Research Note

Hand Washing Compliance among Retail Food Establishment Workers in Minnesota

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ABSTRACT

Inadequate hand washing by food workers is an important contributing factor to foodborne disease outbreaks in retail food establishments (RFEs). We conducted a survey of RFEs to investigate the effect of hand washing training, availability of hand washing facilities, and the ability of the person in charge (PIC) to describe hand washing according to the Minnesota Food Code (food code) on workers’ ability to demonstrate food code–compliant hand washing. Only 52% of the PICs could describe the hand washing procedure outlined in the food code, and only 48% of workers could demonstrate code-compliant hand washing. The most common problems observed were failure to wash for 20 s and failure to use a fingernail brush. There was a strong positive association between the PIC being a certified food manager and being able to describe the food code hand washing procedure (odds ratio [OR], 5.5; 95% confidence interval [CI], 2.2 to 13.7), and there was an even stronger association between the PIC being able to describe hand washing and workers being able to demonstrate code-compliant hand washing (OR, 15; 95% CI, 6 to 37). Significant associations were detected among correct hand washing demonstration, physical infrastructure for hand washing, and the hand washing training methods used by the establishment. However, the principal determinant of successful hand washing demonstration was the PIC’s ability to describe proper hand washing procedure. These results suggest that improving hand washing practices among food workers will require interventions that address PIC knowledge of hand washing requirement and procedure and the development and implementation of effective hand washing training methods.

Foodborne diseases are a major public health problem in the United States and throughout the world (13). Noroviruses are the leading known cause of foodborne illness and are increasingly recognized as the leading cause of outbreaks (1). Infected food workers may transmit norovirus and other foodborne pathogens by touching foods or food contact surfaces with contaminated hands (9, 10). According to the Centers for Disease Control and Prevention, poor personal hygiene is one of the five most common causes of foodborne disease outbreaks (19). Thus, proper and consistent hand washing must be practiced by all food workers to reduce the risk of disease transmission (5, 15, 17). The Minnesota Food Code (food code) specifies a hand washing protocol for food workers, which includes wetting the hands, applying soap, rubbing the hands together vigorously for at least 20 s, and rinsing with clean water (18). In addition to this, food workers in Minnesota are required to use a fingernail brush during hand washing to scrub areas underneath the nails and between the fingers (18). However, epidemiologic and inspection data show that there is low compliance with hand washing requirements among retail food establishment (RFE) workers (1, 19).

Public health agencies promote hand washing among food workers by requiring that appropriate hand washing facilities be provided in each RFE and that ongoing hand washing training is conducted (18, 20). Thus, all RFEs in Minnesota must have fully equipped hand washing stations, and except for establishments with minimal food preparation, such as those that serve prepackaged food, all must have a state-certified food manager who is trained in safe food preparation, sanitation, and the prevention of foodborne illnesses. Additionally, there must be a designated person in charge (PIC) of a RFE at all hours of operation who is knowledgeable about foodborne disease risk factors, such as poor worker hygiene, and who is responsible for ensuring that appropriate measures are in place to prevent foodborne disease transmission.

Lack of hand washing facilities and ignorance of the health benefits associated with hand washing are important barriers to hand washing in the general population (6, 7, 10, 16). However, the barriers to hand washing in RFEs are not fully understood. We therefore conducted a survey of RFEs to investigate the relationship among hand washing training, the ability of the PIC to describe hand washing according to the food code, and the availability of appropriate hand washing facilities and workers’ ability to demonstrate food code–compliant hand washing.

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FIGURE 1. Hand washing training methods used in surveyed establishments. The persons in charge were asked to select from the following list of likely training methods: training manual, signs, video, demonstration, explanation, training sign-off, or formal certification. None of the establishments used all seven methods.

MATERIALS AND METHODS

Data were collected by sanitarians while conducting routine inspections of 123 RFEs. The surveyed establishments included restaurants, delis, bakeries, and grocery stores in 12 inspectional jurisdictions across Minnesota. A standardized instrument was used to collect data for the study, and all participating sanitarians were trained to use the instrument before data collection began. In each establishment surveyed, the PIC was asked if he or she was a state certified food manager. Then the PIC was asked to describe the hand washing procedure stipulated by the food code and to identify which if any of the following methods were used to conduct employee hand washing training: posted materials, training video, use of written training manual, explanation of hand washing requirement and procedure, demonstration of proper hand washing, training with employee sign-off, and/or comprehensive training with formal certification. After the PIC was interviewed, a food handler was asked to demonstrate hand washing according to the food code. Care was taken to select a worker who had not heard the hand washing description given by the PIC. A satisfactory hand washing description or demonstration had to include wetting the hands, lathering soap up to the wrist, rubbing vigorously for 20 s, using a fingernail brush, rinsing with clean water, and drying hands with a disposable paper towel. Following the demonstration, the evaluator conducted an inspection of the establishment’s hand washing facilities to determine if they were accessible, supplied with water at a temperature of at least 43°C (110°F), and clean and if soap, disposable towels, and a fingernail brush were present at the sink. Inspection of the hand washing facilities was performed after the hand washing demonstration to reduce the likelihood of bias.

Statistical analysis of the data was performed with the Statistical Analysis System (SAS) software (SAS Institute, Cary, N.C.) and EpiInfo 2002 (Centers for Disease Control and Prevention, Atlanta, Ga.). The analysis of variance procedure was used to test associations among numerical variables, and associations among categorical variables were tested by χ² tests.

RESULTS

Training methods. Most establishments provided some type of hand washing training to employees. The number of methods used for hand washing training ranged from no formal training in 14% of the establishments to six different methods in one establishment (Fig. 1). The most frequently reported method used for hand washing training was a verbal explanation of hand washing (Table 1). Among establishments that used only one method of training, demonstration and explanation were the most effective methods in that employees in RFEs that reported using either of these methods were two to three times more likely to demonstrate code-compliant hand washing than were employees who received no formal training (Table 2). However, the effectiveness of all training methods was dependent on the

### TABLE 1. Correct hand washing demonstrations by training methods used

<table>
<thead>
<tr>
<th>Training method</th>
<th>Frequency (%)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Rate ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanation</td>
<td>62</td>
<td>37 (60)</td>
<td>25 (40)</td>
<td>2.9</td>
</tr>
<tr>
<td>Demonstration</td>
<td>54</td>
<td>32 (59)</td>
<td>22 (41)</td>
<td>2.8</td>
</tr>
<tr>
<td>Signs and posters</td>
<td>41</td>
<td>18 (44)</td>
<td>23 (56)</td>
<td>2.1</td>
</tr>
<tr>
<td>Sign-off</td>
<td>30</td>
<td>19 (63)</td>
<td>11 (37)</td>
<td>3.0</td>
</tr>
<tr>
<td>Training manual</td>
<td>29</td>
<td>19 (66)</td>
<td>10 (34)</td>
<td>3.1</td>
</tr>
<tr>
<td>Video</td>
<td>23</td>
<td>12 (52)</td>
<td>11 (48)</td>
<td>2.5</td>
</tr>
<tr>
<td>None</td>
<td>14</td>
<td>3 (21)</td>
<td>11 (79)</td>
<td>Reference</td>
</tr>
<tr>
<td>Certificate</td>
<td>6</td>
<td>3 (50)</td>
<td>3 (50)</td>
<td>2.4</td>
</tr>
</tbody>
</table>

<sup>a</sup> For all establishments.

<sup>b</sup> Fifty-three percent of establishments reported using two or more training methods.

### TABLE 2. Correct hand washing demonstrations by training method<sup>a</sup>

<table>
<thead>
<tr>
<th>Training method</th>
<th>Frequency (%)</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Rate ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanation</td>
<td>15</td>
<td>7 (47)</td>
<td>8 (53)</td>
<td>2.2</td>
</tr>
<tr>
<td>Demonstration</td>
<td>8</td>
<td>5 (63)</td>
<td>3 (37)</td>
<td>3.0</td>
</tr>
<tr>
<td>None</td>
<td>14</td>
<td>3 (21)</td>
<td>11 (79)</td>
<td>Reference</td>
</tr>
<tr>
<td>Signs and posters</td>
<td>7</td>
<td>2 (29)</td>
<td>5 (71)</td>
<td>1.4</td>
</tr>
<tr>
<td>Training manual</td>
<td>5</td>
<td>1 (20)</td>
<td>4 (80)</td>
<td>1.0</td>
</tr>
<tr>
<td>Video</td>
<td>2</td>
<td>0 (0)</td>
<td>2 (100)</td>
<td>0</td>
</tr>
</tbody>
</table>

<sup>a</sup> For 37 establishments that reported using only one hand washing training method compared with 14 establishments that did no formal training. None of these establishments offered formal training with certification.
FIGURE 2. Percentage of correct hand washing demonstrations by number of training methods. The training methods were training manual, signs, video, demonstration, explanation, training sign-off, or formal certification. None of the establishments used all seven methods.

PIC’s ability to describe hand washing, and irrespective of the training method, 60 to 84% of workers could demonstrate hand washing when the PIC could describe hand washing and only 0 to 30% of workers could when the PIC could not describe the procedure. There was also a strong positive association between the number of hand washing training methods and worker’s ability to demonstrate hand washing ($\chi^2$ test for trend, $P < 0.01$) (Fig. 2).

Hand washing description. Only 52% of the PICs could describe the hand washing procedure outlined in the food code. The PICs who were state-certified food managers were more likely to be able to describe the food code hand washing procedure (48 [66%] of 73 compared with 8 [25%] of 32; odds ratio [OR], 5.8; 95% confidence interval [CI], 2.3 to 14.7). Failure to specify the need to use a fingernail brush was the most common problem with the hand washing descriptions given by the PICs. However, 77% of PICs who were state-certified food managers described the need to use a fingernail brush compared with 38% of uncertified PICs (OR, 5.5; 95% CI, 2.2 to 13.7).

Hand washing demonstration. Only 48% of food handlers could demonstrate hand washing according to the food code. The most frequent problems with the hand washing demonstrations were failure to use a fingernail brush and failure to wash for 20 s. These problems were noted in 89 and 60% of incorrect hand washing demonstrations, respectively. The ability to demonstrate code-compliant hand washing was significantly associated with the PIC being able to describe hand washing (44 [76%] of 58 compared with 9 [18%] of 51; OR, 14.7; 95% CI, 5.7 to 36.5).

Hand washing facilities. Only 68 (55%) of the establishments surveyed were fully equipped for hand washing according to the food code. The most common problems with the hand washing facilities were a lack of fingernail brush and inaccessibility of the hand sink. These problems were noted in 38 and 24% of the establishments, respectively. Hand washing facilities were more likely to be fully equipped in the establishments where a certified food manager was the PIC during the survey (45 [60%] of 75 versus 12 [38%] of 32; OR, 2.5; 95% CI, 1.1 to 6.3). A nailbrush was at the demonstration sink in 62% of establishments, elsewhere in the establishment in 21%, and completely absent in 17% of establishments. If the brush was at the sink it was used 86% (57 of 66) of the time, whereas if it was not at the sink it was used 7% (3 of 44) of the time (OR, 87; 95% CI, 22 to 339).

DISCUSSION

Poor hand washing by food workers is an important risk factor for foodborne disease outbreaks in RFEs (3, 7, 11, 14, 21). This includes the failure to both wash hands and wash hands correctly. Although we were not able to directly observe the frequency or adequacy of hand washing during routine foodservice operations, we believe that being able to demonstrate proper hand washing technique is a necessary condition for good hand washing practices and may be a useful indicator of likely hand washing compliance in RFEs (13, 17).

Several important findings were made in this study. Among them, we have shown that there is a strong association between the hand washing knowledge of the PIC and the ability of food workers to demonstrate proper hand washing. Assigning a person who is knowledgeable about operational and code requirements to be in charge of a RFE at all hours of operation is essential for ensuring the appropriate detection and resolution of food safety hazards (4). However, under current Minnesota food regulations, a PIC of a food establishment does not have to demonstrate achievement of food safety knowledge standards through testing and certification; thus, the food safety knowledge of individual PICs is highly variable. These results suggest that uncertified managers may lack the skills and/or inclination to ensure appropriate levels of compliance with hand washing by food workers; thus, a certified food manager may need to be present in high-risk RFEs during all hours of operation to help ensure acceptable levels of hand washing compliance.

Workers in establishments that conduct some type of hand washing training could more frequently demonstrate proper hand washing than workers in establishments that did no training. In addition, hand washing performance was directly proportional to the number of methods used to conduct hand washing training. These findings reinforce the long-held belief that appropriate food safety education can help improve food safety performance in retail establishments (2, 4, 12). In particular, demonstration of hand washing technique and verbal explanations of hand washing appeared to be the most effective training methods when used alone. Both depend on personal communication with the food worker. In contrast, less personal methods, such as the use of training manuals, signs, posters, and videos, did not appear to be successful when used as the sole method. However, these materials may be important to reinforce the primary training. The increasing effectiveness of multiple methods of training also suggests that repeating the training messages in different ways may be important (8).
In conclusion, our results suggest that improving hand washing practices among food workers will require interventions that address PIC knowledge of hand washing requirement and procedure, physical facilities for hand washing, and the development and implementation of appropriate training methods. Personal communication with the food worker appears to be important for effective training and is very likely to be important for translating hand washing knowledge into routine practice.

REFERENCES