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Major Article

Reengineering the patient's environment: Establishment of a "Red Box" to improve communications with patients on isolation precautions

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Background: Hospitalized patients on isolation precautions are reported to have less frequent health care provider (HCP) visits owing to time required to don and doff personal protective equipment (PPE). Thus, placement on isolation precautions leads to negative patient perception and affects their care.

Methods: A "Red Box" that extended 3 feet beyond the door was marked in 50 patient rooms of a tertiary care hospital and used for patient communication by HCPs without PPE. HCP and patient perceptions of the Red Box were studied via a survey and personal interviews. Compliance was also observed by "secret shoppers." Rates of health care–associated infections (HAIs) were monitored.

Results: Over a 1-year period, HCPs reported improved patient communication, utilization of time, and increased interactions. HCPs used the Red Box to communicate with patients 76% of the time. In 92% of the cases, HCPs remembered not to use PPE while in the Red Box and were observed 80% of the time using PPE when venturing beyond the Red Box. Patients reported improved frequency of HCP contact and satisfaction. HAIs in these units did not show any increase compared with those in prior years.

Conclusions: HCP interaction and communication with patients on isolation precautions improved with the reengineering of the patient environment in the form of the Red Box. HAI rates did not increase with this intervention.

BACKGROUND

Patients with selected infectious diseases that are spread via airborne, droplet, or contact route are placed on isolation precautions. When patients are on these precautions, health care providers (HCPs) wear personal protective equipment (PPE) before entering the room to minimize exposure to secondary infection and subsequent transmission of diseases.[1] Before entering the room of a patient on airborne precautions, an N95 respirator is donned; for droplet precautions, a surgical mask is donned; and for contact precautions, a gown and gloves must be donned upon entry. All PPE is doffed upon exiting. The use of transmission-based isolation precautions for identified pathogens reduces the incidence of health care–associated infections (HAIs) by interrupting known routes of transmission. [1,2]

This requirement, to wear PPE while caring for patients, was outlined by the Centers for Disease Control and Prevention's Healthcare Infection Control Practices Advisory Committee (HICPAC) for HCP and patient safety. However, it has unfortunately resulted in a reduced number of visits to a patient's room, which in turn led to less optimal care. [1,3-7] As reported by Knowles,[8] patients with infectious diseases felt as though they were a danger to themselves and to others; this was brought on by HCP use of PPE, which was felt to be an "exaggerated use of protective clothing." A number of patients commented on the use of HCP protective wear and said, "It made me feel like I was a dirty, unclean person seeing the doctors and nurses coming into the room wearing aprons and touching me with gloves."[9] Patients believe that the stigma of an infectious disease diagnosis affects the attitudes of the HCP, which leads to their care being affected. In a study, although contact precautions led to improved hand hygiene (63.2%

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vs 47.4% in rooms of patients not on contact precautions), it did lead to 36.4% fewer hourly HCP visits than patients not on contact precautions (2.78 vs 4.37 visits per hour) as well as 17.7% less direct patient contact time with HCPs (13.98 vs 16.98 minutes per hour) and 23.6% reduction in visitors.[10] In addition, it has been demonstrated that as the proportion of patients on contact precautions increases, the compliance with isolation precautions tends to decrease. A prospective study demonstrated that as the proportion of patients in contact precautions increased from $<20\%$ to $>60\%$, the compliance with hand hygiene prior to entry as well as contact precautions bundle decreased significantly: 43.6%-4.9% for hand hygiene (odds ratio, 10.1; 95% confidence interval, 1.84-55.54; $P = .008$) and 31.5%-6.5% for the contact precautions bundle (odds ratio 6.6; 95% confidence interval, 1.15-37.44; $P = .03$).[11]

An easy solution to modify the environment to support patient and HCP interactions and avoid the negative consequences of isolation precautions is the creation of a designated area that extends 3 feet beyond the door for communicating with the patient without wearing PPE. Other researchers who have studied the use of the safe zone, also referred to as the Red Box, reported positive patient ratings and that it lessened the perception of being isolated.[12] HCP awareness of isolation precautions, perceived compliance with PPE, and decreased infection rates have also been demonstrated.[13] The use of the Red Box also increased HCP satisfaction regarding communication with patients, lessening communication barriers, and decreasing the use of PPE, plus related cost.[14-16]

METHODS

A quality improvement project was initiated in 50 patient rooms spread over different medical, surgical, and intensive care units (ICUs) in a large tertiary hospital, from January 1, 2016, to December 31, 2017, piloting the use of a safe zone, also referred to as the Red Box. The Red Box delineated space at the doorway of the patient's room, which allowed the HCP and patient to have full view of each other to facilitate communication without the HCP wearing PPE. At the doorway of each room, a 3-foot area beyond the entry of the door was marked by red duct tape. This area was >6 feet away from the head of the patient's bed. HCPs on the units were educated on the use of the Red Box. They were informed that only crossing the red duct tape on the floor indicated the need to don PPE. Patients who were on airborne precautions were not included in the study.

To evaluate HCP perception of the Red Box a voluntary questionnaire was provided to all of the HCPs on the unit midway through the study with an expected turnaround time of 2 weeks. This was a convenience sample. The responses were anonymous and collected in a sealed box kept on the units. The completed surveys were aggregated, and results described. Scores from the National Database for Nursing Indicators were also obtained for this period to assess nursing satisfaction.

Compliance observations were performed over a 2-week period after 1 year of the study period by "secret shoppers." A standardized method used by the infection prevention personnel was used to train the secret shoppers, and the observations were monitored to ensure uniformity in the methods. An observational checklist was used to assess the use of the Red Box and appropriate donning of PPE. The use of PPE while in the Red Box, as well as when going beyond, was observed both in rooms on contact and/or droplet precautions.

Patients placed on isolation precautions were interviewed by the unit nursing managers prior to discharge and asked about their experience with the Red Box. Subjective impressions were recorded. Patients' perceptions regarding HCP communication were also assessed using the Hospital Consumer Assessment of Healthcare Providers and Systems survey. This survey was administered to a random sample of patients between 48 hours and 6 weeks after discharge.

To assess changes in HAI, a unit-specific HAI report card with central line–associated bloodstream infection, catheter-associated urinary tract infections, *Clostridium difficile* (C diff), and methicillin-resistant *Staphylococcus aureus* bacteremias, as defined by the National Healthcare Safety Network, were monitored and compared with reported infections in the year prior to the pilot project.

RESULTS

A total of 146 completed surveys were received. The results of these surveys are shown in Table 1. Most HCPs used the Red Box when catering to dietary needs (45%) and proving test results and updates (34%). The survey showed an overwhelming positive response with 97% of HCPs saying that they were able to communicate with the patient more often and that the use of the Red Box saved time. As many as 40% of the respondents reported that the frequency of patient interaction increased by as much as 5 times a day after the Red Box implementation. A total of 72% of the respondents felt that use of the Red Box decreased barriers in taking care of patients on contact and/or droplet precautions. All the respondents taking care of patients on droplet precautions felt comfortable not donning a mask if they were interacting with the patients in the Red Box, though the number was small. During this period, the unit registered nurse satisfaction for the National Database for Nursing Indicators was reported as 4.32 and exceeded the magnet mean.

During the secret shopper observation period, the HCPs' utilization of the Red Box for both contact and droplet precautions was monitored. It was found that 76% of HCPs used the Red Box to communicate with patients in the isolation precaution rooms, 92% of HCPs remembered not to don PPE nor apply hand sanitizer while in the Red Box, and 80% of HCPs who went beyond the Red Box wore PPE and used alcohol-based sanitizers (Table 2).

A further breakdown of the data for the HCP's utilization of the Red Box for droplet precautions shows that only 80% of HCPs used the Red Box to communicate with patients in the isolation precaution rooms, 96% of HCPs remembered not to don PPE wear nor apply hand sanitizers while in the Red Box, and 84% of HCPs who went beyond the Red Box wore PPE and used an alcohol-based hand sanitizer.

For patients on contact precautions, 72% of HCPs used the Red Box to communicate with patients in the isolation rooms, 90% of HCPs remembered not to don PPE nor apply hand sanitizer while in the Red Box, and 77% of HCPs who went beyond the Red Box wore PPE and used an alcohol-based sanitizer. The compliance rates of both using PPE beyond the Red Box and not using PPE in the Red Box were significantly higher in the rooms of patients on droplet precautions. Most HCPs who did not utilize the Red Box were pharmacy technicians and HCPs from other units and departments in this facility.

Table 1
Health care provider survey responses regarding Red Box use (n = 146)

	Yes*	No
Red Box increased frequency of patient checks over baseline, n (%)	133 (97)	4 (3)
1-3 times/d	25 (22)	—
3-5 times/d	44 (38)	—
5-10 times/d or more	45 (40)	—
Red Box lessened barrier to care for contact isolation, n (%)	104 (72)	40 (28)
Improved frequency of assessment and communication, n (%)	142 (97)	4 (3)
Helped save time by not wearing PPE, n (%)	142 (98)	3 (2)
Comfortable using Red Box without mask if patient droplet (n=17), n (%)	17 (100)	0 (0)

PPE, personal protective equipment.
*The total number varies because not all questions were answered in each questionnaire.

Table 2
Two-week observation data on compliance in a single unit with patients placed in droplet and contact precautions in rooms with Red Box

	HCP utilizing Red Box n = 109		PPE in Red Box n = 68		PPE beyond Red box n = 164	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Droplet	41 (80)	10 (20)	1 (4)	27 (96)	60 (84)	11 (16)
Contact	42 (72)	16 (28)	4 (10)	36 (90)	72 (77)	21 (23)
Total	83 (76)	26 (24)	5 (8)	63 (92)	132 (80)	32 (20)
P value	.13		.03		.009	

HCP, health care provider; *PPE*, personal protective equipment.

The patient's response to the Red Box was measured via patient satisfaction scores on completed patient surveys. The Nursing Communication score on the Hospital Consumer Assessment of Healthcare Providers and Systems survey increased from 5% in 2015 across an entire unit to 13% in 2016 and 21% in 2017. Patient responses were overwhelmingly positive and a perception of improved frequency of HCP contact as well as satisfaction was noted. A total of 75 patients were interviewed, of whom 69 (92%) reported that the HCP rounded every hour on them during the period the Red Box was used.

The numbers of HAIs in these units did not show any increases when compared with the period prior to the initiation of the Red Box (2015) (Table 3). There was a significant decrease in the number of HAIs in 2017 compared with that in 2015; however, most of the decrease was attributed to the lower C diff rates, which was a facility-wide phenomenon observed during this year owing to the implementation of an aggressive infection control bundle. When excluding C diff rates, the decrease in HAIs between 2015 and 2017 was not significant ($P = .96$).

DISCUSSION

The Red Box is an easily implemented infection control tool that can be used to enhance patient-HCP interaction without compromising HCP safety. In at least 1 prior study, its use was welcomed by HCPs and shown to have improved effects on patient communication, resulting in increased patient interaction.[16] Consistent with this, our study demonstrates increased frequency of patient checks with the use of the Red Box, which increased by 5 times a day in as many as 40% of the cases. The Red Box also improved the ease of interactions with patients, and most HCPs believed that it saved time. Furthermore, its use was widely accepted, and HCPs were comfortable interacting with patients without PPE.

As has been demonstrated in multiple prior studies, interactions with HCPs with PPE can lead to a patient feeling stigmatized and can consequently contribute to loneliness and depression.[8, 17] Patients on isolation precautions for infectious diseases are also potentially at increased risk to certain stresses that can have an emotional and behavioral impact.[17-19] Patients who are confined to their rooms are prone to loneliness and depression and tend to feel stigmatized. The negative effects of isolation on patients include fear, anxiety, depression, and rapid mood changes. It has also been reported that decreased HCP-patient contact may affect patients' perception of their hospital experience and the feeling of being isolated may negatively influence their stay.[12,17] Exploring opportunities to reengineer the environment to balance the needs of the patient and the safety of HCPs can minimize negative consequences. Patients on contact precautions have been shown to have decreased patient satisfaction and are less likely to recommend the health care facility to friends.[20] Thus, the Red Box may be a useful tool in helping alleviate these concerns and improving patient satisfaction.

By maintaining 6 feet from the head of the bed, the use of the Red Box did not lead to any significant change in the number of HAIs. Our study is, to our knowledge, one of the first to establish this and alleviate any concerns use of the Red Box may have about HAIs. Furthermore, by decreasing the use of PPE, direct cost savings attributable to the cost of actual PPE, as well as indirect cost savings particularly by decreasing the time needed to don and doff the PPE, was realized. Similar results have been reported previously; a prior study estimated savings of $110,000 and 2,700 man-hours per year.[14]

Our study did suffer from limitations. Considering that the samples were convenience samples and not randomized, we cannot rule out the possibility of selection bias. There was intensive education provided to the HCPs during the period, which may have influenced their practices. Further, not all data points were captured because some patients and HCPs may not have returned the questionnaires and surveys although all patients did agree to be interviewed. The observations by secret shoppers can have limitations, including effects on validity due to unmasking of the secret shopper.[21] Furthermore, the decrease in rates of C diff infections did decrease the HAI rates overall. Yet, the lack of an increase does support the hypothesis that there were no adverse effects on the safety of patients and HCPs.

CONCLUSION

The use of the Red Box led to multiple benefits. With this simple solution, the positive outcomes achieved included improved patient care experience and HCP experience, decreased hospital equipment usage and costs without affecting HAIs and patient and HCP safety. In conclusion, incorporating the Red Box into isolation precaution protocols may be an effective yet simple engineering solution to

Table 3
Health care–associated infections in units across years with and without use of Red Box

Type of infection	2017 (with Red Box)	2016 (with Red Box)	2015 (without Red Box)
CLABSI*	0.37	0.31	0.43
CAUTI†	1.1	1	1.4
C diff‡	3.2	5.55	6.1
MRSA bacteremia‡	0.95	0.63	0.99
P value (compared with 2015)	.693	.95	
	Excluding C diff 0.96	Excluding C diff 0.86	

CAUTI, catheter-associated urinary tract infection; *C diff, Clostridium difficile; CLABSI*, central line–associated blood stream infection; *MRSA*, methicillin-resistant *Staphylococcus aureus*.
*CLABSIs are per 1,000 patient catheter-days.
†CAUTIs are per 1,000 patient catheter-days.
‡C diff and MRSA rates are per 10,000 patient-days.

maintain patient and HCP safety and improve patient-HCP experience and satisfaction.

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