

The Impact of Discontinuing Contact Precautions for
Multi-drug Resistant Organisms

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Abstract

The utility of contact precautions (CPs) for multi-drug resistant organisms (MDROs), such as Methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant *Enterococcus* (VRE) colonization and infection remains a debatable component of infection prevention for many reasons. Applying CPs for MDRO colonization and infection includes financial costs associated with nursing workloads, patient supplies, patient throughput delays, and social isolation concerns for patients. Recent literature indicates the discontinuance of CPs and the application of standard precautions (SPs) for MDRO colonization and infection is an effective infection prevention strategy, as it decreases associated costs without increasing infection risks or adverse events. The objective of this project was to evaluate the effects on MDRO hospital-onset infection rates, overall patient experience scores and associated financial costs when making a practice change from CPs to SPs for MDRO colonization and infection. The results of this project may provide an impetus for changes in practice by providing a cost-effective alternative to disease prevention and affording clinicians more purposeful time to focus on delivering quality patient care. Further practice implications may be transferable to other MDROs and, as such, provide a greater focus on quality patient care by reducing potential adverse events and maintaining fiscal responsibilities.

Keywords: discontinuing, discontinuance, or removal of contact precautions for MDRO

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The Impact of Discontinuing Contact Precautions for
Multi-drug Resistant Organisms

For many years, the application of contact precautions (CPs) has been recommended for patients with MDRO colonization or infection as a strategy to prevent disease transmission. The *Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006* guidelines from the Healthcare Infection Control Practices Advisory Committee (HICPAC) recommended wearing a gown and gloves for all interactions that may involve contact with the patient or potentially contaminated areas in the patient's environment to prevent disease transmission. The importance of this guideline in focusing on prevention strategies for MDROs was paramount as resistance to new antimicrobials continued to emerge. This same commitment to reducing healthcare-associated infections (HAIs) and disease transmission can also be seen in collaborative efforts through many organizations, including the Centers for Disease Control and Prevention (CDC), the Agency for Healthcare Research and Quality (AHRQ), the Society for Healthcare Epidemiology of America (SHEA) and the World Health Organization (WHO).

Regulatory agencies, such as The Joint Commission (TJC) and the Centers for Medicare and Medicaid Services (CMS), have also placed HAI prevention at the forefront of patient safety. They have promoted National Patient Safety Goals (NPSGs) beginning in 2002 ("Facts about the national patient safety goals," (TJC, 2018), and CMS hospital-acquired condition (HAC) reduction program penalties beginning for fiscal year 2015 discharges (CMS, 2018 July 25). Both NPSGs and hospital reduction programs include a focus on MDROs with NPSG 07.03.01 and HAC penalties within Domain 2 for MRSA bacteremia.

Purpose of Project

The purpose of this project was to synthesize the knowledge learned from the literature review and to translate knowledge in order to benefit the patients effectively within the practice environment. By evaluating the effectiveness of SPs as a cost-effective strategy in preventing hospital-onset (HO) MRSA and VRE infections and investigating the effects of the practice change on the patient experience and subsequent patient satisfaction scores. Specifically, the outcomes measures were focused on HO laboratory identified (LabID) MRSA and HO LabID VRE bloodstream infection (BSI) incidence density rates and whether this measure would increase statistically ($p=0.05$) from baseline, overall Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction scores for “rate the hospital” would increase by 5% from baseline and if PPE supply costs would decrease by 25% from baseline. These outcomes aligned with organizational goals to eliminate health inequalities and to promote patient safety in everyday patient care.

Significance of Project

Although recent reports are available regarding the trends of HAIs, the most recent financial meta-analysis notes the cost of HAIs vary on a per-case basis and, according to Zimlichman et al. (2013), the cost of central-line associated bloodstream infections (CLABSIs) was the costliest at \$ 45,814 per case. MRSA related CLABSIs had higher associated costs reported at \$58,614 per case. However, with a continued focus on infection prevention, the incidence of HAIs has decreased over the past few years according to the National Healthcare Safety Network (NHSN), specifically the prevention of CLABSIs as this measure has declined by roughly 50% between 2008 and 2016. Catheter-associated urinary tract infections (CAUTIs) rates have also consistently declined from 2012 through 2016. Declines have also been seen in

MRSA bacteremia rates since 2005 due to the decline in hospital-onset and community-onset, healthcare-associated bacteremia (CDC, 2018 January 5).

In focusing on HAI prevention, many strategies are available. Understanding the effectiveness of these strategies is an important component of an infection prevention program, whereas the effectiveness of each strategy will inevitably affect patient outcomes (Pogorzelska-Maziarz, Gilmartin, & Reese, 2018). In addition to the effect on patient outcomes, infection prevention programs must also weigh the financial burden of prevention, as the utilization of hospital resources is inevitable when implementing prevention strategies. Cost-effective strategies benefitting the patient and the health care organization can translate into additional resource utilization.

Definition of Terms

Standard Precautions:

“The application of Standard Precautions during patient care is *determined by the nature of the healthcare worker (HCW)-patient interaction* and the extent of anticipated blood, body fluid, or pathogen exposure. For some interactions (e.g., performing venipuncture), only gloves may be needed; during other interactions (e.g., intubation), use of gloves, gown, and face shield or mask and goggles is necessary” (CDC, 2007, p. 66).

Contact Precautions:

“Healthcare personnel caring for patients on Contact Precautions *wear a gown and gloves for all interactions* that may involve contact with the patient or potentially contaminated areas in the patient’s environment. Donning PPE upon room entry and discarding before exiting the patient room is done to contain pathogens, especially those that have been implicated in transmission through environmental contamination” (CDC, 2007, p. 70).

Problem Statement

The practice at a southeastern United States “Health System”, noted as a level II trauma and tertiary care not-for-profit health care network containing 553-beds; was to apply CPs for all patients with MDRO colonization or infection. Since the application of CPs for MDRO colonized and infected patients can result in unnecessary financial costs to the organization and can have a negative impact on the patients’ perception regarding the quality of care provided; a change in practice was planned for both acute care facilities within the network.

In one multi-site study, the cost avoidance for discontinuing CPs for specific MDROs, as reported by VerLee, Berriel-Cass, Buck, & Nguyen (2014) was \$ 34.72 per day on the average nursing unit and \$42.32 per day on intensive care units. Both estimates include the cost of personal protective equipment (PPE) and the daily excess staff time for donning and doffing. Annual cost avoidance resulted in \$141,900 gross or \$122,500 net savings (VerLee et al., 2014). Edmond, Masroor, Stevens, Ober, Bearman, (2015) during a 15-month study period, reported a decrease in CPs isolation days from 39, 928 patient days to 22,145 patient days; resulting in a 45% reduction in isolation days and a cost savings of \$ 497,924 annually or \$ 622,405 during the study period. This study utilized the cost calculations based on VerLee, et al. (2014), assuming an average of \$ 35 for supplies and health care worker time.

Additionally, the results of a California hospital system, revealed annual cost savings of \$643,776 for PPE once CPs were no longer required for MRSA and VRE positive isolates (with the exception of draining wounds). This study also calculated the average room entries for nursing in intensive care units (ICU) as 5.68 times per hour and 1.71 times per hour for medical-surgical floors. Based on the assumption of a constant rate of room entries, this study estimated nursing spent more than 45,000 hours in donning/doffing PPE over a one-year period. Although the nursing time spent in room entries reflects an approximate worth of \$4.6 million, this is a

‘sunken cost’ (Martin et al., 2016). This estimate does offer, however, the value of nursing time in focusing on quality patient care.

This investigation was a quality improvement (QI) project encompassing two health care facilities; one acute and one community hospital. Prior practice was all patients with MDRO colonization and infection were placed in CPs for the duration of hospitalization as well as any subsequent admissions. Given the recent study results and SHEA guidance, the discontinuation of CPs for MDROs colonization and infection was thought to be a plausible cost-effective prevention strategy by removing disparities and promoting healthy patient outcomes. The goal of the project was to implement a successful practice change for the identified patient population and to determine the effect on infection rates, patient experience, and associated costs.

Theoretical Framework

Three models were selected as theoretical frameworks to support and guide the change project. One model, Donabedian’s quality of care, was utilized to assess the quality of care; employing a framework to evaluate structure, process, and outcomes. The second model was selected to assist the health care staff in the process of making a change (Kurt Lewin’s Change Theory). Finally, the third model was chosen to guide the Doctor of Nursing Practice (DNP) project leader in transforming the status quo; changing process and practice that was not easily changed (Transformational Leadership Theory) whereas this type of leader utilizes both leader and follower (Herman, Gish, & Rosenblum, 2015) to ensure success ‘together’.

Donabedian's health care quality framework proposes improvements in the structure should lead to improvements in the process with an end goal of improving outcomes. In assessing quality, problems may be present initially as there can be varying notions of what defines quality (Donabedian, Evaluating the quality of medical care, 1966). Thus, it was

important to understand the values and current goals of the health system structure in approaching the definition of quality and when attempting to initiate change. According to Donabedian (1988), the structure is the attributes of the system or facility in this case, whether it is material resources such as equipment and PPE or staff resources when providing patient care. The process is defined as what is actually done when patient care is given (Donabedian, 1988)—such as applying SPs versus CP—when providing care to patients. The “outcome is the effects of care on the health status of patients and population” (Donabedian, 1988, p. 1745) and for the project, the outcomes were assessed utilizing the HO LabID MRSA and HO LabID VRE BSI incidence density rates, PPE costs, and patient satisfaction scores. Appendix A (Figure 1) illustrates Donabedian’s framework of evaluating structure, process, and outcomes.

The second model utilized for the project was Kurt Lewin’s change theory. Lewin’s theory is a classic change model utilizing a 3-step format including unfreezing, changing, and refreezing. Appendix B (Figure 2) illustrates the steps of Lewis’ change theory; relating the steps to this change project. A premise of Lewin’s model is to understand change is planned—accepting first, that change needs to occur. It is imperative to develop a key message, explaining why and to what benefit the change will bring.

In the first step, ‘unfreezing’ is the status of the situation such as the application of CPs for MDRO colonized or infected patients. According to Hussain, Lei, Haider, Hussain, Ali, (2018), this stage helps to prepare the group behavior for change and provides an impetus for leaders to make a change. In using Lewin’s model of change as it relates to the change project (utilizing SPs versus CP), unfreezing was achieved by presenting the driving force for change, as CPs (donning/doffing) would no longer be necessary when providing care for the identified population. The second step of Lewin’s model was the actual change or the moving and

changing of behaviors or processes. This step focused on explaining to staff what the new target would be, such as applying SPs for the identified patient population. During this step, it was important to explain to staff the components of SP, the benefit of making the change in practice and to garner commitment to make the change. Refreezing, the third step in Lewin's theory is refreezing or maintaining the change. The importance of this step and subsequent reinforcement is crucial; otherwise, a drift toward the original status may occur. Pertinent to the project, assessment and rounding by the infection prevention staff on the nursing units were a focus to ensure the refreezing stage.

The leadership theory utilized for the change project was Transformational Leadership and at the center of transformational leadership is the premise "certain leaders can inspire followers to accomplish great things" (Northouse, 2016, p. 190). James Burns, a political sociologist, best described the transformational leadership style. In planning a system change and utilizing a decision-making leadership approach, transformational leaders inspire by goals and values to achieve change. In achieving the change, transformational leaders strengthen and uplift, allowing the staff to feel they are the change originators and not pawns of the change (Burns, 2012). Appendix C (Figure 3) shows the illustration of the transformational leadership model. An application for the project in utilizing transformational leadership was the collaboration needed to ensure the success of the system-wide change from CPs to SP, thereby reaching a common goal and ensuring the project outcome.

Review of Literature

Database Search

Within the Association of Professionals in Infection Control and Epidemiology (APIC) professional and practice standards, implementation science implores preventionists to utilize scientific studies to promote and integrate evidence-based practices into everyday practice as a way to improve quality, reliability, and safety of health care (Bubb, et al., 2016). Incorporating this premise, a literature search was performed utilizing search engines PubMed, CINAHL, MEDLINE, and Cochrane collaborative within a prescribed period of 1998 to 2018. Inclusion criteria required articles with original research studies of controlled trials or quasi-experimental designs, systematic reviews and meta-analyses, practice guidelines or expert guidance, published in peer-review scientific journals, and included human subjects in acute care settings that evaluated a practice change of discontinuing CPs for MDROs. Outbreak studies, commentaries, editorials, and correspondence were excluded.

The key word search utilized the following terms: removing[All Fields] OR discontinuing[All Fields] OR discontinuance[All Fields] AND (("Contact"[Journal] OR "Contact"[Journal] OR "contact"[All Fields]) AND precautions[All Fields]) AND ("multidrug-resistant organism")[MeSH Terms] OR ("multi-drug resistant" [All Fields] AND "multidrug"[All Field (s)] AND "resistant"[All Fields]) OR "multidrug-resistant organisms"[All Fields] OR "MDRO"[All Fields])). In searching individual terms, “contact precautions” resulted in 840 articles and “MDRO” resulted in 130 articles. Further exclusions were applied including the non-removal or non-cessation of CPs and revealed a final result of thirteen articles, five systematic literature reviews, two practice guidelines, and one expert guidance document for review; all are included and ranked by the level of evidence and quality (Oman, Duran, & Fink,

2008). Appendix D provides an overview of cited articles, systematic reviews, professional and expert guidelines.

The Guide to the Elimination of Methicillin-Resistant Staphylococcus Aureus (MRSA) Transmission in Hospital Settings (APIC, 2010) addresses key concepts including epidemiology, risk assessment, surveillance methodology, active surveillance testing as well as basic components of horizontal prevention strategies. A key concept regarding precautions notes, “The use of standard precautions for all patient and contact precautions for patients colonized or infected with MRSA is recommended to eliminate transmission of MRSA and other MDROs in the hospital setting” (APIC, 2010, p. 37). This document also includes a reference to the discontinuation of CPs for MRSA and although there are no definitive recommendations, many hospitals have elected to develop facility-based protocols.

Siegel, Rhinehart, Jackson, Chiarello, Healthcare Infection Control Practice Advisory Committee (2006), in “*The Management of Multidrug-Resistant Organisms in Healthcare Settings*,” notes that MDRO’s are a national priority requiring all health care facilities and agencies to assume responsibility. The clinical significance of MRSA is well supported and mortality risks can be increased further if there are reduced Vancomycin susceptibilities, resulting in Vancomycin-intermediate/resistant *Staphylococcus aureus* (VISA/VRSA). This document has been the historical reference guideline for isolation precautions for MDROs: “Healthcare providers caring for patients on contact precautions should wear a gown and gloves for all interactions involving contact with the patient or potentially contaminated areas in the patient’s environment” (Siegel et al., 2006, p. 24).

The Duration of Contact Precautions for Acute-Care Settings expert guidance from SHEA is a document that addresses when and under what circumstances CPs can be

discontinued. This is clinically important as many facilities continue to struggle with a large population remaining in CPs for both MRSA colonization and infection (Banach et al., 2018). Following the process outlined in the *Handbook for SHEA-Sponsored Guidelines and Expert Documents* (2017), whereas the topic for the duration of CPs was the highest ranked concern, this resulted in a proposal to move forward with the development of an expert guidance document.

Specific to MRSA, there are four recommendations: establish a policy for the discontinuation of CPs for MRSA; for patients not on an effective antimicrobial therapy, utilize negative screening cultures to guide CPs discontinuance decisions; extend CPs for high-risk patients (chronic wounds in acute care settings); and utilize an alternative approach to CPs if endemic MRSA infection rates are low and no facility outbreaks exists. The alternative approach to CPs is further delineated as facilities should monitor MRSA infection rates and maximize the use of SP. The recommendations for VRE are similar and include establishing a policy for the discontinuation of CPs for VRE, using negative stool or rectal swab cultures to guide discontinuation of CPs for the treatment of VRE infections, and considering extension of CPs for high-risk patients immunosuppressed or receiving broad-spectrum antimicrobial therapy without VRE activity or patients in protected environments. Additionally, outside of outbreak settings, the guidance suggests using CPs for VRE infection for the index admission. Specific to multi-drug resistant Enterobacteriaceae (MDR-E), the recommendations include: establishing a policy and should extensively drug-resistant MDR-E such as carbapenemase-producing resistant Enterobacteriaceae (CRE) exist in the facility; hospitals should maintain CPs indefinitely (Banach et al., 2018).

Critical Analysis of Articles

All thirteen studies primarily compared hospital-onset infection rates, adverse events, or clinical culture rates pre- and post-discontinuation of contact precautions and application of standard precautions. Most of the studies were performed in the United States (10 studies), with one study being performed in France, one study in Canada and another performed in Switzerland.

Patients sampled in ten of the thirteen studies included inpatients from ICUs and medical wards representing eight academic centers, including one study with both an academic center and a community teaching hospital (Martin et al., 2016). One study included in-patients with hematologic malignancies as well as recipients of stem cell transplantation (Almyroudis et al., 2016). The study, performed in France, comprised an adult patient population from a 16-bed polyvalent ICU (Renaudin et al., 2017). The study, performed in Canada, comprised four academic centers totaling 2,200 inpatient beds and included a large malignant hematology program, medical and surgical units, and a trauma unit for three of the four sites (Lemieux et al., 2017).

In reviewing the articles, specific categorizations were identified utilizing active surveillance, horizontal prevention strategies, and draining wounds. Appendix E reveals a thematic approach to the literature review. From these categories, three themes were derived. The first theme focused on a practice change from CPs to SPs for MDRO to include active surveillance (Gandra et al., 2014; Martin et al., 2018; Martin et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017; Tschudin-Sutter et al., 2016; Zahar et al., 2015). The second theme included a practice change from CPs to SPs for MDRO with horizontal prevention strategies or draining wound criteria (Bearman et al., 2018; Edmond et al., 2015; Gandra, et al., 2014; Martin

et al., 2018; Martin et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017) and the third theme identified studies without any subheadings (Almyroudis et al., 2016; Bardossy et al., 2017; Bearman et al., 2007; Lemieux et al., 2017). The primary objective in all studies was to determine the need for CPs as a prevention strategy, whereas historical guidelines for the prevention of MDROs have been to apply CPS as a preventive strategy for transmission.

Several researchers have also noted the potential cost savings to the organization with the reduction of PPE utilization and associated staff workloads (Almyroudis et al., 2016; Bardossy et al., 2017; Edmond et al., 2015; Martin et al., 2016). Some have addressed the patient experience, non-infectious outcome measures, and social concerns such as anxiety and depression (Bardossy et al., 2017; Gandra et al., 2014; Martin et al., 2016).

Active Surveillance

Active surveillance testing (AST) is a process whereby a diagnostic test is performed solely for the purpose of identifying asymptomatic carriers, typically focused on MRSA or VRE within a patient population. The premise being, patients colonized with MDROs may represent a substantial reservoir for person-to-person transmission in the acute care setting. Typically, AST is recommended for high risk populations, such as dialysis, transplant populations and in-hospital locations where high MDRO rates exist; even with the implementation of the basic prevention strategies. Additionally, there may be legislative mandates that require AST, depending on the facility type and location (Calfee et al., 2014).

Of the thirteen articles, eight were identified as incorporating active surveillance (Almyroudis et al., 2016; Gandra et al., 2014; Martin et al., 2018; Martin et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017; Tschudin-Sutter et al., 2016; Zahar et al., 2015). Four of the studies utilized a retrospective observational design (Gandra et al., 2014; Martin et al., 2018;

Martin et al., 2016; Zahar et al., 2015), three of the studies utilized a prospective design (Almyroudis et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017), whereas Tschudin-Sutter et al. (2016) included a cohort approach.

In performing active surveillance, two studies included MRSA and VRE pathogens (Gandra et al., 2014; Martin et al., 2018), while Martin et al. (2016) included MRSA, VRE, and *Clostridium difficile* infections (CDI) and Renaudin et al. (2017) included MRSA and extended-spectrum beta-lactamase (ESBL) pathogens. Tschudin-Sutter et al. (2016) and Zahar et al. (2015) reported results for a single pathogen (ESBL) whereas the remaining study focused on MRSA only (McKinnell et al., 2017). Almyroudis et al. (2016) provided VRE surveillance for their transplant population. In reflecting on the premise of AST, it is important to note, three of the eight studies performing AST have facilities located within the state of California, requiring AST per mandate (Martin et al., 2016; Martin et al., 2018; McKinnell et al., 2017) in addition to one study performed in a New York-based facility with a patient population of hematologic malignancies and recipients of hematopoietic stem cell transplantation (Almyroudis et al., 2016) and the remaining state-side study being performed in Massachusetts (Gandra et al., 2014). The next two studies performing AST are located in France (Renaudin et al., 2017; Zahar et al., 2015) where patients colonized or infected with ESBL pathogens must be isolated. The remaining study was located in Switzerland and has similar ESBL requirements (Tschudin-Sutter et al., 2016).

Of the eight studies included in the surveillance theme, four included infection rates for MDRO pre and post-practice change intervention from CPs to SPs (Almyroudis et al., 2016; Edmond et al., 2015; Gandra et al., 2014; Martin et al., 2018). Two of these studies included non-infectious outcome measures (Gandra et al., 2014; Martin et al., 2018). Gandra et al. (2014)

included the impact of CPs on falls and pressure ulcers and Martin et al. (2018) also included these two measures; however, four additional non-infectious measures were also included (postoperative respiratory failure, wound dehiscence, postoperative hemorrhage and/or hematoma, pulmonary emboli and deep vein thrombosis).

Four of the eight articles reported incidence rates of MDRO acquisition (McKinnell et al., 2017; Renaudin et al., 2017; Tschudin-Sutter et al., 2016; Zahar et al., 2015); with three focused specifically on ESBL acquisition (Renaudin et al., 2017; Tschudin-Sutter et al., 2016; Zahar et al., 2015) and the remaining studies focused on MRSA acquisition, including environmental MRSA contamination rates (McKinnell et al., 2017) and VRE and MRSA in hematologic malignant patients (Almyroudis et al., 2016). Martin et al. (2016) compared the percentage of MRSA and VRE isolate rates, including results from percent positive surveillance screening for MRSA and VRE and also reported clinical culture rates as a marker for infection. Renaudin et al. (2017) included a pre and post comparison; however, this study included the incidence density for MRSA and ESBL carriage at admission. Almyroudis et al. (2016) provided both VRE and MRSA bacteremia specific rates and also included CDI rates, although CPs were maintained for patients with CDI.

There was no significant increase in infection rates for the discontinuance of CPs and application of SPs in two studies reporting infection rates or clinical isolate rates (Martin et al., 2018; Martin et al., 2016). Martin et al. (2016) found a decrease in MRSA and VRE infection rates for both academic and community hospital populations with combined MRSA rate results pre and post (0.40 to 0.32). Likewise, the combined VRE infection rates also decreased from pre to post intervention (0.48 to 0.40), suggesting a practice change from CPs to SPs would be beneficial to prevent the transmission of other MDROs. Additionally, annual gown cost savings

reported by Martin et al. (2016) exceeded \$700k after CPs were discontinued and nursing time analysis calculated over 45,000 hours of time saved by reducing the donning and doffing time for gloves and gown when applying CPs. In calculating the nursing time saved, this study reported an approximate savings of \$ 4.6 million and although this would be a sunken cost, it does allow nursing to focus more closely on quality patient care (Martin et al., 2016). This belief would seem to support the results of Martin et al. (2018), in which the non-infectious adverse event rates declined pre and post CP discontinuation (12.3 to 10.0; $p=.02$).

Although the initial MRSA acquisition rates increased immediately (0.77 to 0.89), the rates then decreased by 0.017 and with the overall study period rates remaining stable (Gandra et al., 2014). The VRE acquisition rate had a similar finding (1.39 to 2.19), then decreasing by 0.016. There was no overall change in VRE acquisition rates ($p<0.438$). The results specific to falls and pressure ulcer showed a significant difference among MRSA and VRE patients compared with other adult medical-surgical patients pre- and post-policy change from CPs to SPs (4.57 vs 2.04; $p<.0001$ and 4.82 vs 2.10; $p<0.0001$) respectively for falls and (4.87 vs 1.22 vs 4.17 vs 1.19; $p<.0001$) respectively for pressure ulcers (Gandra et al., 2014).

Horizontal Strategies or Draining Wounds

Horizontal prevention strategies can include hand hygiene, skin antisepsis, environmental and equipment disinfection, as well as additional evidence-based infection prevention bundles; placing a focus on the entire population whereas a vertical strategy focuses on reducing one target, such as strategies to specifically reduce central line-associated infections (Traa et al., 2014). Draining wounds may also present an increased risk for MDRO transmission, especially if standard precautions are not followed appropriately.

Six of the thirteen studies reviewed, included horizontal strategies (Bearman et al., 2018; Edmond et al., 2015; Martin et al., 2018; Martin et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017). Four of the six studies also included criteria for draining wounds, representing an increased risk and patients meeting these criteria remained on CPs (Bearman et al., 2018; Edmond et al., 2015; Gandra et al., 2014; Martin et al., 2016). Of note, four of these same six studies also included active surveillance as part of the study interventions (Martin et al., 2018; Martin et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017).

Whereas two of the six studies utilized a retrospective observational design (Martin et al., 2018; Martin et al., 2016) and two studies utilized a prospective before and after design (McKinnell et al., 2017; Renaudin et al., 2017), an interrupted time series analysis was utilized by Bearman et al. (2018) to compare pre- and post-practice change from CPs to SP.

When implementing horizontal strategies, Bearman et al. (2018) also noted several additional interventions, including the implementation of a urinary catheter bundle, chlorhexidine gluconate (CHG) perineal care, hospital-wide CHG bathing outside of ICUs, assessments and feedback of bare below the elbows, implementation of an ultraviolet-C disinfection robot and a 72-hour automatic urinary catheter discontinuation order. Although not new interventions, Edmond et al. (2015), continued three horizontal interventions (hand hygiene, daily CHG baths and bare below the elbow) during the study.

Martin et al. (2018), expanded the use of chlorhexidine gluconate (CHG) bathing throughout all inpatients areas; with the exception of neonatal ICU. Additionally, compliance with CHG bathing was documented in the medical record and was audited frequently. Similarly, CHG was implemented in all units excluding neonates and perinatal patients in the study performed by Martin et al. (2016).

Renauldin et al. (2017) elected to focus on hand hygiene compliance and specific training for SP, including training in actual situations and immediate corrective action for non-compliance. Additionally, this study reported on hand hygiene compliance rates and antibiotic consumption, pre- and post- practice change. In a study intervention performed by McKinnel et al. (2017), nurses were trained on CHG bathing eight weeks prior to initiating the practice change for all adult patients; with a focus on bathing from the neck down.

Bearman et al. (2018) listed several outcome measures; including the percent compliant for the seven implemented horizontal measures comparing ICUs to hospital-wide, the impact of each measure on MRSA and VRE infection rates as well as the impact of device-associated infections. Martin et al. (2016) also included hand hygiene compliance rates pre- and post-practice change, in addition to a cost analysis for PPE and CHG and a nursing time analysis pre- and post-practice change.

In a slightly different approach, Edmond et al. (2015) presented HAI data for the hospital ward and intensive care units, including an estimate of cost savings after applying SPs instead of CP. The 15-month study period revealed an overall decrease in HAI rates in hospital wards ($p=.91$) as well as an insignificant decrease in ICU device-associated infections, although the central line-associated BSI decrease was significant ($<.004$). The cost savings results are close to \$ 500,000 annually, based on the reduction of isolation days during the study period (39,928 isolation days to 22,145 isolation days) representing a 45% reduction.

Exclusion of Surveillance, Horizontal Strategies or Draining Wounds

Three of the thirteen studies declined the use of AST, horizontal strategies or included draining wound criteria within the study methodology (Bardossy et al., 2017; Bearman et al., 2007; Lemieux et al., 2017). Each of the three studies took a varied approach to study designs,

including a retrospective design (Bardossy et al., 2017), a controlled trial (Bearman et al., 2007) and a longitudinal study (Lemieux et al., 2017).

Bardossy et al. (2017) only included device associated infections with no location attribution. In providing device-associated infection rates, Bearman et al. (2007) also included infection rates, including non-MDRO pathogens. In addition to reporting infection rates, Lemieux et al. (2017) included clinical isolate and mortality measures.

In the study performed by Almyroudis et al. (2016), the incidence of VRE bacteremia and MRSA bacteremia, as well as the CDI rate, decreased after the cessation of CP, although not statistically significant. In the same study, only CPs were discontinued for VRE patients and although this study represented a single center, the impressive three-year period—along with the high-risk hematology patient population—reveals an important question regarding the necessity of CPs in the prevention of VRE infections.

In reviewing the study by Bearman et al. (2007), three device-associated rates were included in the results; these were BSI, urinary tract infections (UTI) and ventilator-associated pneumonia (VAP). According to the results, all infections increased between phase 1 and phase 2 of the study (BSI from 6.2 to 14.1; UTI from 4.4 to 7.4 and VAP from 0 to 2.3) and all with statistical significance at $<.001$. However, it is worth noting; specific to MDRO infection increases from phase 1 to phase 2, there was only a slight increase associated with BSI and UTI, whereas BSI went from (0 to 3) with two associated with MRSA and one associated with VRE in phase 2. The UTI in phase 2 was associated with VRE. Considering the device utilization rates for central venous lines in phase 1 and phase 2 were 0.74 and 0.72, respectively and the urinary catheter utilization rates were 0.85 and 0.87, respectively; the increase would most likely be attributed to chance and especially since the study period duration was six months.

After VRE screening and isolation practices were stopped for four large academic centers, the rate of all outcomes increased during the 18-month study period; however, none increased statistically and Lemieux et al. (2017) noted ongoing surveillance performed after the study period resulted in a return to baseline.

Systematic Literature Reviews

Five systematic reviews were included and provide relevant support for the project (Cohen, Cohen, & Shang, 2015; Kullar et al., 2016; Marra et al., 2018; Morgan et al., 2009; Morgan et al., 2015). Cohen et al., (2015) and Morgan et al. (2015) found the evidence to be neither for or against CP, with Cohen et al. (2015) suggesting researchers consider power calculations, compliance monitoring, and concurrent controls when designing future studies. Kullar et al. (2016) found in endemic settings there is little evidence to support the routine utilization of CPs as an MSRA transmission prevention strategy. The authors also included a notation on education for patients regarding CPs in addition to health care worker adherence to hand hygiene and SP. Marra et al. (2018) concluded the discontinuation of CPs for MRSA and VRE did not increase infection rates.

In reviewing adverse outcomes, Morgan et al. (2009) noted the application of CPs may have unintended consequences. Several adverse outcomes reported as part of the review- included delays associated with the transfer of patients in CP. For example, in one pilot study referenced, the facility experienced an average of 10.9 delay-days in placing a CPs patient in a transferring facility whereas there was only an average of 4.3 delay-days for similar patients not on CP. In addition to increased anxiety concerns of patients placed on CP, Morgan et al. (2009) reported an effect on patient satisfaction scores as in one inpatient study, patients on CPs vs non-CP were more inclined to formally complain to the hospital (8% vs 1%; $p < .001$). Still, the

emphasis should be on the patient and staff education for CP, as well as the awareness of the potential adverse outcomes associated with the application of CP. Likewise, the importance of whether the patient should remain in CPs or initiate a practice change to SPs is the larger component to be addressed.

Synthesis of Evidence

The studies reviewed have clinical significance as the application of CPs has historically been utilized in providing care to patients with MDROs as an intervention to prevent transmission. More recently, health care organizations have questioned the need or efficacy of CPs as an intervention for endemic MDRO populations, although organizations still support CPs for outbreak concerns or patients with MDRO draining wounds.

The articles included in the literature review comprise evidence suggesting CPs may not be a necessary intervention for the prevention of MDRO transmission in the absence of increased rates, as the application of SPs for endemic MDRO populations is more practical and cost effective. All articles favored the use of SPs in lieu of CPs for endemic MDRO populations; combining SPs with horizontal infection prevention measures. Although this strategy is inconsistent with current CDC MDRO guidelines, there is satisfactory evidence in the literature reviewed for this project to initiate a practice change for the endemic MDRO patient population. The application of standard precautions for patients with MDRO colonization and infections can be an effective prevention approach, implementing as a system-wide change for the population served. Discontinuing CPs and applying SPs as part of system-wide practice change could offer nursing more time to focus on quality patient care and decrease associated costs of PPE, while not adversely affecting MDRO infection rates.

Integration of Literature

A practice change from CPs to SPs for patient MDRO colonization and infections may be a more cost-effective prevention strategy. Recent studies (Bardossy et al., 2017; Bearman et al., 2018; Edmond et al., 2015; Martin et al., 2018; Renaudin et al., 2017) support the utilization of SPs in lieu of CPs for patients colonized with MDRO. Martin et al. (2016) report similar findings, although this article notes maintaining CPs for patient MDRO infections with draining wounds. Maximizing the use of SPs was supported in all reviewed studies and is also part of a horizontal infection prevention program. The rationale for these recommendations were also included in the expert guidance document, as the awareness of many variations to discontinuing CPs exists. As part of the SHEA review process, a survey was performed and pertinent to this project has a concerning result; hospitals continue to utilize CPs indefinitely for patients with MRSA history. Within a clinical setting, this approach is simply not sustainable as eventually all patients would be in CPs and based on the literature review may no longer be necessary; providing an opportunity for greater cost-effectiveness and more opportunities to focus on providing quality patient care.

Summary of Recommendations

Following the review of the literature, the summary recommendation suggests sufficient evidence in the literature to implement a practice change from CPs to SPs for MDRO colonized and infected patients (excluding CRE) in an acute care population. The 13 articles reviewed and expert guidance (Banach et al., 2018) supports this strategy; understanding endemic MRSA rates are not increased and a horizontal infection control program is present. Although the systematic literature was not conclusive in the support of CPs removal, neither is the support for the rejection of CPs removal. Morgan et al., (2015) notes that CPs for endemic MRSA and VRE in acute care hospitals should be decided at the local level and dependent on local resources. The

evidence from the literature supported a change project that would implement a policy and practice change to apply SPs for MDRO colonized and infected patients.

Project Design and Implementation

Project Design

The project focused on quality improvement, utilizing a descriptive, quasi-experimental methodology with a pre-post design to evaluate the effects of discontinuing CP on specific MDRO hospital-onset infection rates, overall patient experience scores, and associated financial costs when making a practice change from contact precautions to standard precautions for MDRO colonization and infections.

Permission for the use of MRSA and VRE infection rates was obtained from the System Director of Infection Prevention of the Health System. Appendix F provides the permission to utilize the data for the project. The methodology utilized to obtain MRSA and VRE infection rates was identified as the NHSN LabID MRSA and VRE BSI events. The measure included all non-duplicate MRSA or VRE isolates from a unique blood source, from all adult inpatient locations > 3 days after admission to the facility. The measured outcome was expressed as HO LabID MRSA or HO LabID VRE blood events with no prior blood event for the patient in the previous 14 days. The results were interpreted as the HO MRSA LabID BSI incidence density rates and the HO VRE LabID BSI incidence density rate, whereas the numbers of LabID HO MRSA event(s) were divided respectively by the predicted LabID HO MRSA events. The predicted events were calculated from NHSN 2015 data using LabID probabilities estimated from negative binomial models. The reliability and validity of utilizing the measure was performed by infection prevention, microbiology and the finance department through annual review of data components to include the number of admissions and MRSA, as well as VRE laboratory isolates in assuring the electronic capturing is within +/- 5% of the number obtained when performing manual calculations (CDC, 2018 January).

Permission for the use of patient experience scores was obtained from the Senior Vice President of Human Resources at the Health System. Appendix G provides the permission to utilize the data for this project. The specific instrument utilized in obtaining the scores was the HCAHPS survey instrument and data collection methodology measured the patients' perception of their hospital stay (Appendix H). The HCAHPS survey contains 27 questions administered to patients regarding their hospital stay. Eighteen core questions focus on the following categories: communication with nurses and doctors, the responsiveness of hospital staff, the cleanliness, and quietness of the hospital environment, pain management, communication about medicines, discharge information, overall rating of hospital, and whether the patient would recommend the hospital to others. Through Press Ganey Associates, an approved survey vendor by HCAHPS, the general survey was administered via mail to a random sample of adult patients (not restricted to Medicare patients) between two days and six weeks following each patient's discharge (CMS, 2017). However, for the quality improvement project, the internal survey data was utilized for real-time results versus the general survey, as it was considered a lagging measure. The validity of the survey results was enhanced through adjustment factors in order to eliminate any advantage or disadvantage in scores beyond the control of the hospital and Press Ganey provided a sampling methodology. The score is based on the percentage of responses in the highest possible category for the "Rate the Hospital" survey question and in this case the range is from 0 representing the 'worst' rating through 10, representing the 'best' rating; expressing as a monthly percentage score.

Permission for the components utilized in the determination of financial costs associated with PPE was obtained through several Health System departments, including finance, materials management and nursing informatics. Appendix I provides approval for utilizing the financial

data for this project. In performing the analysis, the approach utilized was similar to VerLee et al. (2014), whereas the daily cost for CPs isolation and daily excess staff time across the hospital will be calculated to help determine the cost savings for PPE and staff donning/doffing time saved.

When calculating the daily CPs isolation cost, the number of staff entries into a CPs patient room per day was determined by the number of gowns utilized, assuming one gown per room entry. Appendix J is a sample of the infection control audit utilized in calculating PPE usage. An audit by the infection prevention staff was performed for two CPs patients per nursing unit per twenty-four hour over a period of two weeks to determine an average cost per day for PPE; reported as daily PPE costs. The infection prevention staff calculated donning/doffing time during the daily prevalence rounds and without the knowledge of staff; reporting as an average time. An inter-rater reliability measure was provided by following a standardized method of time calculation 1) donning started with the opening of the PPE drawer, donning the gown and ended at the donning of the second glove; 2) doffing started with the removal of gown and gloves and ended with the disposal of PPE. Appendix K represents the template utilized to perform PPE audits.

Goal and Expected Outcomes

The goal of the QI project was to implement strategies in the most effective manner; promoting positive effects on the overall patient experience, a cost-efficiency for PPE and no deleterious change in healthcare-onset infections. In this case, a practice change from applying CPs for the identified MDRO patient population, to applying SPs for the same MDRO patient population was implemented. According to the literature review, both the patient and the facility may receive benefits through a decrease in patient adverse outcomes (Kullar et al., 2016; Martin

et al., 2018; Morgan et al., 2009) and financial cost avoidance for the facility (Edmond et al., 2015; Martin et al., 2016; VerLee et al., 2014).

At the completion of the quality improvement project, specific outcome objectives included the following:

- HO MRSA LabID BSI monthly incidence density rate would not increase statistically from baseline.
- HO VRE LabID BSI monthly incidence density rate would not increase statistically from baseline.
- Overall monthly HCAHPS patient satisfaction scores would increase by 5% from baseline.
- PPE supply costs would decrease by 25% from baseline.

Additional process measures for the project included the following:

- Overall hand hygiene rate
- Cost calculation for PPE (gloves, gowns)
- Cost calculation for daily excess staff time
- Average number of staff entries into CPs rooms
- Total number of contact isolation days
- Total number of patient days

Project Setting

The project was conducted at the Health System (level II trauma campus), a 304-bed, acute and tertiary care teaching hospital with 48 intensive care beds and the community hospital campus, an 81-bed with eight intensive care beds. The remaining patient care beds comprised a

women's birthing pavilion, a rehabilitative center, and a long-term care nursing facility, which was not part of the project.

Population

The population comprised all inpatient adult acute care patients admitted to both hospitals during the project timeline with MRSA or VRE positive isolates. Excluded patient care areas were neonatology, geriatrics and women's services. Community populations and surrounding areas included over 29,000 with 45% Caucasian, 36% African American, 19% Asian, Hispanic and other (United States Census Bureau, 2017). The top three community ranked causes of death, according to the Georgia Department of Health 2016 report, were Ischemic Heart and Vascular Disease, Malignant Neoplasm (trachea, bronchus and lung and chronic obstructive pulmonary disease (GDH, 2017).

Timeline

IRB approval was received December 11, 2018 and the pre-intervention period was established as September 1, 2018, to November 30, 2018. The pre-intervention period included the project proposal and IRB approval, immediately followed with the educational portion. The remainder of December 2018 was utilized as a data wash-out period and the post-intervention period was determined to be January 1, 2019, to March 31, 2019.

Procedures

For project development (to fulfill the Doctor of Nursing Practice project/degree requirements), the Project Leader/Infection Preventionist (PLIP) met with the Chief Operating Officer (COO), the Chief Medical Officer (CMO) and the Chief Nursing Officer (CNO) at the Health System to garner approval and support. In assessing organizational readiness for change, a safety culture was inherent in the organization. However subject matter expertise was lacking

according to the CMO in past years with regard to infection prevention, resulting in two very distinct occurrences solidifying the need for change: a sizable reimbursement penalty applied to the facility for health care-associated conditions associated with infections and unfavorable accreditation survey results related to infection control. Based on a desire to create a safer environment for the patients, the organization was completely engaged and supportive of the change project. As part of the overall timeline, the project was sub-divided into three phases: introduction, audit, and an evaluation phase. Appendix L (Figure 4) provides a full timeline of the project.

Introductory phase. The introductory phase began December 12, 2018, and involved stakeholder meetings to present the overall project proposal including the guidelines, goals, and desired outcomes. Stakeholders were identified as administrators and nurses, as well as medical, laboratory, allied health, environmental services, and infection prevention and control staff. A brief PowerPoint presentation summarizing the literature, project objectives, benefits, and the proposed timeline was utilized to educate staff, to promote understanding and to support the practice change (unfreezing). Appendix M provides the presentation utilized during the educational portion of the project. It is important to note, the Health System had received education regarding the components of SPs in 2017 in the form of a Back to Basics Campaign as part of building a robust horizontal infection prevention program. Appendix N (Table 1) illustrates the components of the Back to Basics Campaign.

During the introductory phase, the facility isolation grid pertinent to the project was updated to eliminate the requirement of CPs for MDRO colonization or infection. Appendix O provides the updated isolation education grid. The isolation grid update was sent to the Infection Control Committee via email for approval. No barriers to committee approval were noted and

subsequent approval was received. Subsequent meetings in the form of ‘prevalence rounds’ were scheduled throughout the project timeline; providing continued education and staff support.

Another important component was the automatic laboratory message applied to laboratory results for MRSA positive surveillance screens and clinical isolates. Prior terminology utilized in the comment section for both screen and isolate was as follows. “Results require the application of Contact Precautions per Infection Control”. Appendix P notes the updated verbiage.

The Information Technology (IT) department removed historical isolation flags within the electronic medical record (EMR) for CPs in the STAR system (admit, transfer, and discharge). The process was carried out by clearing the field containing the information about MDROs. Subsequently, the field was populated for only one pathogen, CRE, in which the PLIP completed moving forward. All existing and new positive MDRO isolates for currently admitted patients followed SP. The second step incorporated a daily review by the PLIP to identify positive MDRO isolates utilizing an electronic surveillance system, VigiLanz, which received pertinent microbiology laboratory results through an HL-7 interface. This daily review allowed the PLIP to assist the nursing staff and to ensure the appropriate isolation precaution was in place.

All materials presented during the introductory phase were available as a reference resource on the internal Infection Prevention and Control website. At the close of the introductory phase, the ‘go-live’ day for practice change (intervention) was initiated prior to the post-intervention period of the project.

The intervention focused on:

- Isolation grid change to reflect the elimination of CPs for MDRO colonization and infection and application of SPs for the identified population.
- Removal of historical CPs isolation flags for MDRO positive results field in STAR (screens and isolates).
- Laboratory MDRO surveillance screen and clinical isolate result “comment” modification.

Implementation phase. The implementation phase continued through the post-evaluation phase to ensure compliance with the updated isolation policy and practice change. As part of the audit process, each IP reviewed the patient isolation status daily on assigned units, ensuring compliance and understanding of the practice change. This phase also incorporated real-time, on the spot education, in assisting staff to move away from the old process and to embrace the new process (change). The close of this phase was expected to solidify the new process and practice change, paving the way for continued compliance and successful practice shift (refreezing).

Evaluation phase. The evaluation was initiated at the close of the implementation phase, and where the outcome measures were evaluated. During this phase, the data was compiled and disseminated to the project stakeholders. Comparisons were made between pre and post rates for HO MRSA and VRE LabID incidence density rates, applying a two-sample *t*-test and Cohen’s *d* effect to determine the effect size of the practice change. The overall patient satisfaction scores and PPE costs were also compared to baseline costs. Additional comparisons were made between total patient days, total patient admissions, and total isolation days to ensure no significant changes occur in denominator data. Although the project consisted of two

facilities within the network, the patient populations and services were not conducive to comparisons.

Fiscal Considerations

As many of the human and financial assets needed for this project were in place, initial costs were not expected; however, the return on investment (ROI) for the intended practice change was expected to be beneficial to the organization. The three main components for fiscal consideration were the decrease costs of PPE, decrease health care worker time in donning and doffing PPE and the in-kind costs for project planning by the System Director of Infection Prevention.

Ethical Considerations

In anticipation of the QI project, the DNP project leader completed the required Collaborative Institutional Training Initiative (CITI) courses prior to project implementation, focusing on the required ethical principles, protecting privacy, and securing the rights of all subjects and participants involved in research. The project was not expected to require a patient privacy disclosure, as only aggregate infection rate data and overall patient experience scores were utilized to determine the effectiveness of the interventions. According to the Health System Institutional Review Board (IRB) process:

If you are a Health System Associate, completing a degree that requires a research or QI project for matriculation purposes, your project must be submitted to your school's IRB for review/approval. The Health System will only provide institutional approval to conduct your project at our organization once we have an approval letter from your school's IRB (p.1).

Appendix Q represents the approval process to obtain from the Health System Office of Research office.

Sustainability

Several steps were taken to ensure project sustainability. Once the initial MDRO field in STAR was cleared, the PLIP entered CPs for identified CREs. This step was part of the daily workload of the PLIP would remain in effect. Additionally, as part of the daily workload, Preventionists performed audits on each assigned nursing unit, ensuring the correct isolation signage was posted. In sustaining the removal of CPs for MDROs, the STAR field was controlled by the Infection Prevention department whereas inadvertent placement of CPs by nursing staff was not possible.

Once the QI project was complete, the results were shared with several committees, including the Infection Control, HAI, the Quality Board, and the Executive Board. Providing the results, along with the cost-effectiveness of the practice change, would ensure administrative support for the practice continuation.

Evaluation Plan

Data Analysis Plan

Project start date commenced on December 12, 2018, as well as a ‘wash out’ period from December 1 through December 31, 2018; incorporating adequate training and implementation processes beginning December 12, 2018. The collection of post-intervention data (outcome measures) consisted of data recorded during the period from January 1, 2019, to March 31, 2019. As part of the daily workload of the IPs, all CP flags were reviewed for appropriateness.

Pre- and post- measures were summarized separately using descriptive statistics and/or frequency tables. Continuous variables were summarized by n, mean, standard deviation [SD],

minimum, median, maximum and range. Categorical variables were summarized by frequency count and percentage of patients within each category.

Outcome measures, HO MRSA LabID BSI incidence density rates and HO VRE LabID incidence density rates were compared to corresponding baseline measures using a two-sample *t*-test. The overall patient satisfaction scores for “rate the hospital” were analyzed by showing the difference from baseline. The PPE supply costs were analyzed by showing the difference in outcome dollars calculated versus baseline costs. Additionally, the effect size was calculated to determine the magnitude of the difference between the HO measures; showing the strength of the relationship between the practice change and the incidence density rates.

The HO MRSA Lab ID and HO VRE LabID blood event measure follows the CDC NHSN methodology for inpatient reporting (CDC, 2018 January), which offers a non-interpretive, non-biased approach to HAI identification. It is important to note, NHSN performs a risk adjustment for the HO MRSA LabID BSI incidence density rate based on the quarterly community-onset prevalence rate. In utilizing the NHSN methodology, the outcome measure for HO MRSA LabID BSI incidence density rate and HO VRE LabID BSI incidence density rate was compared respectively to the baseline HO MRSA LabID BSI incidence density rate and HO VRE LabID BSI incidence density rate utilizing a two-sample *t*-test performed through the NHSN database statistical calculator. The data was presented in a table format. In evaluating the pre and post HO MRSA LabID BSI incidence density rate and HO VRE LabID BSI incidence density rate, the outcome of no increase of MRSA or VRE infection rates were met if the *p*-value is ≥ 0.05 or if the *p*-value was below 0.05 and the difference in rates between pre and post (post-rate minus pre-rate) was negative; creating a question of whether this indicates a rate decrease in favor of SPs.

The overall patient satisfaction score (rate the hospital measure), in analyzing the difference from baseline, was evaluated and the outcome for improvement in patient satisfaction was considered met if the patient satisfactions score (rate the hospital) increases by 5%. Posing a question for the consideration of CPs removal and whether this may have created a positive effect on patient satisfaction scores. PPE costs were evaluated and the outcome for a reduction of cost was considered to be met if the decrease in PPE costs constitutes a 25% in cost savings from baseline, suggesting possible cost savings from the practice change from CPs to SPs. In evaluating the financial costs, the following data were reviewed:

- Total number of patient days
- Total number of contact precaution days
- Unit cost of PPE (gloves and gowns); daily and monthly
- Average daily staff time for donning/doffing PPE
- In-kind costs of DNP project leader

Further analysis was considered using model-based methods (linear regression, logistic regression ...etc.) to test for the difference between the pre- and post- intervention. All statistical analysis was conducted at 5% significance level using R version 3.4 (R Foundation for Statistical Computin, Vienna, Austria) and/or SAS version 9.4 (SAS Institute Inc., Cary, NC). Any deviation from the analysis plan was documented in the final project report.

Safety Monitoring Plan

As part of a safety monitoring plan, the outcome measures were monitored monthly and reported to the HAI and Infection Control Committee's to ensure no significant increases were noted in the infection related outcome measures, specifically the HO LabID MRSA BSI incidence density rate and the HO LabID VRE BSI incidence density rate. A significant increase

in infection-related outcome measures was defined as a rate greater than three standard deviations from the combined mean of the studies identified from the critical analysis portion of the literature review and where incidence density rates were utilized in the outcome measures for MRSA or VRE pathogens (three of 13 studies), totaling four outcome measures. The remaining studies utilized a variety of outcome measures such as device associated infection rates, ratios or prevalence rates; thereby creating a difference in calculation methodologies.

During the monthly monitoring review, should the HO MRSA LabID BSI incidence density rate or the HO LabID VRE BSI incidence density rate increase significantly, the HAI and Infection Control Committee reserved the right to review the practice change in addition to recommending the cessation of the quality improvement project.

Results

Findings and Outcomes

In following the prescribed Safety Monitoring Plan for this project and as shown in Figure 5, at no time during the project period did the incidence density rate; either MRSA or VRE, result in an increase greater than three standard deviations above the calculated combined mean of the studies included in the literature review and where incidence density rates were utilized in the outcome measures for MRSA or VRE pathogens (three of 13 studies, totaling four outcome measures) as shown in Table 2.

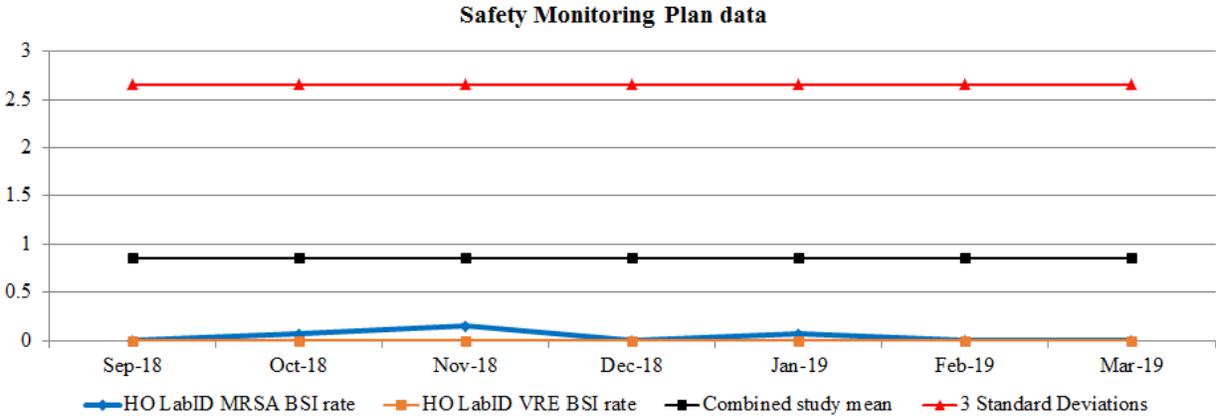


Figure 5. Safety Monitoring Plan of MRSA and VRE Rates. This figure illustrates the combined means/SD and hospital onset (HO) outcome rates.

Table 2							
<i>Paired Samples of Three Combined Studies from Literature for Safety Monitoring Plan</i>							
<u>Mean 1</u>	<u>SD 1</u>	<u>N1</u>	<u>Mean 2</u>	<u>SD 2</u>	<u>N2</u>	<u>Combined Mean</u>	<u>Combined SD</u>
.933	.966	4	.780	.779	4	.856	.885

In total, the CP period (pre-intervention) revealed 8, 174 patients corresponding to 43, 129 patient days and the SP period (post-intervention) revealing 7, 024 patients corresponding to 45, 566 patient days were admitted to the hospital during the project period. Of the 43, 129 patient days during the CP period, 2,267 (5%) were designated as contact precaution days. As expected, a decrease in contact precaution days were seen in the SP period whereby only 217 contact precaution days were utilized, representing < 1.0% of total patient days, as shown in Figure 6 and Table 3.

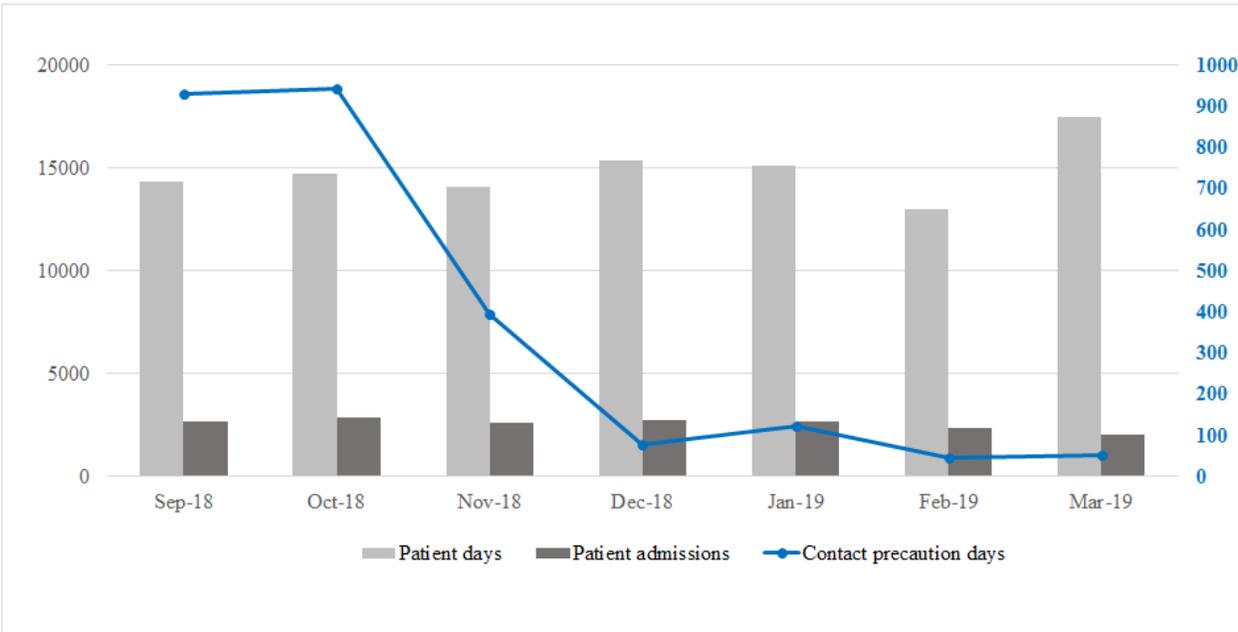


Figure 6. Days and Admissions of Patients. This figure illustrates the number of days and admissions by month, including contact precaution days.

Table 3						
<i>Percentage of Contact Precaution days versus patient days by Month</i>						
<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>	<u>February</u>	<u>March</u>
6.5%	6.4%	2.8%	<1%	<1%	<1 %	<1%

Although the intervention was implemented after IRB approval (December 12, 2018), a precipitous drop in contact precaution days were noted in November 2018. Data were reviewed and validated by all IP team members; noting patient admissions and patient days were decreased slightly in November creating a plausible reason for the decrease in contact precaution days. The total contact precaution days for January 2019 through March 2019 appear to be even more decreased than November, suggestive of a successful practice change implementation.

Hand hygiene as an additional process measure revealed an annual average of twenty thousand hand hygiene observations for 2018, as shown in Table 4, the CP period accounted for 4,983 hand hygiene observations resulting in an 89% compliance rate. During the SP period, 5,302 hand hygiene observations were conducted with a 91% compliance rate.

Table 4							
<i>Frequency of Hand Hygiene Compliance Opportunities for Hand Hygiene and Percentage of Overall Compliance by Month</i>							
	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>
Compliance	1536	1451	1455	1334	1558	1686	1579
Opportunities	1699	1656	1628	1490	1718	1849	1735
Percentage	90%	88%	89%	90%	91%	91%	91%

Infection Outcomes

Regarding the outcome measures associated with BSI events, the HO MRSA LabID BSI mean incidence density rate for the CP and SP periods were 0.07 versus 0.02 (paired t-test p=0.518) as shown in Table 5, representing no significant rate difference between the two periods and thus favoring the use of SPs.

Although significance was not noted in the mean rate between the two periods, the effect size (Cohen’s d) was noted to be 1.02 as shown in Table 6, representing a large effect for the practice change.

Table 5							
<i>Paired Samples Test Differences Between Pre MRSA-Incidence Density Rate and Post MRSA-Incidence Density Rate</i>							
Paired Differences							
<u>Mean</u>	<u>Std. Deviation</u>	<u>Std. Error Mean</u>	<u>95% Confidence Interval</u>		<u>t</u>	<u>df</u>	<u>Sig. (2-tailed)</u>
			<u>Lower</u>	<u>Upper</u>			
.05000	.11136	.06429	-.22662	.32662	.778	2	.518

Note: Significant at the p=< 0.05 level.

Table 6								
<i>Cohen’s d Effect of Practice Change on MRSA Incidence Density Rates</i>								
<u>Mean 1</u>	<u>Std. Dev.1</u>	<u>N1</u>	<u>Mean 2</u>	<u>Std. Dev.2</u>	<u>N2</u>	<u>d lower limit</u>	<u>d upper limit</u>	<u>Cohen’s d</u>
0.0733	0.07506	3	0.0233	.04041	3	0.93	1.06	1.02

Note: Cohen’s d small effect = 0.2, Medium effect = 0.5, Large effect = 0.8

The incidence density rates for HO VRE LabID BSI events were unchanged at 0.00 for both CP and SP periods, representing no significant difference between the two periods and favoring the use of SPs. Due to no change in HO VRE LabID BSI rates; a Cohen’s d was not calculated.

Patient Satisfaction Outcomes

In a review of the outcome measure associated with patient satisfaction, the overall HCAHPS patient satisfaction scores for “rate the hospital” was 72.5% for the CP period and

68.5% for the SP period, representing a decrease of 5.5% since initiating the practice change.

Table 7, illustrates the “rate the hospital” percentage for each month in the CP and SP periods.

Table 7						
<i>Hospital Consumer Assessment of Healthcare Providers and Systems Patient Satisfaction Scores “Rate the Hospital” Monthly Percentage</i>						
<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>	<u>February</u>	<u>March</u>
73.2%	71.5%	72.8%	71.3%	72.9%	68.5%	67.1%
<i>Note: Percentage is based on the responses received in the highest possible category for “Rate the Hospital” survey question. (0=worst through 10=best)</i>						

Financial Outcomes

The remaining outcome measure focused on PPE costs, assuming each CP day cost \$7.50 in PPE supplies. In estimating the PPE usage costs, staff entries were assessed over the 3-month SP period and although staff entries were not assessed during the CP period, assumptions were made regarding the same rate of room entry remained relatively the same between the two periods. In assuming one gown per staff entry, staff entries for ICU CP rooms during the SP period was noted as an average of 15 entries, whereas the average number of staff entries into general medical rooms was 16 entries. Since the staff room entries were relatively the same for both ICU and medical rooms, 15 staff entries per CP room per day was utilized in the overall calculations to determine estimated PPE usage costs. The cost of the disposable gown was \$ 0.42 each, and the gloves cost was \$ 0.08 per pair (\$0.50 per entry); thus calculating the estimated daily PPE usage costs as \$ 7.50 per CP day.

Considering the CP period comprised 2,267 CP days, this accounted for \$17,003 of gown and gloves usage costs; whereas the SP period accounted for 217 CP days and thus an estimated

\$ 1, 628 for gown and glove usage. This represented estimated cost savings between the two periods of \$ 15, 375 (90% reduction) or an estimated \$ 61, 500 in annualized PPE savings.

In an attempt to quantify the time-saved considering less CP days and therefore less donning/doffing time for PPE, the average number of staff entries (15) per CP day and the average PPE donning/doffing time (one minute) was utilized to calculate the average costs of staff time. Human resources provided the average hourly staff salary (\$33.46) for personnel (registered nurse, patient care technicians, physician, advanced practice providers, environmental services, phlebotomist, case manager, pastoral care, nutrition services, and imaging technicians) entering a patient room. Based on 2,267 CP days, the calculated staff time was estimated to be 567 hours in staff time for donning/doffing PPE, representing a salary cost of \$18, 972 during the CP period. Calculations for the SP period, in using 217 CP days, revealed 54 staff hours dedicated to donning/doffing of PPE, representing \$ 1, 807 in salary costs; comprising a salary cost reduction of \$17, 165 (513 less staff hours or 90% reduction) during the SP period. An estimated salary cost avoidance of \$ 68, 660 would be expected over a twelve-month period.

In determining the success of the PPE supply cost outcome measure, this measure was successful as the initial outcome goal was to decrease PPE costs by 25%; whereas the PPE cost savings between the two periods of \$15, 375 represented a 90% cost reduction from baseline.

Overall estimated financial savings, including PPE (\$15, 375) and staff time-saved (\$17, 165) resulted in \$ 32, 540 savings for the project period or an annualized savings of \$ 130, 160. Table 8 illustrates the total PPE and time-saved costs for each project period.

Although not considered in the overall estimated financial savings, the in-kind costs for the DNP project leader in facilitating this project change were in excess of 400 hours.

The findings of this project suggest SP may be a viable alternative to CP and were congruent with an increasing body of evidence favoring the removal of CP and the application of SPs (Almyroudis et al., 2016; Bardossy et al., 2017; Bearman et al., 2018; Edmond et al., 2015; Gandra et al., 2014; Marra et al., 2018; Martin et al., 2016; Martin et al., 2018; Renaudin et al., 2017) for patients with colonization or infection with MRSA and VRE.

Table 8				
<i>Cost Analysis Before and After Contact Precautions Practice Change</i>				
<u>Cost Indicator</u>	<u>CP Period Sept.-Nov. 2018</u>	<u>SP Period Jan.-Mar. 2019</u>	<u>Cost Difference</u>	<u>Annualized</u>
PPE (Gown/Gloves)	\$ 17, 003	\$ 1, 628	\$ 15, 375	\$ 61, 500
Time-Dollars Don/Doff	\$ 18, 972	\$ 1, 807	\$ 17, 165	\$ 68, 660
Totals	\$ 35, 975	\$ 3, 435	\$ 32, 540	\$ 130, 160
<i>Note: Slight differences in totals are due to rounding.</i>				

This practice change could be safely implemented at similar healthcare facilities; however, low endemic infection rates and an established robust horizontal infection prevention strategy program must be a baseline requirement prior to making such a practice change. The results also demonstrated potential cost savings to the institution through PPE supplies as well as redirected staff time in focusing on the delivery of quality patient care.

Discussion

In evaluating the discontinuance of CPs and the application of SP for select MDRO colonization and infection as a practice change in an acute care and community hospital, no

evidence was associated with an increase in MRSA or VRE LabID infection rates. Similarly, patient satisfaction scores and PPE cost expenditures would also benefit from this continued practice change. Although the overall patient satisfaction score outcome was not met (-5.5% versus the 5% goal), it is worth noting the Press Ganey data, in a study of close to 2,000 hospitals, revealed the lowest patient satisfaction scores during the winter months; specifically January to mid-March (Schmidt, 2011). Retrospectively, this particular outcome measure would be better suited during off winter months; otherwise, this would be a potential confounding factor.

It is understood when calculating the overall estimated financial savings for the project period as \$ 32, 540, the portion associated with staff time saved (\$ 17, 165) is essentially ‘time-freed’; allowing staff to focus more time on quality patient care. The staff time expressed in less donning/doffing time (513 hours less) represents an annualized 2, 052 hours or expressed as a 0.99 full-time equivalent (FTE).

In evaluating the theoretical frameworks chosen for this project, Donabedian’s quality of care, Kurt Lewin’s change theory and transformational leadership style provided substantial support in the success of the project. Donabedian’s components of structure, process and outcomes provided an understanding for both the project leader and the staff in knowing the project components in an easy to understand format. Kurt Lewin’s change theory was most helpful for the project leader as the premise for change was contemplated prior as well as garnering the support for change. The transformational leadership style was an excellent choice as this style provided opportunities for working with the staff in making a change; having and working toward the vision together.

Several challenges presented during the project in the form of physician communication, whereas several community physicians not practicing at the facility on a routine basis were unaware of the practice change. This lack of awareness led to isolation precaution order discrepancies according to the implemented practice change, causing concern from several physicians. Once the practice change was clarified with the physicians, the cause for concern was alleviated.

Another challenge occurred when patients were transferred into or out of the facility, whereas the receiving facility was not aware of the practice change and therefore awareness and education towards SPs was a constant reminder. Transfer patients into the facility were less of an issue, as the patient service center made appropriate changes in the isolation status per the isolation grid provided. Although the receiving facilities presented a challenge initially, an unintended positive consequence was the collaboration with other healthcare facilities in promoting a potential practice change for those sites.

A challenge presented when performing the PPE audits 'after' the removal of CP as less patients were on CP, thereby creating less opportunities to perform audits. This challenge was mitigated by successive daily audits for patients on CP.

One challenge not previously considered was the ability to perform audits, without experiencing the Hawthorne effect, for standard precautions; including hand hygiene. This is an important factor as the two dependent factors for considering the practice change from CP to SP was based on low endemic infection rates and a robust horizontal infection prevention program; specifically standard precautions. One solution for this challenge is to perform video surveillance for hand hygiene, removing the Hawthorne effect and capturing numerous hand hygiene compliance opportunities.

The largest proponent and support agent for the practice change was the department of nursing. This was largely driven by the removal of PPE donning requirements for episodes of care not involving direct patient or environmental contact while in the patient's room. Likewise, allied health staff members such as patient care technicians, respiratory therapists and rehabilitative therapists expressed appreciation for the practice change.

Conclusion

A cost-effective alternative to disease prevention and more purposeful time to focus on delivering quality patient care were the driving forces in creating change for this project. Removing CP and applying SP for select MDRO colonization and infections for this health care system appears to have been successful, although the project duration was quite limited and therefore subject to scrutiny. As there were no reported negative effects this practice change will continue, although with caution and with a heightened focus on the compliance of horizontal prevention strategies such as hand hygiene and standard precautions for all patient care.

Recommendations

DNP as Consultant

The project offered numerous opportunities for the DNP project leader to engage in policy and practice change ideas with senior executives and administrators in the organization. In forming and facilitating the collaborative groups across the two sites, leadership opportunities were provided. In addition to leadership opportunities, this DNP project leader also served in a consultative capacity to first-year medical residents and fellow nursing colleagues; providing recommendations for literature reviews, process and outcomes measure identification, collaboration initiatives and change management processes.

Based on the consultant role, mentoring opportunities were made available to masters prepared nurses seeking doctoral nursing degrees; providing future partnerships and stakeholders of learning. Additionally, consultative opportunities were provided to neighboring healthcare facilities regarding the practice change as well as advancing evidence-based practice, change theories and implementation science.

Transferability of Project Findings

Since the project included only one acute care and one community hospital setting, the findings are not generalizable to patients in all healthcare settings. A recommendation for the practice changes such as pilots for the intervention including removal of CPs and the application of SPs would be for facilities to have infection prevention programs with established horizontal prevention strategies in addition to low endemic rates for MRSA and VRE. Facilities with congregate living models of care, such as long term care facilities, would need to proceed with caution, as the level of care and transmission opportunities may vary.

In light of the physician communication challenges for this project, a recommendation would be to include all physicians (contract and community privileges) as part of the provider communication. Also as part of the community awareness, additional information sharing forums should be sought out prior to practice change implementation. This would help to alleviate the lack of awareness for transferring facilities.

Dissemination Plan

The findings of the project were initially presented in a public presentation at the university where the DNP project leader was enrolled. The next presentation opportunity was to the quarterly Infection Prevention and Control and Board meetings, representing departments throughout the facility such as surgical services, laboratory, nursing, environmental services, pharmacy, quality resources; and including the hospital board members. Additionally, the project findings were presented to the HAI and Educational Coordinators meeting with a focus on clinical staff. The Health System will be initiating an annual performance improvement showcase and plans are to include this DNP project as one of the project presentations.

External submission of the doctoral project proposal to the APICs Graduate Student Award (GSA) resulted in the DNP project leader being selected as the 2019 APIC Graduate Student Award recipient and in accepting the award, the DNP project leader agreed to submit a final report to APIC in the form of a manuscript suitable for publication in the American Journal of Infection Control and Epidemiology (AJIC) as outlined in the agreement. Additionally, the DNP project leader, as part of the 2019 GSA recipient agreement, must present at the next national conference as part of the formal education program or to the APIC Research Committee.

Future Scholarship

Regarding future nursing scholarship, expanding the current DNP project to include a prolonged timeline to capture longitudinal changes, the inclusion of admission prevalence rates to estimate community MDRO rates and a focus on aspects of hand hygiene to elicit true adherence rates in the absence of the Hawthorne effect will provide additional information in the merits ‘for’ or ‘against’ the removal of CPs. The importance of hand hygiene, inclusive of standard precautions, contributes greatly to the success of this particular practice change and is noted in multiple studies as ‘horizontal prevention strategies’ (Bearman et al., 2018; Edmond et al., 2015; Gandra et al., 2014; Martin et al., 2018; Martin et al., 2016; McKinnell et al., 2017; Renaudin et al., 2017).

Admittedly the DNP project duration and scope of three months is limited, therefore a consideration for a longitudinal approach (possibly several years) would help to identify the long-term effects of CP removal in the hospital population. Including the admission prevalence rates will expand the scope of the patient population to include community prevalence rates and would contribute to understanding the patient flow pre and post discharge status. Specific to hand hygiene rates and performing audits in the absence of the Hawthorne effect, remote video auditing may offer the opportunity to understand true hand hygiene rates and thus identify important gaps in standard precaution practices as well as providing feedback with subsequent hand hygiene improvement (Armellino et al., 2012).

This DNP project also provided the impetus to expand outcomes related to the removal of CPs such as antibiotic pressure (Lemieux et al., 2017; Renaudin et al., 2017), consideration of anxiety scores and outcome measures associated with non-infectious events such as postoperative respiratory failure, hemorrhage/hematoma, thrombosis, wound dehiscence, pressure ulcers, and falls or trauma (Martin, et al., 2018). Although antibiotic utilization rates

were not collected or compared in this project, they may provide healthcare facilities with further data regarding prescribing and antibiotic exposure changes when removing CPs and applying SPs. Likewise, colonization and transmission rates were not reviewed and may prove valuable to other facilities; however, the costs associated with screening patients upon admit and transfer may be prohibitive as was the case with the Health System.

Relative to the HCAHPS survey, there may be opportunities for research, including multivariable logistic regression of survey questions capturing patient satisfaction with care, to determine how the removal of CP may affect outcomes related to coordination of care, concerns of care and respect for patient needs. Patients cared for while under contact precautions may be more likely to perceive problems with their care, thereby creating an effect on overall patient satisfaction scores pertaining to care (Mehrotra et al., 2013). The DNP project leader, through collaboration with multiple site clinical leaders, can assist with future project implementation benefiting the patient population; translating research into practice, thus supporting and promulgating quality patient care.

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APPENDIX A

Donabedian Framework

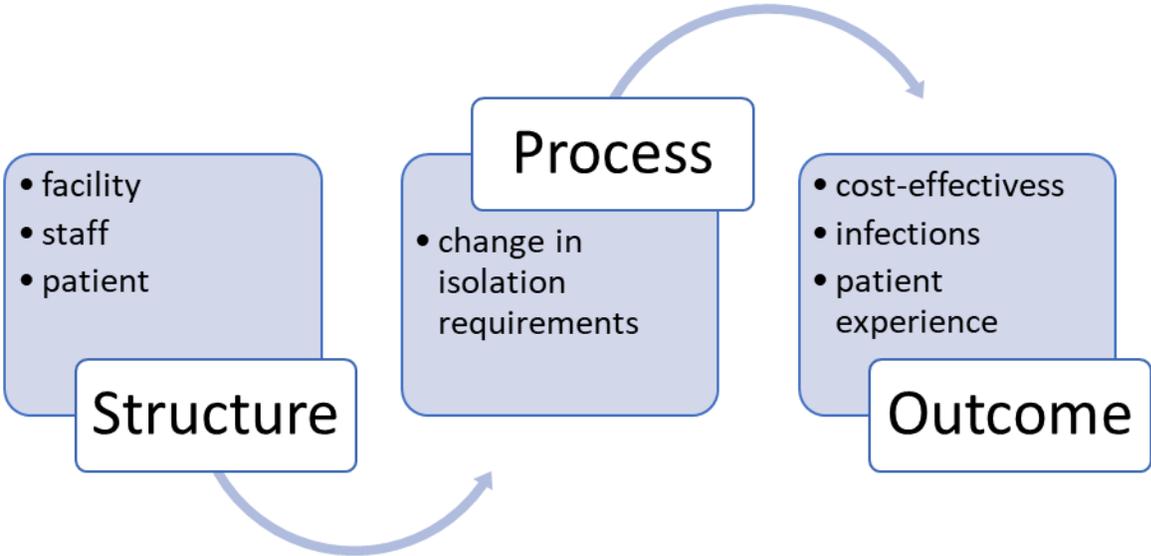


Figure 1. Donabedian Framework. This figure illustrates the steps in quality improvement.

APPENDIX B

Kurt Lewin's Change Theory Model

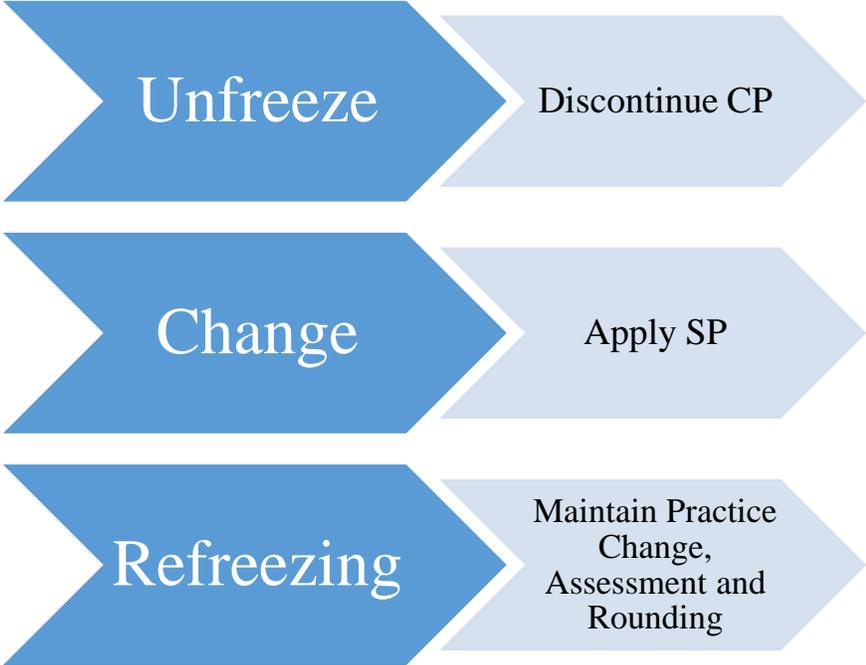


Figure 2. Change Theory Model. This figure illustrates the steps in Kurt Lewin's Change Model.

APPENDIX C

Transformational Leadership Model

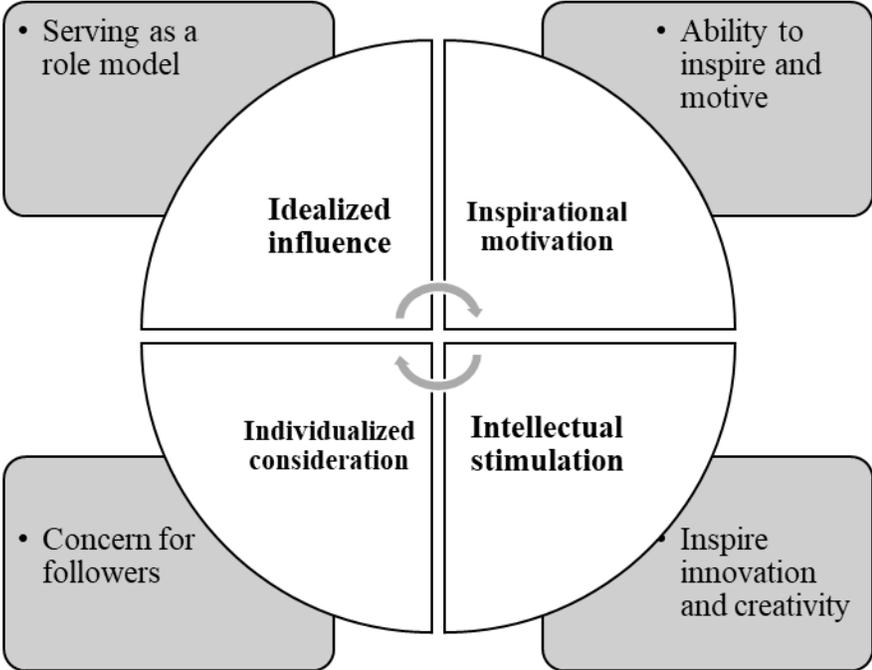


Figure 3. Transformational Leadership Model. This figure illustrates the components of Transformational Leadership Model.

APPENDIX D

Quantitative Table of Study Characteristics

Matrix Topic (Guideline): Discontinuation of Contact Precautions for MDRO

Keywords: discontinuing, discontinuance, or removal of contact precautions for MDRO

Databases Searched: PubMed, MEDLINE and Cochrane Collaboratives

Authors, Title, Journal, Year (APA)	Purpose	Dep. Var.	Ind. Var.	# of Subjects	Subject Characteristics	Research Design	Source or Instrument	Year Data Collected/Methods	Level of Evidence	Comments (Findings, Results, Significance, Implications)
(Almyroudis et al., 2016) Discontinuation of systematic surveillance and contact precautions for Vancomycin-resistant Enterococcus (VRE) and its impact on the incidence of VRE faecium bacteremia in patients with hematologic	To evaluate the effect of discontinuation of CPs and systematic surveillance for VRE on the incidence of VRE bacteremia	The incidence of VRE bacteremia,	Removal of CPs and surveillance.	Pre-change 1,057; post change 1,262.	125-bed Cancer center in Buffalo, NY. Total of three Hematology-oncology unit with hematologic malignancies and stem cell transplantation.	This study was a quasi-experimental pre- and post-design.	Statistical analysis performed utilizing SPSS Version 22. Time series analysis using ARIMA; others included <i>t</i> -test	The study intervention was initiated on March 1, 2011, containing two periods. The first period was from March 2008 to February 2011 and the second period was from March 2011 to February 2014.	Level III	The results of the independent variable (incidence of VRE bacteremia) remained stable after the discontinuance of CP. The time series model showed that the change from CPs was not statistically significant. Levofloxacin prophylaxis had no effect on the VRE rates. Both MRSA and C-diff remained stable (CP was not removed for these

malignancies										pathogens). Nursing hours decreased per patient/per day from 13.99 to 12.86 ($p=>.05$).
(Bardossy et al., 2017) Evaluation of contact precautions for methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococcus	To evaluate changes in MRSA and VRE infection rates after discontinuation of CP.	The dependent variables were identified as the MRSA and VRE infection rates.	Independent variables were identified as removal of CPs and the application of SP.	For this study, 36,907 and 40,439 patient days were included for pre and post periods.	The study characteristics included all patients admitted to Henry Ford Health System from. General ward and ICU beds, with single and shared rooms.	This study was designed as a retrospective pre- and post-study.	No specific instrument was listed; however, the Poisson model and Fisher exact test were utilized for statistical analysis. Stealth observers for HH data.	The study period is from October 2012 to September 2014. National Healthcare Safety Network (NHSN) definitions were utilized to identify infections.	Level III	Results of this study revealed no adverse effect on infection rates after discontinuation of CP. MRSA infections for VAP 0.13 vs 0.11 ($p= .84$); CLABSI, 0.11 vs 0.19 ($p= .45$); SSI, 0 vs 0.14 ($P = .50$); and CAUTI, 0.025 vs 0.033 ($p= .84$); (2) VRE infections: CAUTI, 0.27 vs 0.13 ($p= .19$) and CLABSI, 0.29 vs 0.3 ($p= .94$); and (3) HA-MRSAB rates: 0.14 vs 0.11 ($p=.55$), respectively. Supportive of practice change, consider application to other MDROs.
(Bearman et al., 2018)	To investigate	The dependent	Independent variable	For this study, the	The study characteristics	This study was	The instruments	The study period was between	Level III	No increased MRSA and VRE infection

<p>Impact of discontinuing contact precautions for Methicillin-resistant Staphylococcus aureus and Vancomycin-resistant Enterococcus: An interrupted time series analysis</p>	<p>the effects of MRSA and VRE infection rates when CPs are discontinued.</p>	<p>variables were identified as the MRSA and VRE infection rates and seven process measures.</p>	<p>was identified as removal of CPs and the application of SP; along with seven horizontal strategies (urinary catheter bundle, CHG perineal care, CHG bathing, d/c of CP, bare below the elbow, UV disinfection, 72 hr d/c of urinary catheter</p>	<p>number of subjects and/or patient days was indeterminate.</p>	<p>included all patients admitted to Virginia Commonwealth University Medical Center. General wards, including 146 ICU beds.</p>	<p>designed as an interrupted time series.</p>	<p>utilized for statistical analysis was SAS Proc ARIMA and Proc Autoreg 9.4 for two-tailed and Durbin-Watson for serial autocorrelation and Dickey-Fuller Unit root test. HH observers.</p>	<p>January 2010 and March 2017. National Healthcare Safety Network (NHSN) definitions were utilized to identify infections.</p>		<p>rates were seen with the discontinuance of CP when combined with horizontal infection prevention strategies.</p>
<p>(Bearman et al., 2007) A controlled trial of universal gloving versus contact</p>	<p>To compare universal gloving and contact precautions on the</p>	<p>Multiple dependent variables identified as compliance rate for PPE, HH rates and</p>	<p>The independent variable was identified as a change from CPs to universal</p>	<p>The number of subjects for screening was identified as 198 and 228 for</p>	<p>The study characteristics included a medical intensive care unit.</p>	<p>Designed as a controlled trial.</p>	<p>Analysis performed with SPSS using Fisher exact test, χ^2, and <i>t</i>-test. 14 item</p>	<p>The study period was between September 2008 and September 2009. Phase 1=6 months and</p>	<p>Level III</p>	<p>Infection rates for BSI (6.2 to 14.1), UTI (4.4 to 7.4), and VAP (0 to 2.3) increased during phase II (universal gloving period). All ($p < .001$)</p>

precautions for preventing the transmission of multi-drug-resistant organisms	control of MDROs.	device-associated infection rates; and HCW attitudes toward PPE compliance.	gloving.	phase 1 and 257 and 301 for phase two.			questionnaires for HCW attitudes towards PPE.	phase two= six months		
(Edmond et al., 2015) The impact of discontinuing contact precautions for VRE and MRSA on device-associated infections	To investigate the impact of discontinuing contact CPs on MRSA and VRE infection rates in the presence of a horizontal infection prevention program.	The dependent variables were identified as the MRSA and VRE device-associated infection rates.	Independent variables were identified as the removal of CPs and the application of SP. hand hygiene (HH), daily chlorhexidine bathing of all inpatients (except infants), and a recommendation of bare-	For this study, the number of subjects was not listed; however, 39,928 and 22,145 isolation patient days was listed for pre and post periods.	The study characteristics included all patients admitted to an 865 bed, safety net, and academic center. General wards, including beds.	This study was designed as a quasi-experimental pre- and post-study.	No instrument was mentioned; however, a Z-test was utilized to compare rates between the study periods. HH observations and prevalence survey for bare below the elbow with >11,000 patient care episodes.	The 30-month study period was between January 2012 and June 2014. National Healthcare Safety Network (NHSN) definitions were utilized to identify infections.	Level III	No change in MRSA and VRE infection rates. No change in CAUTI, CLABSI, or VAP rates for all organisms, except CLABSI after CPs was discontinued. Provides decrease in infection rates and cost savings associated with PPE reduction.

			below-the-elbows.							
(Gandra et al., 2014) Impact of contact precautions on falls, pressure ulcers and transmission of MRSA and VRE in hospitalized patients	To evaluate fall and pressure ulcer rates among MRSA and VRE patients and VRE and MRSA transmission rates.	The dependent variables were MRSA and VRE infection rates, fall rates and pressure ulcer rates.	Independent variables were identified as the removal of CPs for colonized or infected patients with MRSA or VRE.	For this study, a total of 200 patients which represented 16822 pt. days for MRSA/VRE patients before the change and 17012 pt. days after the change.	The study characteristics included all patients admitted to the adult medical-surgical inpatient units	The study was designed as a single center retrospective hospital-wide cohort.	The analysis was performed using SAS version 9.3; using Chi-square, student's <i>t</i> -test, Z-test and interrupted time series.	The study period was between November 2009 and October 2011.	Level III	MRSA rates increased by 0.12 after the policy change; however, this was not statistically significant. The overall MRSA rate did not change during the study period. Statistical significance for the difference in fall and pressure ulcers for patients in CPs ($p < 0.0001$).
(Lemieux et al., 2017) Longitudinal multicenter analysis of outcomes after cessation of control measures for	To evaluate outcomes after the discontinuation of CPs on VRE rates.	The dependent variables included clinical and blood isolates for VRE, infections, and	The independent variables were identified as VRE screening, CP, cohorting, enhance	For this study, 618 patient charts were reviewed. All deaths within 30 days of VRE infection	This study included inpatients at four academic health centers in Canada, totaling 2200 patient beds.	The study utilized a longitudinal quasi-experimental design.	The analysis was performed using SAS 9.3.	The study period was between July 2010 and December 2013.		All measures increased after cessation of CPs (although none were statistically significant); however, the continuation of the study revealed a decreased to or below the pre-study results.

Vancomycin-resistant Enterococci		bacteremias and mortality rates.	environmental cleaning.	were reviewed, as was all-cause mortality.						
(Martin et al., 2016) Elimination of routine contact precautions for endemic Methicillin-resistant Staphylococcus aureus and Vancomycin-resistant Enterococcus: A retrospective quasi-experimental study	To evaluate the impact of discontinuing contact CPs and the expansion of CHG use on MRSA and VRE infection rates.	The dependent variables were identified as MRSA, VRE, and C. difficile clinical culture rates.	Independent variables were identified as the removal of CPs and the application of SP. Expansion of CHG use.	For this study, the number of subjects nor patient days were listed.	The study characteristics included all patients admitted to a 540 bed, tertiary, academic, and level 1 trauma hospital, including 154 ICU beds. Also included a 265-bed community teaching hospital, including 22 ICU beds.	This study was designed as a retrospective, nonrandomized, observational quasi-experimental pre- and post-study.	The analysis was performed utilizing Stata, version 14.0.	The study period was between June 2013 and June 2015. National Healthcare Safety Network (NHSN) definitions were utilized to identify infections.	Level III	No change in MRSA, VRE, and C.diff LabID clinical culture rates after CPs was discontinued. Discontinuation of CPs provides cost savings, without increasing infection rates.
(Martin et al., 2018) Noninfectious hospital adverse events decline after elimination of	To evaluate the impact of discontinuing CP.	The dependent variables were identified as the MRSA and VRE infection	Independent variables were identified as the removal of CPs and the	For this study, the number of subjects was not listed. Patient admissions	The study characteristics included all patients admitted to a 540 bed, tertiary, academic, and	This study was designed as a retrospective, nonrandomized,	The analysis was performed utilizing Stata, version 14.0.	The study period was between June 2013 and June 2015. National Healthcare Safety Network (NHSN)	Level III	Non-infectious adverse events decreased by 19% (12.3 vs 10.0) No significant change in infections (20.7 vs 19.4; pre and post). Suggestive of CPs

contact precautions for MRSA and VRE.		rates and non-infectious adverse events.	application of SP. Expansion of CHG use.	of 24, 732 and 25,536 were listed for pre and post periods, respectively	level 1 trauma hospital, including 154 ICU beds. Also included a 265-bed community teaching hospital, including 22 ICU beds.	observational quasi-experimental pre- and post-study.		definitions were utilized to identify infections. Adverse events collected from CMS and AHRQ PSI and internal adverse-event reporting period.		discontinuance may reduce noninfectious adverse events.
(McKinnell et al., 2017) Discontinuation of contact precautions with the introduction of universal daily chlorhexidine bathing	To evaluate the impact of CPs policy change	The dependent variables were identified as the environmental contamination and MRSA acquisition rates.	Independent variable was identified as the removal of CPs and the introduction of CHG bathing.	During the 1 st phase of the study period, 453 patients were admitted to the ICU; the second phase resulted in 417 patients.	Patients admitted to the ICU at a 377-bed community hospital. The ICU consisted of a 22-bed med-surge, 8-bed burn unit and an 8-bed cardiac ICU.	The study was designed as a pre- and post-quasi-experimental.	Data were analyzed using SAS 9.3, Chi-square and <i>t</i> -tests were used. 3M Clean trace for environmental cleanliness and BBL CHROMager for surveillance cultures.	The study period was between April and July 2017.	Level III	There was an increase in contact precaution days for enteric pathogens during the second period from 23 to 102, (<i>p</i> <.01). MRSA acquisition remained stable.
(Renaudin et al., 2017) Impact of	To compare the incident	The dependent variables were	Independent variable was identified	For this study, the numbers of subjects	The study characteristics included all patients	This study was designed as a	The analysis was performed using SAS	The study period was between January 2012 and February	Level III	No increase in acquired MRSA and ESBL cases after discontinuing CPs

<p>discontinuing contact precautions for MRSA and ESBL in an intensive care unit: A prospective noninferiority pre- and post-study</p>	<p>densities for MRSA and ESBL acquisition once CPs was discontinued and SPs was applied.</p>	<p>identified as the MRSA and ESBL VRE incident density. Patient characteristics, HH rates, and antibiotic consumption rates.</p>	<p>as the removal of CPs and the application of SP.</p>	<p>nor patient days were listed.</p>	<p>admitted to a 16-bed polyvalent, single-room ICU at a regional hospital in Metz, France.</p>	<p>prospective noninferiority pre- and post-study.</p>	<p>9.3 version; bacteria strains identified by ChromID ESBL and ChromID MRSA both bioMerieux along with MALDI-TOF MS.</p>	<p>2016. Definition of ICU acquired MRSA or ESBL was 48 hours or greater.</p>		<p>and with dedicated equipment, HH, leadership and antibiotic stewardship.</p>
<p>(Tschudin-Sutter, et al., 2016) Prospective validation of cessation of contact precautions for extended-spectrum beta lactamase-producing Escherichia coli</p>	<p>To determine the transmission risk of ESBL transmission after the cessation of CP.</p>	<p>The dependent variables identified were transmission rates for ESBL.</p>	<p>The independent variable was the removal of CPs for ESBL colonization and infections.</p>	<p>This study included 231 contact patients exposed to 211 index cases.</p>	<p>The study characteristics included an acute-care hospital (735 beds) and a 320-bed geriatric and rehabilitative center.</p>	<p>This study was designed as a prospective cohort.</p>	<p>Instrumentation for pulse-field gel electrophoresis (PFGE) was performed on cultures. Standard cultures used chromID. Etest strips to confirm ESBL. Statistical analysis was performed through</p>	<p>The study period was between January 2012 and December 2013.</p>	<p>Level III</p>	<p>The transmission rate at the acute care hospital increased from 1.5% to 2.6%, not considered significant. Most likely the result of horizontal prevention strategies. The geriatric center increased from 4.5% to 8.8% and is reported to be similar to similar settings. Lower rates are suggestive of the prevention strategies shorter length of stays.</p>

							Fisher exact test and Mann-Whitney U test; logistic regression was utilized to determine risk ratios of transmission .			
(Zahar et al., 2015) About the usefulness of contact precautions for carriers of extended-spectrum beta-lactamase-producing Escherichia coli	To compare ESBL incidence between two French hospitals with different infection control policies.	The dependent variable is the ESBL incidence rates.	The independent variable is identified as the change in policy for CPs. Consumption of alcohol hand rub (AHR) and a defined daily dose of antibiotics was also considered	The study did not include the number of subjects.	Hospital A comprised 550 beds and 26,000 admissions whereas hospital B comprised 800 beds with 30,000 admissions.	A retrospective observational design was utilized for this study.	ChromID was utilized for screening cultures and double disk synergy test was used to detect ESBL. SAS software 9.2 was utilized for analysis and Chi-square, Kolmogorov-Smirnov and <i>t</i> -test were used.	The study period was between January 2006 and September 2010.	Level III	The overall ESBL rates increased in hospital A from 0.41 to 1.87 and in hospital B from 0.54 to 1.31. The increase was due to a Klebsiella pneumonia and E. cloacae outbreak whereas these two pathogens are known to have enzymes that produce carbapenemases. AHR increased in both facilities (hospital A at 20% and hospital B at 28%). Antibiotic consumption decreased during the study period by 4%

										for hospital A and by 3% for hospital B.
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Literature Review Theme

Article	Pathogens	Active surveillance	Horizontal measures	Draining wounds remain on CP
(Almyroudis, et al., 2016)	VRE	No	No	No
(Bardossy, et al., 2017)	MRSA, VRE	No	No	No
(Bearman, et al., 2018)	MRSA, VRE	No	Yes	Yes
(Bearman, et al., 2007)	MRSA, VRE	No	No	No
(Edmond, Masroor, Stevens, Ober, & Bearman, 2015)	MRSA, VRE	No	Yes	Yes
(Gandra, et al., 2014)	MRSA, VRE	Yes	No	Yes (also select MDROs such as ESBL and CP-CRE)
(Lemieux, et al., 2017)	VRE	No	No	No
(Martin, et al., 2018)	MRSA, VRE	Yes	Yes	No
(Martin, et al., 2016)	MRSA, VRE, Cdiff	Yes	Yes	Yes
(McKinnell, et al., 2017)	MRSA	Yes	Yes	No
(Renaudin, et al., 2017)	MRSA, ESBL	Yes	Yes	No
(Tschudin-Sutter, et al., 2016)	ESBL	Yes	No	No
(Zahar, et al., 2015)	ESBL	Yes	No	No

Infection Prevention Approval Letter

September 24, 2018

To the Jacksonville University DNP Project Review Committee members:

In providing support to Darlene Carey (System Director of Infection Prevention) for her Doctor of Nursing Practice Quality Improvement project proposal entitled "The Impact of Discontinuing Contact Precautions for Multi-drug Resistant Organisms (MDRO)",

I approve the utilization of:

- GMC Aggregate hospital onset MRSA and VRE LabID SIR data

Respectfully,

Signature Redacted

Darlene Carey, MSN RN CIC(NE)-BC FAPIC
System Director Infection Prevention and Control

Human Resources Approval Letter

September 24, 2018

To the Jacksonville University DNP Project Review Committee members:

In providing support to Darlene Carey (System Director of Infection Prevention) for her Doctor of Nursing Practice Quality Improvement project proposal entitled "The Impact of Discontinuing Contact Precautions for Multi-drug Resistant Organisms (MDRO)",

I approve the utilization of:

- GMC Human Resources **average hourly staff salary** for personnel (registered nurse, licensed practical nurse, medical doctor, physician assistant, environmental services, nurse technician, advance practice nurse/nurse practitioner, phlebotomist, medical social worker, care manager, pastoral care, nutrition services, and x-ray technician) who enter a patient room.
- GMC Internal Patient Experience scores

Respectfully,
Signature Redacted

Stephen A. Nadeau
Senior Vice President, Human Resources

Patient Experience Survey

{PRINT_DATE}

RE: Your hospital discharge on Precode 4 ({PRECODE4})

Dear {FIRST_NAME} {LAST_NAME},

Thank you for choosing [redacted]. We hope you are recovering well and that your recent visit with us exceeded your expectations. This is a voluntary survey. Your health benefits will not be affected by your participation in the survey. Please take a few minutes to share your feedback about your recent inpatient stay that ended on the date listed above by completing the enclosed survey. There are three simple steps.

ANSWER EACH QUESTION: Respond to each question. Questions 1–25 are part of a national initiative sponsored by the United States Department of Health and Human Services to measure the quality of care in hospitals. The overall results will provide comparisons on issues of hospital care that are important to all consumers.

PROVIDE ANY COMMENTS: Your written comments provide us with more than a number. Please let us know what we have done very well, and what we could have done to make your experience better.

RETURN THE SURVEY: Place the survey in the postage paid envelope and put it in the mail.

Your answers may be shared with the hospital for quality improvement and may be used for research purposes. The number on the bottom of the survey is used to tell us if you returned the survey so we don't send you reminders.

Our Leadership team personally reviews every written comment and use your ratings and comments to improve our services. If you have any questions concerning this survey, please contact 877-842-2477. For other questions about your hospital stay, please contact Allison Hamlet, Patient Representative Supervisor, 678-312-4343. Again, thank you for choosing Gwinnett Medical Center. Should you need healthcare services again in the future, we hope that you choose Gwinnett Medical Center.

Sincerely,

Signature Redacted

J. Thomas Shepherd, FACHE
Executive Vice President and COO

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0938-0981. The time required to complete this information collected is estimated to average 8 minutes for questions 1-25 on the survey, including the time to review instructions, search existing data resources, gather the data needed, and complete and review the information collection. If you have any comments concerning the accuracy of the time estimate(s) or suggestions for improving this form, please write to: Centers for Medicare & Medicaid Services, 7500 Security Boulevard, C1-25-05, Baltimore, MD 21244-1850.

Return to: 710 Rush Street, South Bend, IN 46601

Please provide contact information if the hospital needs to contact you. This information is not required.

Patient's Name: (optional) _____

Telephone Number: (optional) _____

THANK YOU. Please return the completed survey in the postage-paid envelope.

PREVIEW

Questions 1-22 and 26-32 are part of the HCAHPS Survey and are works of the U.S. Government. These HCAHPS questions are in the public domain and therefore are NOT subject to U.S. copyright laws. The three Care Transitions Measure® questions (Questions 23-25) are copyright of Eric A. Coleman, MD, MPH, all rights reserved.



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CL#4871-H20101-01-09/18

OMB Control Number: 0938-0981

SURVEY INSTRUCTIONS: You should only fill out this survey if you were the patient during the hospital stay named in the cover letter. Do not fill out this survey if you were not the patient. Answer all the questions by completely filling in the circle to the left of your answer. You are sometimes told to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

Yes

No → **If No, Go to Question 1**

Please answer the questions in this survey about your stay at **Gwinnett Medical Center - Lawrenceville**. Do not include any other hospital stays in your answers.

YOUR CARE FROM NURSES

1. During this hospital stay, how often did nurses treat you with courtesy and respect?
 - Never
 - Sometimes
 - Usually
 - Always
2. During this hospital stay, how often did nurses listen carefully to you?
 - Never
 - Sometimes
 - Usually
 - Always
3. During this hospital stay, how often did nurses explain things in a way you could understand?
 - Never
 - Sometimes
 - Usually
 - Always
4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?
 - Never
 - Sometimes
 - Usually
 - Always
 - I never pressed the call button

YOUR CARE FROM DOCTORS

5. During this hospital stay, how often did doctors treat you with courtesy and respect?
 - Never
 - Sometimes
 - Usually
 - Always

6. During this hospital stay, how often did doctors listen carefully to you?
 - Never
 - Sometimes
 - Usually
 - Always
7. During this hospital stay, how often did doctors explain things in a way you could understand?
 - Never
 - Sometimes
 - Usually
 - Always

THE HOSPITAL ENVIRONMENT

8. During this hospital stay, how often were your room and bathroom kept clean?
 - Never
 - Sometimes
 - Usually
 - Always
9. During this hospital stay, how often was the area around your room quiet at night?
 - Never
 - Sometimes
 - Usually
 - Always

YOUR EXPERIENCES IN THIS HOSPITAL

10. During this hospital stay, did you need help from nurses or other hospital staff in getting to the bathroom or in using a bedpan?
 - Yes
 - No → **If No, Go to Question 12**

continue to page 2

Return To: Press Ganey Associates, 710 Rush Street, South Bend, IN 46601

1234567890-1-1

11. How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?
 - Never
 - Sometimes
 - Usually
 - Always
12. During this hospital stay, did you have any pain?
 - Yes
 - No → **If No, Go to Question 15**
13. During this hospital stay, how often did hospital staff talk with you about how much pain you had?
 - Never
 - Sometimes
 - Usually
 - Always
14. During this hospital stay, how often did hospital staff talk with you about how to treat your pain?
 - Never
 - Sometimes
 - Usually
 - Always
15. During this hospital stay, were you given any medicine that you had not taken before?
 - Yes
 - No → **If No, Go to Question 18**
16. Before giving you any new medicine, how often did hospital staff tell you what the medicine was for?
 - Never
 - Sometimes
 - Usually
 - Always
17. Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand?
 - Never
 - Sometimes
 - Usually
 - Always

WHEN YOU LEFT THE HOSPITAL

18. After you left the hospital, did you go directly to your own home, to someone else's home, or to another health facility?
 - Own home
 - Someone else's home
 - Another health facility → **If Another, Go to Question 21**
19. During this hospital stay, did doctors, nurses or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?
 - Yes
 - No

20. During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?
 - Yes
 - No

OVERALL RATING OF HOSPITAL

Please answer the following questions about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.

21. Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital during your stay?
 - 0 Worst hospital possible
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - 10 Best hospital possible
22. Would you recommend this hospital to your friends and family?
 - Definitely no
 - Probably no
 - Probably yes
 - Definitely yes

UNDERSTANDING YOUR CARE WHEN YOU LEFT THE HOSPITAL

23. During this hospital stay, staff took my preferences and those of my family or caregiver into account in deciding what my health care needs would be when I left.
 - Strongly disagree
 - Disagree
 - Agree
 - Strongly agree
24. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.
 - Strongly disagree
 - Disagree
 - Agree
 - Strongly agree
25. When I left the hospital, I clearly understood the purpose for taking each of my medications.
 - Strongly disagree
 - Disagree
 - Agree
 - Strongly agree
 - I was not given any medication when I left the hospital



ABOUT YOU

- 26. During this hospital stay, were you admitted to this hospital through the Emergency Room?
 - Yes
 - No
- 27. In general, how would you rate your overall health?
 - Excellent
 - Very good
 - Good
 - Fair
 - Poor
- 28. In general, how would you rate your overall mental or emotional health?
 - Excellent
 - Very good
 - Good
 - Fair
 - Poor
- 29. What is the highest grade or level of school that you have completed?
 - 8th grade or less
 - Some high school, but did not graduate
 - High school graduate or GED
 - Some college or 2-year degree
 - 4-year college graduate
 - More than 4-year college degree

- 30. Are you of Spanish, Hispanic or Latino origin or descent?
 - No, not Spanish/Hispanic/Latino
 - Yes, Puerto Rican
 - Yes, Mexican, Mexican American, Chicano
 - Yes, Cuban
 - Yes, other Spanish/Hispanic/Latino
- 31. What is your race? Please choose one or more.
 - White
 - Black or African American
 - Asian
 - Native Hawaiian or other Pacific Islander
 - American Indian or Alaska Native
- 32. What language do you mainly speak at home?
 - English
 - Spanish
 - Chinese
 - Russian
 - Vietnamese
 - Portuguese
 - Some other language (please print):

ADDITIONAL QUESTIONS ABOUT YOUR CARE

Now that we have asked you to tell us about what happened during your care, we would like to ask you (an additional question/a few additional questions) about your experience. If a question does not apply to you, please skip to the next question.

	very poor	poor	fair	good	very good
	1	2	3	4	5
1. Courtesy of the person who admitted you	<input type="radio"/>				
2. Quality of the food	<input type="radio"/>				
3. Courtesy of the person who served your food	<input type="radio"/>				
4. Overall feeling the building environment aided my healing process	<input type="radio"/>				

If you recognized an opportunity for to make an improvement, would you please share your thoughts?

What did we do well during your stay? How did we impress you?

continue to page 4

Financial Approval letter

September 24, 2018

To the Jacksonville University DNP Project Review Committee members:

In providing support to Darlene Carey (System Director of Infection Prevention) for her Doctor of Nursing Practice Quality Improvement project proposal entitled "The Impact of Discontinuing Contact Precautions for Multi-drug Resistant Organisms (MDRO)",

I approve the utilization of:

- GMC Stock and Non-stock Usage and cost History for gloves and isolation gowns
- GMC Total number of patient days from financial reports

Respectfully,

Signature Redacted

Thomas Y. McBride, III
Executive Vice President and Chief Financial Officer

Infection Prevention PPE Audit

Instructions:

Select two patient rooms on CP, stock each PPE drawer with 20 isolation gowns.

Enter the facility site, unit, auditor, and date of audit in blanks provided. Circle day of the week for when the audit was initiated. Enter the start time, expecting to audit for 24 hours from the start time.

Upon return (after 24 hours) count the number of gowns left inside each PPE drawer for the designated patient room, subtract this total from the original 20 gowns; place the result in bold square.

Facility: _____

Patient Unit: _____

Auditor (print): _____

Date: _____

Day of Week: S M T W Th F S

Start time: ____:____ End time: ____:____

Item	Number utilized
Gowns	

PPE Time Audit

Infection Prevention and Control PPE Audit

Instructions: Perform audit without staff being aware

Select two patient rooms on CP, one from the medical surgical floor and one from the ICU.

Enter the facility site, unit, auditor, and date of audit in blanks provided. Circle day of the week for when the audit was initiated.

The standardized method of time calculation is

1. Donning will start with the opening of the PPE drawer, donning the gown and will end at the donning of the second glove;

2. Doffing will start with the removal of gown and gloves and end with the disposal of PPE.

Facility: _____

Patient Unit: _____

Auditor (print): _____

Date: _____

Day of Week: S M T W Th F S

Med-Surgical Patient Room	
Donning	Start time: ____:____ End time: ____:____
Doffing	Start time: ____:____ End time: ____:____
ICU Patient Room	
Donning	Start time: ____:____ End time: ____:____
Doffing	Start time: ____:____ End time: ____:____

Project Timeline

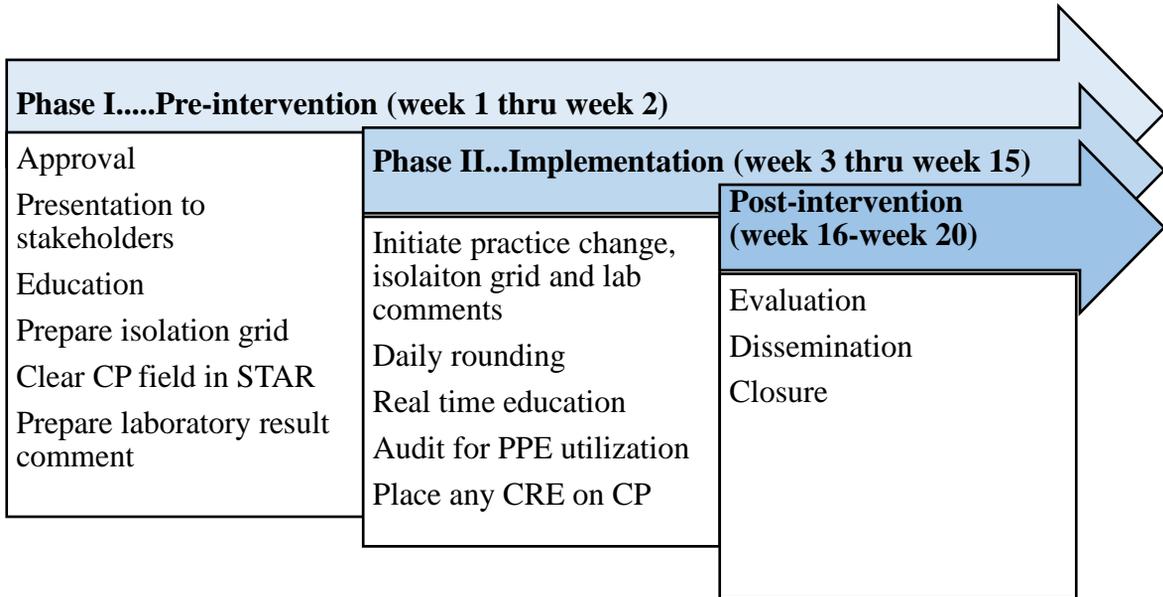


Figure 4. Project Timeline. This figure illustrates the major phases of the Project Timeline.

APPENDIX M

PowerPoint “Discontinuing Contact Precautions”

Infection Prevention and Control



Discontinuing Contact Precautions for MDRO's

Infection Prevention and Control 2018

Purpose

- To synthesize the knowledge learned from the literature review and to translate that knowledge to effectively benefit the patients that are within the practice environment.
- Evaluate the effectiveness of standard precautions (SP) as a cost-effective strategy in preventing hospital onset MRSA and VRE infections.



Practice change Proposal

- Discontinue the use of Contact Precautions (CP) for MDRO colonization and infections (to include draining wounds)
 - With the exception of Cdiff and CRE pathogens
 - Utilize the application of Standard Precautions for this population
- Cdiff and CRE will remain on Contact Precautions

Objective

- Prevent hospital onset MRSA and VRE infections with practice change
 - specifically the outcomes measures would be that HO MRSA and VRE LabID SIR will not increase statistically ($p=0.05$) from baseline.
- Investigate the effects of this practice change on the patient experience and subsequent patient satisfaction scores
 - overall patient satisfaction scores will increase by 5% from baseline.
- Provide cost-effective strategies
 - PPE supply costs will decrease by 25% from baseline.

Benefits

- There was no significant increase in infection rates for the discontinuance of CP and application of SP in six of the nine studies reporting infection rates or clinical isolate rates.
 - (Almyroudis, et al., 2016; Bardossy, et al., 2017; Bearman, et al., 2018; Edmond, et al., 2015; Martin, et al., 2018; Martin, et al., 2016).
- The other three studies increased initially, however ongoing surveillance performed after the study period resulted in a return to baseline.
 - Bearman, et al., 2007; Gandra, et al., 2014; Lemieux, et al., 2017)

Benefits

- Cost effective prevention strategy
 - annual gown cost savings reported by Martin et al. (2016) exceeded \$700k after CPs were discontinued and nursing time analysis calculated over 45,000 hours of time saved by reducing the donning and doffing time for gloves and gown when applying CPs.
 - Based on the reduction of isolation days during the study period (39,928 isolation days to 22,145 isolation days) representing a 45% reduction; the cost savings results are close to \$ 500,000 annually (Edmond, et al., 2015).

Benefits

- In calculating the nursing time saved, this study reported an approximate savings of \$ 4.6 million and although this would be considered a sunken cost, it does allow nursing to focus more on quality patient care (Martin, et al., 2016).

Results

- The literature review comprise evidence that suggests CP may not be a necessary intervention for the prevention of MDRO transmission in the absence of increased rates;
 - as the application of SP for endemic MDRO populations is more practical and cost effective.
 - all articles favored the use of SP in lieu of CP for endemic MDRO populations; combining SP with **horizontal infection prevention measures**.



Our Back to Basics Campaign

horizontal infection prevention measures

Table 1. Back to Basics Campaign Components		
Topic	Education or Practice Change	Infection Prevention Measure
Hand hygiene and dispensers	Assessment performed; added dispensers outside each patient room, point of care areas and standardization as possible.	Promote optimal hand hygiene opportunities.
Patient 'speak up' cards	Speak up! Tent cards placed on all new admit tray tables: Can you wash your hands, can my line be removed, and can my bladder catheter be removed?	Promote patient safety awareness and self-care engagement.
Standard Precautions	Review and update policies, Created computer based learning module for all disciplines.	Promote understanding and utilization of standard precautions in hospital setting.
New Isolation Signage	Updated staff and visitor guidance; new color scheme. Developed computer based learning module for all disciplines.	Promote understanding of isolation precautions.
Environmental disinfection	Review chemical disinfectants, change in sporicidal agent, created education/training program.	Promote disinfection contact times, surface areas, cleaning process.
Device disinfection	Review and update policies, apply cleaning instruction tags to all equipment, create education competency.	Promote equipment disinfection, appropriate disinfectant, contact times.
CLABSI Team (vertical strategy)	Review and update insertion, access and maintenance practice/education. Instituted bundle audits, standardized insertion checklist/line kit.	Promote skin antisepsis, aseptic and sterile techniques.

Potential Benefits

- Martin et al. (2018) non-infectious adverse event rates declined pre and post CP discontinuation (12.3 to 10.0; $p=.02$).
 - Falls and trauma
 - Pressure ulcers
 - Postoperative respiratory failure
 - Wound dehiscence
 - Postoperative hemorrhage and/or hematoma
 - Pulmonary emboli and deep vein thrombosis
- These are potential reimbursement concerns

Potential Benefits

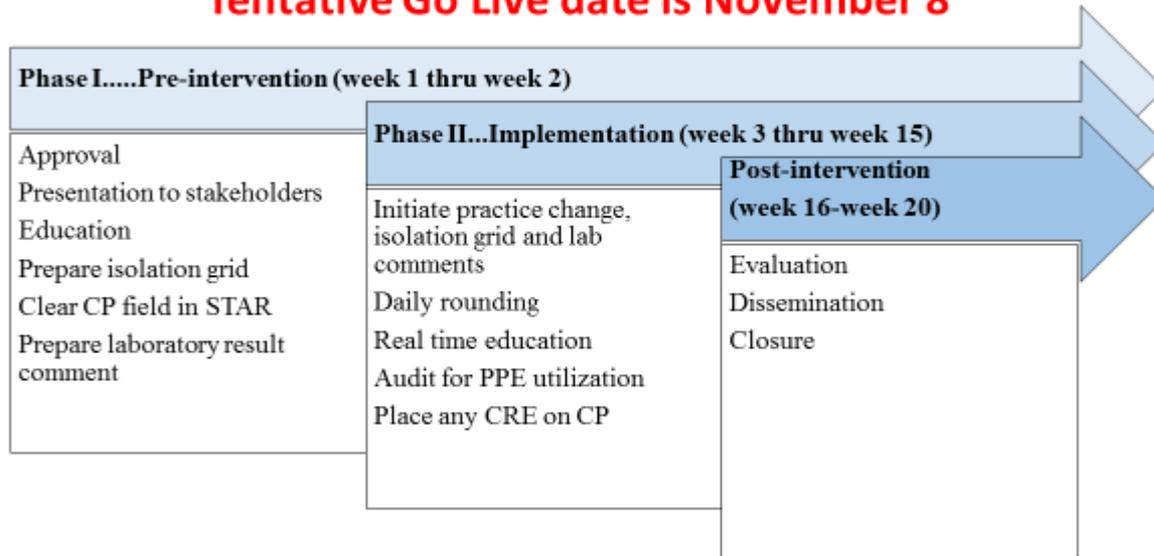
- The results specific to **falls and pressure ulcer** showed a significant difference among MRSA and VRE patients compared with other adult medical-surgical patients before and after policy change from CP to SP (Gandra et al., 2014)
- Falls
 - 4.57 vs 2.04; and 4.82 vs 2.10; $p < 0.0001$
- Pressure ulcers
 - 4.87 vs 1.22 and 4.17 vs 1.19; $p < 0.0001$

Planned interventions

- Isolation grid change to reflect the elimination of CP for MDRO colonization and infection and application of SP for the identified population.
- Removal of historical CP isolation flags for MDRO positive results field in STAR (screens and isolates). (IP will input CRE patients)
- Laboratory MDRO surveillance screen and clinical isolate result “comment” modification.

Proposed Timeline

Tentative Go Live date is November 8





Remember...Standard Precautions

- Determined by the nature of the HCW-patient interaction and the extent of anticipated blood, body fluid, or pathogen exposure.
- Includes hand hygiene; use of gloves, gown, mask, eye protection, or face shield, depending on the anticipated exposure; and safe injection practices.
- Patient equipment or items in the patient environment
 - properly clean and disinfect or sterilize reusable equipment before use on another patient.



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Questions

- Please contact Infection Prevention and Control

Back to Basics Components of Standard Precautions

Table 1		
<i>Back to Basics Campaign Components</i>		
<u>Topic</u>	<u>Education or Practice Change</u>	<u>Infection Prevention Measure</u>
Hand hygiene and dispensers	Perform assessment; add dispensers outside each patient room, point of care areas and standardization as possible.	Promote optimal hand hygiene opportunities.
Patient ‘speak up’ cards	Speak up! Tent cards placed on all new admit tray tables: Can you wash your hands, can my line be removed, and can my bladder catheter be removed?	Promote patient safety awareness and self-care engagement.
Standard Precautions	Review and update policies, Created a computer-based learning module for all disciplines.	Promote understanding and utilization of standard precautions in a hospital setting.
New Isolation Signage	Update staff and visitor guidance; new color scheme. A developed computer-based learning module for all disciplines.	Promote understanding of isolation precautions.
Environmental disinfection	Review chemical disinfectants, change in the sporicidal agent, created an education/training program.	Promote disinfection contact times, surface areas, cleaning process.
Device disinfection	Review and update policies, apply cleaning instruction tags to all equipment, create education competency.	Promote equipment disinfection, appropriate disinfectant, contact times.
CLABSI Team (vertical strategy)	Review and update insertion, access, and maintenance practice/education. Instituted bundle audits, standardized insertion checklist/line kit.	Promote skin antisepsis, aseptic, and sterile techniques.

APPENDIX O

Isolation Grid



DISEASE	ISOLATION CATEGORY	REQUIRED PERSONAL PROTECTIVE EQUIPMENT (PPE)	REQUIREMENTS TO DISCONTINUE ISOLATION
CLOSTRIDIUM DIFFICILE (C DIFF)	Modified CONTACT	GOWN and GLOVES Patient CONTACT and /or CONTACT with Patient's ENVIRONMENT	Duration of admission
TUBERCULOSIS	AIRBORNE**** After discharge, the Airborne Precautions sign must stay on the door and the doors remain closed for 60 minutes (EVS may enter to clean the room during the 60 minute time period as long as they wear an N95 mask).	N 95 RESPIRATOR – Associates and visitors while going into negative pressure room and patient when leaving negative pressure room and not cleared from TB	For Suspected TB:** <ul style="list-style-type: none"> • There is another diagnosis that explains the clinical syndrome OR • The results of three sputum AFB smears are negative, which each are collected 8-24 hours apart and at least one specimen is an early morning For Confirmed TB:** <ul style="list-style-type: none"> • Patient is on effective therapy, improving clinically, 3 negative sputum AFBs on 3 consecutive days

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SHINGLES	STANDARD (Localized in patient with intact immune system) with lesions that can be contained/covered	Basic PPE for Standard Precautions	Isolated for Duration of Illness
	AIRBORNE AND CONTACT (Disseminated disease in any patient). Localized disease in immunocompromised patient until disseminated infection ruled out.	Associates must wear N95 mask and Contact isolation with GOWN and GLOVES	
INFLUENZA	DROPLET	REGULAR (YELLOW MASK) – Associates REGULAR (YELLOW MASK) – VISITORS and PATIENT OUTSIDE of Room	Five days from onset of symptoms, afebrile 24 hours, and no symptoms and/or suspicion of flu NOTE: Duration of Droplet precautions may be longer if still symptomatic and physician still has suspicion of flu
	BACTERIAL MENINGITIS (suspected and confirmed)	DROPLET	REGULAR (YELLOW MASK) – ASSOCIATES REGULAR (YELLOW MASK) – VISITORS and PATIENT OUTSIDE of Room
VIRAL MENINGITIS	STANDARD	NONE	NO ISOLATION NEEDED
MRSA OR VRE INFECTION (BLOOD, URINE, SPUTUM, WOUND,)	STANDARD	GOWN and GLOVES Patient CONTACT and /or CONTACT with Patient's Environment	PPE per Standard Precautions
MDRO...ONLY CRE (will reflect on laboratory report)	CONTACT	GOWN and GLOVES Patient CONTACT and /or CONTACT with Patient's Environment	Isolated for Duration of Admission

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** Note: A suspected or confirmed hospitalized patient, if deemed medically stable, can be discharged prior to converting positive AFB sputum smears to negative AFB sputum smears if certain criterion is met. Please refer to Tuberculosis Control Plan, Policy 600-26.

**** NOTE: If a patient with confirmed airborne disease on Airborne Precautions is being discharged from the negative pressure room, the Airborne Precautions signs stays on the door and the door remains closed for 60 minutes. (EVS may enter to clean room during the 60min time period as long as they wear an N95).

Please refer to the CDC's Appendix A "Type and Duration of Precautions Recommended for Selected Infections and Conditions" from the HICPAC Patient Guidelines for an extensive list of conditions and illnesses requiring isolation.

http://www.cdc.gov/hicpac/2007IP/2007ip_appendA.html

Posted: 04/2017 Rev 9/2018

Laboratory Result Comment

Laboratory results for MDROs, excluding MDR CPs CRE:

Results require the application of Standard Precautions per Infection Control.

Health System IRB

Non-Sponsored Research Project <u>Facesheet</u>	
VERSION DATE	PAGE
September 2018	1 of 4

SUBMISSION INSTRUCTIONS

Any _____ affiliated individual proposing to conduct a quality improvement (QI) or research project involving _____ patients or their data, MUST submit a project summary along with a completed copy of this facesheet to the Office of Research for review/approval.

Determinations of whether a proposed project is human subjects research or QI **must** be made by an authorized individual in the Office of Research at GMC. There is only one exception to this. Please see “(_____ Associates Only” section below.

The turnaround time for review/approval of a research/QI project is 2 – 3 weeks. Please plan accordingly.

Please submit all required paperwork as follows:

Office of Research (OOR):

Associates Only:

If you are a _____ Associate completing a degree that requires a research or QI project for matriculation purposes, your project must be submitted to your school's IRB for review/approval.

_____ will only provide institutional approval to conduct your project at our organization once we have an approval letter from your school's IRB.

Please provide a copy of your IRB approval letter, or confirmation of correspondence with your IRB, along with a completed/signed copy of this form to the Director of Research at _____ (contact details noted above).

Affiliated Physicians Only:

If a _____ Affiliated Physician submits a project proposal that is deemed, “human subjects research requiring expedited or convened IRB review”, the Director of the Office of Research will advise on next steps.

Non-Sponsored Research Project Facesheet	
VERSION DATE	PAGE
September 2018	2 of 4

PROJECT INFORMATION SHEET

A. Project Title: []

B. Date Project to Begin: []

C. Estimated Duration of Project: []

D. Principal Investigator: (include Degree): []
 Institutional Affiliation: [] OTHER [] (specify) _____
 GME Division: []

Mailing Address for Communications: []
 Telephone No.: [] 24-Hour #: []
 E-mail: []

NOTE: It is essential that all Co-Investigators and other project personnel be listed, and that the list be kept current. Signatures of Co-Investigators are required at the end of this form.

NAME AND DEGREE	INSTITUTION	DEPARTMENT

E. Faculty Sponsor/Preceptor (for student, resident projects only) _____

F. Are you credentialed by _____ to provide the required clinical services?
 Yes
 No
 Resident
 N/A

Non-Sponsored Research Project <u>Facesheet</u>	
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G. Institutional Involvement:

Check those Departments/services which will need to provide resources and indicate whether these have been arranged, and with whom from GMC.

Pharmacy	_____	_____
Laboratory	_____	_____
Nursing	_____	_____
Patient Accounts	_____	_____
Medical Records	_____	_____
Other (specify):	_____	_____
	_____	_____

H. Project Site Locations (check all that apply):

- G
- G
- G
- G
- Jk
- C
- G

I. How will patients be recruited:

- Private practice Physician referral ER Public Ads
- Other (specify): _____

J. Please indicate whether any of the following patient populations/scenarios are involved (check all that apply):

<input type="checkbox"/> Prisoners	<input type="checkbox"/> Pregnant Women
<input type="checkbox"/> Psychiatric patients	<input type="checkbox"/> Subjects whose primary language is not English
<input type="checkbox"/> Patients as experimental subjects	<input type="checkbox"/> Questionnaires
<input type="checkbox"/> Mentally disabled	<input type="checkbox"/> Data banks, archives, and/or medical records
<input type="checkbox"/> Patients as control subjects	<input type="checkbox"/> Tissue banks
<input type="checkbox"/> Non-patient volunteer	<input type="checkbox"/> Charges incurred by patient

Non-Sponsored Research Project Facesheet	
VERSION DATE	PAGE
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<input type="checkbox"/> Students as subjects	<input type="checkbox"/> Charges levied against 3 rd party carrier
<input type="checkbox"/> Trainees as subjects	<input type="checkbox"/> Per subject fees (finder's fee)
<input type="checkbox"/> Subjects in the Armed Services (active duty)	<input type="checkbox"/> Autopsy or surgical pathology tissue
<input type="checkbox"/> Filming, video, or recording subjects	

PLEASE NOTE THE FOLLOWING:

1. GMC does not engage in research involving children. As such, no subjects under the age of 18 should be part of any research project at
2. No research should include payments to subjects
3. If this project involves the use of non-FDA approved drugs or devices, or a new indication or administration of an approved drug or device, full IRB review will be required.

The Principal Investigator, Co-Investigators, and, where applicable, the GMC Sponsor/Preceptor hereby assures the reviewers that all procedures performed under the protocol will be conducted by individuals legally and responsibly entitled to do so, and that any deviation from the protocol will be submitted for review and approval prior to its implementation. The individuals signing this application also acknowledge that they have provided full details of their project for review by:

Date	Principal Investigator Name	Principal Investigator Signature
Date	Faculty Sponsor/Preceptor Name	Faculty Sponsor/Preceptor Signature
Date	Co-Investigator Name	Co-Investigator Signature
Date	Co-Investigator Name	Co-Investigator Signature