Journal of Clinical Anesthesia 52 (2019) 1–5

Contents lists available at ScienceDirect

Journal of Clinical Anesthesia

journal homepage: www.elsevier.com/locate/jclinane

Original Contribution

Unscheduled absences in a cohort of nurse anesthetists during a 3-year period: Statistical implications for the identification of outlier personnel

Richard H. Epstein, MD[a,*,1], Franklin Dexter, MD, PhD, FASA[b,2], Edward A. Maratea, MD[c,3]

[a] Department of Anesthesiology, Perioperative Medicine and Pain Management, University of Miami, Miller School of Medicine, 1400 NW 12th Avenue, Suite 3075, Miami, FL 33136, United States of America
[b] Department of Anesthesia, University of Iowa, 200 Hawkins Drive, Iowa City, IA 52242, United States of America
[c] Department of Anesthesiology, Perioperative Medicine and Pain Management, University of Miami, Miller School of Medicine, 1400 NW 12th Avenue, Suite 3075, Miami, FL 33136, United States of America

ARTICLE INFO

Keywords:
Sick leave
Personnel staffing and scheduling
Statistical power analysis

ABSTRACT

Study objective: To estimate the prevalence of unscheduled absences in a cohort of certified registered nurse anesthetists (CRNAs) over a 3-year period, for purposes of critiquing statistical review of individual providers relative to potential identification of patterns of such absences.
Design: Retrospective, observational study.
Setting: University hospital.
Subjects: 99 CRNAs performing clinical assignments in the operating rooms.
Interventions: None.
Measurements: CRNA daily clinical assignments and unscheduled absences were retrieved from the department's staff assignment software package. Data were extracted and analyzed to estimate the prevalence of unscheduled absences by CRNAs by day of the week, and whether each absence occurred on the workday before or after either a holiday or a personal vacation. A statistical power analysis was performed to determine the number of workdays of data required to identify outlier personnel above the 95th percentile among all CRNAs while controlling for a family-wise error rate of 5%.
Main results: The overall incidence of unscheduled absences pooled by days was 1.7%, with small differences among days of the week, and before or after vacations. A year of data would be required to detect outliers for unscheduled absences exceeding the 95% upper confidence limit among all CRNAs. Attempting to identify patterns of absences being on specific days of the week or as related to holidays and vacations would require multiple years of data.
Conclusions: OR managers can detect CRNAs with excessive numbers of unscheduled absences, but at least a year of data is required. Detecting apparent "patterns" of absences would require multiple years of data and is thus impractical.

1. Introduction

In the human resources literature, an unscheduled absence has been defined as an employee not appearing for work when the absence was not officially approved by the end of the previous workday [1]. If after assignments for the next workday have been posted, certified registered nurse anesthetists (CRNAs), anesthesiologists, or residents call in to report they are unable to work because of illness, this can result in disruption to the operating room (OR) schedule and additional departmental expenses to cover for potentially absent providers. When such notifications are received within a few hours of the first-case start time, pressure is created on OR managers to find available providers get the first-cases started. These unscheduled absences may cause disruptions in the OR schedule and workflow.

* Corresponding author at: 1400 NW 12th Ave, Suite 3075, Miami, FL 33136, United States of America.
E-mail addresses: repstein@med.miami.edu (R.H. Epstein), Franklin-Dexter@UIowa.edu (F. Dexter), emaratea@med.miami.edu (E.A. Maratea).
URL: https://www.franklindexter.net (F. Dexter).
[1] This author helped design the study, obtain the data, analyze the data, and write the manuscript.
[2] This author helped design the study, analyze the data, and write the manuscript.
[3] This author helped obtain the data and critically reviewed the manuscript.

https://doi.org/10.1016/j.jclinane.2018.08.028
Received 17 July 2018; Received in revised form 8 August 2018; Accepted 16 August 2018
0952-8180/

Previous studies of unscheduled absences have assumed that some of these occurrences are preventable (e.g., due to poor planning by the employee) or voluntary (e.g., an illness was feigned) [2]. Many hospitals have human resource policies regarding disciplinary action, up to termination, for described "patterns" of unscheduled absences. Prior data regarding the prevalence of unscheduled absences and their distribution among all employees are necessary to determine how many workdays must be analyzed to mitigate the risk of falsely identifying employee(s) as having excessive absences. Because individuals' reputations and livelihoods are at potential risk, accusations of unprofessional behavior (e.g., feigning illness to avoid work) should not be based on random statistical variation.

We found only 1 published study from a search of PubMed[4] related to the prevalence of absences among nurse anesthetists or anesthesiologists [3]. That investigation by Dzoljic et al. did not provide sufficient data to allow calculations related to the number of workdays required for reliable identification of outliers [3]. Therefore, we analyzed the prevalence of unscheduled absences in a cohort of certified registered nurse anesthetists (CRNAs) at an academic hospital in the United States over an approximately 3-year period.

2. Materials and methods

This study was determined by the University of Miami Institutional Review Board on February 27, 2018, to be non-human subjects research. Staff names were deidentified to ensure privacy using the Secure Hash Algorithm-1 with a randomly determined salt value (whose seed number was not saved).

Daily assignments of the CRNAs were exported as an Excel workbook (Microsoft, Redmond, WA) from the University of Miami Hospital (UMH) anesthesiology department's staff scheduling system (QGenda, Atlanta, GA) for the period of Monday, March 2, 2015, through Tuesday, January 30, 2018 (N = 762 weekdays, N = 744 workdays).

We limited the study to the CRNAs as those were the only anesthesia providers for whom complete information had been recorded in the scheduling system regarding the presence of unscheduled absences. The CRNAs were scheduled to work at either the University of Miami Hospital or the Sylvester Comprehensive Cancer Center, directly across the street. Approximately 30 anesthetizing locations in 6 separate surgical suites were opened each morning for cases. The CRNAs were reassigned among any of the anesthetizing locations, as necessary, on the morning of surgery to cover unscheduled absences.

The QGenda schedule was updated daily by schedulers to show if an individual had an unscheduled absence, defined as the person calling in sick after the schedule had been posted on the workday before the date of surgery. Subsequent days of illness, if present, were recorded as an excused illness if the scheduler was notified in advance.[5]

The exported QGenda schedule required extensive parsing before analysis. For every date that each CRNA was scheduled to work, the date, the shift assignment, and the presence of an unscheduled absence were extracted from the Excel worksheet. Visual Basic for Applications (Microsoft, Redmond, WA) was used. Excel formulas were applied to determine the day of the week and if an unscheduled absence occurred on the day before or the day after a holiday (hospital or personal). The resulting worksheet was then used as the data source for the pivot tables used in the analysis.

For each CRNA, the percentage of unscheduled absences among days he or she was scheduled to work was calculated. For each day of the week, the number of unscheduled absences divided by the count for that weekday, excluding holidays, also was calculated.

To determine the suitable sample size for the numbers of workdays needed to detect an individual with greater than average unscheduled absences, we made two choices to obtain the briefest possible period (i.e., deliberate underestimation of the number of workdays of data required). First, we sought to detect a rate of unscheduled absences sufficient to exceed at least 95% of unscheduled absences (i.e., cumulative distribution in ascending sequence as shown in Fig. 1). Had we instead considered the cumulative distribution in descending sequence, a smaller percentage would be obtained, and thus, a larger sample size would have been required. Second, we accepted a familywise error rate of 5.0%, despite the organizational risk of making at least 1 false accusation. The exact sample size for the single binomial proportion was calculated using StatXact v11.1 (Cytel, Inc., Cambridge, MA). Bonferroni adjustment was used for the number of CRNAs since unexpected absences and CRNAs' actions could be correlated (e.g., if there were a cluster of illnesses from an upper respiratory illness).

3. Results

There were 762 weekdays, including holidays, analyzed during the approximately 3-year study period. Among the 28,689 scheduled shifts during non-holiday workdays (N = 744), there were 489 unscheduled absences (1.7%), with small differences among days of the week (Table 1). The rates of unscheduled absences on the workday before or after the start or end of a vacation or on the workday before or after a hospital holiday were similar to the unscheduled absence rate on other workdays (Table 1). Thus, the data from all workdays were pooled for analysis. This served to reduce the dimensionality of our dataset, thus reducing the change of detecting an anomalous pattern [4].

Overall, on 59% of days, there were 0 unscheduled absences (i.e., all CRNAs reported to work as assigned) (Table 2). Nevertheless, at the study hospital, to have no more than a 5% risk (i.e., 1 of 20 days) of not having enough CRNAs to ensure a timely start to all cases on the OR schedule, a minimum of 2 unassigned CRNAs would have been needed each day and available at 7 am. To have no more than a 1% risk of not having sufficient staff, 3 unassigned CRNAs would have been needed (Table 2).

Among the unscheduled absences, 95.5% were attributable to CRNAs having an individual rate of unscheduled absences < 6.0% (Fig. 1). No CRNA was responsible for > 5% of the total unscheduled absences over the study interval (Fig. 2).

To be able to detect an outlier (i.e., ≥6.0% rate of unscheduled absences) compared to the average CRNA (i.e., the pooled 1.7% rate of unscheduled absences) with 80% statistical power with a familywise error rate of no greater than 5%, based on the 63 CRNAs accounting for up to a 6.0% unscheduled absence rate (Fig. 1), a total of 263 workdays would be required. For the pooled analysis among workdays, that would be at least 1 calendar year of data. For any specific day of the week (e.g., Mondays), the 263 workdays of data needed would take approximately 5 calendar years. For evaluating unscheduled absences before federal or personal holidays, > 5 calendar years would be necessary. These periods were slightly biased underestimates for the study hospital because a value of 63 CRNAs was used for the outlier calculations, but 70 CRNAs had shift assignments (45 full time and 25 per diem).

[4] The search was performed on July 10, 2018 using the following search string: ("sick leave" OR (unplanned AND (absence or absences)) OR (unscheduled AND (absence OR absences))) AND (nurse OR nurses OR nursing OR anaesthetist OR anesthetist OR anesthesiologist OR anaesthesiologist OR anaesthetists OR anesthetists OR anesthesiologists OR anaesthesiologists) AND (anesthesia OR anaesthesia OR anesthesiology OR anaesthesiology). Among the 11 articles returned, only 1 was related to the topic of the study.

[5] For example, if a CRNA called in at 6:00 AM on Monday July 9 and at 5:00 AM on Tuesday July 10, to say he was sick and unable to work that day, these would be recorded as 2 unscheduled absences. However, if by mid-afternoon on Tuesday the individual called back to inform the scheduler that he would be unable to work his remaining 2 shifts for the week due to the illness, those would be annotated in QGenda as "SICK", not as "CALL OUT" This alternate classification of the absence was reasonable because the scheduler would have had time to arrange for a per diem CRNA or a staff CRNA who did not work 5 days a week to cover.