Buyer Beware: Personnel Selling Nail Guns Know Little About Dangerous Tools

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Background *Nail gun use is ubiquitous in wood frame construction. Accessibility and decreasing costs have extended associated occupational hazards to consumers. Compelling evidence documents decreased injury risk among trained users and those with tools with sequential triggers. To prevent inadvertent discharge of nails, this safer trigger requires the nose be depressed before the trigger is pulled to fire. The sequential trigger is not required by the Consumer Product Safety Commission (CPSC) or the Occupational Safety and Health Administration (OSHA) nor are there any guidelines for training.*

Methods *We collected data from personnel at 217 points of sale/rental of framing nail guns in four areas of the country.*

Results *Sales personnel had little understanding of risks associated with use of framing nail guns. Individuals who had used the tool and those working in construction outlets were more likely to be knowledgeable; even so, less than half understood differences in trigger/actuation systems.*

Conclusions *Consumers, including contractors purchasing for workers, cannot count on receiving accurate information from sales personnel regarding risks associated with use of these tools. The attitudes and limited knowledge of some sales personnel regarding these potentially deadly tools likely contributes to a culture accepting of injury. The findings demonstrate how influences on the culture of construction are not limited to workers, employers, or the places construction gets done.* Am. J. Ind. Med. 2011.

KEY WORDS: injury; nail guns; sales personnel; knowledge; injury prevention; safety culture

'Get a buddy and the operator's manual and 4 or 5 beers and you're good to go.'—Salesperson in a lumber yard describing how to learn to use a nail gun

BACKGROUND

Nail guns are a common source of injury in wood frame construction accounting for as much as 14% of non-fatal work-related injuries among residential carpenters [Lipscomb et al., 2003a]. Typically powered by compressed air, the tools were designed to increase productivity in the fast-paced construction industry. A nail gun is capable of rapidly sinking a large framing nail into dense wood.

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Accepted 1 March 2011
DOI 10.1002/ajim.20954. Published online in Wiley Online Library (wileyonlinelibrary.com).

As nail gun use has become more common so have associated injuries [Baggs et al., 1999, 2001; Dement and Lipscomb, 1999; Dement et al., 2003; Lipscomb et al., 2003a,b]. They are also responsible for a significant injury burden among consumers who now account for over one-third of emergency department treated injuries from nail-guns in the United States [Lipscomb and Jackson, 2007]. Easy accessibility of the tools through the consumer market has extended an occupational hazard to the public who are more likely to be inexperienced and untrained tool operators.

The primary safety device to prevent accidental discharge of nails is the trigger mechanism in combination with the nose contact element [ANSI, 1983]. The more common contact trip design allows nail discharge anytime the nose and the trigger mechanism are both depressed. This allows workers to hold the trigger down and ''bump nail.'' In contrast, the sequential design requires the nose be depressed before the trigger, making it more difficult to unintentionally discharge nails. Sequential triggers also prevent injuries following recoil of the gun; with a contact trigger if the nose contacts a surface after recoil with the user's finger still on the trigger the tool will discharge.

The injuries associated with use of these tools are typically puncture wounds to the extremities, particularly to the hands or fingers, but injuries to other body parts are not uncommon. The injuries associated with these tools are not limited to minor events and they can be among the most costly injuries in residential construction [Lipscomb et al., 2003c]. There are reports of serious, even devastating, events in the medical literature [Wu et al., 1975; le Nobel and Wing, 1987; Kizer et al., 1995; Beaver and Cheatham, 1999; Wang et al., 1999; Nadesan, 2000; Jithoo et al., 2001; Webb et al., 2001; Takagi et al., 2003] as well as in the press over the last few years [Associated Press, 1998, 2004, 2005; McIntosh, 2008]. In April of 2007, a 26-year-old residential framer died from a nail gun injury in which his brain stem was pierced [Department of Labor, Occupational Safety and Health Administration (OSHA) Fatality Report, April 2007]. The carpenter was using a contact trip tool and the OSHA inspector concluded the worker likely fell with his finger on the trigger and the actuation system ''worked as designed.'' In this case, that means the tool fired when the nosepiece hit his head while he had his finger on the trigger.

Engineers at the Consumer Product Safety Commission (CPSC) have documented that the center of gravity for most nailers is next to the trigger towards the head of the nailer [CPSC, 2002]. This means that the tool is easily balanced at this point making it natural for the user to hold the tool with a finger on the trigger. If a tool with a contact trip trigger is held in this manner it will fire anytime the nosepiece of the gun is depressed making it easy for a worker to bump the nose against his own body or against that of a co-worker and fire a nail. In the case of consumer use, stand-by exposure risk can extend to family members including children. In the same report, CPSC described the propensity for contact trip nailers to double fire particularly when the user was trying to accurately place the nailer in activities such as toe-nailing. They describe users as being less likely to hold the nailer firmly enough to counter the nailer's recoil in this circumstance. This is consistent with findings in research reports [Dement et al., 2003; Lipscomb et al., 2003a].

Carpenters provide their own hand tools, but power tools such as nail guns are typically provided by the employing contractor making workers dependent upon their employer to provide the safer tool. Despite evidence that contact trip nailers carry twice the risk of injury, even after accounting for training and experience [Lipscomb et al., 2006, 2008a], diffusion of tools with the safer trigger into the hands of workers remains a challenge.

The International Staple Nail and Tool Association (ISANTA) sponsored a voluntary ANSI standard change effective in May, 2003 [ANSI, 2003] that specifically calls for *shipping* of ''most of the larger (framing) tools with sequential actuation systems.'' This wording has allowed manufacturers to comply with the standard while shipping an alternative contact trip trigger with the tool. Tools continue to be sold with contact triggers, tools are often shipped with a contact trigger in the same box, buyers may request a contact trip trigger be placed on their tool, and there are hundreds of thousands of tools already in the workplace. Additionally, tools are now available with a toggle switch that allows the user to switch from contact to sequential actuation as desired. The combination of known risk, a weak standard, and ease of purchase of these tools at a variety of sales outlets makes the knowledge of the sales personnel potentially very important.

METHODS

Overview and Sites of Work

Data were collected from personnel in establishments that sold or rented pneumatic nail guns in order to document and describe the knowledge of sales staff regarding the safety mechanisms and associated injury risks on the tools they market, and to assess the recommendations for safe use they make to potential users. Geographic sites of data collection were North Carolina, West Virginia and southwestern Pennsylvania, Missouri and southern Illinois, and Texas. In each area, a list of suppliers was identified using the Internet and Yellow pages beginning within a 25 mile radius of the investigators and expanded as

needed to identify 40 sales or rental outlets in each area. Outlets included those selling primarily to builders (such as lumber yards, building supply, tool outlets) as well as those selling to consumers (box home improvement stores, hardware, multi-specialty, pawn).

Data Collection and Outcomes to Be Assessed

After training in a standard approach, members of the research team went into identified outlets as if they planned to buy a framing nail gun. Sales personnel were given a chance to volunteer information about safety mechanisms. If not volunteered, a generic question on safety of the tools was asked. If the salesperson failed to volunteer information about safety or triggering mechanisms, specific questions were asked along the lines of: ''Are they dangerous?'', ''I have heard there are differences in the triggers on these tools. Can you tell me anything about those?'' ''I read something about a sequential trigger, what does that mean?'' ''Aren't there two kinds of triggers? Is one better than the other?'' At some point in the exchange the researcher would comment about the number of Hispanic construction workers in the area and asked if there is a sales person who speaks Spanish in their tool departments. In outlets that sold and rented tools, data were collected from both sales personnel and personnel renting the tools if they were different.

After ending the discussion with the sales staff, the researchers left the store immediately and recorded their experiences on a data collection form. Nothing was recorded in the store to avoid influencing the salesperson or raising concern about the nature of the inquiries. The form included the investigator, the date of the visit, and whether the sales outlet was a construction supply house or not. Each form had a unique number assigned; the investigator kept a log of places visited and the corresponding number assigned to the data collection tool for that visit. No information was collected on individual sales personnel as the store was considered the relevant unit of analysis. All procedures were approved by the Duke University Institutional Review Board.

Analyses

The analyses of these data were very straightforward. After the data were entered and cleaned, basic descriptive statistics were generated. We examined and described findings by geographic area, type of sales outlet (construction vendors vs. outlets where consumers buy tools as well), as well as by gender of the investigator. Differences in proportions were tested with a chi-squared statistic; odds of offering safety information and correct information about trigger mechanisms were assessed using multivariate logistic regression. However, we emphasize that the point of the exercise was not hypothesis testing, but rather a rich descriptive presentation. To that end we also systematically reviewed comments recorded in the process of data collection that might provide greater insight of sales personnel's knowledge or beliefs regarding use of these tools. This content analysis was organized around major themes that were identified from the question list (use of tools, safety guidance/training, trigger differences), as well as common themes that emerged after reading additional recorded comments. These included misinformation, safety information based on knowledge of dangerous experiences or injuries, and poor construction recommendations.

RESULTS

Data were collected from a total of 217 establishments in Missouri (n = 44), S. Illinois (n = 40), North Carolina (n = 46), West Virginia/S. Pennsylvania (n = 37), and Texas (n = 50) by six different investigators including 2 women and 4 men. Ninety-six establishments (44.2%) were visited by women and 121 (55.8%) were visited by men. Fifty-three (24%) of the outlets that were visited sold primarily to builders.

General Safety Information and Knowledge of Trigger Differences

Most of the personnel we approached reported that they had used a nail gun previously (62%). Less than half (41%) provided us with any safety information about the tools; less than 25% mentioned any differences in triggers on the tools and of those who did, 60% of that group described the differences correctly. When directly asked what the differences were between contact and sequential triggers, 29% correctly described the trigger differences (Table I).

Staff in construction outlets, lumber yards, and tool outlets were more likely to mention trigger differences on the tools, particularly, as well as to describe those

TABLE I. Knowledge and Experience of Nail Gun Sales Personnel

	Frequency (%) (n = 217)
Salesperson reported personally using a nail gun	134 (61.8)
Salesperson offered any safety information	88 (40.6%)
Salesperson mentioned trigger differences (Correctly described differences n = 32; 60.4%)	53 (24.4)
Salesperson understood differences between Contact and sequential trigger mechanisms	63 (29.0)

differences correctly, than those in primary consumer outlets. They were also more likely to offer some safety information (Fig. 1).

Individuals who reported that they had personally used a nail gun before compared to those who had not were more likely to offer some safety information (49.3% vs. 26.5%; P-value = 0.0009), to mention differences in trigger configurations (33.6% vs. 9.6%; P-value < 0.0001) and more likely to then correctly explain those differences (69.2% vs. 41.7%; P-value = 0.08). The proportion of personnel who reported having used a nail gun before did not vary significantly by geographic region or gender of the investigator making the inquiry. However, there were differences by region in the offering of any safety information, mentioning the trigger differences, and appearing to understand those differences correctly (Fig. 2).

Personnel queried by male investigators were more likely to mention trigger differences, and more likely to correctly describe those differences (Fig. 3). However, among those who mentioned the trigger differences on their own without being asked, there were no differences in the proportions who correctly described the differences regardless of the gender of the person making the inquiry.

Odds of providing any safety information was greater among those who had used the tool (OR 2.89; 95% CI: 1.56–5.37) and among those working in construction outlets (OR 1.99; 95% CI: 1.02–3.89) even after considering geographic differences. Odds of relaying correct knowledge of differences between contact and sequential actuation were even greater among users (OR 5.37; 95% CI: 2.43–11.83) and among those working in construction outlets (OR 3.50; 95% CI: 1.62–7.57) although the estimates are less precise.

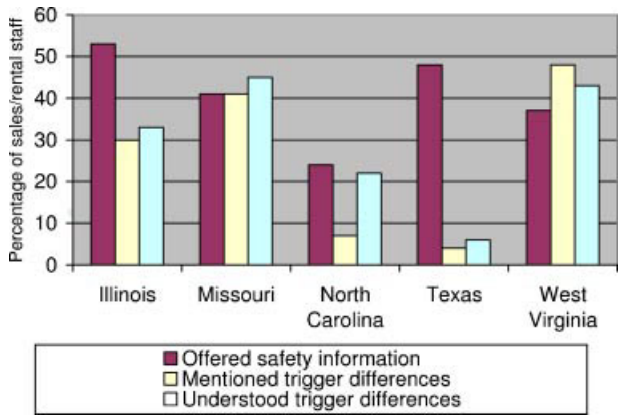

FIGURE 2. Information collected from sales/rental outlets by type of outlet. Differences in proportions statistically significant ($P = 0.002$) for mention of trigger differences and understanding differences correctly; $P = 0.08$ for offered safety information.

Although most personnel we approached did not offer any safety information on their own, we did receive some very appropriate safety guidelines including the importance of bracing parts to be nailed without putting body parts in the line of fire, keeping bystanders out of the way, recommendations to wear safety glasses and use only nails designed for tool being used and the job being done. We were advised to avoid speed when working with the tools and practical suggestions were made such as use of leather gloves to avoid splinters in your hands. We were told to avoid knots in the wood, other nails, or metal attachments (such as joist hangers) as we were nailing since they could cause nails to ricochet, and we were advised about the danger associated with recoil of the tool after firing. At times we received some very specific guidance such as being told to only use a tool with a sequential trigger to fasten metal joist hangers.

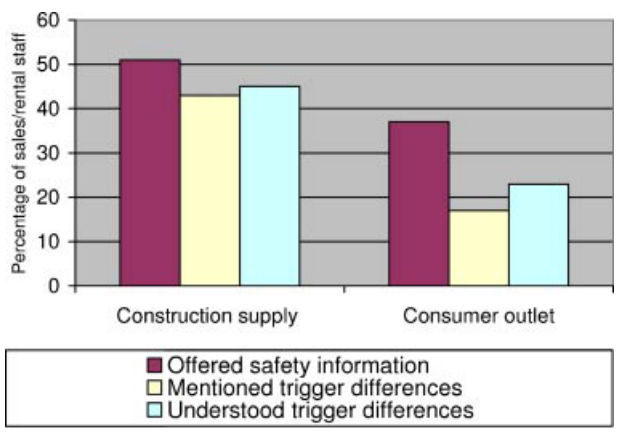

FIGURE 1. Information collected from sales/rental outlets by geographic area. Differences in proportions statistically significant for mention of trigger differences and understanding differences correctly ($P < 0.001$); offered safety information ($P < 0.06$).

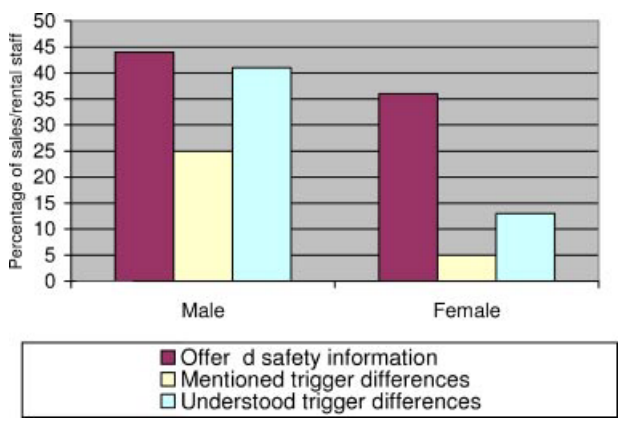

FIGURE 3. Information collected from sales/rental outlets by gender of investigator. Differences in proportions statistically significant ($P < 0.001$) for mention of trigger differences and understanding differences correctly.

Although it was rare that anyone suggested that training was needed, a few of the personnel we talked with offered to provide some training, or at least a demonstration and trial, if we bought or rented a tool from them. We were commonly reassured that the tools were easy to use as evidenced by these comments.

> This is not rocket science, just load and shoot.
>
> Just use your head.
>
> Every man needs one, they are easy to use.
>
> Instructions are in the box; it is easy.
>
> No training is necessary; you just have to get used to how it feels.

Safety information based on dangerous experiences

A number of personnel relayed personal injury experiences or those of acquaintances. One person in a tool supply shop advised that the tools were dangerous, but that there was nothing you could do to prevent injury. He specifically said training was of no use, you just had to get used to using the tools. This person relayed knowledge of several people he knew who had been injured including a friend whose framing gun recoiled, hit him in the chest, and discharged a nail. He knew nothing about trigger differences, relaying they are all basically the same, but he did advise considering use of a hammer.

Other suggestions relayed in discussion of injuries included:

> Don't put it on your lap. You'll hit the trigger and shoot yourself in the leg. I know people who have done this.
>
> Nothing will stop the nail from coming out if you press it against something.
>
> [Nail] guns are dangerous. Unplugging it from the compressor turns it off, it won't fire.

Often staff relaying injury stories still reassured us the tools were safe to use. For example, one person explained:

> *'they're safe,*' but then indicated you could shoot a nail through your hand.

Another offered reassurance that:

> Even if you shoot yourself, you really won't get hurt.

Misinformation

We also received a considerable amount of misinformation as we visited stores; 74.2% of sales personnel provided some misinformation about the tools. Occasionally, a salesperson would acknowledge that they knew nothing about the tools, but many simply relayed erroneous information as illustrated below.

> No way you can hurt yourself with these. They don't fire like a gun. You have to have the nose pressed down to fire so there is no way you can shoot yourself.

This comment clearly reveals a lack of understanding regarding misfires that occur following the common recoil of the tool after firing. It also fails to acknowledge that a tool with contact actuation held with the trigger depressed will fire a nail into anything the nosepiece touches whether that is a board, the user's thigh or another person. The comment came from a salesperson who assured us when directly asked about differences in the trigger mechanisms:

> You don't need to know anything about the trigger, you can read anything on the Internet these days—everyone is an expert, just ignore that stuff.

We were told by another that trigger differences simply referred to the shape of trigger—*"some are more curved"*—and that you should just find one that fits your finger.

Sometimes even when trying to offer a warning the information was incorrect including the person who told us:

> They fire just like a pistol. Just pull the trigger and fire.

When asked if the tools were dangerous one salesperson commented:

> You would have to be an idiot to shoot yourself with one of these.

Another advised:

> The way OSHA has it these days, it would be hard to hurt yourself with these tools unless you are an idiot.

Although current OSHA regulations for pneumatic power tools do not address the common hazards associated

with the contact trigger, this person had the expectation—or at least gave the potential buyer the impression—that OSHA is doing more than it is to protect tool users than is truly the case.

We received a number of pieces of erroneous information about tools that had both sequential and contact actuation. We were advised that the switch that changed the actuation was the on/off switch for the tool and the gauge to adjust depth of nail placement. We were also advised to run your compressor at 150 psi (higher than the manufacture recommendations) in order to sink the nail deep enough.

Lastly, we were given some tips that were just bad construction safety advice such as:

> Always back up as your fire the tool so you see how your nails look (line up).

This person never mentioned that in so doing, you place yourself at risk of inadvertently backing off the edge of the structure.

Availability of Spanish speaking personnel

About a third (n = 73; 34.6%) reported that a Spanish speaker was available in the store where they worked. It is not surprising that there were significant differences in the proportions of stores with Spanish speakers available based on geographic region ranging from a low of 3% in the West Virginia/Pennsylvania area to 92% in Texas. We did not observe any significant differences in the proportion of stores with Spanish speaking staff by whether the outlet was a primary construction/tool vendor compared to a consumer outlet.

DISCUSSION

Exploring occupational risks and culture in construction and other employment segments dominated by self-employed workers, small employers, and informal work, requires creative approaches that consider supply chains and equipment rental/leasing outlets. Even when research data are extensive, as in the case of nail gun injuries, dissemination of information, and changes in practice are challenging for public health and safety professionals.

It may not be surprising that sales personnel we talked with did not know much about nail guns they were selling. These are not highly paid or trained individuals, and they typically sell lots of tools and pieces of equipment. However, the frequency with which incorrect information was passed on to potential buyers is quite concerning. Outlets selling primarily to contractors were more likely to offer safety information and understand trigger differences; still only half of these vendors offered safety information and less than half had appropriate knowledge of trigger differences, which we found surprising.

The safety suggestions we were offered covered major topic areas previously recommended for training of users based on the epidemiology of injuries [Lipscomb et al., 2003a, 2006, 2008]. Unfortunately, safety information is not consistently offered by sales personnel with 59% failing to offer any suggestions for safe use. Six to seven years after the industry-sponsored, voluntary ANSI standard called for shipping of framing nailers with sequential actuation most sales personnel have no knowledge of trigger differences; this included less than half of the personnel we talked with in construction outlets and less than a third of those in consumer outlets.

In large part, the sales and rental personnel we talked with were very cooperative and willing to tell us about the tools they sold; we did not feel rushed by them or pushed to purchase. On occasion they even advised us against purchasing the tool. Furthermore, a number of the sales personnel who were not familiar with the tools were willing to open up boxes and dig for information. Making this information more recognizable on the box could be of assistance to sales personnel who are likely to be selling hundreds of different tools. Finally, some sales personnel did offer demonstration and supervised use to new users. However, this type of behavior and accurate knowledge of the use of the tools and the associated risks was the exception rather than the rule.

We acknowledge that we collected data from each store on only one occasion; it is certainly possible that someone else in the store may have been a better informant. However, in collecting and recording our data on each store, if one person did not know but sought another person who did, we recorded data from the knowledgeable source. We also sought out the sales person responsible for tools or construction projects in large box stores and asked for someone who could help us with questions about a framing nail gun.

Because we did not have both male and female investigators in each geographic area we could not formally control for gender, or geographic location, in our analyses. However, it does not appear that the differences we observed were driven by the gender of the investigators. Even though the trigger differences were more likely to be mentioned to men than women, the proportions of those personnel who did mention the trigger differences who also correctly described the differences to male and female investigators were the same. We did note some clearly sexist comments including a salesperson who advised sequential triggers for women and contact triggers for men and a salesperson who put his arm around a female investigator when she asked more about the danger associated with recoil and commented,

Princess, if I tell you, what are the chances you are going to know what it means?

Of note, this person did know about the trigger differences and could clearly describe the danger of recoil and inadvertent firing when pressed to do so; he just did not think it was important to do so for a woman.

Given that: (1) there are over 35,000 injuries from nail guns treated in US emergency departments each year including about 14,000 among consumers [Lipscomb and Jackson, 2007]; (2) nail guns are responsible for the greatest number of tool or equipment related hospital admissions among individuals in the construction trades [Lipscomb et al., 2010b] despite the fact that their use is largely confined to wood frame construction; and (3) devastating injuries have been documented among consumers and workers including deaths [Associated Press, 1998, 2004, 2005; Department of Labor, OSHA Fatality Report, April 2007; McIntosh, 2008], the reassurance that the tools are not just easy to use, but also safe is disturbing. This is particularly concerning given the documentation that tools with contact triggers carry twice the risk of acute injury of those with sequential actuation [Lipscomb et al., 2006, 2008, 2010a], yet individuals who purchase tools are typically not being so informed. In fact, they often get erroneous information about the actuation systems.

There is much current discourse about safety culture in the construction industry that is often centered on top down approaches that involve management and leadership. The NIOSH Construction Sector Council has defined specific goals surrounding the topic of safety culture for the National Occupational Research Agenda (NORA) [NIOSH, 2010]. Certainly some of the advice we received from sales personnel regarding the use of nail guns would not be representative of a culture of safety among consumer users or among construction workers, the most dramatic perhaps being the comment with which we opened our presentation. It is interesting that many sales personnel were willing to say the tools were both easy and safe to use. This was the case even among people who knew of someone who had been hurt—sometimes severely. All of us were told about people who had been injured using the tools as we were reassured that they were safe.

CONCLUSIONS

Consumers, including contractors purchasing tools for the workers they hire and for whom they have certain safety responsibilities, cannot count on reliably receiving accurate information from sales outlets regarding risks associated with framing nail gun use. Sales personnel appear to have limited knowledge of the risks associated with use of pneumatic nail guns or control measures. Our findings also demonstrate that influences on safety culture are not necessarily limited to workers, their employers, or the places construction gets done. The attitudes and limited knowledge of some sales personnel regarding the use of these potentially deadly tools likely contributes to a culture that is accepting of injury as a consequence of using power tools such as these.

The points of sales or rental of framing nail guns provide an excellent potential venue to influence the type of tools purchased as well as safety attitudes and knowledge of consumers. These outlets could potentially provide training for users as well. Achieving these things would require devotion of resources that would allow appropriate training of personnel. Such a strong safety orientation in the sales process could benefit vendors by minimizing their potential liability exposure.

As it stands now, sales personnel do not even have access to information that they need to provide consistent messages on safety to purchasers of these tools. We have never seen any reference to the ANSI standard in product materials we have reviewed, making it difficult for sales personnel to gain such knowledge even if they regularly reviewed product information shipped in the boxes in which the tools are sold. This raises the question as to whose responsibility it is to relay such information, and illustrates the weakness of such voluntary standards.

Further, the 40-year-old Occupational Safety and Health Act (OSHA) focuses primarily on employers; existing product safety laws focus on consumers not workers. CPSC and OSHA could improve safe use of large framing nail guns through joint efforts focused on assuring the use of tools with sequential triggers and education of users and sales personnel but such collaboration across government agencies can be challenging.

As the National Institute for Occupational Safety and Health (NIOSH) increases its focus on diffusion of research-to-practice (R2P), interest in analysis of information dissemination pathways, as presented here, should extend well beyond those interested in nail guns. Insuring that customers at the point of sale get accurate and meaningful safety and health information needs to be recognized as an important and critical dimension of supply chain management. Furthermore, as there is an increased blurring of exposures to potentially dangerous tools across work and home, a system is needed that can protect both workers and consumers in the U.S. Our experiences make it abundantly clear that our current ad hoc dissemination of safety information in the U.S. does not really work.

ACKNOWLEDGMENTS

This work was funded through the Center for Construction Research and Training (CPWR) Small Study no. 09-4-PS. For thoughtful guidance and suggestions we

thank Matt Gillen, CIH; Deputy Director, NIOSH Office of Construction and Coordinator, NIOSH Construction Program, Washington, D.C., and James W. Platner, PhD, CIH, Associate Director, CPWR Center for Construction Research and Training, Silver Spring, MD.

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