

Time Well Spent: Patient Industry and Occupation Data Collection in Emergency Departments

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Objective: No comprehensive national system tracking work-related diseases and injuries exists in the United States. Industry and occupation (I/O) are the missing data elements that would make existing healthcare data useful for occupational health. The authors previously petitioned the National Uniform Billing Committee (NUBC) to adopt I/O standards for states to consider during their healthcare data rulemaking processes. **Methods:** The NUBC asked for a pilot study to ascertain the potential burden. The time and cost to ask I/O questions in two hospital emergency departments was evaluated. **Results:** Asking four I/O questions required 48 seconds on average and cost between \$520 and \$623 per Registrar per year. The annual cost for the two hospitals to gather I/O on every patient was \$4160 and \$15,000. **Conclusions:** We conclude no undue burden compared with the estimated \$250 billion cost of occupational illnesses and injuries.

Every year, nearly 3 million Americans suffer from workplace injuries and illnesses, yet hospitals in the United States do not currently track and report these incidents.¹ Moreover, there is no comprehensive national system tracking of work-related diseases and injuries in the United States.² Industry and occupational (I/O) data are the missing link that fill this gap and make more robust healthcare data available that can help facilitate significant occupational health advances. Standards applicable to all industries, including healthcare, already exist to codify I/O: the North American Industrial Classification System (NAICS) and the standard occupational classification (SOC).^{3,4} The inclusion of I/O data elements in hospital administrative data would ultimately facilitate the collection of important information from every patient in the United States who is seen in the emergency department (ED) or admitted to the hospital. This would create national capacity from existing data systems currently used for illness and injury surveillance (eg, National Hospital Discharge Survey, National Hospital Ambulatory Medical Care Survey, National Ambulatory Medical Care Survey), and make them useful for *occupational* illness and

injury surveillance. The addition of two new variables would enable physicians, researchers, and payers to accurately account for occupational injuries and illnesses and support prevention initiatives.

Failure to prevent occupational injury and illness comes at a major economic cost. For example, \$62.3 billion was spent on workers' compensation in 2014 which is only one aspect of the total cost to employers.⁵ For all non-fatal and fatal occupational illnesses and injuries combined, the estimated price tag reaches a staggering \$250 billion.⁶ Preventing occupational injury and illness enhances quality of life for workers and their families.⁷ In addition, it leads to reduced healthcare expenditures, for both private insurance and workers' compensation insurance costs and improving economic performance by keeping workers healthy and on the job, reducing workers' compensation indemnity costs (lost wages).⁸

We described in an earlier paper published by this journal, our efforts to petition the National Uniform Billing Committee (NUBC) to adopt I/O standards for states to consider during their administrative rulemaking processes for healthcare data collection. Our petition focused specifically on hospitals.⁹ From 2011 to 2013, we petitioned the NUBC on numerous occasions to consider the adoption of NAICS and SOC standards to facilitate the uptake of these data elements as states oversaw their public health hospital data collection activities. The rationale and benefits of that petition were previously described.⁹ Despite promising research findings for data acquisition time in non-hospital settings, and the benefits of adopting I/O standards, our petitions were denied. The NUBC asked for a pilot study to show that the acquisition of such data did not impose an undue burden on hospitals because it believed such collection would be untenable. While this was outside the scope of the committee's oversight, we ultimately secured research funds to proceed with a pilot study to evaluate the time and cost required to ask I/O questions in hospital emergency departments.

We found no previous studies specific to hospitals, or studies that examined the cost of data collection, so undertook the current research to evaluate the time and cost required to ask I/O questions in hospital emergency departments.

METHODS

The pilot study was conducted at two urban hospitals: the Hospital of the University of Pennsylvania, which registers approximately 72,000 patients per year, and St. Joseph's Hospital in Philadelphia, PA, which registers approximately 20,000 patients per year.¹⁰ The data were collected over the duration of 1 week at each location, between the hours of 7:00 am ET and 11:00 pm ET. Patients aged at least 21 years, consecutively appearing for registration in the Emergency Department (ED) or Admitting Department (AD) during the observation period, were eligible to be observed for the purposes of data collection on the registration process. This study was approved by the Drexel University Institutional Review Board and was granted a HIPAA Waiver of Authorization and Consent.

The study was designed to measure the time and cost required to collect a patient's industry and occupation (I/O) information during the hospital registration process. Members of the hospital registration staff were trained to ask and record the patients' answers

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TABLE 1. Industry and Occupation Study Questions

1. What is your job? If retired or unemployed, what was your previous occupation? (Eg, registered nurse, carpenter, store clerk, cook, etc.)
2. What type of field or business is this job in? (Eg, healthcare, construction, retail, food service, etc.)
3. Do you do any volunteer or unpaid work? If yes, what do you do? (Eg, volunteer firefighter, little league coach, etc.)
4. Is your visit today related to any work or volunteer work? If yes or maybe, which?

to four questions regarding their industry and occupation at the beginning of each registration (Table 1). Training (lasting approximately 1 hour) consisted of an introduction to the study, the essential role Registrars play in data acquisition, rehearsal of the script, and a question and answer exchange. The hospitals each offered a 1-week window of opportunity to conduct the pilot study. Registrars scheduled to work during that week were invited to participate by their departmental managers, and if they participated received a \$50 Visa gift card. There were a total of 17 Registrars involved in the study between the two hospitals, and 11 observers from the research team.

The patients' answers were recorded on a data collection form through free text by the Registrar. During the patient-Registrar interaction, trained research assistants observed the registration process and recorded the time to complete each of the four study-specific questions, as well as the entire registration process. The research assistants measured the time of the registration process using Champion sports stopwatches or their personal smartphone stopwatch function. Each of the two data collection instruments recorded time to a hundredth of a second.

Cost Analysis

In order to assess the cost burden related to asking the additional four industry and occupation questions, we considered time spent by each Registrar, average number of patients seen per year (at each institution, separately), average Registrar salary, and the number of full time Registrars on staff. The cost analysis was performed by taking the average time spent per patient and multiplying it by the number of patients seen per year per Registrar. This total time spent was converted into a percentage of each Registrar's full time salary, and multiplied by the number of full time Registrars on staff in each institution. We conducted cost analyses using the following assumptions: (1) a 48 second mean time to ask I/O questions (average of both hospitals), and (2) a \$32,422/year Registrar salary.¹¹

We used the following equation:

$$\frac{\text{patients registered}}{\text{FTE Registrars}} \times \frac{48 \text{ seconds}}{\text{patient registered}} \times \frac{1 \text{ year worked}}{7,488,000 \text{ seconds}} \times \frac{\$32,422}{\text{yearly Registrar salary}} = \$ \text{ per Registrar/year}$$

We divided the number of patients seen in each ED by the number of Registrars to yield the number of patients registered/year/Registrar. We calculated total hours of Registrar time by multiplying 48 seconds by the number of patients registered/year/Registrar. We calculated the number of seconds worked per year based on 52 weeks at 40 hours per week (7,488,000 seconds).

Data Analysis

Data management and analyses were conducted using Microsoft Excel and SAS statistical software 9.3 (SAS Institute Inc, Cary, NC). Descriptive statistics were assessed to determine the means

and variances associated with the time required to capture each patient's I/O information and the full registration process.

RESULTS

Admission departments were dropped from the study when we observed that the majority of patients going to inpatient registration had already been registered through the ED.

Time

Figure 1 and Table 2 display the mean time required to ask the additional industry and occupation questions. The combined mean for both pilot sites was 48.2 seconds, with a median of 43.3 seconds (n = 243). The Hospital of the University of Pennsylvania (HUP) experienced a mean of 46.2 seconds (n = 171), while SJH (n = 72) was slightly higher at 52.8 seconds. Question 1, "What is your job? If retired or unemployed, what was your previous occupation?" required the greatest amount of time at both HUP and SJH (16.1 seconds and 17.3 seconds, respectively). For some participants, their response to question 1 included description of the industry in which they worked (question 2). Some participants were unemployed and did not do volunteer work. Therefore, question 4 was irrelevant. For these reasons, the number of respondents (n) in Table 2 may vary among questions 1-4. Question number 4 was not always asked especially if a patient responded that they were unemployed and did not do volunteer work. However, the number of omissions of question #4 did not alter our results. At the HUP pilot site, some patients were fast-tracked to care (21 cases) therefore full registration times were not available. The exclusion of these cases did not change the results; therefore we retained them in the analysis (data not shown).

Cost

Utilizing the equation described, we found asking I/O questions amounted to \$520 per Registrar each year at SJH, and \$623 per Registrar each year at HUP.

SJH cost:

$$\frac{20,000 \text{ patients registered}}{8 \text{ FTE Registrars}} \times \frac{48 \text{ seconds}}{\text{patient registered}} \times \frac{1 \text{ year worked}}{7,488,000 \text{ seconds}} \times \frac{\$32,422}{\text{yearly Registrar salary}} = \$520 \text{ per Registrar/year}$$

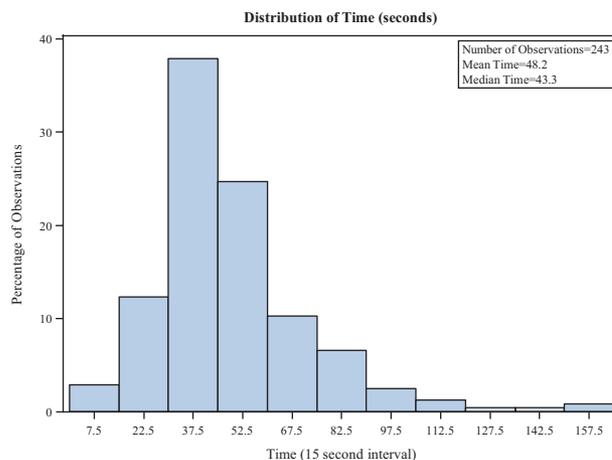


FIGURE 1. Distribution of time required to ask industry and occupation questions.

TABLE 2. Time Required to Ask Industry and Occupation Questions During Registration (in seconds)

	Both Hospitals				Hospital of the University of Pennsylvania				St. Joseph's Hospital						
	<i>n</i>	Mean	Median	Range	<i>n</i>	Mean	Median	Range	<i>n</i>	Mean	Median	Range			
Question 1	242	16.5	12.7	0.0	83.0	171	16.1	12.0	0.0	83.0	71	17.3	13.8	2.5	78.4
Question 2	210	13.6	11.9	1.2	45.8	149	12.7	11.1	1.2	45.8	61	15.6	14.0	1.7	40.3
Question 3	242	11.2	7.8	0.2	44.0	170	10.8	7.4	0.6	44.0	72	12.4	8.7	0.2	39.4
Question 4	232	9.1	6.9	1.1	74.6	163	8.4	6.3	1.1	64.7	69	10.6	7.9	1.2	74.6
All I/O questions	243	48.2	43.3	4.7	153.6	171	46.2	41.7	4.7	153.6	72	52.8	48.2	25.4	122.7
Full registration	221	237.8	174.0	13.5	905.2	150*	164.8	139.8	13.5	788.8	71	391.9	410.2	38.4	905.2

*Twenty one patients were fast-tracked and did not receive full registration.

HUP cost:

$$\begin{aligned} & \frac{72,000 \text{ patients registered}}{24 \text{ FTE Registrars}} \times \frac{48 \text{ seconds}}{\text{patient registered}} \\ & \times \frac{1 \text{ year worked}}{7,488,000 \text{ seconds}} \times \frac{\$32,422}{\text{yearly Registrar salary}} \\ & = \$623 \text{ per Registrar/year} \end{aligned}$$

The total cost for SJH would be \$4160 per year to gather industry and occupation information on every patient, while the total cost for HUP would be just under \$15,000 per year, 0.00017% of HUP's annual \$8.6 billion operating revenue.¹⁰

CONCLUSION

Since our last paper describing the need for I/O in healthcare data, we presented our petition once more to the NUBC.⁹ The request (Supplemental Digital Content 1, <http://links.lww.com/JOM/A345>) asked for inclusion on the uniform bill of two existing federal standards:

- (1) Standard Occupational Classification
Code source: US Department of Labor, Bureau of Labor Statistics—2010 SOCsystem.
For public health data reporting only when required by state or federal law or regulations.
- (2) North American Industry Classification System (NAICS)
Code source: US Census Bureau—2007 NAICS codes.
For public health data reporting only when required by state or federal law or regulations.

The NUBC voted to dismiss our petition. In the minutes from the meeting (Supplemental Digital Content 2, <http://links.lww.com/JOM/A346>) the NUBC provided four reasons why it voted to dismiss. The first concern that led to the present study was:

If industry and occupation would have to be collected from every patient entering the hospital, the administrative burden of codifying every patient would be too high.

Our first finding was that for all patients seen between the two emergency departments, asking four I/O questions took an average of 48 seconds per patient encounter. Implementation with minimal burden is a critical consideration, and promising pilot research has been conducted. In 2011, the REGARDS study conducted a telephone survey of adults 45 years and older. Four questions were asked about employment industry and occupation. Among the 17,000 REGARDS participants, the time to collect narrative I/O information was 43 seconds on average.¹²

The REGARDS study looked at data acquisition time only. Our second finding extrapolated the time required to ask and record

these four questions—considering the average salary of a Registrar—to an estimated hospital cost of \$520 to \$623 per Registrar per year. The total annual cost for the two participating hospitals to gather industry and occupation information on every patient was \$4160 (SJH) and \$15,000 (HUP). We contacted the previous Manager of Emergency Medicine Registration at the University of Pennsylvania Health System (HUP) to share the results. She reflected that asking the four questions was not unduly cumbersome and that the health issue we were addressing was important. However, she emphasized that “every second counts” during patient registration. She emphasized that asking I/O questions requires training and that asking the questions must be balanced with the efficiency necessary for appropriate processing of patients in emergency department. Some patients have difficulty understanding questions because of their underlying health condition, the stress of visiting the hospital, or other reasons. She suggested that it was best to wait until after the patient was “bedded”, meaning they were in a patient care area waiting to be seen by the clinical staff. In her hospital, full registration was done at the bedside, not at intake where patients first enter the emergency department. While the manager was not in a position to comment on the cost impact to the hospital's overall operating budget, she did comment that a \$15,000 cost out of the administrative budget for ED registration (\$1.4 million annually) would be equivalent to a half time Registrar. She did comment that if a government standard required the information to be collected, the hospital would absorb the requirement into its registration procedures while maintaining the top priorities of efficiency and expeditious transfer of the patient from registration to clinical care. She emphasized that the patient's clinical condition and attendance to it was the top priority of a hospital Registrar. Finally, she commented that questions such as smoking behavior, do get added to the registration process on occasion and that registration is the best time to ask them—as opposed to the clinician asking during the clinical encounter. (Michele T. Harmon, MBA, personal communication, April 2017). Considering the \$250 billion price tag for occupational illnesses and injuries,⁶ we conclude that the estimated costs at these two pilot sites would be reasonable and manageable to create a sustainable injury and illness surveillance system for all workers—using already existing data—through the standards setting process of the NUBC.

Lastly, we heard from NUBC members of the difficulty training and retaining Registrars:

Registrars have the highest turnover of any employees in the hospital business office.

...there is high staff turnover...there is still a cost associated with taking an individual out of their current employment situation for [training]. [They] do not have people that they can just plug in while others are absent.

...training and education sessions have been cut back severely because of lack of staff.

...to expect hospitals to collect the data is unrealistic (Supplemental Digital Content 2, <http://links.lww.com/JOM/A346>).

Our observations from the facilities with whom we worked were markedly different. Most of the Registrars had been with the hospitals for their entire careers or for many years. Registrars deeply cared for the patients who came to their EDs and often knew them by name. These patients were often very poor and very sick. The Registrars were professional and courteous and dedicated to their work. While many of them had never been involved in a research study, they quickly understood their role in gathering data. We could see their pride in this new awareness of how their day to day job activities made research possible. The training sessions we conducted took only 1 hour and were scheduled prior to shift. This was done to accommodate Registrar and Administrator preferences not to take away time from work. That NUBC membership thinks these professionals cannot handle the collection of critical public health data—in addition to all the sensitive information they routinely acquire from patients (reason for visit, insurance information, home address, race, etc.) is pejorative at best.

Our study was focused on Registrars acquiring I/O information and as such did not address how much time or cost there would be to change the free text collected on industry and occupation into numerically coded data. However, a technological solution already exists. The NIOSH Industry and Occupation Computerized Coding System (NIOCCS) is an automated coding algorithm developed to code I/O from narrative text—an economical and labor-efficient method to record data in a standardized manner. NIOCCS converts I/O narrative text to coded data at the rate of 2 to 3 records per second, and early results showed an 85% to 90% accuracy rate based on coding I/O text only (Susan Nowlin, personal communication, 2011). For a hospital like HUP with 72,000 ED visits per year, 3 seconds would require approximately 60 hours annually to code all discharges using NIOCCS. This would amount to 3% of a full-time equivalent's time, working 40 hours a week for 50 weeks annually.

Limitations

The study took place at two hospitals in one urban location and included registration only in the emergency departments (ED). Due to duplication of registration between the ED and the admitting department, we excluded inpatient registrations from the study. Registration processes may vary amongst hospitals, thus the results of this study are not necessarily generalizable to all EDs throughout the United States. The ED is a complex and often chaotic environment. A strength of this study was that we were able to demonstrate the facility and expediency of asking I/O questions with staff who received minimal training in two EDs with different registration processes and patient volumes. While we did do formal training of the Registrars when possible, training was occasionally done informally when unanticipated constraints occurred (eg, last minute changes in Registrar schedule due to illness and/or weather delays). The formal training is preferred as it gave time to answer Registrar questions, have Registrars perform mock data acquisition, and respond to Registrar ideas about the study.

Question number 4 (“Is your visit today related to any work or volunteer work? If yes or maybe, which?”) was not always asked especially if a patient responded that they were unemployed and did not do volunteer work. While omissions of question #4 did not alter our results, if I/O questions are to be standard on patient intake, question #4 should be asked because a person could be seeking care due to exposure during jobs held prior to their unemployment. In the future, use of this question should clarify that this question pertains to any exposure throughout a person's career(s).

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