# NURSE STAFFING DURING THE SARS, MERS, AND EBOLA EPIDEMICS: A NARRATIVE REVIEW

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## Abstract

**Background:** The COVID-19 pandemic has put an immense strain on health systems worldwide. Nurses at the front line are prone to experience several staffing issues facing ever-increasing stresses to the health care system by a pandemic situation. The staffing experiences of nurses in this context can have a significant impact on current nursing practice and existing policies.
Objective: To carry out a synthesis of the scientific evidence available on the staffing experiences of nurses during the SARS, MERS, and Ebola epidemics.

**Method:** A narrative review was conducted. A literature search was carried out in PubMed, Scopus, and CINAHL databases. All studies describing nurses' experiences were included regardless of methodology. A total of 16 articles was included in the review.

**Results:** Narrative synthesis revealed ten themes from the results of the articles: training, staffing ratios and models, shifting models, volunteer staffing, skill mix, planning staffing needs, hospital preparedness, communication, effects of workload, and structured workflow processes.
Conclusions: Nurses are pivotal to the healthcare response to infectious disease pandemics and epidemics. The results of this review should provide a basis for nurse managers and administrators on how they can actively engage in supporting the staffing concerns and issues of nurses during the COVID-19 pandemic.

**Keywords:** *nurse staffing, COVID-19, pandemic, narrative review*

## Introduction

The COVID-19 pandemic brought about an increasing demand for health systems worldwide. Before the outbreak, the Philippines' healthcare system was already faced with inequities in access to health services and the distribution of health facilities and health workers (Dayrit et al.,2018). As the number of COVID-19 cases quickly increased, the lack of and strain on health resources and personnel has revealed the country's fragile health care system (Department of Health [DOH], 2020; World Health Organization [WHO], 2020b).

As such, concerns have been raised about ways to improve the management of human resources for nursing, given the upward trajectory of COVID-19 cases in the country and the health care system's limited surge capacity. Due to the importance of this issue and the lack of sufficient literature on COVID-19, this review will focus on SARS, MERS, and Ebola epidemics due to the similarity of the first two coronaviruses, and the possible insights we can get from public health response and clinical experiences during the more recent Ebola epidemic from 2014-2016. Thus, the present review will synthesize the published literature regarding nurse staffing experiences during these epidemics as a potential basis for evidence-based nurse staffing management during the COVID-19 pandemic.

## Methods

### Search Strategy

A comprehensive bibliographic search was carried out, the objective of which was to obtain scientific evidence available on

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the staffing experiences of nurses during the SARS, MERS, and Ebola epidemics. An initial search strategy was designed which was later adapted to the syntax of the following databases: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Scopus. No limitation on study design, language, or date of publication was used. The search was carried out in the title and abstract fields, as well as in the thesaurus of the different databases to identify the corresponding medical subject headings (MeSH). The search strategy included the following keywords: "staffing", "personnel staffing", "staffing ratio", "staff scheduling", "staffing pattern", "staff nurses", "SARS-CoV", "ebola virus", "MERS-CoV".

**Data Extraction and Evidence Synthesis**

Three independent reviewers carried out the study selection process. An excel worksheet was used to facilitate the identification and selection process. Duplicates were removed. Any disagreements between the reviewers were resolved by consensus. Initially, the title and abstract of relevant studies were taken into account to assess the relevance of the work. Subsequently, a total of 16 relevant papers was selected for a more detailed review (Figure 1).

Data extraction was conducted by all three reviewers. Extracted data included: author/s, year of publication, study design, geographical setting, and the main study findings. Data were synthesized through "data-driven" thematic analysis conducted in two steps: (1) coding text and (2) developing descriptive themes (Thomas and Harden, 2008).

The reporting of this narrative review was guided by the SANRA instrument (Baethege et al., 2019).

## Results

Sixteen articles were included in this narrative review. Five of these were on SARS (Gomersall et al., 2006; Loutfy et al., 2004; O' Sullivan et al., 2009; Shiao et al., 2007; Yu et al., 2007) two were about MERS (Al-Dorzi et al., 2016; Kang et al., 2018), and the remaining nine articles were on the Ebola epidemic (Baduge et al., 2018; Cao et al., 2015; Eckes et al., 2016; Matlock et al., 2015; Johnson, 2015; Johnson et al., 2015; Lehmann et al., 2015; Rushton, 2015; Speroni et al., 2015). One article was a literature review on the Ebola epidemic, while seven papers were original studies involving nurses as participants. The rest were articles that share their experiences, perspectives, and recommendations on the epidemic. Ten themes were generated from the results of the articles, and are summarized below:

**Figure 1.** *Flow of studies in the review*
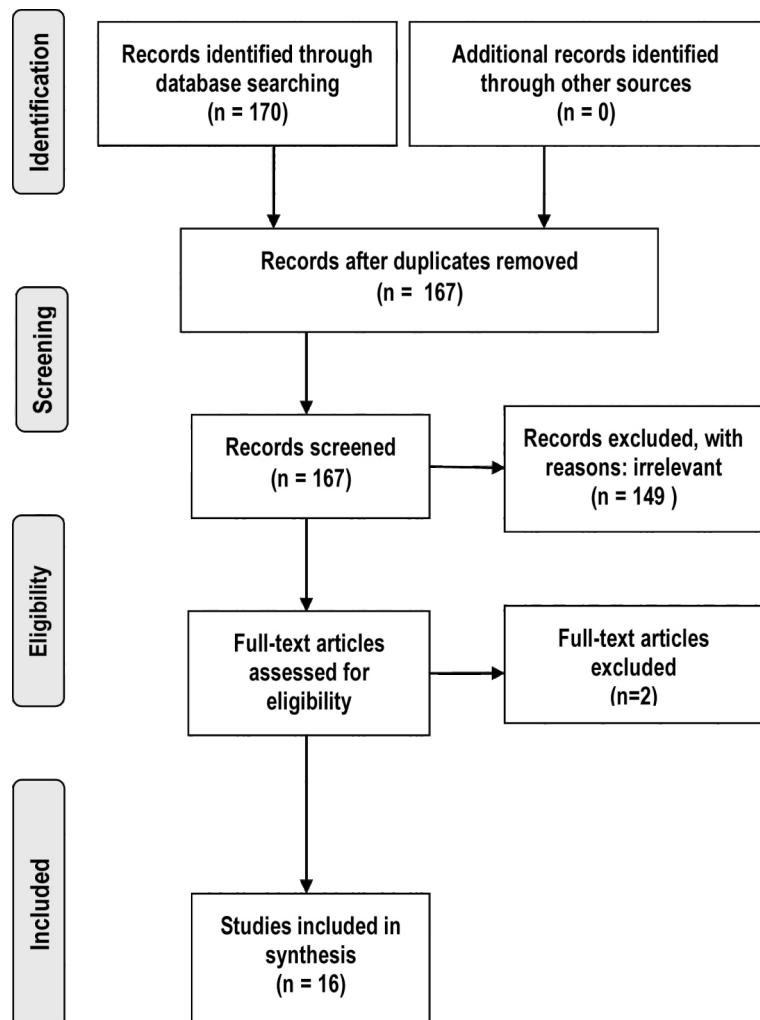


**Training**

Limited training opportunities caused unnecessary anxiety for nurses (Baduge et al., 2018). Training and education on evidence-based practices and protocols are crucial in ensuring the provision of appropriate, safe, and quality nursing care during outbreaks (Baduge et al., 2018; Speroni et al., 2015) and can reduce fear, anxiety, and apprehension among nurses (Eckes et al., 2016; Johnson et al., 2015). A core team of nurses with knowledge of epidemiology and infection control can be organized to support staff members who are yet to be trained to provide care for patients with infectious diseases. They can be designated as trainers for educating additional volunteer or reserve staff (Eckes et al., 2016).

Consistent training and retraining through periodic refresher courses can keep current and reserve/additional staff members updated and prepared to care for patients (Eckes et al., 2016; Gomersall et al., 2006). Various education and training methods used include didactic lessons, slide presentation, video, return

demonstration, knowledge assessment, poster, and simulation drills(Eckes et al., 2016).

## Staffing Ratios and Models

Safe staff-to-patient ratios are essential in providing effective and high-quality nursing care. The appropriate staffing level depends on the roles carried out by nurses, the layout of the unit, and the skill mix of the staff (Gomersall et al.,2006). No less than three nurses on duty for each shift were necessary based on staff experiences during the Ebola outbreak (Johnson et al.,2015). A staffing model based on the "buddy system" can be considered where two nurses are in the patient's room at all times. One nurse can perform direct patient care while another can act as a monitor observing compliance with infection control procedures, obtaining supplies, and assisting other staff members as needed (Eckes et al.,2016; Loutfy et al., 2004).

For units with critically-ill patients requiring oxygen support, hourly monitoring, and complex procedures, a nurse-to-patient ratio of 1-2:1 was required (Baduge et al., 2018; Gomersall et al., 2006; Johnson et al., 2015; Loutfy et al., 2004). For units with more stable patients, a nurse-patient ratio of 1:2 WAS recommended, where ICU nurses worked with ward nurses as a team (Gomersall et al., 2006; Johnson et al., 2015; Loutfy et al., 2004). An additional 1-2 nurses were deployed for each additional 4-10 patients to assist in special procedures such as prone positioning (Al-Dorzi et. al, 2016; Gomersall et al., 2006)

For smaller units (<6 beds), the unit team leader can take on the infection control nurse's role. A nurse specialist can be assigned for each ICU to provide training and support for new staff while a nurse administrator can be assigned to handle communication, coordinate deployment and training of new staff, and ensure an adequate supply of equipment (Gomersall et al., 2006).

## Shifting Models

In the twelve-hour shift model reported in the literature on the Ebola epidemic (Gomersall et al.,2006; Johnson, 2015; Lehmann et al., 2015), duty hours were divided into smaller increments of three to four hours each. This strategy considered experiences from hospital drills and staff feedback regarding comfort, tolerance, satisfaction with work conditions, and personnel safety (Johnson, 2015; Lehmann et al., 2015). Because of the additional time spent donning and doffing personal protective equipment, these shifts lasted 13 hours or longer (Johnson et al., 2015; Lehmann et al., 2015). Hence, it was suggested that shift durations be decreased to eight hours, comprising two blocks of two hours each for direct patient contact (Lehmann et al., 2015).

## Volunteer Staffing

Several facilities considered volunteer staffing to recruit additional nursing staff during the Ebola outbreak (Johnson et al., 2015; Matlock et al., 2015; Rushton, 2015). Enacting a voluntary care model considers nurses' ethical responsibility to provide care to all patients while ensuring the fair allocation of responsibilities across the nursing workforce. To avoid misguided assumptions, blame, or resentment, facilities considering this model should create a transparent recruitment process grounded on encouraging nurses to volunteer and understanding those who choose not to (Johnson et al., 2015; Rushton, 2015).

Volunteers should be fully informed of the risks they are assuming, the effectiveness and availability of personal protective equipment, the additional compensation and benefits they will be receiving, and the availability of treatment for those infected with the infectious disease (Rushton, 2015).

## Skill Mix

In an Ebola epidemic, a patient's care in a high-containment area would require a large number of healthcare personnel (Eckes et al.,2016). The nurses caring for these patients often comprise a wide range of specialties, such as critical care, emergency, and medical-surgical staff (Baduge et al.,2018; Johnson, 2015). Likewise, interdisciplinary staff volunteers are also viewed as crucial in providing an adequate number of staff in these areas (Eckes et al., 2016).

This diversity in backgrounds and skillsets was deemed beneficial not only for the patients but also for the nurses to learn new skills from their colleagues during patient care (Johnson, 2015). Essentially, staffing during epidemics should be planned (Baduge et al., 2018) and should delineate the staff's skill mix who will take charge of these units (Eckes et al., 2016).

## Planning Staffing Needs

Eight out of the sixteen articles in this review discussed the significance of planning for staffing needs during epidemics. Nursing administrators must continuously find ways to maintain and augment the nursing personnel. This theme is subdivided into three sub-themes:

### *Considerations in planning.*

It is recommended that the staffing of containment care units or isolation units during epidemics, should be planned; With careful consideration of the number of nurses and healthcare workers per shift(Baduge et al., 2018). In determining the needs for a specialized area, attention should be given to patient acuity (Eckes et al. 2016; Johnson, 2015), the specialized skill set needed for that acuity, anticipated clinical interventions, and staff

availability. The formulation of a successful staffing model results from the consideration of best available evidence by leadership, combined with staff input on the model that is best suited for the specific requirements of providing care to patients in an epidemic (Johnson, 2015).

### Contingency planning to ensure adequate care

A particular concern of nursing staff to be considered during an epidemic is burnout. During the Middle East respiratory syndrome (MERS-CoV) epidemic, one study reported that nurses experienced burnout owing to heavy workload, coupled with their concerns about being infected. Therefore, as part of emergency planning, nurse managers and hospital administrators should establish strategies that prevent nurses from burnout, negatively affecting staffing and quality of care provided to patients (Kang et al., 2018).

Furthermore, nursing staff are also concerned about the uncertainty of staffing processes during epidemics. Nurses were concerned about staffing issues such as: (1) a definite number of days that they will be providing care, (2) the ramifications of a requisite quarantine period,(3) and the possible shortage of nursing staff who will "backfill" other clinical areas (Speroni et al., 2015).

It was recommended that staffing plans include contingencies in anticipation of staff illness (Gomersall et al., 2006) and staff absence (Baduge et al., 2018). An estimated 40 – 70% of staff may not work during an influenza pandemic (Anderson et al., 2003). Such was the case during the Ebola epidemic, wherein the results of a survey indicate that nurses may take a sick leave if they think they might be assigned to care for people with Ebola virus disease (Baduge et al., 2018). Similarly, during the MERS-CoV outbreak, bedside nurses frequently had symptoms of acute respiratory infection. Their sick leave duration ranged from 1-15 days per nurse. In comparison, in the 2 months before the outbreak, nurses had fewer sick leaves which typically ranged from 1-2 days per nurse (Al-Dorzi et al., 2016).

Also included in contingency planning is the consideration of nursing staff belonging to vulnerable populations and their deployment area during an epidemic. Current evidence suggests that pregnant and immunocompromised nursing staff may be redeployed to low-risk units as part of a contingency plan. Staff safety should remain to be a primary goal in a hospital infectious outbreak (Al-Dorzi et al., 2016).

### Planning staffing needs in the critical care units

In the event of an epidemic, the intensive care unit's resources may be severely strained and may require an increase in intensive care capability. Early preparation may include the following activities: ensuring that staff are immediately available to provide intensive care unit– level nursing care (Matlock et al.,2015), and the training of reserve staff (Gomersall et al., 2006). Important nursing issues that are to be considered in planning for the staffing of critical care units are the following: time spent donning and doffing, need for additional rest days to counter the effect of increased work stress, changes in the skill mix of staff (increase in the proportion of nurses with little ICU experience), increased administrative burden on senior nurses and need to allocate nurses to enforce infection control procedures. Staffing a unit for one critically ill patient would require 16.8 full-time equivalents for a week of 24/7 care, which translates to four nurses per shift (Matlock et al., 2015). As a result of these issues, it is suggested that nursing manpower should be increased by 20–25%, even without an increase in bed numbers (Gomersall et al., 2006).

Due to anticipated staff shortages in the critical care units in an epidemic, building and training an additional reserve staff is essential in ensuring that nursing staff is immediately available in the intensive care units (Matlock et al., 2015) and that the reserve staff can be rapidly assimilated in the ICU team (Gomersall et al., 2006). In identifying potential reserve staff, it was suggested to consider that the departments of internal medicine and emergency medicine are likely to be strained in terms of human resources and may not be able to contribute staff. Conversely, staff from the anesthesia and surgery departments are more likely to be potentially available as reserve staff since elective surgery may be postponed during an epidemic (Gomersall et al.,2006).

To facilitate the prompt and seamless identification of reserve staff, it is also suggested that a register of staff with prior ICU experience should be maintained with their consent. Moreover, in the planning of a reserve staff, the problems in the assimilation of less well-trained staff into the team must also be considered (Matlock et al., 2015).

### Hospital Preparedness

The lack of preparedness has been identified as a recurring theme across different epidemics. Previous epidemics highlight critical issues in terms of preparedness such as: inadequate training, inadequate resources, lack of support by the hospital administration, the lack of resources and existing guidelines, and the overall lack of workplace safety (Speroni et al., 2015), inadequate human resource support, and the lack of assistance with family caregiving roles and responsibilities (O' Sullivan et al., 2009). Nurses also express their concern about the need for long term human resource support. There is an urgent need for hospital administrators and policy planners to consult with frontline nurses and other healthcare workers in planning for epidemics.

Therefore, preparedness plans must incorporate the support of nursing staff, especially those who are required to stay at work or

be quarantined during an epidemic. It is suggested that support should not only entail the provision of training, adequate staff capacity, adequate food, and the availability of living environments and communication facilities (Gomersall et al., 2006). However, it should also include the provision of child, elder, or pet care of nurses who are on requisite quarantine (O' Sullivan et al., 2009).

### Communication

Nurses perceive that there is a need to have improved communication to create a supportive and safe work environment towards a better quality of care (Kang et al., 2018). To achieve this, specific recommendations have been made (WHO, 2020a), such as: (1) a crisis communication plan should be developed, with the senior director or a deputy as the spokesperson, (2) channels of communication with hospital administration, hospital units, staff and relative should be delineated in the communication plan, and (3) daily briefing and debriefing sessions should be conducted to inform staff of the epidemic status and policy changes, and to facilitate feedback.

### Effects of Workload

Due to the high volume of work and understaffing in their units, nurses experienced burnout over time and complained of getting off work later. Burnout was felt due to the deteriorating situation and the uncertainty of when the epidemic would end (Kang et al., 2018). Nurses also had intensified role conflict in terms of taking care of their children, elders, and pets (O' Sullivan et al.,2009). Other nurses reported feeling privileged to be part of the team managing the outbreak and caring for patients (University of the Philippines [UP], 2020).

During the SARS epidemic, a workload of more than two patients per healthcare worker is significantly associated with the occurrence of super-spreading events in hospital wards (OR=2.76, 95% CI=1.16– 6.57) (Yu et al., 2007). Meanwhile, a perceived increase in workload was also significantly associated with nurse's consideration of leaving their job (aOR=3.73, 95% CI=1.82-8.24) (Shiao et al.,2007).

### Structure Workflow Processes

The nursing administrators established nurses' job descriptions and responsibilities (Cao et al., 2015). Some roles that were clearly defined include charge nurse, primary bedside nurse, secondary bedside nurse, "environmental nurse" for supplies and restocking, monitor in the anteroom, several support persons for specimen transport, and workflow management. Before the start of the shift, a team huddle was done to review previous events and provide an assessment of the patient's condition (4). Whenever patient transport is needed between departments, security staff escorts the patient, logging the date, time, and persons involved in the transfer (Loutfy et al., 2004).

## Discussion

The synthesis of findings in this narrative review of the literature resulted in ten themes. These findings synthesize what is known in literature around the experiences of nurses while working during different epidemics. As such, they are important to inform support strategies to optimize the nursing workforce during and following the COVID-19 pandemic.

The findings of this review emphasize that quality nursing care during epidemics was ensured by providing appropriate training and safe staffing ratios. The provision of proper and consistent training ensures nurses' readiness in pandemic response and helps to ensure a safe and effective working environment (Al-Tawfiq et al., 2018). On the other hand, several studies have already documented the link between nurse staffing ratios and patient safety; wherein the risk of patient safety events, morbidity, and even mortality increase as the number of patients per nurse increases (Olley et al. .2019).

Effective means of professional communication is also essential to promote a positive organizational climate, which is most likely an essential antecedent to developing a strong safety climate (Hughes, 2008; Nadzam, 2009). Likewise, our review has demonstrated the importance of effective communication so that appropriate information is disseminated promptly. This review identified that crisis communication plans, clear communication channels, and daily briefing and debriefing sessions created safe work environments.

It is also essential to consider nurses' working hours to ensure adequate response capacity and maintain their well-being amid a pandemic. Correspondingly, our review highlighted that shorter duty hours promoted comfort, work satisfaction, and nursing personnel safety. Prolonged work hours of nurses can contribute to a series of adverse effects on nurses which can affect their physical and emotional safety (Kunaviktikul et al., 2015; Patterson et al., 2018).

Organizational preparedness was a key consideration for nurses across studies in this review. The lack of preparedness has been identified as a recurring theme across different epidemics. Increased workload led to increased staff burnout, role conflict, super-spreading of infection in hospital wards, and nurse's consideration of leaving their job. Preparedness in a pandemic should give consideration not only to the planning of a response and recovery operation but also to the personnel who are required to respond (Reissman et al., 2006). Therefore, pandemic preparedness plans must include strategies for expanding and adapting the healthcare team as demand surges and illness circulates among staff members. Preparedness measures identified in this review include: constructing a contingency plan; establishing structured workflow processes, which entails having clearly defined nursing roles, huddles, and

a hospital traffic flow plan; and judicious planning of nurse staffing, taking into consideration patient acuity, staff availability, and skill mix.

Part of planning may also include the recruitment of volunteer staff ahead of time. Our review has discussed how reserve staff may help ease the strain on critical care units. Moreover, this review also emphasized the importance of transparency and understanding of the recruitment of volunteer staff. However, it should be noted that the aspects surrounding volunteerism remain complex, as there are several factors that may affect a nurse's willingness to volunteer in frontline work (Rosychuk et al., 2008). Therefore, specific guidelines must be put in place prior to the recruitment of volunteers as pre-pandemic planning.

## Limitations

Although a comprehensive search of the databases using the keyword combinations was undertaken, publications not indexed in these databases could have been omitted. Also, due to time and resource constraints, this review only included studies published in English. Therefore, studies published in other native languages, where the SARS, MERS, and Ebola epidemics were widespread, may have been excluded. The reference lists of relevant documents were not scanned and searching of grey literature was also not conducted. Furthermore, the available studies do not present high quality of scientific evidence, and therefore results of this review may not be generalizable. The main limitation of this review is the emerging production of new and numerous scientific publications related to nurse staffing during the current COVID-19 pandemic. However, it should be noted that the review was conducted during the earlier phase of the pandemic to provide timely information that can potentially inform changes in nursing clinical practice. Nonetheless, the results of this review may provide implications for practice and policy affecting nurse staffing during the current pandemic. The authors cannot formulate specific recommendations based solely on these results since they did not identify the effect of various staffing strategies on patient-sensitive and nurse outcomes. More research is needed in this area.

## Conclusions and Recommendations

The rich staffing experiences of nurses presented in this review suggest a need for administrators, policymakers, and health care organizations to actively engage in supporting nurses during a pandemic. Their engagement should recognize the importance of nurses and their crucial role in pandemic control. Adequate staffing is essential to ensure that nurses can maintain their physical and emotional well-being while doing frontline work. It is also vital that nurses continuously receive clear lines of communication, concise and current information on nursing care

and infection control, as well as structured workflow patterns to optimize their safety. Nurse managers and administrators must demonstrate receptivity to the staffing concerns that nurses are likely to experience in a pandemic. Without this support, nurses become potentially more vulnerable to stress and burnout, which can lead to the loss of nurses from the workforce.

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