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Short Communication

# COVID-19, Human Factors and Patient Safety in Long-Term Care Facilities

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## INTRODUCTION

According to the Florida Department of Health, as of July 24, 2020, 2,445 of the 5,777 COVID-related deaths (more than 42%) in Florida were persons who were either residents or staff at long-term care facilities for the elderly such as nursing homes [1]. Residents of these organizations are particularly susceptible to infectious diseases such as influenza. Indeed, pneumonia and other respiratory tract infections constitute the leading cause of mortality and hospitalization in nursing home residents, predisposing them to COVID transmission [2].

In response to COVID-19, Healthcare Workers (HCWs), other employees and volunteers in the healthcare industry are facing a number of unexpected challenges such as: increased workload, higher throughput of medical screenings, reallocating personnel, cross-training personnel in new departments, expediting testing procedures, and donning/doffing personal protective equipment more frequently [3]. This is compounded in long-term care facilities where staffing shortages and high turnover, high resident to staff ratios, supply shortages and inadequate infection prevention and control measures have been well-documented for years preceding the advent of COVID-19 [4].

Healthcare provision in any of today's medical, or sociotechnical, settings is complex. This complexity is a function of the interaction of workplace psychosocial factors, standards of care, organizational processes and procedures, patient throughput, patient-to-provider ratios, evolving technology and ergonomics (e.g., physical workspace/medical device design).Further, HCWs are faced with balancing the demands of ethical patient care with the legal and economics-based demands of organizations where they are employed. Adverse outcomes related to healthcare provision result from both active (e.g., HCW error) and latent factors (e.g., inadequate procedures) that emerge from this complexity. With respect to Healthcare Acquired Infections (HCAI), undesired outcomes are formulaic of 'perfect storms' in environments where breaches in organizational defenses facilitate the spread of microbes to those most vulnerable. The consequences of adverse outcomes can be devastating, including the unnecessary loss of life, as demonstrated by the toll that coronavirus has recently taken in long-term care facilities for the elderly [5].

Conventional healthcare organization approaches to infection control are aimed at reducing or eliminating the risk of HCAI [6]. For example:

- At the organizational level, surveillance programs to monitor compliance with infection control best practices may be implemented
- At the technical level, diagnostics and predictive software can be used to proactively identify problem areas related to patient safety
- At the team level, employees may be trained and encouraged to adopt a culture of infection control in which each person feels responsible to apply infection control best practices
- At the individual level, workers may follow checklists to minimize infections and engage in effective hand hygiene practices

Although some modicum of success has been achieved using these approaches, the ongoing, and in some cases increasing, transmission of coronavirus demonstrates that much room is left for improvement. This is especially true for Florida's long-term care facilities.

## HUMAN FACTORS AND ERGONOMICS IN HEALTHCARE

A significant proportion of this kind of patient harm can be prevented, and the field of Human Factors (HF) can offer both explanations and solutions. HF is a field of science that is concerned with human performance within a system. From an HF perspective, patient safety can be improved by gaining a thorough understanding of human interactions within the healthcare system. The healthcare system is comprised of elements such as organizational policies, the physical work environment (including technology), teamwork and other social interactions, and procedures that HCWs perform. Shared beliefs and values that interact with an organization's structures and control systems to produce behavioral norms are referred to as its safety climate or

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safety culture. In fact, the Joint Commission defines safety culture in healthcare: "the summary of knowledge, attitudes, behaviors and beliefs that staff shares about the primary importance of the well-being and care of the patients they serve, supported by systems and structures that reinforce the focus on patient safety [7]."Common components of an effective safety culture include: acknowledgment of the high-risk, error-prone nature of an organization's activities, a blame-free environment where individuals are able to report errors or close calls without punishment, the expectation of collaboration across ranks to seek solutions to vulnerabilities, and a willingness on the part of the organization to direct resources to address safety concerns [8]. A well-known model clearly defines the (many times, observable and measurable) characteristics of an organization's safety culture [9]:

- **Informed:** those who manage and operate the system have current knowledge about the human, technical, organizational and environmental factors that determine the safety of the system as a whole
- **Reporting:** the organization cultivates an atmosphere where people are prepared to report errors and near misses without fear of reprisal
- **Learning:** an organization must possess the willingness and competence to draw the right conclusions from its safety information/management system and the will to implement major reforms
- **Just:** an atmosphere of trust in which people are encourages or rewarded for providing essential safety-related information. There is clarity with respect to acceptable and unacceptable behavior
- **Flexible:** A culture in which an organization can rapidly reconfigure in the face of high-tempo or high-risk operations with the will and capability to shift from a hierarchical to a flatter mode.

A fundamental concept in HF is that human error is unavoidable in any system and that organizations are accountable to design systems that are error-resilient. Resilient systems have the capability to recognize and prevent errors and to mitigate the undesired outcome of errors that cannot be prevented [6,9].Organizations with strong safety cultures actively seek to improve policies, procedures and tools that optimize HCWs' ability to efficiently incorporate safe working practices. Safety culture can be measured and acted upon, and it is arguably the most important aspect of patient safety in any healthcare organization. Many times, a disconnect exists between an organization's policies and HCWs' implementation of them. It is critical that HCWs have an accurate mental model of tasks that they engage in, including clinical procedures and any risks associated with healthcare provision. In scenarios where clinical tasks are perceived to be separate from the prevention and control of infection, HCW error can be explained by factors such as: delayed feedback between omission and consequence/appearance of symptoms; HCWs having previously experienced positive results using the same inadequate procedures; time pressure and high cognitive workload; the lack of consistent infection control cues; and insufficient workspace design [5]. Nevertheless, the condition of many organizations' safety culture creates a state of unawareness of these issues or an unpreparedness to take effective corrective action.

In addition to providing theoretical models, such as those that underlie safety culture, HF researchers and practitioners have produced effective, practical approaches to reducing HCAIs. For example, checklists, an oft-used HF tool, address cognitive workload demands, help to reduce procedural errors and contribute to process standardization. In published reports examining the use of checklists to address HCAI issues, there is scant evidence of HF expertise, such as the implementation of task analysis, in the design of such checklists [5]. Nevertheless, the use of checklists in the prevention and control of HCAIs is associated with the reduction of transmission rates.

The relationship between workplace design and hand hygiene is another practical area where an HF approach has been effective in identifying and addressing HCAIs. Moments at which transmission of an infectious organism is most likely to occur in a clinical setting include: prior to patient contact; prior to performing an aseptic task; after body fluid exposure; after patient contact; and after contacting a patient's surroundings. Research has shown that hand hygiene adherence following these moments is near 40%, a rate that can undoubtedly be improved. Hand sanitizer usability shows promise in having a positive effect in hand hygiene adherence. Usability in this context includes visibility and proximity of dispensers to points of care and room entrances, unobstructed access and location along the workflow path [10].

Several other approaches provide examples of HF success stories in medical settings. Among the most effective include: automation or forcing functions in medical devices that prevent incorrect actions; human-machine redundancy procedures (e.g., visual inspection of medications and then scanning medication bar codes for computer verification); forced pauses in a procedure to verify that correct steps are being followed; reminders and other decision support tools; standardization of procedures, equipment and supplies across the organization; HCW pre-briefing, cross-checking and debriefing; and facilitating team training, communication and performance [11].

## CONCLUSION

HF has a demonstrated utility in improving patient safety and in diminishing the adverse effects of HCAIs specifically. HF professionals are currently conducting research in areas directly related to COVID-19.Such efforts are aimed at immediate response, as well as at preparation for and response to future public health threats. HF professionals who engage in such work seek to enhance HCW and organizational performance as well as to protect HCWs, patients and their family members as well as the general population. The value of HF is clear in identifying, investigating and preventing HCAIs, and more broadly, medical error and malpractice. There is a growing trend in applying HF expertise to improving medical systems performance, a much needed and overdue approach to preserving patient safety and reducing both patient harm and the unnecessary loss of life.

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