

Developing Pediatric Pulmonology

Infection Control Guidelines

By

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Developing Pediatric Pulmonology  
Infection Control Guidelines

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**Abstract**

Research shows that infection prevention and control measures aim to ensure the protection of patients and families seen in the healthcare setting. The main goal of this project was to develop comprehensive infection control guidelines based on a systematic review of published literature for infection control guidelines or recommendations for pediatric pulmonology patients. The Division of Pediatric Pulmonology at a Midwestern Hospital does not have infection control guidelines for the division. There is a lack of specific research regarding infection control protocol for pediatric pulmonology patients. However, there is an ample body of literature containing recommendations for patients with cystic fibrosis, children who have tracheostomies, and other high-risk pediatric populations. This literature was analyzed along with other related studies involving infection control practices in both the inpatient and outpatient settings. Comprehensive infection control guidelines were developed, approved, and implemented in a pediatric pulmonary clinic at a Midwestern Hospital.

**Table of Contents**

<b>Title Page</b>	1
<b>DNP Project Team Approval Form</b>	2
<b>Acknowledgements</b>	3
<b>Abstract</b>	4
<b>Table of Contents</b>	5
<b>Chapter I: Introduction</b>	8
a. Background and Significance	8
b. Problem Statement	9
c. Project Aims	10
d. Clinical Question	10
e. Congruence with Organizational Strategic Plan	10
f. Synthesis of Evidence	11
a. Systematic Review of Literature	12
b. Guidelines	13
c. Retrospective Audit	13
d. Quasiexperimental Design	14
e. Controlled Trials	15
f. Survey	17
g. Prospective Cohort Study	17
h. Surveillance Study	18
i. Prospective Controlled Studies	19
j. Policy Statements	20

k. Critique of Evidence	21
g. Implications for Practice and Further Investigations	25
h. Theoretical Framework	26
<b>Chapter II: Methodology</b>	<b>28</b>
a. Needs Assessment	28
b. Project Design	29
c. Setting and Population	29
d. Project Plan	30
e. Data Analysis	32
f. Ethical Issues	33
g. Institutional Review Board	33
<b>Chapter III: Organizational Assessment</b>	<b>34</b>
a. Organizational Assessment	34
b. Cost Factors	36
<b>Chapter IV: Results</b>	<b>38</b>
a. Analysis of Implementation Process	38
b. Analysis of Project Outcome Data	38
<b>Chapter V: Discussion</b>	<b>41</b>
a. Summary of Major Findings	41
b. Limitations	41
c. Implication for Practice	42
a. Practice	42
b. Future Research	43

c. Nursing	44
d. Health Policy	45
<b>Chapter VI: Conclusion</b>	46
a. Value of the Project	46
b. <i>DNP Essential</i>	46
c. Dissemination	48
d. Personal and Professional Goals	48
<b>References</b>	50
<b>Appendices</b>	55
a. Appendix A: Institutional Review Board	55
b. Appendix B: Pediatric Pulmonology Infection Control Guidelines	56
c. Appendix C: Timeline	58

## **Chapter I: Introduction**

Infection control practices are a part of all healthcare systems. “Infection prevention and control measures aim to ensure the protection of those who might be vulnerable to acquiring infection both in the general community and while receiving care due to health problems” (World Health Organization, 2017). Infection control measures are designed to protect both the patient and the healthcare worker. The introduction of infection control guidelines and procedures have been proven to reduce the acquisition of nosocomial infection and can reduce healthcare costs. There is a concept of opportunity cost that can be used to add quantitative value to infection control practices—reducing length of stay, reducing treatment burden, increasing patient satisfaction (Graves, 2004, p.565).

### **Background and Significance**

Historically, the nursing profession plays a key role in infection prevention and the health and well-being of the patient. In fact, the origin of modern nursing started with Florence Nightingale and her insights into infection prevention in 1854 during the Crimean War (Fee & Garofalo, 2010, p. 1591). The nursing profession is based on sound, safe, and evidence-based care. Infection control is necessary to help keep the patient safe and to promote an environment of healing. Many chronically ill and medically complex children are at greater risk for infection as these children tend to frequent medical clinics and hospitals more than their peers. Working in a pediatric pulmonary practice brings a mixture of different patient types to the office from generally healthy to chronically ill to critically ill. With that in mind, it is important to have infection control guidelines that protect the most vulnerable and at-risk patient, and nursing plays an invaluable role in the development and execution of the guidelines.



There is a lack of specific research regarding infection control protocol for pediatric pulmonology patients. However, there is an ample body of literature containing recommendations for patients with cystic fibrosis, children who have tracheostomies, and other high-risk pediatric populations. This literature was analyzed along with other related studies involving infection control practices in both the inpatient and outpatient settings.

### **Problem Statement**

The main goal of this project was to develop comprehensive infection control guidelines based on the results of a systematic review of published literature for infection control guidelines or recommendations for pediatric pulmonology patients. The Division of Pediatric Pulmonology at a Midwestern Hospital does not have infection control guidelines for the division. The division primarily sees pulmonology patients ages 0-18; however, there is an adult cystic fibrosis center located in the pediatric pulmonology clinic that sees adults 18-76 years old. The clinic sees children diagnosed with chronic cough, abnormal breath sounds, congenital lung diseases, recurrent respiratory infections, empyema, asthma, allergic bronchopulmonary aspergillosis, lung nodules, cystic fibrosis, multi-system genetic conditions, tracheostomy-ventilated patients, and many more complex diseases. Given the complexity of the patient population seen in the pulmonary clinics, there is concern of potential person-to-person transmission of infection. Therefore, a review of current literature and best practice was needed to develop overarching infection control guidelines to reduce and/or prevent the spread of infection to these pediatric patients.

**Project Aims**

The goal of this project was to develop infection control guidelines that incorporates best practice for infection control for pediatric pulmonology patients. The development of infection control guidelines was achieved through the completion of the following objectives:

- 1) Analyze current infection control practices for both inpatient and outpatient settings.
- 2) Analyze current infection control practices for specific high-risk diseases such as cystic fibrosis or pediatric home ventilated patients.
- 3) Summarize findings outlining the current best practices per the literature.
- 4) Extrapolate findings and write infection control guidelines that can be used in the pediatric pulmonology clinic.

**Clinical Question**

The PICO question is: In a pediatric pulmonology clinic (P), can a systematic review of literature of infection control practices (I) be used to develop comprehensive infection control guidelines (Co)? Evidence based practice is an important part of patient care and arguably an essential component of health care policy development. Since a systematic review of literature is unaffected by other variables being measured it is the independent variable. The completion of comprehensive infection control guidelines is dependent on the completion of the review of literature so it is the dependent variable.

**Congruence with Organizational Strategic Plan**

Patients seen at the pediatric pulmonology clinic at a Midwestern Hospital will be impacted by this project. The Midwestern Hospital is a large, level-1 trauma center. The mission of the Midwestern Hospital is “In the spirit of Christ and the example of Francis of Assisi, the Mission of [Midwestern Hospital] is to serve persons with the greatest care and love in a community that celebrates the Gift of Life” (OSF HealthCare, 2018). The strategic plan of the

healthcare system is to align financial, technological, and human resources to the mission of the institution. All decisions should be made with the patient in mind. The goal of this project was to create infection control guidelines that optimizes the care and safety of the children seen in the pulmonary clinic. This goal parallels the Midwest Hospital's mission of serving with the greatest care.

### **Synthesis of Evidence**

A systematic literature review was utilized and Google Scholar was used to find appropriate evidence with the following search terms: pediatric infection control, pediatric pulmonology isolation, pediatric pulmonology infection control, cystic fibrosis infection control, intensive care unit infection control, and chronic illness infection control. A total of 6,793,200 articles were retrieved with the first search. It became evident that more specific search terms needed to be utilized. The search term 'guidelines' was added to all aforementioned search terms and any reference to antibiotics, therapeutic and invasive intervention, and African, Asian, and Australian based studies were removed along with all articles published before 1992. There were 102 articles remaining after this exclusion criteria was implemented. There is limited recent research on the topic of infection control and guideline development for a pediatric pulmonary clinic, so all relevant non-pediatric research was reviewed. The remaining 102 articles were reviewed, leaving 14 articles for final review.

A second systematic literature review was completed using the American Academy of Pediatric's online education database using the following search term: infection control. There were 480 articles that were available for review. All articles published before 2012 were removed. This left 128 articles for review and after removing articles not related to infection control practice or guidelines and duplicate articles, there were six articles for final review.

The evidence has been summarized and organized into the following categories: Systematic Review of Literature, Guidelines, Retrospective Audits, Quasiexperimental Design, Controlled Trials, Survey, Prospective Cohort Studies, Surveillance Study, Prospective Controlled Studies, and policy statements.

**Systematic Review of Literature.** A systematic review of literature by Cooper et al. (2004) was completed to evaluate the currently published evidence for the effectiveness of reducing methicillin resistant *Staphylococcus aureus* (MRSA) colonization in hospitalized patients. The authors specifically searched for articles describing an isolation policy for MRSA. In total, 46 studies were reviewed with 18 discussing the use of isolation wards, nine using nursing cohorts, and 19 articles describing a different or variety of different practices. Through systematic review, the authors concluded that there were a variety of major methodological weaknesses and inadequate reporting. The authors reported that these factors made it difficult to determine the actual causes of reduction of MRSA. “No well designed studies exist that allow the role of isolation measures alone to be assessed” (Cooper et al., 2004, p.1). The authors concluded that currently published national guidelines should be used until further research is completed.

Morgan, Diekema, Sepkowitz, and Perencevich (2009) completed a systematic review of literature looking at adverse outcomes associated with contact precautions. The authors recognized that infection control practices are important for patient safety and to help slow down or stop the spread of nosocomial pathogens; however, the authors also noted that patients in isolation can have worse outcomes. The authors systematically reviewed 15 studies related to adverse outcomes due to contact precautions. The authors concluded that there were four main adverse outcomes. These adverse outcomes included: less interaction with healthcare workers;

delays in care and increase in adverse events; increased depression and anxiety; and decreased patient satisfaction. The authors suggested that providers be aware of the aforementioned adverse outcomes when caring for isolated patients.

**Guidelines.** Authors Diekema and Edmond (2007) provided guidelines for the monitoring and implementation of infection control guidelines. The authors presented research and data from other studies about the importance of surveillance guidelines, the initiation of contact precautions, and the monitoring of the ongoing acquisition of pathogens. The authors also suggested to monitor and optimize contact precautions, monitor for the known adverse effects of having a patient in contact precautions, and figure out a way to properly evaluate the success of isolation protocols. The authors concluded that infection control planning and culture surveillance monitoring “should recognize the following needs: preparing the laboratory and reducing the turnaround time for screening tests, monitoring and optimizing the contact precaution interventions, monitoring and ameliorating the known adverse effects of contact precautions, and measuring important outcomes that can evaluate the effectiveness of a program of active surveillance cultures and contact precautions” (Diekema & Edmond, 2007, p. 1106).

Authors Saiman et al. (2014) released national consensus guidelines addressing infection prevention and control guidelines for patients diagnosed with cystic fibrosis. The guidelines address both inpatient and outpatient care settings and are mandatory for all cystic fibrosis centers that are nationally accredited by the Cystic Fibrosis Foundation.

**Retrospective Audit.** Authors Griffiths et al. (2005) completed a retrospective clinical audit that was initiated after a 21% increase in pseudomonas infections at a pediatric cystic fibrosis center in 1999. It was hypothesized that the increase in infection rate would lead to worse prognosis for patients. The patients from 1999 were observed and a cross-sectional study

of the 2002 clinic was performed. Strict infection control practices were put into place (the use of gowns and gloves in clinic). After the implementation of strict infection control, the epidemic strain prevalence had decreased from 21 to 14% ( $p=0.004$ ). Further research is needed to determine if other factors, such as cohort segregation, explained the decrease in person-to-person transmission.

Authors Macartney, Gorelick, Manning, Hodinka, and Bell (2000) completed a retrospective audit to determine the cost-effectiveness and cost-benefit of an infection control program to help reduce nosocomial respiratory syncytial virus (RSV) infections. An intervention was introduced that consisted of early recognition of RSV symptoms with early laboratory testing. The patients who tested positive were cohorted and put into contact isolation. Prior to the intervention, there were 88 patients who acquired RSV and after the intervention there were 60 patients who acquired RSV. This study showed that a targeted infection control intervention is a cost-effective to reduce nosocomial infection of RSV.

Authors McCaleb et al. (2016) completed a retrospective audit to describe the respiratory microbiology of children with long-term tracheostomies. A total of 93 children seen at the Arkansas Center for Respiratory Technology Dependent Children were included in the study. The audit showed that the most common organism cultured was *P. aeruginosa* with the second most common organism cultured being *S. aureus*. However, the most common organism cultured after placement of tracheostomy is *S aureus*. This study concluded that this population is at risk for acquiring pathogens and these children will bring pathogens into the hospital setting.

**Quasiexperimental Design.** A quasiexperimental study was completed by Marra et al. (2009) to examine the effect of a series of interventions to reduce the incidence of ventilator-associated pneumonia (VAP) in an intensive care setting. The study was set up over three

different phases. The first phase was from March 2001 until December 2002 and included the implementation of the Centers for Disease Control and Prevention guidelines. These guidelines included: the elevation of the head of bed, humidified routine ventilator circuits were not changed, and when heat-and-moisture exchangers malfunction (or are soiled) they are changed (Marra et al., 2009, p. 620). Phase 2 incorporated the same isolation practices but the team intervened to improve process. These interventions were not specifically discussed in the literature. Finally, Phase 3 consisted of educating all staff about the changes and asked for the changes to be implemented consistently by all staff to all patients. “The incidence density of VAP in the intensive care unit per 1000 patient-days was 16.4 in phase I, 15.0 in phase 2, and 10.4 in phase 3,  $p=.05$ . Getting to zero VAP was possible only in phase 3 when compliance with all interventions exceeded 95%” (Marra et al., 2009, p. 619). The authors concluded that reducing the rate of VAP is very complex, time consuming, and requires a variety of interventions.

**Controlled Trials.** A study completed by Marra et al. (2008) was designed to evaluate hand hygiene compliance in two adult step-down units. The study was designed with two groups. The first group (control group) was observed and the number of hand hygiene encounters were recorded. The second group was also observed with number of hand hygiene encounters recorded; however, feedback about compliance was given to the unit manager to discuss with staff. The study took place over six months. Over the course of six months, there were 117, 579 total hand hygiene encounters recorded. The authors concluded that “feedback intervention regarding hand hygiene had no significant effect on the rate of compliance. Other measures must be used to increase and sustain the rate of hand hygiene compliance” (Marra et al., 2008, p. 730).

A controlled trial completed by Stelfox, Bates, and Redelmeier (2003) was completed to see if using patient isolation practices inadvertently lead to patient neglect and errors. The main objective was to examine the overall quality of the medical care being delivered to patients that were in isolation. The study used adult patients who were isolated for MRSA at two large teaching hospitals in North America. There were two cohorts—a general cohort and a disease specific cohort with each cohort having a matched control. The patients in the study were assessed for quality-of-care measures, process outcomes, and patient satisfaction. The study found that isolated patients were twice as likely to have adverse events during hospitalization ( $P < .001$ ). Isolated patients were also more likely to complain about their care, have vital signs not taken as ordered, and not have a daily provider note. The authors concluded that “compared with controls, patients isolated for infection control precautions experience more preventable adverse events, express greater dissatisfaction with their treatment, and have less documented care” (Stelfox et al., 2003, p. 1899). Moving forward in clinical care, the authors recommended continuing to use well-designed and carefully evaluated interventions in order to provide optimal care for patients.

A randomized controlled trial was completed by Roberts et al. (2000) to assess if the transmission of respiratory infections in child care could be reduced by improved infection control procedures. The study was designed as a randomized controlled trial of infection control practices. Staff were trained on proper hand hygiene and aseptic nose-wiping techniques. The authors concluded that there is a significant reduction in respiratory illness in children aged 24 months and under using the aforementioned infection control interventions.



**Survey.** Authors Zhou, Garber, and Saiman (2008) surveyed Cystic Fibrosis (CF) Centers in the United States about written infection control policies. The study was designed to see if CF Center policy matched the published guidelines released by the CF Foundation. All 190 CF Centers in the United States received a letter requesting that a copy of written infection control policy be sent for analysis. If the Centers did not respond to the letter, the authors called or e-mailed the CF Center Director. In total, 158 CF Centers responded to the authors' request. The results showed intermittent compliance with the guidelines. For example, only 13% of respondents had a policy that stated to use bleach to clean surfaces for patients with a B. Cepacia infection. The authors noted that the study was limited. For example, the request for written policy does not assess the relative impact of specific infection control guidelines on the acquisition of pathogens. Also, the CF Foundation Guidelines may have been interpreted differently by different Centers, which could not be ascertained with the policy review.

**Prospective Cohort Study.** Montecalvo et al. (1999) completed a prospective cohort study on an adult inpatient unit. The main objective of the study was to determine whether or not enhanced infection control practices would reduce the transmission rate of vancomycin-resistant enterococci. The targeted patient population was patients 18 or older who were admitted to an adult oncology unit. The patients were split up into two groups with 259 patients receiving enhanced infection-control strategies and 184 patients receiving standard infection-control practices. The study concluded that enhanced infection-control strategies reduce transmission of bacteria in the oncology population. Specifically, bloodstream infections reduced from 2.1 patients per 1000 patient-days to 0.45 patients per 1000 patient-days. Also, colonization was reduced from 20.7 patients per 1000 patient-days to 10.3 patients per 1000 patient-days.

Cohen, Austin, Weinstein, Matlow, and Redelmeier (2008) completed a prospective observation study to compare the quantity and quality of care received by isolation patients relative to nonisolated patients. There were 65 patients that were included in the study. Of the 65 patients, 24 were isolated and 41 were nonisolated. During the study period, interactions between the medical team and the patient/family were observed. Quantity of care was measured by the amount of time a provider spent in the room and quality of care as measured by the use of the Pediatric Family Satisfaction Questionnaire. The authors concluded that there were no large differences in quality or quantity of care between patients in isolation and patients not in isolation.

**Surveillance Study.** Piza et al. (2013) completed a 12-year surveillance study to assess the frequency of multidrug resistant microorganisms that were responsible for the implementation of contact precautions in the intensive care unit. Over the 12-year surveillance period, patients were isolated for being in the ICU for more than 72 hours with intubation or tracheostomy, patients in the ICU for more than 72 hours with wounds with purulent drainage, patients referred from other institutions after more than 24 hours of hospitalization, and patients with diarrhea isolated with *Clostridium difficile*. The organisms most commonly identified on sputum culture were *P. aeruginosa*, *A. baumannii*, MRSA, and *C. difficile*. The researchers were able to show that the introduction of isolation precautions was able to reduce infection rates of the aforementioned bacteria ( $p = <.05$ ). The authors specifically recommended “the need for continued follow-up of adherence to contact precautions, preferably by trained observers, given that the factors associated with noncompliance are many and conspicuous” (Piza et al., 2013, p. 372).

**Prospective Controlled Studies.** Madge, Paton, McColl, and Mackie (1992) completed a prospective controlled study to attempt to determine the most effective way to prevent nosocomial infection with RSV. The research was completed by analyzing four units in a large pediatric hospital. In this study, all children two years old and under were swabbed for RSV within 18 days of admission. The main outcome measure was to record the occurrence of nosocomial infection, which was defined as the number of children who were initially RSV negative that became RSV positive after seven days or more in the hospital. There was a significant reduction of nosocomial infection ( $p= 0.0022$ ) after the introduction of wearing gowns and gloves for caretakers. This study concluded that the rapid identification of RSV along with the wearing of gowns and gloves can significantly reduce the risk of nosocomial infection.

Bergmans et al. (2001) completed a prospective, randomized, double-blind, placebo-controlled study looking at the prevention of ventilator-associated pneumonia by oral decontamination. In this study, 87 patients received topical antimicrobial prophylaxis in the oropharynx and 139 patients, divided over two control groups, received placebo. Baseline characteristics were comparable in all three groups. Topical prophylaxis eradicated colonization present on admission in the oropharynx and in the trachea. Topical prophylaxis eradicated colonization present on admission in oropharynx (75% in study group versus 0% in control group A and 9% in control group B patients and in trachea (52% versus 22% in A and 7% in B). Additionally, topical prophylaxis prevented acquired oropharyngeal colonization (10% versus 59% in A and 63% in B). Rates of colonization throughout the gastrointestinal system were not impacted. Incidences of VAP were 10% in study patients, 31% in Group A, and 23% in Group B patients. Overall, the authors concluded that oropharyngeal colonization is of paramount

importance in the presence of ventilator acquired pneumonia and should be considered a targeted approach to prevent colonization in this patient population.

**Policy Statements.** In 1998, the American Academy of Pediatrics released revised Centers for Disease Control and Prevention (CDC) guidelines for isolation precautions in hospitals with a strong focus on pediatrics. The guidelines provided recommendations for the use of contact, droplet and airborne isolation along with a list of diseases that automatically warrant specific isolation practices. Finally, the guidelines offered recommendations on when to use private rooms versus disease cohorting.

In 2000, the American Academy of Pediatrics released a policy statement addressing infection control in physicians' offices. This policy statement recommended that hand-washing must occur before and after every patient contact, separation of patients with infectious disease, safe handling and disposal of needles and other sharps, appropriate use of personal protection equipment, appropriate sterilization of medical equipment, and a judicious use of antibiotics. This policy standard was produced to create a uniform policy across all outpatient primary and specialty care offices.

Finally, in 2017, the American Academy of Pediatrics released an updated policy statement for infection control practices in pediatric ambulatory settings. The policy statement is fairly similar to other policy statements released by the American Academy of Pediatrics; however, the updated policy statement provides recommendations for isolation for a variety of pediatric illnesses. Also, the policy statement recommends that providers discuss isolation practices in detail, so the patient and family are aware of the policy and why it is needed. Finally, there is an updated section on general cleaning and housekeeping that addresses the need to pay

special attention to cleaning areas that children are more likely to touch (e.g. lower base cabinets).

**Critique of Evidence.** A strength of all studies was the focus on patient outcomes and the practical use of infection control in both the inpatient and outpatient patient care areas. Strengths of the systematic reviews includes the volume and variety of research including detailed analysis of the literature and practical applications for further research (Cooper et al., 2004; Morgan et al., 2009). Some of the limitations of the systematic reviews were that some studies did not include the full body of evidence (Cooper et al., 2004; Morgan et al., 2009). None of the studies discussed minority, low income, or rural patients (Cooper et al., 2004; Morgan et al., 2009), so it is unclear if these populations were included in the research. This is important information to know when assessing at-risk populations for pathogen exposure and treatment. Authors of both systematic reviews of literature (Cooper et al., 2004; Morgan et al., 2009) discussed that infection control is difficult to analyze due to the extraneous factors that may lead to the acquisition or eradication of a pathogen, the authors also recommended that more well-designed research is needed but may be difficult to complete.

Diekema and Edmond (2007) provided guidelines that used a scaffolding approach for improving infection control measures and surveillance in the hospital setting. The approach was presented in an easy to understand manner that is consistent with the goal of improving infection control practices. However, a limitation of the study was that there is no mention of how to pay for the additional recommended surveillance cultures. These cultures are expensive and can add significant cost to the patient and the healthcare facility.

Saiman et al. (2014) provided clearly written infection control practices for all cystic fibrosis centers that are nationally accredited by the Cystic Fibrosis Foundation; the recommendations from these guidelines must be included in all infection control policies.

Griffiths et al. (2004) were able to show a 7% decrease in epidemic strain prevalence after the implementation of strict infection control guidelines. The change in prevalence was statistically significant with a  $p=0.004$  which indicates the benefit of implementing infection control guidelines. The authors did not discuss any extraneous factors that may have also led to the reduction of pathogen prevalence. For example, more information about cohorting or decreased patient-to-patient exposure would have been appreciated.

Macartney et al. (2000) showed a cost savings of \$1563 per prevented nosocomial infection. This study emphasized that infection control interventions can be both easy and cost effective. While there was an initial increase in cost due to testing for RSV, the cost savings outweighed the final cost of expenditures.

The retrospective audit completed by McCaleb et al. (2016) provided insight to the microbiology of children with long-term tracheostomies. While this is great information to have, the study only followed children in Arkansas at one institution. There may be variability in microbiology depending on the location of the patient. Also, the authors recognized that there was early acquisition of organisms but did not provide guidance on how to prevent or delay acquisition of these aggressive bacterias.

Marra et al. (2009) showed how changes in infection control practice can lead to a significant decline in ventilator acquired pneumonia. One limitation to note is that this process was both time and resource consuming. It also may not be possible in larger intensive care units given the individualized focus on detail during the implementation phases.

A major limitation of the controlled trial completed by Marra et al. (2008) was that it was fairly obvious in the control group that hand hygiene observations were taking place. In theory, this should have increased the amount of people completing hand hygiene, which would have made it difficult to assess whether the independent variable has any true clinical significance. Instead of highlighting this issue, the authors simply concluded that the intervention had no significant effect on compliance.

The research completed by Stelfox et al. (2003) was interesting because there are not very many studies completed that look at the negative aspects of isolation practices. The researchers highlighted that patient care and satisfaction tend to be negatively impacted when isolation practices are put into place. This is important information to keep in mind during the development of new infection control guidelines. A limitation of the study was that the authors did not provide recommendations or guidance on how to improve this identified issue.

The research completed by Roberts et al. (2000) was significant as it was a well-designed study that showed that simple infection control techniques, such as handwashing, can have a statistically significant impact on the reduction of transmitted respiratory illnesses. The authors also noted that it is more difficult to prevent transmission of illnesses in older children as they tend to share germs more frequently than younger children (share cups, silverware, toys in mouth, etc.). The authors suggested that future research could look at the use of teaching infection control interventions with older children and seeing if there is a reduction of transmitted infection in this population.

The limitations of the survey completed by Zhou et al. (2008) were fairly significant. As mentioned in the synthesis of evidence, the study was limited because there were factors that could not be assessed through a simple survey. For example, the request of a written policy by

centers does not mean that the policy is being utilized, that the policy is working, or provide any other performance standards of that specific center.

The study completed by Montecalvo et al. (1999) was a well-designed prospective cohort study that was completed to determine if infection control practices could be used to reduce the transmission of vancomycin-resistant enterococci. This was a large study with 443 participants, which allowed the researchers the opportunity to thoroughly test if enhanced infection control measures provided benefit to the patient. One limitation that will need further exploration would be to assess how sustainable these interventions will be over time.

Cohen et al. (2008) assessed the quantity and quality of care received by pediatric patients that were in isolation or not in isolation during admission. There were several limitations to this study. First, the size of the sample does not provide the necessary power to detect small changes in time. Also, the observations were only made during morning rounds, so there is a possibility that care throughout the day was different. Finally, the data for the study was only collected during the first 48 hours of a patient's admission.

The 12-year surveillance study completed by Piza et al. (2013) was a well-designed approach to monitoring the effects of infection control precautions on ICU patients. There was a large patient population that was included in the survey and the impact of infection control considered statistically significant ( $p < .05$ ). One limitation was a need for follow-up studies as there are many factors associated with non-compliance to infection control; however, none of those factors were specifically identified.

Madge et al. (1992) completed a prospective controlled study to determine the best practice to prevent the spread of RSV. While the results were statistically significant, the authors did not discuss other factors that may have contributed to the decline in spread (cohorting,



aggressive hand hygiene, etc.). Regardless of the limitations, the study is well designed and provides guidelines for implementation in other centers.

Finally, the policy statements from the American Academy of Pediatrics provided a specific set of guidelines and recommendations for pediatric offices. These policy statements are based on expert opinion from sound clinical evidence. These guidelines provided a solid foundation for the development of pediatric pulmonology infection control guidelines.

### **Implications for Practice and Further Investigations**

Studies completed by Griffiths et al. (2004), Marra et al. (2009), Montecalvo et al. (1999), and Piza et al. (2013) suggest that there is evidence that infection control can be used successfully to care for patients and to prevent the spread of nosocomial and other infections. Successful use of infection control practices in a variety of different settings may suggest that research can be applied to a pediatric pulmonology setting as well. Studies completed by Cooper et al. (2004), Griffiths et al. (2004), Marra et al. (2009), Montecalvo et al. (1999), and Piza et al. (2013) highlighted the effectiveness of implementing infection control practices, but also emphasized the need for further research. All reviewed studies addressed the research question in an indirect fashion by discussing the pros and cons of infection control implementation. This information was synthesized and used to develop infection control guidelines that can be used in a pediatric pulmonology clinic. Medical professionals need to educate themselves on the pros and cons of infection control and evaluate current practice to see if it is optimized to provide best care for patients.

Moving forward, more studies need to be completed to address current infection control practices to help develop and/or update comprehensive infection control guidelines for pediatric pulmonology clinics. Further review of literature was completed as there were gaps in the

original review. The second review was necessary to help find enough high-quality information to create new pediatric infection control guidelines. The second literature review focused on infection control for patients with tracheostomies and an extensive review of pediatric infection control policy statements from the American Academy of Pediatrics. Completing a second review of literature provided the necessary information to properly address the PICO question.

### **Theoretical Framework**

According to the American Nurses Association, “Nursing is the protection, promotion, and optimization of health and abilities, prevention of illness and injury, facilitation of healing, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, groups, communities, and populations” (American Nurses Association, 2018). Throughout history, nursing has developed from a skill or occupation to a recognized profession. Nursing theory has been developed to help guide nurses and the nursing profession. According to Smith and Parker (2015), “On the basis of strongly held values and beliefs about nursing, and within contexts of various worldviews, theories are patterns that guide the thinking about, being, and doing of nursing” (p.7). Nurses can use theory to help guide practice, research, and improve patient relationships and outcomes. The theoretical framework that will be used for this project is the comfort theory by Katharine Kolcaba.

The initial review of literature showed that there is some resistance and discomfort by both medical staff and patients when using enhanced infection control practices as evidenced by staff and patient satisfaction surveys (Morgan et al., 2009). The comfort theory was chosen because it is designed to incorporate comfort, both physical and psychological, into everyday practice (Kolcaba & DiMarco, 2005). Comfort theory is a mid-range theory for nursing practice and research that states that comfort is essential to promote healing and overall well-being. The

theory states that “comforting interventions, when effective, result in increased comfort for recipients (patients and families), compared with preintervention baselines” (Smith & Parker, 2015, p.383). Basic comfort interventions such as room temperature and patient environment should always be addressed, but this theory also challenges the nurse to incorporate comfort into more complex interventions such as infection control.

According to Kolcaba and DiMarco (2005), in order to use comfort theory, three steps are required, “1) understanding the technical definition of comfort and its origins, 2) understanding the relationships (propositions) between the general concepts entailed in the theory, and 3) relating the general concepts to specific pediatric problems/settings in order to enlighten practice and generate research questions” (p.188). These steps were considered when creating the final infection control guidelines as these steps will provide the medical care team with some anticipatory guidance on how to best execute the infection control guidelines in a patient and family centered way that continues to meet the mission of the Midwestern Hospital of serving with the greatest care and love. The comfort theory not only aligns with the goals of creating and executing a comprehensive infection control guidelines, but it also aligns to the mission of the healthcare organization in which these patients are seen.

## **Chapter II: Methodology**

### **Needs Assessment**

Infection control measures are designed to provide protection of both patients and healthcare workers. The review of literature has shown that use of infection control practices can be used to reduce the acquisition of nosocomial infection and reduce healthcare costs.

Additionally, infection control practices can provide a concept of opportunity cost that can be used to add quantitative value such as reducing length of stay, reducing treatment burden, and increasing patient satisfaction (Graves, 2004, p.565).

A SWOT analysis of the pediatric pulmonology clinic provided excellent insight to the clinic's strengths, weaknesses, opportunities, and threats. A significant strength of the pediatric pulmonology clinic was its willingness to analyze current practice with the desire to make improvements based on best practice and empiric evidence. A weakness that has been previously mentioned was the clinic's lack of comprehensive infection control guidelines. There was a great opportunity available to the clinic to create comprehensive guidelines that will reduce or eliminate the threat of unnecessarily exposing patients, families, and staff to nosocomial infection.

A systematic review of published literature can be used to develop infection control guidelines and recommendations for pediatric pulmonology patients. The pediatric pulmonology clinic at a Midwestern Hospital did not have individualized infection control guidelines for the division. As previously mentioned, given the complexity of the patient population seen in the pulmonary clinics, a specific infection control plan can be used to help prevent nosocomial infection and ultimately improve patient care. The goal of this project was to create infection control guidelines based on the completed needs assessment. The needs assessment was

reviewed with the management team consisting of the registered nurse clinical coordinator, manager, and medical director for the department of pediatric pulmonology. With the support of the management team, it was determined that a review of current literature and best practice was needed to develop an infection control guidelines to reduce and prevent the spread of infection to these pediatric patients.

### **Project Design**

The best project design to achieve the goal of developing infection control guidelines was to design the project as quality improvement. According to Silver et al. (2016), “Quality improvement involves a combined effort among health care staff and stakeholders to diagnose and treat problems in the health care system” (p. 893). The process of working to improve patient experience and cares can be daunting as it requires the alignment of behavior change, policy change, and cooperation across multiple levels and areas of a healthcare organization. A quality improvement project provides an established set of principles, approaches, and guidelines that can be used to address the identified problem and create a process to systematically improve the identified problem.

### **Setting and Population**

The systematic review of literature was completed to create infection control guidelines for a pediatric pulmonology clinic, located in a Midwestern Hospital. The clinic primarily sees pulmonology patients ages 0-18; however, there is an adult cystic fibrosis center located in the pediatric pulmonology clinic that sees adults 18-76 years old. The clinic sees children diagnosed with chronic cough, abnormal breath sounds, congenital lung diseases, recurrent respiratory infections, empyema, asthma, allergic bronchopulmonary aspergillosis, lung nodules, cystic

fibrosis, multi-system genetic conditions, tracheostomy-ventilated patients, and other more complex diseases.

The clinic is located inside the main hospital campus. Once patients and families arrive for their appointment, they must register at one of the admitting desks (approximately a 5-10-minute walk from the main entrance). The current clinic location and registration process puts the patients at risk for acquiring nosocomial infection as the patients must walk through the hospital to arrive to clinic and must register at general admitting putting them in contact with potentially sick patients.

### **Project Plan**

A systematic review of literature was utilized to develop infectious control guidelines for pediatric pulmonology patients. A systematic review of literature was used because it is characterized as being objective, systematic, transparent, and replicable. A systematic review of literature has an “explicit approach [that] aims to minimize bias and allows readers of the review to assess the author’s assumptions, procedures, evidence and conclusions, rather than taking the author’s conclusions on faith” (Siddaway, 2014, p.1).

The systematic review of literature was completed using a seven-step process. The first step was to identify the research question. The research question was: In a pediatric pulmonology clinic (P), can a systematic review of literature of infection control practices (I) be used to develop comprehensive infection control guidelines (Co)?

The second step was to define the inclusion and exclusion criteria. Articles that were included for review were those that contained research completed on the following topics: pediatric infection control, pediatric pulmonology isolation, pediatric pulmonology infection control, cystic fibrosis infection control, chronic illness infection control, primary care infection

control, and tracheostomy infection control. All research published before 1992 was eliminated, along with all research not completed in North America or Europe.

The third step was to search for studies. By using institutional access from both Bradley University and the Midwest Hospital, Google Scholar was used to search peer-reviewed academic journals and books, conference papers, abstracts, and technical reports. Step four was to select studies based on the aforementioned inclusion and exclusion criteria.

Step five was to extract information from the included studies and record pertinent information. Step six involved making sure that the studies were properly evaluated for bias. The Cochrane Handbook for Systematic Reviews of Interventions (2017) was used to help detect potential bias. Once potential bias had been ruled out, the final step was to summarize findings, including detailed methodology (Cornell University, 2018).

Once the guidelines were developed, they were reviewed by the management team for the pediatric pulmonology clinic at the Midwestern Hospital. The management team consists of a registered nurse clinical coordinator, manager, and medical director. The clinical coordinator is a registered nurse who is responsible for the day-to-day operations of the pulmonology clinic. The manager is a registered nurse who is responsible for department policy, budgets, personnel, and resource allocation. Finally, the medical director is a board-certified pediatric pulmonologist. There was unanimous agreement to implement the guidelines, so no additional review was needed. A copy of the new infection control guidelines was sent to the Department of Infection Control at the Midwestern Hospital. Both the management team and Department of Infection Control were aware of this project and supported its development. The projected timeline for completion of guidelines and approval by the management team and infection control was August 2019.

The guidelines were also presented to the pediatric pulmonology staff for further review and critique. The audience for this presentation included three physicians, one pediatric clinical nurse specialist, five registered nurses, one medical office assistant, one respiratory therapist, and one prior authorization specialist. The pediatric pulmonology staff also unanimously approved the infection control guidelines.

Once the guidelines were officially approved and implemented, the Department of Infection Control in collaboration with the Division of Pediatric Pulmonology will review guidelines annually, per hospital policy, and discuss any potential changes or recommendations that will be needed to sustain the guidelines long-term.

### **Data Analysis**

A multi-step approach was used to analyze the data for the systematic review of literature. The first step was to summarize the data. A spreadsheet was created highlighting essential information to analyze such as author, title of study, year, intervention, comparison, and results. The spreadsheet was useful in both organizing the information and assessing quality and heterogeneity (Pai, 2013, p. 4). Next, an iterative process with constant comparative method was used to identify common themes among the reviewed literature. This was useful to help identify common practices and recommendations found throughout the published research. Finally, the data collected was summarized and used to develop comprehensive pediatric pulmonology infection control guidelines. Once the guidelines were completed, they were reviewed by the management team of the Division of Pediatric Pulmonology and the Infection Control Department. Recommendations from both teams were welcomed and changes were made as needed.



**Ethical Issues**

While there were no perceived ethical issues associated with the completion of this project, there are potential ethical issues when completing systematic reviews of literature. According to Vergnes, Marchal-Sixou, Nabet, Maret, and Hamel (2010), “The question of ethics in systematic reviews is rarely touched upon. This could lead to some drawbacks, as systematic reviews may contain studies with ethical insufficiencies, may be a possible way to publish unethical research and may also be prone to conflict of interest. Finally, informed consent given for an original study is not necessarily still valid at the systematic review level. There is no doubt that routine ethical assessment in systematic reviews would help to improve the ethical and methodological quality of studies in general” (p.771). However, there is no accepted and standardized approach to the ethical evaluation of systematic reviews of evidence. Therefore, research that has blatant violations of ethical standards and bias was not included in the systematic review of literature.

**Institutional Review Board**

The research proposal was presented to the Midwestern Hospital’s Department of Clinical Research. The research department submitted the proposal to the Institutional Review Board for a review to see if the proposal qualifies as research. The Institutional Review Board returned a letter [Appendix A] stating the proposal was deemed quality improvement and does not require Institutional Review Board approval to continue.

### **Chapter III: Organizational Assessment and Cost Effectiveness Analysis**

#### **Organizational Assessment**

Before beginning this quality improvement project, it was important to identify key stakeholders that can provide guidance and support. The aforementioned management team for the Division of Pediatric Pulmonary at the Midwestern Hospital, which consists of the clinical coordinator, manager, and medical director, were interviewed about the systematic review of literature being used to develop updated infection control guidelines. Approval was received to continue with the project and the development of the infection control guidelines. The management team agreed that an update to the infection control guidelines was needed and the management team agreed to support the project.

There were no identified barriers or risks to completing the systematic review of literature. This project was designed with the goal of creating pediatric infection control guidelines. The guidelines were disseminated to the members of the Division of Pediatric Pulmonology via e-mail as this is the established procedure for the department. The author of the project is the de facto educator for the department and will provide in person education about the guidelines and will be available as a resource to answer questions. Each staff member of the Division of Pediatric Pulmonology was met with individually and reviewed the infection control guidelines. Each new employee to the Division of Pediatric Pulmonology will also receive individual education.

There are two potential barriers with the implementation of the infection control guidelines. First, the Division of Pediatric Pulmonology has many short-term medical staff members, such as students and resident physicians. These staff members may begin to see patients before appropriate education about the infection control guidelines has been given as

there is no formalized orientation process for these staff members. It is also not required that department policies are reviewed before students and staff start seeing patients. Since there is no formalized orientation process for short-term medical staff, it was decided that a copy of the guidelines will be kept in the clinic and will be provided to all students, resident physicians, and other guests on their first day in the clinic. These guidelines will be reviewed in person by the educator and the educator will be available to answer questions. If the educator is not available, the pulmonology registered nurse will provide education on the infection control guidelines. It would be ideal to develop a policy requiring students and staff members to be educated on department infection control policy before patients are seen in clinic.

Another potential barrier is patient confusion about the new comprehensive infection control guidelines. To provide comprehensive education, all current and new pediatric pulmonology patients in the practice will receive a letter outlining the change in policy, why the changes occurred, along with contact information to speak with the educator if there are questions or concerns. The educator is also available if patients or families have questions during their visits to the pulmonology clinic. If the educator is not available, the pulmonology registered nurse will be available to provide education and answer questions.

Interprofessional collaboration was needed to successfully complete the project. As previously mentioned, partnerships with the management team and Department of Infection Control was necessary. The management team consists of a registered nurse clinical coordinator, manager, and medical director. The staff at the Department of Infection Control who will review the guidelines are two registered nurses with Board Certification in Infection Control. These two groups provided feedback that was used to revise the final infection control guidelines.

**Cost Factors**

There was no cost in completing the systematic review of literature. Access to online journals is provided by both Bradley University and the Midwestern Hospital. If the final product is to be published, there may be an associated application and publication fee. Typical fees range between \$50-\$500, but most publications offer a discounted rate for students. This fee will be paid for by the author.

The current cost for potential supplies has already been approved by the pediatric pulmonology manager. The cost of isolation gowns is \$86.47 per 100 gowns, \$6.78 per box of gloves, and \$8.77 per box of isolation masks. It is currently projected that over the course of one year that 1,000 gowns, 40 boxes of gloves, and 40 boxes of isolation masks will be needed. This will be a total cost of \$1,486.70

The guidelines developed indicated the need for dedicated stethoscopes when seeing patients in the Pediatric Home Vent clinic. This program will need six stethoscopes. These were purchased through the hospital for \$76.38 for a total of \$458.28.

The guidelines will be disseminated by the educator for pediatric pulmonology. The current hourly wage for the educator is \$32.48. Each educator session is approximately 30 minutes long. With an estimated 144 students and resident physicians during the course of one year, the cost of education by the educator will be \$2,338.56. This cost will go up as the hourly salary for the educator increases each year.

There are approximately 4,500 patients seen in the pediatric pulmonology clinic each year with 1,200 of those patients being new to the Division. Initially, 4,500 letters will need to be sent to the established patients with an additional 1,200 letters sent out each subsequent year for

new patients. The initial cost for paper, envelopes, printing, and stamps will be \$2,295 with yearly costs being \$655.71 for letters to new patients and families.

## **Chapter IV: Results**

### **Analysis of Implementation Process**

As previously mentioned, the project began with a systematic review of literature. The initial review of literature took approximately three months to complete in order to critically analyze and document the findings. The initial findings and project proposal were presented in a meeting to both the project mentor and faculty advisor. After this meeting, it was deemed necessary that another review of literature should be completed focusing specifically on pediatric infection control recommendations. The second review of literature took approximately two months to complete.

The next step of the project was to complete a multi-step approach to data analysis. A spreadsheet was created highlighting essential information to analyze such as author, title of study, year, intervention, comparison, and results. After the data on the spreadsheet was entered, an iterative process with constant comparative method was used to identify common themes among the reviewed literature. This method was useful as it helped identify common themes throughout the published research. Finally, the data collected was summarized and used to develop comprehensive pediatric pulmonology infection control guidelines.

### **Analysis of Project Outcome Data**

Once the guidelines were completed, they were reviewed by the management team and members of the Infection Control Department. There were no recommended changes made by either the management team or the Infection Control Department, but there was a request by the management team to present this data to the Division of Pediatric Pulmonology to elicit further feedback. A presentation was made on July 2, 2018 to the Division of Pediatric Pulmonology and staff members had the opportunity to ask questions and seek clarification. At this time, there

was a move by the manager of the Division to vote to adopt the guidelines as department policy. The vote to adopt the guidelines was unexpected and not initiated by the author of this project. The Division of Pediatric Pulmonology and management team voted to adopt the recommendations as department policy with an implementation date of July 9, 2018.

The pediatric pulmonology infection control guidelines [Appendix B] is composed of five main sections. These sections were developed after compiling the results from the systematic review of literature. The first section reviews the definitions of standard precautions, contact precautions, droplet precautions, and airborne precautions. It is important to formalize these definitions so all staff working in the Division of Pediatric Pulmonology have the same working definitions.

The second section of the pediatric pulmonology infection control guidelines addresses the specifics of standard precautions. Since standard precautions are designed to protect all patients, it is necessary to make sure that all medical staff understand this foundational step. The standard precautions section discusses appropriate hand hygiene, appropriate use of gloves, the use of face shield/goggles, the use of gowns, and how to properly clean exam rooms and medical equipment.

The third and fourth sections of the guidelines highlight important infection control measures to be used for cystic fibrosis patients and pediatric home vent (tracheostomy) patients respectively. These two patient populations are at great risk of acquiring nosocomial infection as well as spreading infectious microbials to other patients. These additional precautions were designed to limit the risk of new acquisition of nosocomial infection and to limit patient-to-patient spread of infectious pathogens.

Finally, the last section of the guidelines provides a list of diseases and conditions that require a specific type of isolation regardless of a patient's presenting signs or symptoms. This list was compiled from the systematic review of literature and organized in an easy-to-read manner. The list is broken down into three sections (Airborne Precautions, Droplet Precautions, Contact Precautions) with the diseases requiring isolation listed in each section. This list will help medical staff quickly determine if a patient needs to be placed in isolation.



## **Chapter V: Discussion**

### **Summary of Major Findings**

The goal of this project was to develop infection control guidelines for the Division of Pediatric Pulmonology located at Midwestern Hospital. The pediatric pulmonology clinic did not have infection control guidelines specific to the types of patients being seen in the clinic. The review of literature showed the benefits of infection control and provided the necessary data to support a change in infection control practice at Midwestern Hospital.

The most difficult part of completing the systematic review of literature was the limited literature published about pediatric pulmonology infection control. This meant that broader search terms had to be used to find relevant research. The lack of specific research meant that a significant amount of time had to be spent reviewing other types of published literature.

The project was successful as the systematic review of literature was used to create a comprehensive infection control guidelines. Additionally, the unanimous adaption of the infection control guidelines by the Division of Pediatric Pulmonology was an additional success. The development and adaptation of comprehensive infection control guidelines will hopefully not only protect the pediatric pulmonary clinic staff but its most vulnerable patients as well.

### **Limitations**

The major limitation of completing a systematic review of literature to develop pediatric infection control guidelines was the limited published research available. The inability to ethically create a randomized controlled trial limits the available literature to weaker levels of evidence. Another limitation in completing the systematic review was the initial search parameters did not provide ample articles for final review so a second review of literature with expanded search parameters was necessary. Also, not all of the reviewed literature was pediatric

specific. Due to limited available published pediatric research, research using adult patients was used for this project. Finally, another limitation is in the implementation process. As previously mentioned, there are a number of students and resident physicians who see patients in the Division of Pediatric Pulmonology. The frequent influx of new students and residents can make implementation of the infection control guidelines difficult as it will be necessary to make sure all the students and resident physicians are aware of, understand, and implement the guidelines.

### **Implications for Practice**

**Practice.** The implementation of the infection control guidelines should be sustainable in the pediatric pulmonology clinic. It is policy at the Midwestern Hospital to have the infection control guidelines reviewed by medical staff yearly. The infection control department at the Midwestern Hospital will review the clinic's compliance with the guidelines along with interviewing medical staff to elicit recommended changes. One way compliance is measured is by the Department of Infection Control's hand hygiene monitors. The hand hygiene monitors are responsible for monitoring the proper execution of infection control guidelines. If the infection control guidelines are not followed, the hand hygiene monitors file a report to both the Department of Infection Control and the Division of Pediatric Pulmonology. There are no other formalized monitoring systems in place at this time.

A challenge to sustaining the infection control guidelines would be cost considerations. The final infection control guidelines will require that the pediatric pulmonology clinic pay for gowns, gloves, and masks to be used during patient care. While this cost has been approved by current management, there is always the possibility that future management would not approve the additional costs. It should be noted that research has shown an average cost savings of \$1563 per prevented nosocomial infection (Macartney et al., 2000). This cost savings can help offset

the cost of supplies to the hospital. Future modifications to the infection control guidelines should be made based on changes in published literature, published professional guidelines, and from interviews with medical staff.

The infection control guidelines can be adapted and used in a variety of different settings. For example, the Midwestern Hospital's infection control department is reviewing the final guidelines for use in the Pediatric Intermediate Care Unit as that unit typically houses pediatric patients with tracheostomies when hospitalized. The simplicity and relatively low cost of implementation should make these guidelines easy to disseminate throughout the Midwestern Hospital or to be adapted by other institutions.

**Future Research.** Before the infection control guidelines were finalized, they were presented to a group of medical office assistants, registered nurses, advanced practice nurses, respiratory therapists, physicians, resident physicians, and office coordinators. The inclusion of these multidisciplinary team members was deemed essential by the author as the various perspectives and areas of experience were needed to gauge feedback, critique, and offer recommendations to ensure that the infection control guidelines were easy to understand, fit the needs of the pediatric pulmonology clinic, and fit the needs of both the patients and medical staff. It is recommended that further research also use an interdisciplinary model as the various areas of expertise provided by the different team members can provide a comprehensive and holistic viewpoint.

There are a number of potential research questions that can be addressed in the future. A challenge of introducing comprehensive infection control guidelines is collecting data to see if the guidelines have been effective. The idea behind infection control is to prevent a problem from occurring, which can be difficult to measure. It may be of value to do a retrospective chart

audit of the pediatric home ventilation patients to see what bacteria were cultured in the sputum and see how long post-tracheostomy patients were able to culture an organism. This baseline data would be useful to see if the implemented infection control guidelines reduce the time until the patient first acquires bacteria on tracheal aspirate.

The infection control guidelines were initially presented to the pediatric pulmonology clinic via a PowerPoint presentation. The final infection control guidelines were then disseminated via the Midwestern Hospital's e-mail system to the Division of Pediatric Pulmonology staff. Hard copies of the final guidelines are available for reference in the pediatric pulmonology clinic and a copy will be given to new staff and students. Patients and families seen in the clinic will be made aware of the new guidelines via a letter sent to their home address.

**Nursing.** Nurses play an essential role in preventing hospital acquired infections. Nurses do this by implementing evidence-based practice, but also through promoting nursing research and providing patient education. "As patient advocates, nurses are in the unique position to affect change to improve patient care standards. The nurse has many tools available to create a safe environment for patients" (RN, 2015). Nurses are often the first point of patient contact and are responsible for keeping the patient safe through implementation of standard precautions and more complex isolation practices as needed.

Advanced practice nurses need to be aware of the specific infection control precautions that patients need. An advanced practice nurse is in the unique position of utilizing results of research to provide high quality and comprehensive care. Advanced practice nurses working in various roles and settings can demonstrate leadership in infection control and prevention by using their knowledge, skills, and clinical judgement to provide safe and holistic care. The advanced practice nurse, in collaboration with their nursing and physician colleagues, can work

to initiate appropriate and immediate infection control practices to ensure the safety of both patients and caregivers.

**Health Policy.** Infection control practices are an essential part of all healthcare systems. “Infection prevention and control measures aim to ensure the protection of those who might be vulnerable to acquiring infection both in the general community and while receiving care due to health problems” (World Health Organization, 2017). Infection control measures are designed to protect both the patients and the healthcare workers. The use of infection control measures in clinical practice has been proven to reduce the acquisition of nosocomial infection and can reduce healthcare costs. Infection control practices provide safer care to the patient and family and have been proven to lead to better health outcomes.

It is recommended that all specialty clinics located at the Midwestern Hospital review the types of patients seen in the individual specialty clinics. For example, are patients with contact precautions seen in the pulmonary clinic also receiving contact precautions in another pediatric specialty clinic without comprehensive infection control guidelines? All managers and Medical Directors of outpatient pediatrics should review the current infection control guidelines and ensure that the guidelines are providing all of the necessary protections for both patients and the healthcare providers.

## Chapter VI: Conclusion

### Value

The systematic reviews of literature, guidelines, research studies (retrospective audits, quasiexperimental design studies, controlled trials, survey, prospective cohort studies, surveillance study, retrospective controlled studies), and policy statements reviewed demonstrate that infection control guidelines can be used to successfully improve patient care by reducing rates of infection. Results of research highlight the effectiveness of comprehensive infection control policies; implementation of infection control policies can both reduce costs and reduce rate of nosocomial infection acquisition. This project not only highlights the need for comprehensive infection policies in the pediatric pulmonology outpatient setting, but also demonstrates that implementation of comprehensive infection control can be done without adding significant cost or time.

### DNP Essentials

According to the American Association of Colleges of Nursing (2006), “Nursing as a practice profession requires both practice experts and nurse scientists to expand the scientific basis for patient care. Doctoral education in nursing is designed to prepare nurses for the highest level of leadership in practice and scientific inquiry. The DNP is a degree designed specifically to prepare individuals for specialized nursing practice, and *The Essentials of Doctoral Education for Advanced Nursing Practice* articulates the competencies for all nurses practicing at this level” (p.7).

The DNP Essentials are necessary for all Doctor of Nursing Practice scholarly research. The main DNP Essentials met through the completion of this project include: Essential I: Scientific Underpinnings for Practice; Essential II: Organizational and Systems Leadership for

Quality Improvement and Systems Thinking; Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice; Essential V: Health Care Policy for Advocacy in Health Care; Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes; Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health, and Essential VIII: Advanced Practice Nursing.

Essential I was met with through the systematic review of literature and subsequent iterative review of the findings. The review of literature and iterative review allowed the author to integrate nursing science to help understand the significance of infection control and development of comprehensive infection control guidelines based on sound ethics, biophysical science, psychosocial implications, organizational cost saving, and patient outcomes. Essential II was completed by the virtue of this project being quality improvement in nature. The goal of this quality improvement project was to develop infection control guidelines that would meet the needs of the patients, healthcare providers, and the larger healthcare organization. The systematic review of literature, iterative review, and professional collaboration helped achieve Essential III. This project led to the discovery of better infection control practices and the subsequent application of these new practices in the pediatric pulmonology clinic. Essential V was completed as the infection control guidelines in the clinic were changed to address the infection control deficits. This guidelines change should improve patient safety and lead to better patient outcomes. Essential VI was completed through the use of an interprofessional meeting to review proposed infection control guidelines changes and elicit feedback from interdisciplinary team members. The feedback received during this meeting was used to fine-tune the final infection control guidelines. Essential VII was completed once the proposed infection control guidelines were implemented in the clinic. The implementation of the guidelines should reduce the risk of

acquiring nosocomial infection and prevent the spread of multi-drug resistant organisms. Finally, the use of Advanced Practice Nurses in specialty and sub-specialty areas has increased as healthcare has recognized the value of having nurse practitioners in the clinical setting. It is important for Advanced Practice Nurses to engage in scientific inquiry and policy change. Essential VIII was completed through not only the completion of a scholarly project, but also through the nature of the project which asks Advanced Practice Nurses to look at his or her own clinical practice and ensure that the patient seen in clinic is provided with the appropriate type of infection control precautions to ensure safety and positive health outcomes.

### **Dissemination**

This project was disseminated in two ways. First, the final product was presented to the Division of Pediatric Pulmonology at the Midwestern Hospital. This is to ensure that all medical staff has an opportunity to review the research completed that led to the development of the final guidelines. Secondly, the Midwestern Hospital has a nursing research exposition. This project will be submitted for the nursing exposition research conference for presentation.

### **Personal and Professional Goals**

There were four personal and professional goals that were defined before the DNP Capstone project was initiated. The first goal was to conduct a comprehensive and systematic review of literature of infection control practices to determine best practice for infection control in a pediatric pulmonology clinic. This goal was completed as evidenced by the final written guideline recommendation (See Appendix C for Timeline). The second goal was to use science-based theory to review published literature to develop infection control guidelines for pediatric pulmonology patients. This goal was harder to achieve as the author had not previously used science-based theory to review published literature. A project mentor recommended using an



iterative process with constant comparative method to analyze the published research. This method was very helpful and provided a scientifically sound method of research analysis. The third goal was to analyze, synthesize, and evaluate current isolation practices and work to initiate a system level of change in the division of pediatric pulmonology. The author was surprised that the infection control guidelines were unanimously approved by the Division of Pediatric Pulmonology. Change in the healthcare system is often defined as slow and monotonous, so it was a wonderful surprise that policy change was readily embraced and implemented. Finally, the last goal was to use online learning modules and continuing education opportunities to collect appropriate and accurate knowledge to guide research and practice. This was completed through online learning modules, in vivo shadowing experiences with infectious disease providers, and attendance at national conferences.

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## Appendix A



UNIVERSITY OF ILLINOIS  
COLLEGE OF MEDICINE AT PEORIA

Institutional Review Board  
One Illini Drive  
Box 1649  
Peoria, Illinois 61656-1649

FWA 00005172

IRB #00000688

IRB #00000689

DATE: February 14, 2018

TO: Robert Lucia, MA, RN, LCPC, CT  
FROM: University of Illinois College of Medicine at Peoria IRB 1

STUDY TITLE: [1194622-1] Pediatric Pulmonology Infection Control Practices Synthesis of Evidence

IRB REFERENCE #:  
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF NOT HUMAN SUBJECTS RESEARCH  
DECISION DATE: February 14, 2018

Thank you for your submission of New Project materials for this research study. University of Illinois College of Medicine at Peoria IRB 1 has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

We will put a copy of this correspondence on file in our office.

If you have any questions, please contact Mindy Reeter at 309 680 8631 or mreeter@uic.edu. Please include your study title and reference number in all correspondence with this office.

## Appendix B

**Pediatric Pulmonology Infection Control Guidelines****Definitions**

## Standard Precautions

- Standard precautions are a set of infection control practices used to prevent transmission of diseases that can be acquired by contact with blood, body fluids, non-intact skin, and mucous membranes.
- Standard Precautions are used when providing care to all individuals, whether or not they appear infectious or symptomatic.

## Contact Precautions

- Contact precautions are used for infections, diseases, or germs that are spread by touching a patient or items in a patient's room.
- Contact precautions include gown and gloves.

## Droplet Precautions

- Droplet precautions are used for diseases that are spread through droplets caused by coughing or sneezing.
- Droplet precautions include gown, gloves, and mask.

## Airborne Precautions

- Airborne precautions are used for patients with known or suspected pathogens that are known to be transmitted by the airborne route.
- Airborne precautions include gown, gloves, and N95 or higher respirator.

**Standard Precautions**

The use of standard precautions will be used for the care of all patients. Standard precautions include:

- Hand Hygiene (washing with plain or antibacterial soap and water before and after seeing a patient. Soap can be replaced with alcohol hand gel if hands are not visibly soiled)
- The use of gloves when touching blood, body fluids, non-intact skin, mucous membranes, and contaminated items
- The use of gloves during activities involving vascular access
- The use of surgical mask or goggles/face shield if there is a reasonable chance that a splash or spray of blood or body fluids may occur to the eyes, mouth, or nose
- The use of a gown if skin or clothing is likely to be exposed to blood or body fluids
- Proper use of safety devices and disposal of all needles and sharps
- Cleaning of room with hospital approved sanitizer and allowed to dry for 1-3 minutes
- Cleaning of all shared medical equipment (pulse oximeter, thermometer, demonstration equipment) with hospital approved sanitizer and allowed to dry for 1-3 minutes

In addition to standard precaution, all patients with a temperature of 38 degrees Celsius or higher will be placed in droplet precautions.



**Care for Cystic Fibrosis Patients**

- Standard precautions on all patients (as listed above)
- All patients automatically in contact isolation (gown and gloves)
- Avoid the reuse of exam rooms until 30 minutes have passed since last patient in room and room has been cleaned
- Dedicated stethoscopes in each room
- Patient in contact precautions are not to congregate in public places including: waiting areas, playrooms, or hallways. Patients must be immediately placed in a room.

**Care for Pediatric Home Vent (Tracheostomy) Patients**

- Standard precautions on all patients (as listed above)
- All patients automatically in contact isolation and droplet isolation (gown, gloves, and mask)
- Avoid the reuse of exam rooms until 30 minutes have passed since last patient in room and room has been cleaned
- Dedicated stethoscopes in each room
- Patient in contact and droplet precautions are not to congregate in public places including: waiting areas, playrooms, or hallways. Patients must be immediately placed in a room.

**Special Populations**

- Airborne precautions
  - All patients with a diagnosis of measles, varicella, or tuberculosis will be in airborne precautions in addition to standard precautions.
- Droplet precautions
  - All patients with a diagnosis of invasive *Haemophilus influenzae*, invasive *Neisseria meningitidis*, diphtheria, *Mycoplasma pneumoniae*, pertussis, streptococcal pharyngitis (in children less than 5 years old), adenovirus, influenza, mumps, Parvovirus B19 or rubella will be in droplet precautions in addition to standard precautions. All patients with a temperature higher than 38 degrees Celsius will be in droplet precautions.
- Contact Precautions
  - All patients with a diagnosis of *Clostridium difficile*, cutaneous diphtheria, herpes simplex virus, impetigo, major noncontained abscess, pediculosis, scabies, staphylococcal furunculosis or viral/hemorrhagic conjunctivitis will be in contact precautions in addition to standard precautions.

Appendix C

Project Timeline

August 2017

Determined Project Site and Preceptor

September 2017

Began Literature Review

Began Synthesis of Evidence

Described Gap in Knowledge to Research

PICo Question Written

October 2017

Initial Scholarly Project Plan Submitted

CITI Training Completed

Outlined Synthesis of Evidence

November 2017

Completed Initial Synthesis of Evidence

January 2018

Completed Competency Assessment for Practicum Design

Submitted Practicum Plan of Activities

Submitted Scholarly Project Proposal I

Scheduled Scholarly Project Proposal Defense

February 2018

Completed Scholarly Project Proposal II

Submitted IRB Application

March 2018

Completed Scholarly Project Proposal III

April 2018

Completed Competency Assessment for Practicum Design

May 2018

Completed Practicum Plan of Activities

Continued Systematic Review of Literature

June 2018

Completed Systematic Review of Literature

Completed Synthesis of Evidence

July 2018

Finished Project Recommendations Presented to Pulmonary Clinic

Policy Recommendations Implemented

Final Paper Sent for Proofreading

Final Paper Submitted to University