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Communication Challenges in High-Containment Clinical Environments

How one unit surmounted the physical barriers designed to protect staff from highly contagious pathogens.

ABSTRACT: The authors describe the personal protective equipment (PPE) clinicians require when involved in the care of patients with potential or confirmed exposure to highly infectious pathogens, such as the Ebola virus, multidrug-resistant organisms, or severe acute respiratory syndrome coronavirus 2, the cause of COVID-19. They discuss the communication challenges that arise with the various PPE required when caring for patients in high-containment clinical environments and how they and their colleagues in the National Institutes of Health's Special Clinical Studies Unit developed, field-tested, refined, and ultimately implemented policies and procedures that enabled clinicians to communicate effectively with other staff, patients, and external partners, such as governmental agencies, other specialized units, and nonprofit organizations.

Keywords: closed-loop communication, communication barriers, COVID-19, Ebola virus disease, high-containment clinical environments, infectious pathogens, isolation precautions, personal protective equipment, SARS-CoV-2, severe acute respiratory syndrome coronavirus 2

The Special Clinical Studies Unit (SCSU) at the National Institutes of Health Clinical Center in Bethesda, Maryland, was opened in August 2010 as a seven-bed, state-of-the-art inpatient unit that allows for care, infection control, and isolation involving highly infectious pathogens.[1,2] During the Ebola outbreak of 2013–2016, the SCSU was one of four such units in the United States used for patient care[1]; today, there are 14. Clinicians caring for patients with Ebola virus disease in the SCSU soon realized that the personal protective equipment (PPE) and other containment precautions required to keep them and health care workers safe created a number of communication challenges.

In response, SCSU staff developed, field-tested, refined, and ultimately implemented policies and procedures based on principles and practices discussed in the clinical literature authored by health care providers with firsthand knowledge of the type of PPE required when working in high-containment environments in which exposure to high-consequence pathogens is a substantial risk.

In this article, we discuss the traditional communication pathways we found to be suboptimal under such circumstances—whether communicating with other staff, patients, or external partners such as governmental agencies; other specialized units; or nonprofit organizations—and we describe the targeted

modifications that allowed us to provide a cohesive, transparent, high-quality approach to patient care in this high-containment clinical environment.

HEAD-TO-TOE PPE

A patient admitted to the SCSU with an exposure to a highly contagious, high-consequence pathogen, such as Ebola or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19, may require staff to wear PPE that covers the body from head to toe. Depending on the pathogen to which the patient was exposed, necessary PPE for the health care provider may include all or some combination of the following, all of which impede communication to some degree:

- mask, N-95 respirator, or powered air-purifying respirator (PAPR)
- face shield
- gown
- gloves (single or double)
- shoe covers

When full PPE is required, as when caring for a patient infected with an airborne pathogen, such as SARS-CoV-2, or shedding a highly contagious and lethal pathogen, such as Ebola, a helmet-based PAPR system is worn in addition to the gown, gloves, and shoe covers (see Figure 1).

Figure 1. Author Meghan Schlosser demonstrates the full PPE worn on the NIH Special Clinical Studies Unit when caring for patients with highly contagious diseases such as COVID-19. Photo by Ellen Eckes.

IMPEDIMENTS TO COMMUNICATION

Auditory and visual issues. The noise produced by the internal fan of the PAPR helmet makes it difficult for health care providers to hear what others are saying to them. In addition, the protective shroud covering the PAPR helmet and upper body further limits peripheral vision and impedes sound transmission. Together, these aspects of PPE can make routine communication between providers and patients, as well as among colleagues, extremely challenging and stressful, given the risk of exposure if procedures are not followed meticulously.

Impaired tactile communication. With layers of protective clothing and double gloving, communication by touch between caregiver and patient is similarly compromised. According to findings by Dziadzko and colleagues, communication barriers tend to increase patients' emotional distress and felt loss of control, whereas interaction with clinicians (receiving verbal information and explanations, as well as emotional support and reassurance, often conveyed through physical touch) tends to reduce patient stress and increase patient comfort.[3]

Structural barriers to communication. The physical layout and zoning of the SCSU was identified as impeding effective communication in several areas (see Figure 2). The unit is zoned according to risk of potential contagion. Within the hot zone (areas of highest risk), such as occupied patient rooms, the full PPE required to protect staff hinders both communication among staff and between staff and patients. From within the warm zone (areas of intermediate risk), such as the central corridor and the anteroom associated with the large patient room used for respiratory isolation, communication between staff and patients is inhibited by both the staff's full PPE and the walls separating staff from patients. Within the SCSU, the only cold zone (in which staff are isolated from patients and thus protected from possible contagion) is the nurses'

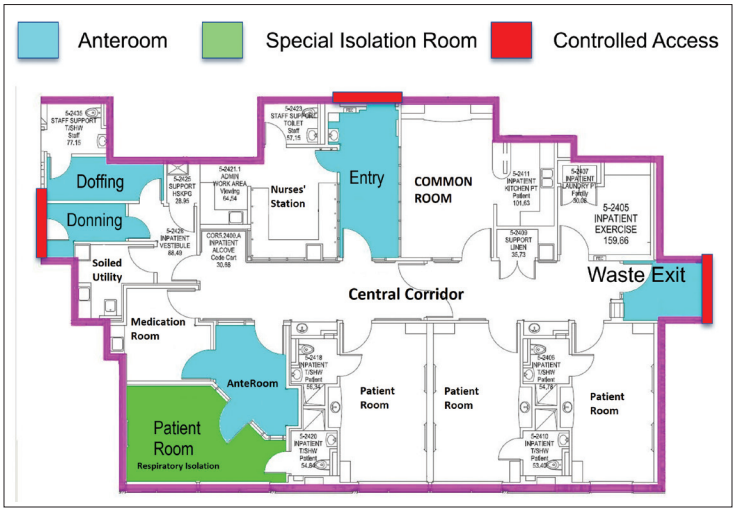

Figure 2. The floor plan of the SCSU. Each of the three smaller patient rooms was designed for two patients. The large patient room (bottom left) was used if a patient required respiratory isolation.

station. Zoning fluctuated somewhat depending on the number of patients on the unit and the type of pathogens to which they had been exposed. During periods in which the hallway was considered a warm zone, the anteroom adjacent to the nurse's station was as well.

Among SCSU staff, effective communication was recognized as an essential component of both optimal patient care and staff and patient safety. The unit thus developed a plan to identify the communication challenges it faced and implement strategies to overcome them while meeting or exceeding safety standards within this unique clinical setting.

IDENTIFYING THE CHALLENGES

To identify the specific communication challenges unique to this type of unit, the SCSU initiated "after-action" discussion meetings, which were held upon patient discharge and included the discharged patient, their family members, and SCSU staff members from all departments. The extensive PPE required when working in a high-containment environment was recognized as impeding three distinct categories of communication:

- among staff
- between staff and patients
- between patients and their family members

We studied each of these categories in depth, considering suggested recommendations for improvement and initiating several such suggestions on a trial basis. Our findings are as follows.

STAFF-TO-STAFF COMMUNICATION STRATEGIES

Closed-loop communication. In high-containment clinical environments, effective spoken communication often necessitates direct eye contact, distinct voices, increased vocal volume, and hand gestures. Closed-loop communication is a means of ensuring that messages are received and understood. The American Heart Association protocols incorporate closed-loop communication to ensure best practices, especially in emergent situations, such as a cardiac arrest.[4]

In closed-loop communication, a team member sends a clear message, and the recipient, making eye contact, reiterates the message to confirm with the sender that the message was correctly understood.[4] This method of communication, which is considered standard operating procedure in codes and acute care settings, had been in practice in the SCSU from the beginning. Although it addressed some of the challenges staff members reported facing when communicating with each other within a patient's room, it created others. For example, during an intubation, closed-loop communication calls for the nurse to repeat to the attending physician the medications and dosages ordered to ensure accuracy. The repetition, however, often had the effect of lowering patients' confidence in the staff's competence and their sense of security. Upon discharge, some patients said there were times when staff members didn't seem to understand each other. Patients didn't appreciate the degree to which PPE could interfere with communication or realize closed-loop communication was a means of ensuring a clear understanding and execution of medical orders.

Bedside reporting in the SCSU continued as before. It was practiced throughout the unit, except in the large room used for respiratory isolation; when a patient was treated there, reporting was performed at the nurses' station. Reporting incorporated closed-loop communication, which worked well both at the bedside, where its purpose was clearly understood by the patients, and at the nurses' station, where all staff involved in the care of the patient in respiratory isolation could easily share information.

Call light systems. In a high-containment clinical setting, a call light system does little to support communication among staff in any areas of the unit other than the nurses' station. In terms of sound and transmission quality, such systems were not designed with PPE in mind. Even experienced staff in the SCSU found it frustrating to use the system, as it often required multiple attempts before message content was received and understood. For example, when clinicians engaged the call light system because additional supplies were required for procedures such as a phlebotomy or an IV insertion, the extensive PPE worn in this environment muffled voices, scrambling communication and rendering the call system laborious and ineffective.

Furthermore, for patients under strict isolation, whose circumstances, environment, and perceived lack of privacy put them at elevated risk for stress, call light systems, which have the attributes of a public address system, can exacerbate stressful feelings.

Dry-erase boards, which have been shown to improve both patient and nurse perception of communication within inpatient acute care settings,[5] were another low-tech strategy we tested in SCSU patient rooms, anterooms, and the hallway. The boards were positioned so they could be seen through the glass windows, allowing brief, nonurgent messages, such as a need for supplies or medications, to be conveyed to staff outside the rooms. The size of the boards, however, often limited the content of written messages, and the process was ultimately deemed too time consuming and inadequate to support all of the unit's communication needs, especially when urgent situations arose. The need for a reliable, real-time means of communication between patient rooms, staff, and outside personnel, as well as between staff within the same room, remained unmet.

Wearable two-way radios with headsets were tested. Unfortunately, despite a thorough investigation of various commercial systems, we found deployment of these devices posed other communication challenges. For example, because of variations in staff vocal tone and volume, the vibration apparatus on the radios garbled communication, particularly for staff whose prior experience with such radios was limited. Variability in transmission quality complicated closed-loop communication, often preventing messages from being fully understood. Uncertainty over whether messages were fully transmitted and understood undermined staff confidence in the integrity of this approach.

In field-testing the two-way radios, we discovered unexpected delays between the points at which messages were sent and received, and realized some messages were lost or truncated when staff tried to listen and talk at the same time. In addition, it was necessary to take special precautions when attaching components, so normal physical activity involved in the provision of care didn't dislodge equipment within the protective suit, rendering radio communication impossible and creating a potential tripping hazard.

A high-tech, room-level approach to communication. Since none of the strategies discussed previously was optimal for use in our high-containment clinical unit, we decided to pursue a high-tech, room-level approach rather than relying solely on approaches leveled at individual staff members. To this end, we abandoned the two-way radios and the call light system, incorporating instead a state-of-the-art system consisting of ceiling-mounted, closed-circuit, high-resolution cameras with sensitive microphones and high-fidelity speakers in each patient room and at the nurses' station. This approach obviated the need for either wearable or bedside devices. The microphone system can transmit voices at a normal conversational level throughout each room. During patient care, the speaker system at the nurses' station remains active to instantly alert staff of any emergent clinical concerns or nonurgent delivery needs. The zoom and repositioning capabilities of the cameras in each room provide a 360° view of the room's interior and the entrance to the bathroom. This technology, which serves to supplement rather than replace several of the more conventional systems discussed previously (closed-loop communication, bedside reporting, and dry-erase boards), allows consulting physicians to perform a quick visual assessment from the nurses' station. When privacy or discretion is required, staff members continue to use dry-erase boards to communicate needs or receive information from the medical team without disturbing a sleeping patient.

CONTINUITY OF CARE

Another area of communication on which the SCSU focused was continuity of care from one shift to another. Now when the departing charge nurse gives a report to the incoming charge nurse, the report incorporates patient assessment and progress, environmental information, and supply status. Although nurses had intuitively provided complete patient reports to oncoming staff, the environmental updates were sometimes overlooked.

The unit introduced an electronic logbook that allows noncritical notes to be made during the shift, enabling nurses to record environmental information, PPE inventory, and autoclaving status for the oncoming charge nurse. Nurses can note other concerns as well, such as staffing information or notes to contractors regarding special precautions for various types of waste. The electronic inventory generated by this process not only lists supply needs, but within a secured folder accessible to staff across disciplines (nursing, medical, rehabilitation, materials management, and housekeeping), also indicates the location of available supplies.

Ensuring that roles and responsibilities were clear and concise was essential, as nursing staff in a high-containment clinical environment such as the SCSU perform many tasks outside of direct patient care. In settings with far fewer access restrictions, these tasks would fall to housekeeping, dietary, pharmacy, supply, or other ancillary staff; under high-containment precautions, however, nursing staff often assume many of these responsibilities because of the severity of the pathogens infecting the patient population and the complex training required to access the unit. The assignment of staff to such tasks as maintaining a clean environment and keeping the unit well stocked with critical supplies must be fair and transparent. Delegating restocking and ordering responsibilities at the beginning of each shift reduced the possibility of double supply orders and inaccurate par levels, while fostering a sense of shared responsibility for maintaining the unit's state of readiness and permitting any concerns to be addressed promptly.

COMMUNICATION WITH FAMILY

It is well established that communication with and support from family members during times of critical illness can be important in patients' successful recovery.[3] Patients admitted because of suspected or confirmed exposure to highly infectious pathogens are not permitted to have visitors. In some cases, even the use of a cell phone is not a viable option owing to the nature of the infection or the patient's weakened physical state. For these reasons, an optimal means of facilitating communication between patients and family was given a great deal of consideration in the SCSU. To provide families an appropriate and acceptable avenue through which to speak with and see their loved one, family members were given access to the speaker system in the nurses' station, which allowed them to communicate directly with the patient in isolation. Feedback indicated that this solution helped both patient and family members to feel a greater connection with each other. Initially, two limitations were identified: the interaction was limited to oral communication and privacy was compromised.

From the beginning, staff expressed concern that the lack of privacy might limit conversations to superficial topics. It was quickly recognized that the addition of a video-based mechanism that would enable patients and family members to see each other would substantially improve the existing speaker system.[6] Video-based communication assured family members of the attentive bedside care the patient was receiving and improved patients' mood and outlook. To address privacy concerns, the SCSU provided patient and family members with portable tablets and access to unit Wi-Fi, which improved both patient and family demeanor.

We used personal digital assistant devices or tablets with special protective casings that could withstand daily, topical chemical decontamination as well as sterilization by vaporized hydrogen peroxide released into the room in which they were stored at the end of the hospital stay. The durability of these electronic devices to chemical decontamination allowed them to be reusable. Tablets were purchased and placed in the patient rooms and at the nurses' station.

Using commercial media software, patients and family members could communicate at their convenience, at a location other than the nurses' station, without required staff intervention. Family members were permitted to carry the device to a dedicated waiting room from which they could have an in-depth conversation with their loved one. Additionally, family members who were not present could use this device to call the patient in isolation. As has been found in other studies,[6] face-to-face communication provides a greater sense of connectivity and a more supportive environment than systems that permit only oral communication. When this system was adopted, several staff members said they no longer felt they were being intrusive by inhibiting personal communication between family members and patients. Furthermore, this electronic connectivity included ready access to the Internet and various forms of electronic entertainment for the recovering patient. When the patient was well enough to get out of bed, we allowed family members to stand in a glass hallway so they could see their loved one up and moving about the room. This visible sign of recovery clearly provided comfort to the family. Roundtable discussions with family members in attendance further helped them feel actively included in the ongoing decision-making process affecting patient care.

INTERDEPARTMENTAL COMMUNICATION

Interdepartmental exchanges were another important aspect of communication considered at the SCSU. Daily clinical huddles were held in the evenings, any time a patient's clinical situation changed, or any time an interdepartmental meeting was deemed necessary for other reasons. Meetings typically included RNs, physicians, respiratory therapists, and, on occasion, family members. Topics included daily events, patients' clinical status, any emerging concerns, and proposed changes to the plan of care. These meetings provided attendees with a forum to voice any concerns. Discussions were viewed as helpful for all involved, as it gave participants a sense of unity regarding patient care and allowed questions or concerns to be addressed immediately. The meeting was considered a safe place, where all disciplines and viewpoints were respected. Experience has shown that caring for patients in high-containment isolation requires the collaboration of many departments within the hospital, and effective communication is essential to the operation of the unit.[2] To this end, the SCSU conducted daily operational meetings with teams from hospital epidemiology, waste management, hospital administration, materials management, facilities management, pharmacy, housekeeping, the diagnostic laboratory, and others in which concerns could be discussed in real time, allowing solutions to be implemented immediately. Solutions to problems regularly encountered in clinical environments with far fewer access restrictions did not work well for the unique environment of the SCSU. Communication with these teams allowed staff to devise collaborative solutions. The meetings allowed urgent topics to be vetted by those most empowered to offer solutions, often providing "quick fixes when glitches were identified in any of our processes."[7] These meetings helped create a cohesive, dynamic environment in which achieving the best outcome for the patient was the highest priority.

"After-action" discussions following each patient discharge allowed participants to air concerns about events that had occurred during admission and provided a structured framework within which

to debrief staff. These discussions prompted consideration of the need for any policy, procedural, or practice updates.

INTERHOSPITAL COMMUNICATION

The SCSU engaged with other governmental agencies, other specialized units caring for patients in high-containment clinical environments, nonprofit organizations, and experts in infectious disease control, discussing patient care and communication. The discussions included staff, patients, and physicians from other hospitals who had delivered or experienced similar care. These exchanges inspired more dynamic and creative thinking among participants.

LESSONS LEARNED

Through trial and error, we discovered the pros and cons of each approach to improving communication. While no single solution addressed all needs, with the exception of the two-way radios and the call light system, the approaches were felt to improve patient care and enhance communication in this high-containment clinical environment. Nurse-to-nurse reports given at the bedside and at shift changes smoothed transition of care. Dry-erase boards remained a consistent means of communication between staff in patient rooms and staff outside. The advanced in-room audiovisual system addressed other staff-to-staff communication needs, and the portable tablets with access to unit Wi-Fi and protective casings that could withstand decontamination comforted both patients and their family members. Evening roundtable discussions with physicians, respiratory therapists, nurses, and family, which allowed concerns to be communicated directly, provided beneficial information to all and were vital in fostering and maintaining a cohesive environment over time.

With the continued potential for global epidemics and pandemics, high-containment clinical facilities will continue to be an important means of combating the spread of disease in the future. With the limits high-containment protections place on communication, it's important for health care providers to continue evaluating various strategies for supporting effective communication between all parties who work or are treated in such facilities. ▼

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Meghan Schlosser is a travel nurse with American Mobile Nursing, Fostoria, OH. Kimberly Adao is a clinical manager at the National Institutes of Health (NIH) Clinical Center (CC), Bethesda, MD, where Anitra Fitzgerald-Monroe and Leighann Ebenezer are senior clinical research nurses, and Ellen Eckes is a nurse consultant. Alberta Derkyi is an NP at the National Institute of Environmental Health Sciences, NIH CC. Contact author: Ellen Eckes, eckese@cc.nih.gov. *The authors and planners have disclosed no potential conflicts of interest, financial or otherwise.*

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