OSH Professionals in Academic Research

A Pilot Strategy for Characterizing Work Activities

By Robert J. Emery, Scott J. Patlovich and Kalyn C. Jannace

A variety of safety and health risks exist on college and university campuses based on the types of teaching and research activities conducted. OSH programs are typically implemented to help identify and control these risks to keep students, faculty, staff and visitors safe. A significant challenge for decision makers at these institutions is how to determine appropriate staffing and resourcing levels for such programs. A further challenge to staffing is ensuring that the job description and duties accurately represent those activities that truly fall under the purview of the position.

Existing methods of measuring efforts often include some level of intense observation or surveillance, which staff may consider to be intrusive and cumbersome (Sewell, Barker & Nyberg, 2012). As a result, the Hawthorne Effect, described in other time and motion studies, may alter the way a staff member conducts his/her routine activities leading to an observed effect further from the normal (Fernald, Coombs, DeAlleaume, et al., 2012). Brown, Emery, Delclos, et al.'s (2015), recently developed predictive models provide the ability to estimate staffing and resourcing needs in academic settings using institutional drivers such as total net assignable square footage, but the models do not account for staff productivity.

In this pilot study the authors utilized the ecological momentary assessment (EMA) research technique to record the work activities being undertaken by OSH personnel during a typical 8-hour work day in an effort to augment the Brown, et al., models by addressing worker productivity. Practicing OSH professionals were evaluated 1 day per week over a 5-week period (for a total of 5 work days, all weekdays) to determine the type of work conducted during the normal 8-hour work shift. This pilot

IN BRIEF

- **In this pilot study, the authors selected the ecological momentary assessment research model as a tool to record the activities of environmental health and safety staff supporting an academic research institution conducted during typical work days.**
- **The researchers determined that the primary activities performed were routine safety surveillance activities, responding to client service requests and necessary safety services, accounting for 45% of the recorded time expenditures.**
- **Managers of safety and health programs may be interested in learning more about this tool to make more informed decisions about staffing and resource allocation and to better articulate to upper management what safety programs do.**

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study represents a novel approach for assessing the functionality and roles played by OSH employees, and it can serve as a reference for determining resource and staffing needs and allocations. The effort can also help OSH programs in the quest for educating upper management and other key stakeholders about what such programs do and what value they bring to the organization.

Literature Review

Epidemiologic and medical research studies that involve some level of self-report inherently encounter biases. Questionnaires, surveys and interviews can introduce social desirability bias, especially when anonymity and confidentiality are not guaranteed, and recall bias to research data (Althubaiti, 2016). The EMA technique allows participants to respond to survey questions to provide an accurate representation of the activity being performed or the environment being encountered in near real time. The EMA model has been shown to capture self-report data better than retrospective self-report studies, as the latter have a higher rate of recall bias and are prone to errors (Bradburn, Rips & Shevell, 1987). Such biases result from participants being asked to recall information at a later date, sometimes after a year or more has elapsed (Dunton, Dzubur & Intille, 2016).

The EMA model has been used frequently in public health research to creatively capture real-time information on health behaviors, and information that has been traditionally recalled retrospectively. For example, in comparing the efficacy of capturing sensitivity to change of clinical symptoms among psychologically distressed older adults using EMA versus traditional paper-and-pencil measures, researchers found that the EMA method outperformed the paper-and-pencil method substantially ($p < 0.001$) in providing feedback to determine the need for psychological treatment (Moore, Depp, Wetherell, et al., 2016).

When comparing responses to substance use in a retrospective questionnaire versus daily text messaging, another study found that participants reported substance use more frequently from the EMA text messages than when asked to complete the retrospective questionnaire. This led researchers to conclude that frequent, repeated EMA methods may reduce the distortion of information that would be provided on a retrospective questionnaire (Rowe, Hern, DeMartini, et al., 2016). EMA methods sometimes maintain the paper-and-pencil measures but include a prompt via text-messaging and e-mail to remind participants to complete the assessment as was done in a study evaluating sit-stand workstations in an office setting (Graves, Murphy, Shepherd, et al., 2015).

EMA methods have been used in the workplace to assess worker stress and its effects. One study asked nurses working in acute and critical care hospitals to carry a personal digital assistant for 1 week of work shifts, during which time they were randomly surveyed within 90-minute intervals. Participants were asked to answer questions regarding their work activity, perceived workload and stress (Shively, Rutledge, Rose, et al., 2011).

Another separated the workday into six roughly equal intervals and had workers of varying socioeconomic status and employment type answer questions regarding their judgments of the workplace at the moment of the survey. They used this EMA to investigate the relationship between work stress and socioeconomic status (Damaske, Zawadzki & Smyth, 2016). Many other studies look at employee stress or health behavior interventions deployed in the workplace.

A literature search reveals that the type of EMA study conducted for research on worker productivity with regard to determining appropriate staffing and resourcing needs is novel. The model previously developed by Brown, et al. (2015), for predicting OSH staffing and resource needs found net assigned square footage to be the most statistically significant driver of predicting staffing. However, this developed model does not account for productivity of these employees.

To augment these models, this pilot project embarked upon an effort to determine how OSH staff at the University of Texas Health Science Center at Houston spends their time during normal work duty hours by providing a basic understanding of the categories of work activities in which OSH professionals routinely engage.

Methods

Several existing EMA tools available online were evaluated and considered for this study, but

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the authors chose to adapt the EMA concept by custom-designing an e-mail-based survey tool. The self-developed survey tool consisted of two customized forms created using Microsoft's InfoPath software.

The first form determined: 1) in which program within the OSH department the participant is employed (biological safety, chemical safety, occupational safety and fire prevention, radiation safety, environmental protection, risk management and emergency preparedness, hospital and clinic safety or administration), and 2) whether the participant was present at work on the day of the study by selecting "present" or "not present (on sick or vacation leave)." If the respondent selected "not present," then s/he was excluded for responding for the remainder of the workday.

For those who identified themselves present at work, the second form was distributed to their work e-mail address every 30 minutes throughout the 8-hour workday to determine: 1) to which program within OSH the person belonged, and 2) what work activity the individual was primarily conducting during the previous 30-minute time interval. Dropdown menus allowed study participants to select answers to each question and written text within the forms provided instructions and definitions of terms.

Prior to conducting the pilot study, the authors held a departmental meeting to present the study objectives and obtain feedback from study participants regarding the list of work activity categories. The researchers clearly presented each work activity category and its associated definition to ensure

TABLE 1
OSH Activity Categories & Descriptions Included in the EMA

Activity category	Examples of activity category
Accident/injury/exposure investigations	Investigating first reports of injury submitted to OSH related to an incident, occupational injury or exposure.
Administrative requirements	Responding to information requests, completing timesheets, photocopies, phone calls, faxes, purchases or networking with colleagues/customers.
Assembling activity report data	Assembling information for monthly program activity reports.
Attaining professional knowledge	Obtaining knowledge and skills related to profession. Includes on- and off-site training, weekly continuing education sessions, webinars, telecommunications and academic programs.
Contingent delays	Time spent waiting for others who did not show up or came unprepared.
Delivering training	Delivering safety training to faculty, staff and students. Includes time spent preparing training materials and associated paperwork and data entry.
Emergency response	Participating in any form of emergency response or unplanned response activity.
External regulatory compliance inspections	Preparing for an unannounced regulatory inspection, hosting site visits and any follow-up actions.
Human resources (HR)/supervisory duties	HR-related or supervisory duties such as interviewing and hiring personnel, preparing and conducting performance reviews and other related supervisory duties.
In transit	In transit to/from labs/clinics, meetings, committees support and incident investigations.
Necessary routine safety services	Conducting respiratory fit testing, equipment calibration, badging personnel exposure monitoring, and collecting, processing or disposing of waste.
Other institutional service	Meetings or working on service-related activities for the institution not otherwise covered in other categories (e.g., university staff councils, employee search committees).
Research protocol/facilities plan reviews	Reviewing protocols in support of various safety committees or plan reviews.
Responding to client service requests	Time spent answering calls, e-mails, personal inquiries related to safety services, regulations and guidelines, policies and standard operating procedures or indoor air quality investigations.
Responding to inquiries	Responding to open records requests or media-related inquiries, activities associated with preparing information for response, interviews or filming.
Safety committees support	Preparing materials for various safety committees such as agendas, minutes, supplementary information, technical support, management of regulatory compliance activities.
Safety surveillance activities	Lab, clinic and other work site inspections, including preparing for surveys, follow-ups, corrective actions and completion of associated paperwork and data entry.

participant understanding and agreement. Several category definitions were modified to provide clarity, and three additional categories not previously identified were reviewed and included to more accurately represent actual staff activities. Study methodology was also explained during this meeting to clarify the procedure and expectations for responses to EMA survey requests.

Subsequently, the researchers conducted a preliminary evaluation of the EMA study prior to actual launch of the pilot study. Initial results and discussion revealed some discrepancies in how employees categorized their work activities. For example, when preparing safety training materials, some employees incorrectly accounted for the time as an "administrative obligation" rather than "delivering training." The authors used another departmental meeting to review the revised categories and associated definitions, and to clarify expectations for the pilot study. Table 1 (p. 59) represents the agreed upon activity categories used in the pilot study.

All staff participant e-mail addresses were tested to ensure that participants were properly receiving messages. Staff were informed that the study was intended strictly for research purposes, not as oversight of their time, and that their responses would have no linkage to performance evaluations. Staff were made aware that responses were anonymous aside from the program designation. No employee identifying information or e-mail addresses were linked to the data.

Study e-mails were distributed to OSH personnel's work e-mail addresses using Microsoft Outlook at 8:00 a.m. on the day of the study (Form 1) and every 30 minutes thereafter (Form 2) until 5:00 p.m. In total, each participant received 18 e-mails per study day, two of which would identify the lunch hour. Note that the data on lunch breaks was not included in this text as it is not relevant to the goal of this study.

Data were collected over a 5-week period, with 1 workday randomly selected during each week. For example, for the first week of the study, Tuesday was the chosen day for data collection. The following week Thursday was selected. Over the 5-week period all traditional workdays (weekdays) were covered.

To ensure accuracy of delivery timeliness, e-mails were scheduled to automatically distribute to personnel using the delayed delivery function within Microsoft Outlook. Survey completion could be conducted wherever the e-mail could be received, such as at a desktop terminal, tablet or smartphone. To receive the e-mails in real time while working in the field, all OSH staff were required to have push-to-device e-mail set up on their smartphones. Form responses were compiled for export into Microsoft Excel for sorting and analysis. Subsequently, the data were analyzed using SAS statistical software.

TABLE 2
Activities Performed

Activities performed by OSH department during EMA pilot study, with emphasis on those accounting for at least 10% of activities conducted.

Activity category	% Time	Proactive, reactive, not applicable
1) Safety surveillance activities	18%	Proactive
2) Responding to client service requests	15%	Reactive
3) Necessary routine safety services	12%	Proactive
4) Attaining professional skills and knowledge	10%	Proactive
5) Administrative requirements	9%	NA
6) Research protocol/facilities plan reviews	7%	Proactive
7) In transit	6%	NA
8) Delivering training	5%	Proactive
9) Safety committees support	4%	Proactive
10) Assembling activity report data	3%	NA
11) Responding to inquiries	3%	NA
12) Other institutional service	2%	NA
13) Emergency response	2%	Reactive
14) Accident/injury/exposure investigations	1%	Reactive
15) External regulatory compliance inspections	1%	Proactive
16) Contingent delays	1%	NA

Results

Out of a possible 2,192 total responses expected over the 5-week pilot study, 2,053 were collected from participants resulting in a response rate of approximately 94%. Lunch hour responses were removed from analysis as this was not considered a work category for OSH personnel. A total of 29 employees were working for the OSH department for 4 out of 5 days and 30 total employees for 1 out of 5 days. Staff attendance on the 5 days ranged from 90% to 97% with an average of 94%. Responses for the different OSH departmental programs were as follows: Total (N = 29); administration (n = 3); biological safety (n = 5); chemical safety

(n = 4); environmental protection (n = 3); hospital and clinic safety (n = 1); occupational safety and fire prevention (n = 6); radiation safety (n = 5); risk management and emergency preparedness (n = 2).

Table 2 reflects the breakdown of the 17 activity groups based on the reported proportion of time spent on each activity by the collective OSH department, listed from highest to lowest. The activities in which OSH staff engage are ranked as follows: safety surveillance activities (18%); responding to client service requests (15%); necessary routine safety services (12%); attaining professional skills and knowledge (10%); administrative requirements (9%); research protocol/facilities plan reviews (7%); in transit (6%); and delivering training (5%). Collectively, these top eight of the 17 identified categories accounted for 82% of the total time commitment for the department.

As expected, the relative ranking of the different activities varied by individual departmental program. For example, the environmental protection, and occupational safety and fire prevention programs each recorded more time in transit than any other program due to the frequency of travel and wide geographic area of responsibility. Another example includes the biological safety program attaining professional skills and knowledge more than other programs due to an intense training program that staff were enrolled in during the time of study.

OSH activities being carried out also differed by day of the week. Safety surveillance activities were most frequent on Wednesdays and lowest on Fridays. Attaining professional skills and knowledge was most frequent on Fridays. Mondays appear to be the primary day for research protocol/facilities plan reviews, while this activity was conducted the least on Wednesdays and Fridays. These were the only activities identified to be unequally represented throughout the work week.

Discussion

Overall, the results from this pilot indicate that the OSH department at the University of Texas Health Science Center at Houston appears to operate on a proactive rather than a reactive basis. Activity categories that made up at least 10% of activity time and made up 55% of all activities (safety surveillance activities, 18%; responding to client service requests, 15%; necessary routine safety services, 12%; attaining professional skills and knowledge, 10%) were heavily proactive rather than reactive (40% vs. 15%), as highlighted in Table 2. This preventive approach is what OSH departments hope to see rather than the opposite. The results are indicative of a customer-service-based program that proactively surveys laboratories and clinic areas to identify safety issues in advance of workplace incidents and injuries.

Attaining professional knowledge fell into the top five most performed activities for OSH personnel. This may indicate that employees are maintaining current knowledge of the field, which could contribute to their ability to ensure that their actions are proactive rather than reactive. However, this finding may not be indicative of the normal amount of training received, as the biological safety program was involved in unique training during the study which may have inflated the results.

Safety surveillance activities were in the top five most performed activities for all of the OSH programs except administration, and risk management and emergency preparedness. These programs did not include the safety surveillance activities category in their top 10, but this was expected. Environmental protection, occupational safety and fire prevention, and risk management and emergency preparedness all had the in transit activity in their top five. Due to the nature of the duties in which these programs perform, they tend to be more mobile, traveling between sites. Protocol/plan reviews also ranked in the top five for half of the programs, an activity expected of those particular programs such as biological safety and radiation safety.

Attaining professional skills and knowledge was found in the top five program-specific activities for biological safety, environmental protection, occupational safety and fire prevention, and radiation safety. While it is positive to see that half of the programs are maintaining updated professional knowledge, this must be in balance with the time necessary to complete normal work activities.

The sample size of the study (N = 29) is limited by the OSH department size and therefore is small. The individual programs also have relatively small sample sizes. This is one of the limitations of the study, but future EMA studies conducted in other OSH programs, both large and small, could be useful to compare between institutions. In addition to the small sample size, EMA days were not blinded, so attendance, productivity and response may have been influenced by the knowledge of the ongoing survey. This could contribute to desirability bias if employees were more likely to be productive or answer productively to meet their manager's expectations, regardless of the up-front disclaimer that performance on the survey would not affect participants' position whatsoever. However, the authors believe that the bias is smaller than that which would be introduced by more intrusive surveillance methods such as logging hours or monitoring by a consultant or third party.

This real-time collection technique also reduces the probability of recall bias by requiring an answer to the survey at the time the activity is being conducted. Being a novel approach to looking at worker activity, the study has no pretest, posttest or comparison groups that could be utilized for statistical analysis. Other OSH programs can utilize this study to compare their departmental activities versus that of the group used for this data collection. This OSH department serves an academic setting, which influences how their departments spend their time. A future comparison could look at OSH departments in strictly business settings versus an academic setting to compare departmental activities.

In addition to the small sample size, the study had a few other limitations. Over the 5-week period, the average absentee rate was approximately 10%. The EMA first asked whether an employee was present at work that day. However, the department also experienced a chronic position vacancy rate of approximately 10% and this study did not consider whether the department was fully staffed at the time it was conducted. This could affect the proportion of time dedicated to certain activities by different OSH units or the absorption of these duties by other units as a result of the vacancies.

This information could help managers of OSH programs confirm that job descriptions match what staff actually do during their daily activities, ensuring that skill sets are appropriately matched with jobs and that training priorities are aligned with each position.

The time over which the study was conducted could have been extended. Rather than selecting only 5 days at random for the surveys, longer periods or consecutive periods may have provided a larger data set. In addition, the data was collected for one activity every 30 minutes, which could also be considered a limitation. Due to the dynamic nature of OSH professions, more than one activity may have been performed at the time, but the survey tool was only able to capture a single activity. Unique activities such as special trainings occurred during the study period as well, which may have skewed the activities of some programs. A higher frequency of data collection (e.g., every 5, 10 or 15 minutes) could have potentially alleviated this issue and should be considered when conducting future studies.

Finally, in this study only one OSH department was reviewed, which did not provide any comparison groups. Due to an inability to find a similar research approach in the published literature, it is difficult to ascertain whether these results are different from those that would be typical of any OSH program. Therefore, it is also suggested that future studies be conducted over a longer period to capture work activities over more workdays to increase the strength of the findings.

Conclusion

This pilot study represents a novel approach for assessing the functionality and roles played by OSH employees. Other OSH programs could consider conducting a similar study for comparisons in the future. Leadership should be cognizant of these findings and sensitive to resource allocation needs, such as time allocated to waste pickups or facility oversight that would be needed in a densely populated medical center with disjointed campus and buildings spread over a wide geographic area. This may also include the need for fuel and maintenance for vehicles in addition to manpower needs. Further evaluation of program-specific data could be beneficial to determine the typical tasks performed by individual OSH departments and shared with professional associations representing these groups. Collectively, this information could also help managers of OSH programs confirm that job descriptions match what staff actually do during their daily activities, ensuring that skill sets are appropriately matched with jobs upon recruitment, and that training priorities are aligned with each position. **PS**

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