fatality since the NFPA standard regarding live fire training was first published back in 1984.

Results of the study suggest a crossroads regarding cancer prevention in the fire service and raises the question of whether the fire service as a whole is ready to do all that is possible to reduce the risk of exposure to carcinogens.

Theory or Framework

Implementation analysis is the study of why authoritative decisions, such as policies, do not lead to expected results (Berman, 1978). Conversely, it may also be viewed as the study of the conditions under which authoritative decisions do lead to desired outcomes

Relevant Scholarship

NFPA 1403 is a national consensus standard that many jurisdictions have adopted either in part or in its entirety, while others have not. Of those jurisdictions that have adopted the standard as a policy or mandate, they do not always implement the standard as it was intended, or in its entirety.

Not fully implementing the standard leads to increased carcinogen exposure to personnel when live fire training is conducted using fuels unapproved under the standard.

Much has been written about

- live-fire training (Avsec, 2016; Bjorge, 2019; Lannon. & Milke, 2014; NFPA, 2018; van der Feyst, 2013),
- carcinogen exposure and cancer rates in the fire service (Avsec, 2018; Bolstad-Johnson, et al., 2020; Daniels, 2017; Roman, 2017; Smith, 2017; Stec, et al, 2018), and
- reducing carcinogen exposure (Calams, 2019; Fent, et al., 2017; Tyson, 2018).

However, research is lacking on the reasons some fire departments continue to use unapproved fuels despite the knowledge that the use of such fuels increases exposure to carcinogens.

Research Question

Which strategies are fire departments using to reduce carcinogen exposure?

What are some reasons participants continue to use fuels unapproved under NFPA 1403 for live fire training despite the higher rate of carcinogens in those fuels?

Participants

Training officers in career fire departments in U.S. cities with populations of 100,000 or more were surveyed.

Specific key informants selected based on the following criteria: the selected have the information needed to answer the research questions, have at least 10 years of experience in their respective fields of expertise, and are familiar with NFPA 1403.

Procedures

Document review included investigations and reports regarding carcinogen exposure and firefighter fatalities, NIOSH, NFPA reports.

A researcher-designed semi-structured interview with key informant interviews (*n* = 7): NFPA, NIOSH, leaders in fire service training.:

A researcher-designed 26-item survey of training officers (*n* = 168) of career fire departments in U.S. cities with populations of 100,000 or more.

Analysis

Qualitative data were analyzed both inductively and through coded outlines to look for patterns regarding attitudes about reducing carcinogen exposure and the use of unapproved fuels.

NVivo was used for qualitative data organization and coding. Quantitative data were analyzed using SPSS.

Integration of qualitative and quantitative data.

Findings

94% of respondents hold at least one live fire training event per year.

85% said it is mandatory for their fire department to adhere to NFPA 1403, but only 56% reported their program always complies with all elements of the standard.

46% use flammable or combustible liquids, and 36% use fuels such as furnishings, tires, or tar paper.

93% reported they are confident in their current live-fire training program.

Respondents reported using unapproved fuels to make the scenario more realistic, to make the fire hotter, and to create thicker smoke.

Respondents reported implementing carcinogen exposure reduction methods, such as ventilation systems in apparatus bays, keeping turnout gear in an outside compartment on vehicles (clean cab concept), and studying various turnout gear for penetrability of carcinogens.

When asked about the relationship between unapproved fuels and increased carcinogens, respondents pointed to other factors regarding exposure, including:

- Personnel would be exposed to carcinogens elsewhere (such as during a real fire response) anyway.
- There are also carcinogens in fuels approved under NFPA 1403 (wood, hay, straw), so personnel would still be exposed.

Interpretation

There are inherent dangers in the firefighting profession. Training is the most controllable environment in which fire personnel operate.

This study provides insight into the participants' attitudes and perceptions about using unapproved fuels for live fire training.

In many cases, fire departments are willing to limit carcinogen exposure by implementing strategies such as limiting diesel exhaust, storing turnout gear in outside compartments of vehicles, and conducting studies on carcinogen penetrability of turnout gear, but they are not willing to part with unapproved fuels during training that create those carcinogens.

Limitations

Limitations included time, open and honest responses from participants, and completion of surveys.

The implications of this study may not be generalizable to the entire fire service, but rather to career fire departments in U.S. cities with a population of 100,000 or higher.

The small qualitative sample may not be representative of all training facilities. The small sample size became less of a limitation through the use of triangulation and the combination of both qualitative and quantitative data.

Recommendations

A strong relationship between fatal live fire training events and the failure to adhere to NFPA 1403 has been established through data analysis. When the standard is not applied properly, unnecessary risks and uncontrolled hazards are introduced in exchange for safety.

It is recommended that fire departments adhere to all elements of NFPA 1403, including the use of approved fuels, to reduce known risks and carcinogen exposure associated with unapproved fuels.

Social Change Implications

This study provides insight into the participants' attitudes and perceptions about the use of unapproved fuels for live fire training. Identifying these reasons and the risks involved gives training facilities and fire departments an opportunity to put training and safety measures in place to make live-fire training safer for the nation's 1.3 million firefighters and prevent unnecessary increased exposure to carcinogens.

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