Editor's note: The formulas on page 84 were corrected after publication to make all exponents negative.

A refined model for estimating the industry-average number of security staff for hospitals

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This article presents and discusses the quantitative factors that can be used in risk-based deployment of security personnel. It demonstrates that the primary drivers of security staffing for risk-based deployment are mathematically measurable factors. While no universal number exists, each hospital may have a threshold of crimes, security breaches or threats that determine precisely when security personnel are to be used and withdrawn.

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INTRODUCTION

Security personnel are frequently characterized as the most expensive security measure used for the protection of hospital environments. In a broad sense, security staff are deployed to reinforce a hospital's overall security program, as policies, procedures, and the physical security system and measures are insufficient for countering an elevated risk situation in-and-of-themselves. Risk is *the possibility of asset loss, damage, or destruction as a result of a threat exploiting a specific vulnerability*. Risk is often the most significant factor driving the deployment of security forces.

Practically speaking, the most difficult issue facing security and hospital leaders is how many security officers are sufficient to respond to the unique security risks

facing the facility. What is the decision process used by security and hospital leaders to deploy security personnel? What factors affect the decision? Are security personnel deployed based on gut instincts or assumptions? Are they deployed based on department managers who are most vocal about their concerns and needs? Security force deployment based on gut instincts or erroneous assumptions can be ineffective and costly. Security personnel, because of their cost, should be deployed based on an objective understanding of risk and/or function. While quantitative deployment guidelines and models are not absolute, they can provide a foundation based on reliable measures (e.g., security call volume, area patrolled), yet remain dynamic and flexible as needs change and as risk evolve.

Tempering quantitative factors with qualitative factors

As this paper illustrates, a number of quantitative factors can be used in risk-based deployment of security personnel. The quantitative factors may include historical security breaches, call for service frequency, past crime types, and crime rates. Other metrics may include size (e.g., interior square footage, number of beds) and population of the facility (e.g., number of employees, patient census, number of emergency department visits). These quantitative factors may be tempered with more qualitative considerations, including the hospital's culture, industry norms and practices, visitor and patient expectations, and the presence of elevated risk spaces (e.g., behavioral health units, trauma centers). Liability and insurance issues are also a qualitative consideration for hospital leadership. Has the hospital been subjected to legal scrutiny in the past for not deploying security personnel? Have security officers used excessive force or taken improper actions? As discussed in a recent International Association for Healthcare Security and Safety Foundation research paper, "Settlements and jury verdicts resulting from these cases can involve hundreds of thousands or even millions of dollars. The costs of defending against such a law-

suit can also be very significant, even if the [healthcare facility] eventually wins in court."[1]

Although qualitative factors, such as patient experience, visitor management, and other factors may influence decisions about the deployment of security personnel, the primary drivers of security staffing for risk-based deployment are mathematically measurable factors. Crime history, crime rates, past security breaches, and calls for service are among the metrics that can be utilized in establishing a security personnel deployment protocol. While no universal number exists, each hospital may have a threshold of crimes, security breaches or threats that determine precisely when security personnel are to be used and withdrawn. To err on the safe side, many security professionals use a liberal approach to deploy and a conservative approach to withdraw. That is, they deploy before threats are actually at the threshold and withdraw only after threats have fallen below the established threshold for a period of time.

Determining the threshold for reducing risk and and managing threats

When determining the threshold, security and hospital leadership must consider two key factors. First, what policies, procedures, and physical security measures can be implemented to reduce risk before security personnel are considered? And, second, what is the manageable threat norm for the hospital? Even with the deployment of security personnel, crimes can and do occur. What is the normal and manageable amount of crime and other security risks for the facility? As we've seen since the Department of Homeland Security introduced the Threat Advisory System, a middle (yellow) threat level is considered normal for the United States today. To illustrate this point, consider a retail store located in a metropolitan area which experiences five violent crimes each year, even with secu-

[1] Kristof, Tina (2018) Issues and Trends in Health Care Security Litigation. The International Association for Healthcare Security and Safety - Foundation; Chicago, IL. (https://iahssf.org/research/issues-and-trends-in-health-care-security-litigation/).

rity personnel present. When security personnel are removed, does crime decrease? After extensive testing and monitoring, it may be found that crimes will still be perpetrated on the premises, even after a reasonable level of security personnel deployment has occurred. An understanding of the threat norm is critical to a reasonable and effective security program.

The other method for deploying security officers is functional deployment, which is when security officers are not deployed based on risk but, instead, are deployed in order to perform a specific task, such as screening visitors as they enter the hospital or to monitor security systems. Employees, patients, and visitors have expectations, as well. Is the expectation that security personnel will be present to control access, to contribute to a feeling of safety, or to provide escorts to vehicles at shift changes? Alternatively, do customers and end users expect an open and friendly environment with no desire to interact with intrusive security personnel? Can the security personnel be dressed in softer uniforms, such as slacks and blazers, rather than more traditional uniforms?

Determining the staffing needs for fixed posts

In hospitals, security officers may be stationed at fixed posts, or they may be responsible for patrolling and responding to incidents within the hospital. Security Officers assigned to a fixed post are not available to respond to an incident or patrol the hospital beyond the immediate area of the fixed post. The use of fixed posts vary significantly among hospitals as they are often based on functional needs. For example, if a hospital implements a visitor management program where visitors are screened as they enter a public entrance, at least one security officer will be posted at each of the hospital's public entrances. In a hospital with two public entrances open 24 hours per day, these two fixed posts will require 8.4 Full-Time Equivalents (FTEs). Determining the staffing needs for fixed posts is a relatively simple exercise. For each 24-hour post that is operational seven days a week, a minimum of 4.2 FTEs is needed, though many hospitals will use a slightly higher number (e.g., 4.5 FTEs) to account for sick time and vacations.

Models for predicting patrol and response officers

Patrol and response officers are security officers who proactively patrol the hospital and respond to incidents. This includes security officers who are assigned to stay in an area (e.g., Emergency Department) but may respond outside that area. Determining the total number of security officers and, specifically, the number of patrol and response officers needed is more challenging and is the ultimate purpose of this research. This project builds on previous efforts to benchmark security staffing levels using data provided by healthcare facility security administrators.[2] Moreover, it is intended to refine and update those earlier recommendations. Using industry data, we have derived a pair of mathematical formulas (or, "models") that allow a facility to identify staffing baselines for total and patrol and response officers based on a handful of facility-specific criteria. Efforts such as these are iterative, as they are improved as more data, knowledge, and experience are collected and used in the construction of the mathematical models. When previous models are compared to more recent ones, they are not unlike weather forecasting models, which may project slightly different paths for the same hurricane. Even though weather models may not predict exactly the same track for a storm, there are usually many points where the models are consistent, such as in terms of strength or general direction. These staffing models are similar to weather models in that different versions may suggest slightly different outcomes, but, in general, there is notable consistency among them.

METHODS USED FOR UPDATING SECURITY STAFFING MODELS

The primary goal of this project was to develop a model to predict security staffing levels for total security FTEs and patrol-and-response FTEs derived from national data on security staffing and accounting for key facility characteristics. A secondary goal was to compare these models to previously developed staffing

[2] Vellani, Karim H., Robert J. Emery, and Nathan Parker (2012). "Staffing Benchmarks: How Many Security Officers are Enough?" Journal of Healthcare Protection Management, Volume 28, Number 2, International Association for Healthcare Security & Safety

models to identify which factors were consistent across the models. Three previous models had been generated following an initial focus group (2011) and two surveys of security administrators (2012, 2013); these efforts had produced two total FTE models (2012, 2014) and one patrol-and-response FTE model (2012).[2, 3] We believed it was time to update the security staffing models using the most current facility information available. To do this, we used a refined method for industry benchmarking that took into consideration specific attributes of individual facilities.

In 2017, IAHSS members who served as their facility's highest-ranking hospital security professional (or their designee) were asked to complete a survey collecting information on indicators of their facility's size, patient volume, and security risk in the prior year. Hospital security leadership were selected to respond to the survey because it was believed they would be responsible for and have ready access to their facility's security incident management records. If the respondent was responsible for more than one healthcare facility, data were requested for each facility individually.

Participants were asked to provide the following information: (1) the number of fixed post and patrol/response security personnel; (2) whether their security force was proprietary or contract; (3) security call volume; (4) facility square footage; (5) exterior patrol responsibilities; (6) total number of facility employees; (7) whether the facility had elevated risk patient care units (e.g., trauma center, psychiatric/behavioral health); (8) the number of hospital beds and emergency department (ED) beds; (9) their ED patient count; (10) their annual inpatient census; and (11) how many hours were spent by security officers patient sitting (e.g., providing one-on-one patient supervision). These questions were selected because they previously had been suggested or shown to

[3] Vellani, Karim H., Robert J. Emery, and Jennifer M. Reingle Gonzalez (2015). "A Data-Driven Model for Estimating Industry Average Numbers of Hospital Security Staff." Journal of Healthcare Protection Management, Volume 31, Number 1, International Association for Healthcare Security & Safety.

be meaningful predictors of staffing or because they had been highlighted as indicators of shifting security practices. Additionally, we sought measures that either would be known or easily accessible to security administrators.

ANALYZING SURVEY DATA

In total, 143 responses containing information on individual facilities' security staffing levels were analyzed; nine additional surveys were received but not analyzed because they were incomplete or were duplicates. A wide variety of facilities were represented in the responses. Participants reported working in facilities with between 5,000 and 23 million square feet and from 22 to 2,000 licensed beds, with total security forces of two to more than 300 officers responding to between 10 and 1.2 million security calls in the previous year.

To analyze the survey data, statistical models were constructed to mathematically determine which of the survey questions predicted security staffing levels for total and patrol-and-response FTEs. More specifically, we were looking for the combination of factors that best predicted security staffing levels. The total FTE and patrol-and-response FTE models were built separately so that one did not influence the other.

Following the model-building process described above, both the total FTE and the patrol-and-response models indicated that (1) total interior square footage of the facility for which security officers were responsible for patrolling and (2) annual number of officer-hours spent patient sitting (if applicable) were predictors of staffing levels. Additional predictors in the total security force FTE model were (3) the number of licensed beds, (4) the presence of an inpatient psychiatric/behavioral health unit, and (5) the presence of a trauma center. Additional predictors in the patrol and response FTE model were (6) total number of facility employees and (7) previous year's security call volume.

Our modeling generated formulas that can be used to determine appropriate staffing levels based on current national practices. These staffing levels can be calculated by inputting facility-specific data into the following formulas:

For total security force FTEs:
FTEs = e^[(9.76x10^{-8}) x (total interior square footage) + (1.53 x 10^{-5}) x (total number of hours spent patient sitting annually) + (1.0775x10^{-3}) x (number of licensed beds) + (0.1460488) x (1 if a psychiatric/behavioral unit but no trauma unit) + (0.2391474) x (1 if a trauma unit but no psychiatric/behavioral unit) + (0.4102736) x (1 if both a psychiatric/behavioral unit and a trauma unit) + 2.404032]

For patrol-and-response FTEs:
FTEs = e^[(2.2x10^{-7}) x (total interior square footage) + (1.4x 10^{-5}) x (total number of hours spent patient sitting annually) + (8.8x10^{-5}) x (total number of facility employees) + (9.1x10^{-7}) x (total number of security calls in previous year) + 1.978012]

With these formulas, staffing benchmarks can be calculated based on a particular facility's responses to the predictor questions. For example, a facility with 750,000 square feet, 2,000 hours spent by security officers patient-sitting in the previous year, 300 licensed beds, and an inpatient psychiatric/ behavioral health unit but no trauma unit would have a national benchmark of 16.8 FTEs on their security force. This same facility, with 1,900 employees and 12,300 security calls in the previous year, would have a benchmark of 10.5 FTEs dedicated to patrol and response. Examples of varying facility sizes and staffing benchmarks are provided in Table 1. The difference in the patrol-and-response FTE staffing benchmark and the total security FTE staffing benchmark was expected, as security officers often perform duties other than patrol-and-response, such as fixed post assignments, visitor management, patient observation, visitor/ patient escorts, or parking assistance/enforcement.

WHY CURRENT MODELS ARE BEST FOR PREDICTING STAFFING TRENDS

Staffing models generated in previous years have included several of these same predictors, albeit in different combinations and yielding different formulas. The relative consistency with which these characteristics are identified as critical predictors of staffing levels demonstrates internal validity, which is to say that this repeated pattern of factor selection

Table 1: Examples of total security FTE and patrol and response FTE benchmarks by selected facility characteristics

Interior Square Footage	Number of Licensed Beds	Total Security FTEs Benchmark		Patrol and Response FTEs Benchmark
		No Specialty Units*	Both Specialty Units*	
12,000	25	11.4	17.2	7.3
750,000	300	16.8	25.4	10.5
3,500,000	800	48.2	72.6	43.8

* Specialty units are defined as (1) a psychiatric/behavioral unit and/or (2) a trauma unit.

increases our confidence that there is an important relationship between these predictors and industry average staffing levels. The fact that different years of data yielded different combinations of these factors and different staffing formulas reflects expected changes over time in industry staffing practices and needs.

Mathematical modeling is an iterative process with the goal of creating new models that improve upon previous versions as new knowledge and experience are obtained. We believe that the current models are an improvement over our prior models for several reasons. Our most recent effort used improved mathematical techniques that allowed us to capture nuances in the data that may have been overlooked in previous years. Additionally, we had a larger number of responses to this survey and greater variation among the facilities than in prior surveys. Finally, we asked more targeted questions in this survey, which had been honed through our previous work.

As a result, we suggest the current models should be considered the best models for predicting current staffing trends because they are based on the most recent data available, which reflect up-to-date staffing practices intended to address current safety and security needs. Even though our two new models were constructed independently of the previous models, they were informed by knowledge from the previous model-building process, from the use of those models during the intervening period, and from

changes in the industry over time. This knowledge was used to ensure the current models fit the data as well as possible and better than the previous models.

Once derived, the models were checked for accuracy against the corresponding characteristics and staffing levels provided by several facilities. Although the current models passed our tests for accuracy, a specific facility's current staffing levels may not match the output of the model for that facility. There are two primary explanations for this, and they are not mutually exclusive. First, the formulas are based on responses from 143 hospitals across the U.S., which means that the staffing benchmarks that will be generated from the formulas equally represent all of those facilities' characteristics. Second, it's possible that the facility in question has over- or understaffed its total security or patrol-and-response FTEs. The benchmarks generated by our models should be considered guidelines to assist with staffing but should not be considered the final word on staffing levels. Instead, the use of these formulas should be a starting point for conversations about facility staffing needs, as every facility has a unique set of considerations relative to safety and security that may necessitate higher or lower staffing levels.

It should be noted that the staffing levels generated by our models' formulas are derived from data reflecting the current staffing practices and facility characteristics of 143 healthcare facilities across the U.S. We believe that a strength of this approach is the use of data reported from hospital security administrators, which enabled us to apply an objective approach for determining security FTE benchmarks. Although we acknowledge that facility staffing practices are centered on promoting the safety and security of patients, visitors, and staff, we are not able to assess how effective these staffing levels are at ensuring security and reducing the risk of crime. In other words, we cannot say at this time whether the current staffing levels are the ideal staffing levels.

CONCLUSION

As we advised with our prior models, it is important to understand the limitations of any method for predicting "industry

averages," particularly a security staffing model. The security staffing model does not address the performance of the security force, nor does it speak to security outcomes, or assess what we are trying to accomplish through the use of security officers. More importantly, unique factors at each hospital may drive staffing levels up or down from the industry average.

To develop a risk-driven approach to security staffing, using the model along with a security risk assessment and security metrics for the hospital is the best method for determining appropriate security staffing levels. As with our prior models, if you'd like to know what the model says for your hospital, please e-mail Karim Vellani at: kv@threatanalysis.com.

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