Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections

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Abstract

Antibiotic overprescription remains one of the major problems in modern healthcare. Unnecessary orders for antibiotics lead to a variety of health problems, including Clostridium difficile infections, allergic and adverse reactions, and antibiotic resistance; they also increase healthcare costs for prescriptions and further follow-up appointments. It is also not uncommon for clinicians to experience pressure from their patients for antibiotic prescriptions for such health conditions as bronchitis or the common cold. Despite these facts, physicians and other healthcare practitioners continue to overprescribe antibiotics. The project expounds on antibiotic stewardship for acute respiratory infections in nursing homes. This problem is not new, and has been addressed by the Centers for Disease Control and Prevention (CDC). One of the means to address this serious problem is with the help of a C-reactive protein test (CRP). The CRP is a sensitive test, and elevated levels of this protein may indicate an inflammatory process within the human body. Reduction in antibiotic prescriptions for acute respiratory infections can be achieved by performing a C-reactive protein test before potential order for antibiotic therapy. Currently, in most skilled nursing facilities, obtaining a CRP is not a common practice. During the implementation stage of the project, the project was presented to clinicians along with the pretest and posttest. This project argued that in the long-term goals, utilization of the C-reactive protein test will significantly reduce antibiotic therapies for acute respiratory infections. Results of the project indicated that the CRP guidelines can make a difference in clinicians' decision-making for prescribing antibiotics for acute respiratory tract infections

Keywords: C-reactive protein, acute respiratory tract infections, provider education, patient, diagnosis, laboratory test, skilled nursing facility.

Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections

Chapter One: Introduction and Overview

Over the past few decades, new, dangerous infectious diseases emerged that presented global concern for millions of people around the world (Mukherjee, 2017). Acute respiratory tract infections (ARTIs) such as avian influenza, severe acute respiratory syndrome, and others remain to be major health problems worldwide. The World Health Organization (WHO) has developed a list of such infectious conditions that is being updated annually (Mukherjee, 2017). Some infections are naïve and do not require medical attention as they resolve on their own. However, other health problems require immediate medical intervention and consequent aggressive treatment. The outbreak of the novel coronavirus disease 2019 (COVID-19) that caused a global pandemic significantly aggravated health conditions in those people who required medical attention. Until this day, for example, scientific communities do not possess sufficient knowledge related to the effects of COVID-19 on patients with certain cardiovascular illnesses such as cardiac arrhythmia, heart failure, and ischemic heart disease (Yang & Jin, 2020).

Some health problems that are harmless or easy to treat in otherwise healthy patients can present dangerous and sometimes lethal health conditions for patients with comorbid cardiovascular conditions. It is not uncommon that patients with chronic illnesses and healthy individuals are frequently misdiagnosed when it comes to infectious diseases (Aman et al., 2021). Imagine a quick, inexpensive, and sensitive test that would help a clinician to differentiate between viral and bacterial infectious conditions and further contribute to a potential reduction of antibiotic overprescription practices. The CRP laboratory test can assist providers in reducing the

number of misdiagnosed health conditions. Such seemingly insignificant positive effects may contribute to a dramatic drop in antibiotic resistance cases as well as relevant drug prices.

Background of the Project

Various infectious illnesses, particularly ARTIs, can be triggered by many different bacteria and viruses, which, in its turn, can cause various illnesses, such as influenza, common cold, bronchitis, pneumonia, and respiratory distress syndromes (Thomas & Bomar, 2021). The similarity in their causes and commonly overlapping presentations may contribute to difficulties in outlining the correct diagnosis; for example, ARTIs may impact large airways, larynx, pharynx, sinuses, and nose (Thomas & Bomar, 2021). Prescription of correct antibiotic treatment for these abdominal infections is not always a straightforward process, as these colonies can represent a mixture of aerobic and anaerobic bacteria (Mikamo et al., 2016). In outpatient healthcare settings, such as the emergency department and primary or urgent care, respiratory tract infections account for more than 30 percent of all diagnoses, with an estimated annual cost of more than 20 billion dollars (Thomas & Bomar, 2021). Health problems related to infections contribute to school and work absenteeism, especially during the fall season, during which clinicians observe a spike in the number of cases caused by the rhinovirus. Whether it is a visit to primary care facility or an inpatient rehabilitation skilled nursing facility, patients seek relief from the symptoms.

In skilled nursing facilities, practically 50 percent of all acquired ARTIs are of viral origin (Masse et al., 2017). These respiratory pathogens include influenza A, influenza B, metapneumovirus, and respiratory syncytial virus (Uršič et al., 2016). Higher fever, more than 38 degrees centigrade, is not always an indicator of bacterial infection (Masse et al., 2017). In most of all cases of ARTIs in skilled nursing facilities viruses are being detected (Uršič et al., 2016).

With CRP tests, patients' outcomes can be significantly improved when it is used to rule out the disease and identify those clients who will benefit from further interventions, such as withholding, stopping, or modifying treatment options. In primary care settings as well as inpatient healthcare facilities, providers frequently depend on laboratory testing results that are expected to be reproducible, reliable, and accurate. For many health concerns, patients and providers alike increasingly expect specialized, patient-focused diagnostic tests that can be performed quickly, easy to operate and rapidly provide results. There is a new trend with modern laboratories that can provide CRP results within hours of taking a blood sample from the patient.

CRP is a protein synthesized by the liver with proinflammatory and anti-inflammatory properties whose level rises in response to inflammation (Nehring et al., 2022). CRP is primarily induced by the IL-6 action on the gene responsible for CRP transcription during the acute phase of an inflammatory or infectious process (Nehring et al., 2022). CRP levels rise with the onset of an inflammatory stimulus and rapidly fall when the stimulus is removed. In chronic conditions which can be infectious or non-infectious in etiology, such as asthma, COPD, and arthritis, persistently elevated CRP levels can be seen. In contrast, medications such as non-steroidal anti-inflammatory drugs, statins (Nehring et al., 2022), and metformin can decrease CRP levels (Karbalaee-Hasani et al., 2021). The test is indicated when the clinician suspects acute or chronic inflammation or infection. CRP does not require fasting and is taken from a peripheral blood specimen. High-sensitivity CRP methods are recommended for more precision, using immunoassays and laser nephelometry to quantify the levels (Nehring et al., 2022).

This practice can improve clinical operations and patient satisfaction because it eliminates long waiting periods between initial testing and the availability of laboratory results; however, in an overwhelming majority of these cases, clinicians end up prescribing unnecessary

antibiotic treatments (Thomas & Bomar, 2021). The purpose is to observe if CRP testing is used to determine the antibiotic prescription.

Determining the Need for Antibiotic Treatment

Unfortunately, in daily general practice, misdiagnosis of common viral acute respiratory conditions has been reported on multiple occasions (Yusoff et al., 2021). Clinicians who work in primary and urgent care facilities encounter patients with multiple gaps in medical history on file, or any history and physical assessments are entirely absent. This applies more to outpatient healthcare settings. This fact contributes to misdiagnosis, consequently, wrong treatment. Immunocompromised patients fall in the category of particularly susceptible populations to which such medical errors can cause devastating outcomes (McNulty et al., 2018). There can be multiple causes for misdiagnosing acute infections. One of the common reasons is that community-acquired pneumonia signs and symptoms, for example, resemble other respiratory conditions, such as bronchitis, influenza, Legionnaires' disease, chronic obstructive pulmonary disease, and tuberculosis.

For example, approximately five percent of adults present with symptoms of acute bronchitis every year in the United States; in fact, bronchitis is among the top ten most common illnesses among patients that visit primary care facilities, which contributes to almost ten million of its visits yearly (Singh et al., 2021). This respiratory condition has a tendency to follow common viral diseases that occur mostly during the flu season. The most common pathogens for acute bronchitis are rhinovirus, parainfluenza, influenza virus A and B, respiratory syncytial virus, and other similar viruses (Singh et al., 2021). This condition is typically self-limited and can be managed with pharmacological as well as nonpharmacological therapies. In standard guidelines for the treatment of acute bronchitis, the American College of Chest Physicians

recommended against antibiotic therapies in cases of uncomplicated acute bronchitis in healthy adults (Singh et al., 2021). One study concluded that utilizing tests that can detect inflammation markers, such as procalcitonin or CRP, can improve outcomes and significantly reduce antibiotic overprescription practices (Schuetz et al., 2018).

Overprescribing

In the current workplace, antibiotics for ARTIs are being prescribed based on symptoms. The CRP is not being utilized as an adjunct tool and management of ARTIs. As a result of acute infection assessments in skilled nursing settings, up to 40 percent of outlined treatments signify antibiotic prescriptions (Barlam et al., 2016). In various healthcare care settings, antibiotics are commonly prescribed for such viral ARTIs as common cold, nonspecific upper respiratory tract infections, and acute bronchitis (Barlam et al., 2016). Such excessive prescription of antibiotic regimens negatively contributes to the cultivation and transmission of antibiotic-resistant bacteria, consequently increasing the cost of healthcare services (Li & Webster, 2018). Patients who unnecessarily take antibiotics are putting themselves at risk for allergic reactions, significant adverse effects of antibiotics, or *Clostridium difficile* infection (Brown et al., 2021). In addition to those mentioned above, there are multiple additional reasons that contribute to the over prescribing of antibiotics. One study indicated that patients who pay out-of-pocket during the visit to a primary care physician are more likely to receive an inappropriate prescription for antibiotic therapy; in contrast, privately insured patients are more likely would not be prescribed antibiotics for their respiratory conditions (Barlam et al., 2016). This fact prompts the hypothesis that patients who pay cash for a visit are most likely uninsured, which means they would rather follow the less expensive route and ask for antibiotics rather than purchase costly pharmaceutical products for symptomatic relief. This type of patient is prone to pressure clinicians to prescribe

antibiotics. Another reason for inappropriate antibiotic prescription practices is low health literacy (Barlam et al., 2016). Overprescribing antibiotics is primarily related to communities with fewer college-educated individuals (Burstein et al., 2019). One of the critical interventions for these communities is educational opportunities which are considered to be one of the deciding factors in achieving desired health outcomes. To this end, a coordinated educational effort should be provided to underserved communities and to communities where patients have limited access to educational institutions. Options for learning and education within the communities typically result in good health outcomes and essential components of communities' overall health (Burstein et al., 2019). Providers should consider engaging resources in modern technology and Internet-based innovative training that can potentially help patients decide when to see a medical provider.

Statement of the Problem

ARTIs commonly occur around the entire calendar year at skilled nursing facilities. Typically, for adult patients without comorbid conditions presenting symptoms are usually loss of appetite, fatigue, fever, periodic chest pain, and cough; however, the elderly have different signs and symptoms of ARTIs and may include abdominal pain, nausea, headache, and absence of fever (Grief & Loza, 2018). Evidence-based practice indicates an array of local bacterial and viral pathogens that may be responsible for those respiratory conditions. Scientific medical communities are also aware of resistance profiles and antibiotic susceptibility of common ARTIs, and therefore physicians frequently treat such conditions empirically. Since the elderly population typically has vague symptoms of respiratory conditions, it is often challenging to draw a distinct line between bacterial and viral ARTIs. Diagnostic testing is also limited to ordering chest x-rays but not in every case-scenario. These elderly patients are typically treated

with oral antibiotics in skilled nursing facilities. Such antibiotic therapies are often unnecessary because, in most cases of ARTIs these conditions are of viral origin. With the utilization of CRP tests as an adjunct to diagnostic decision-making, the rate of antibiotic prescriptions dramatically decreases, which triggers sequalae events that benefit physicians and patients in the skilled nursing facilities, such as reduction of community-resistant antibiotics, reduction of medication costs, and improvement of diagnostic accuracy.

Antibiotic overuse contributes to adverse drug effects, increased costs, and antimicrobial resistance (Schwartz et al., 2021). Antimicrobial resistance is now one of the significant urgent threats to public health, causing serious issues to the successful prevention and treatment of persistent diseases and contributing to high healthcare costs caused by an increase in hospital admissions and drug usage. Error in diagnosing a health problem can be minimized or eliminated when objective tests are utilized (Kavanagh et al., 2019). Challenges in diagnosing the problem include underdiagnosis, overdiagnosis, or misdiagnosis. Issues of misdiagnosis are more challenging to detect and address, but they are equally concerning when considering the potential risk to the patient when treatment is inadequate. Misdiagnoses can lead to antibiotic overprescription practices, which in its turn may result in rising antibiotic resistance problems and increasing costs and efforts in the process of finding alternative ways of treatment and drug options.

The consequences of ill-prescription practices, antibiotic resistance, and more aggressive treatment can affect patients' overall quality of life and health status. The COVID-19 pandemic has complicated healthcare organizations and service delivery. Poor management of ARTIs can result in extensive symptom duration, increased number of days with limited activity, negative impact on missed workdays, increased rate of hospitalizations, and an increased number of

adverse events (McDonagh et al., 2018). Additionally, the overprescription of antibiotics is closely related to an increased incidence of antibiotic prescriptions for self-limiting conditions and frequent hospital readmissions with the same diagnosis. In primary care, antibiotic overprescription practices present a major problem because most of the ARTIs, for example, happen to be of viral origin.

This project also argues that the CRP test represents a diagnostic tool to help clinicians outline the correct diagnosis and improve management of antibiotic overprescription practices and acts as a psychological factor when educating the patient about their respiratory condition. Patients frequently create significant pressure on clinicians to prescribe antibiotics. Should their health condition be of viral origin, by having CRP results on hand, the clinician can present additional justification of the diagnosis to the patient, thus providing additional reassurance. Identification of experiences of healthcare providers will help to summarize their practice experiences and potentially create guidelines for practice improvement.

The Doctor of Nursing Practice (DNP) project performed a medical record review two weeks prior to the implementation of the DNP project to evaluate the use of the CRP test as a tool in prescribing antibiotics for ARTIs among healthcare providers. During the six weeks, the DNP student identified whether antibiotics were prescribed based on respiratory symptoms or in conjunction with CRP test guidelines for the management of ARTIs. Consequently, CRP testing provides an opportunity for increased cost-effectiveness, reduced antibiotic resistance in skilled nursing facilities, and greater satisfaction with care.

Purpose of the Project

The CRP laboratory tests for patients with suspected infectious health conditions were already included in clinical guidelines in many European countries (Huddy et al., 2016). This

protein marker helps determine the extent of inflammation and severity of infection. Although CRP is a nonspecific test as it does not directly pinpoint the affected area, it can provide an important finding about the person's inflammatory response in the system. This DNP project was implemented to observe CRP laboratory testing on patients admitted to the skilled nursing facilities who were diagnosed with a respiratory infection within a six weeks time frame. The project aimed to describe the practices in prescribing antibiotics in ARTIs using CRP tests and practices based on the clinical symptoms. The current standard practice in the skilled nursing facility is to prescribe patient antibiotics for ARTIs based on signs and symptoms and sometimes chest x-ray results. During the implementation of the project, clinicians were informed to consider ordering CRP tests before prescribing antibiotic therapies. In other words, clinicians will order CRP tests as part of a workup for the ARTIs.

This DNP project also aimed to decrease inappropriate prescribing practices for the treatment of respiratory infections, such as nonspecific upper respiratory tract infections, acute bronchitis, including influenza A, influenza B, metapneumovirus, and respiratory syncytial virus, by encouraging change in practice behavior supported by evidence that the CRP test is reliable. The goal was to focus on optimizing the antibiotic prescribing behaviors among the physicians promoting the use of the recommended guidelines for performing a CRP test prior to prescribing antibiotics for respiratory symptoms. Currently, the facility providers are ordering CRP tests secondary to COVID-19. Using the recommended guiding principle for interpreting CRP test results, if CRP levels were less than 20 milligrams/Liter (mg/L), the recommendation would not be to offer antibiotic therapy; CRP levels between 20 mg/L and 50 mg/L constitute continued monitoring, while CRP concentration greater than 50 mg/L, would mean initiation of antibiotic therapy (Huddy et al., 2016). The individual laboratories may determine their own

measurement scale; for example, CRP values from zero to five would be considered normal and above five elevated.

Research Question

Will following the CRP guidelines make a difference in clinicians' decision-making for prescribing antibiotics for acute respiratory tract infections?

PICOT (provider, intervention, comparison, outcome, time) Question

P – Providers in a skilled care facility with prescriptive authority.

I – The use of CRP guidelines for decision-making when prescribing ATB for ARTIs.

C – Presentation of CRP guidelines and comparing them with current practices.

O – Using CRP in decision-making for prescribing antibiotics.

T – Six weeks.

Theoretical Framework

The chosen theoretical framework for this DNP project is the Theory of Planned Behavior (TPB). In the late 60s, Martin Fishbein and Icek Ajzen developed the Theory of Reasoned Action (TRA). In 1977, these authors printed yet another solid scientific research where the described attitude-behavior relations. In it, they found that people's actions are consistently and directly related to their attitudes (Ajzen & Fishbein, 1977). They also outlined that the researchers are most likely to see consistency in predicted behavior if links between behavior and attitudes obtained through correspondence with respect to action elements and the target (Ajzen & Fishbein, 1977). In 1985, the TPB was developed on the foundation of the TRA and added one more element that represents control beliefs. These are beliefs about factors that impede or facilitate the performance of the contemplated behavior (DeNicola et al., 2016).

For many years various scientific healthcare communities, along with social psychologists, were working, attempting to influence the attitudes of physicians to elicit certain behaviors that would benefit clinical environments, safety protocols, and outcomes of treatments (Glasman & Albarracín, 2006). For example, a workshop, a dialogue with the clinician, or other learning options outlining the benefits of CRP tests to differentiate bacterial versus viral respiratory conditions can increase the chances that medical professionals will choose this route to address the misdiagnosis of ambiguous health conditions that consequently contributes to rising antibiotic resistance within the communities, increased healthcare costs, and over prescribing problems. However, emphasizing pro-CRP attitudes, on the other hand, does not guarantee that medical practitioners will choose to order CRP test prior to prescribing antibiotics. For this reason, scientists outlined criteria that make attitudes predict behaviors (Glasman & Albarracín, 2006). Current and past research studies indicate that people's attitudes that they hold with certainty can predict related behavior with better accuracy than those that people distrust (Fishman et al., 2021). For the attitudes to predict behavior more accurately, they must be rather decisive than internally inconsistent or ambivalent. In the same manner, memorable attitudes can better predict behavior than attitudes that are hard to recall. It is also a well-known fact that knowledge achieved during direct experience can elicit greater bonds and consistency between attitudes and behaviors than those based on indirect experience (Zarolia et al., 2017).

To develop a deeper understanding of interactions between the behavioral intentions of the practitioners and their consequent actions, in terms of ordering CRP tests before the initiation of antibiotics, the TPB was applied as the conceptual framework. The TPB represents a breakthrough in the world of root-cause analysis between patients and clinicians. This theory is a particular case of the TRA that, on top of common values with the TRA also includes behavioral

control as an additional determinant of behavior and intentions. The TPB's mechanisms are vividly shown in the current COVID-19 pandemic situation in which government authorities in many counties and cities encourage local communities to uphold preventive health behaviors in an attempt to minimize the spread of the virus (Wollast et al., 2021). One can find many scientific sources in modern literature that investigate and describe psychological factors that influence the health behaviors of healthcare providers while they prescribe certain treatments or laboratory tests. However, there is an apparent deficiency in scientific resources that would perform cross-national research focusing on the health behaviors of providers. For example, the results of a comparison study conducted in Belgium and France between residents during the pandemic indicated that higher intentions, increased perceived control, greater social norms, and more positive attitudes were directly related to the limitation of social contacts and close adherence to hand-washing protocols (Wollast et al., 2021). Ultimately, this project argues that the TPB model has a tendency to display similar results within the communities of healthcare providers when identifying reasons for CRP prescriptions for patients with viral and bacterial infections. Reliance only on laboratory values cannot substitute live, in-person assessment of a patient.

Significance of the Project

The importance of including the CRP test as a decision-making tool cannot be overstated. Both in primary care and in inpatient units, it represents the most studied biomarker for distinguishing viral versus bacterial infections in symptomatic patients. The CRP can also be viewed as an adjunct tool in an attempt to minimize antimicrobial resistance. This test is also being used in skilled nursing facilities because it can provide positive predictive value as an

adjunct to differential diagnosis. The CRP test can be especially beneficial in nursing homes, assisted living, skilled nursing facilities, and other settings with limited financial revenues.

For example, in well-known, underserved, and remote areas in the United States, the incorporation of such tests would be an invaluable asset to local tribes and communities. This test can be easily set up in small mobile clinics, which can change geographical location as needed, driving from one problem area to another. After all, this is what medical practitioners should do. This test should be made affordable and accessible in certain areas to increase patient compliance and adherence to treatment. Conveying CRP results to patients at the time of appointment generally results in greater patient compliance with advised antibiotic treatment and a greater understanding of their health condition (Haenssgen et al., 2018). Upon implementation, this test should minimize treatment-seeking behavior and reduce the pressure healthcare workers experience from patient demands, clinicians' superiors, and hospital guidelines and policies (Haenssgen et al., 2018). The CRP test may positively impact numerous tactics and practices involving prescriptive antibiotic practices, clinical guidelines, and patients' implicit and explicit demands. The CRP test also manifests the provision of additional information to a patient. It is important to note that this test is not intended to be the ultimate decision-making tool but should serve as additional information for physician information and patient education.

The social role of the CRP test also cannot be underestimated. Depending on what country the CRP test concept is being implemented, the researchers should take into consideration the treatment-seeking behavior of the local population. In many European and Asian countries, many antibiotics are available over the counter for purchase. The mechanism of action of antibiotics is frequently misinterpreted and misunderstood by consumers. Antibiotics are frequently perceived as “anti-inflammatory drugs;” therefore, people use them frequently for

such conditions as sore throat or muscle pains which can be perceived as one of the forms of bodily inflammation (Haenssgen et al., 2018). Therefore, education should be provided as appropriate in such cases. Periodic workshops, online conferences, pamphlets and booklets, PowerPoint presentations, and input from medical providers are just a few tools to provide local communities with learning opportunities. During the research process, one study related the response from nurses and primary care providers. The researchers noted that this additional information that the CRP test represents is frequently better than any verbal explanations about the significance of the results (Haenssgen et al., 2018). Undoubtedly, this test would allow supplemental information that can help evaluate the patients faster by providing objective readings. The CRP test does not only provide diagnostic laboratory data. This test can be viewed as a new, supplemental tool within the circle of holistic care that can help to reduce the uncertainty that healthcare workers and patients experience during encounters. In today's world, healthcare in the United States experiences uneasy times in which approximately 30 million Americans remain to be uninsured (Wilensky, 2018). For this and many other reasons, such as limited public health care access, social obstacles, and economic and logistic challenges, uninsured patients are increasingly seeking unconventional private practitioners that can provide certain unconventional medical services. These healthcare-seeking patterns can lead to unnecessary prescription of antibiotics and consequently increase antibiotic resistance cases within the communities. The following listed elements were the anticipated and intended outcomes for the CRP test (Haenssgen et al., 2018):

1. It may serve as an additional tool for healthcare providers to convince patients of prescription or non-prescription of antibiotic therapies.
2. Diagnostic assistance for healthcare providers.

3. May promote positive behavioral shifts in antibiotic prescription patterns among healthcare providers.
4. Facilitates increased compliance with medication regimen or its absence.

One of the long-term goals for skilled nursing facilities was to integrate the CRP test into the daily practice with the intention to positively and effectively alter existing medical practices, increase the social status of primary care clinics, reinforce the confidence of healthcare providers, and earning patient trust that can address potentially risky health behaviors (Haenssgen et al., 2018). In many cases, interviewed patients reported that the CRP test was convenient, comfortable, and provided useful information (Eley et al., 2020). The adaptation of the CRP test into daily clinical care requires clear goals, development of guidance, a practice action plan, and training healthcare providers who have encounters with patients eligible for this diagnostic marker.

Nature, Scope, Limitations, and Delimitations of the Project

This project aimed to investigate, retrospectively, if CRP was used to manage any respiratory infection in patients with respiratory symptoms admitted to the skilled nursing setting. The data were collected using the patient's electronic medical record called "PointClickCare" (PCC). Several variables were used to identify the patients that will be included in the data collection for this DNP project. The process included choosing patients who were prescribed antibiotics; such as Zithromax, Augmentin, penicillin's class, and others related to the treatment of ARTIs; CRP testing under laboratory studies; diagnosis of respiratory infection, such as pneumonia, bronchitis, COVID-19, laryngitis, and respiratory syncytial virus.

- The scope of the project included six weeks of data gathering from the medical records of patients over 50 years of age who had CRP testing performed for ARTIs. The assessment

included an examination of the medical database for antibiotic overprescription practices and relevant test or laboratory orders. The scope also included a presentation to clinicians about the CRP guidelines. A pretest and posttest provided data about the clinicians' knowledge, attitudes, and behaviors.

- Limitations of this project included a brief six weeks time period. Collected data were restricted to the medical records from a skilled nursing facility. The results of the project cannot be applied to the general population. Specific limitations, such as allergies or chronic airway diseases, can be applied in those instances because certain conditions may influence CRP levels and interfere with the diagnosis of acute respiratory infections.
- Delimitations - this project did not consider the review of medical records of those patients who were admitted to the skilled nursing facility during the implementation time with an active diagnosis of ARTI. The medical records of patients who were diagnosed with asthma, chronic COPD, or any other chronic respiratory conditions, because of the potential for false positive CRP results in those who are 49 years of age and younger, were not considered.

This test should be performed on adults who present with various respiratory symptoms. The time window for the research is limited to six weeks. Some limitations in this research may be applied to CRP results that are falsely elevated due to underlying inflammatory conditions, such as asthma. Such results were not taken into account. Medical records of patients with a hospital admission within 30 days were excluded from this study to minimize potential cases of hospital-acquired ARTIs. Experiences of healthcare providers in relation to CRP tests are to be determined in the health care settings that are known for existing antibiotic-related practices. Since this test may be carried out by different laboratories, the value of quality assurance

practices may not be followed at all times resulting, for example, in non-compliance with equipment maintenance procedures (Erasmus et al., 2021).

DNP Essentials

DNP essentials, such as scientific underpinnings for practice, clinical prevention, and population health for improving the Nation's health, were addressed in the project.

DNP Essential I

Scientific underpinnings of CRP test utilization are essential for skilled nursing facilities. The integration of nursing science with biophysical science has become one of the crucial parts of modern healthcare. An informed understanding of CRP indications of physiological processes is an important step in developing treatment plans that would further improve the outcome of ARTIs and minimize the risks of aggravation of health conditions.

DNP Essential II

This DNP project will distinctively contribute to the current medical practice related to the treatment of ARTIs in skilled nursing facilities by translating, evaluating, and disseminating findings into practice. Essential skills for practitioners should incorporate designing evidence-based interventions based on clinical practice guidelines and evaluation of practice outcomes. In reflection of this essential, this project emphasized quality improvement measures in relation to antibiotic stewardship.

DNP Essential VII

Clinical prevention and population health are vital for other DNP Essential that is critical for health improvement not only in local communities but the Nation’s health (Mager & Moore, 2020). It is important to focus the efforts of applying evidence-based practice to practical applications in various nursing facilities. Healthy People 2030 represents a national health

initiative, and its stated most recent stated goal reflects on designing policies for improving health and well-being, engaging in public across multiple sectors, key constituents, and leadership (Mager & Moore, 2020).

Conclusion

Antibiotic mismanagement presents a serious problem for vulnerable populations in skilled nursing facilities. Various viral ARTIs can display ambiguous signs and symptoms and consequently be perceived as bacterial infections. The CRP test is an inexpensive laboratory test and readily accessible test with results available as soon as the same day, and that can help the clinician in ambiguous situations in which presenting symptoms of ARTIs can be perceived as either bacterial or viral infection. Utilization of CRP test results in increased diagnostic accuracy, reduction of antibiotic prescriptions, reduction of associated costs, decreased antibiotic resistance in skilled nursing facilities, and greater patient satisfaction with care.

Chapter Two: Literature Review

This chapter will review the major characteristics of CRP and its physiological functions. The search strategy for the relevant literature will be described. The conceptual framework of the theory will be explained and presented in a table format. Finally, related studies will list and describe major correlated scientific studies and research.

Search Strategy

The search for the related literature and scientific works was conducted primarily using PubMed's (Public Medical Literature Analysis and Retrieval System Online) advanced search builder. Keywords from the PICOT question were typed into the query box, and the "Search" button was changed to "Add to History" using the drop-down menu on the right-hand corner of the button itself. By doing so, all consequent searchers were recorded on PubMed's website. To access the results from the history section, the user should click on the hyperlink that indicates the numerical value of the results for the research papers. There will be multiple filters on display on the web page. The user can filter the results by publication dates, article types, languages, and many other settings. The next seven paragraphs will outline major findings in existing similar scholarly activities and discussion of prior studies.

It is important to provide major characteristics of CRP, its functions within the body, and potential ways for utilization of this test. Tillet and Francis discovered this protein in 1930 (Kaur, 2017). The liver typically synthesizes this protein; however, also by endothelial cells, adipocytes, lymphocytes, macrophages, and the smallest muscle cells (Sproston & Ashworth, 2018). Within the body, at sites of inflammation or infection, CRP can be found elevated up to a thousand times more than a normal level (Sproston & Ashworth, 2018). There are a few factors that can influence CRP levels, and clinicians should take them into consideration to avoid false-positive

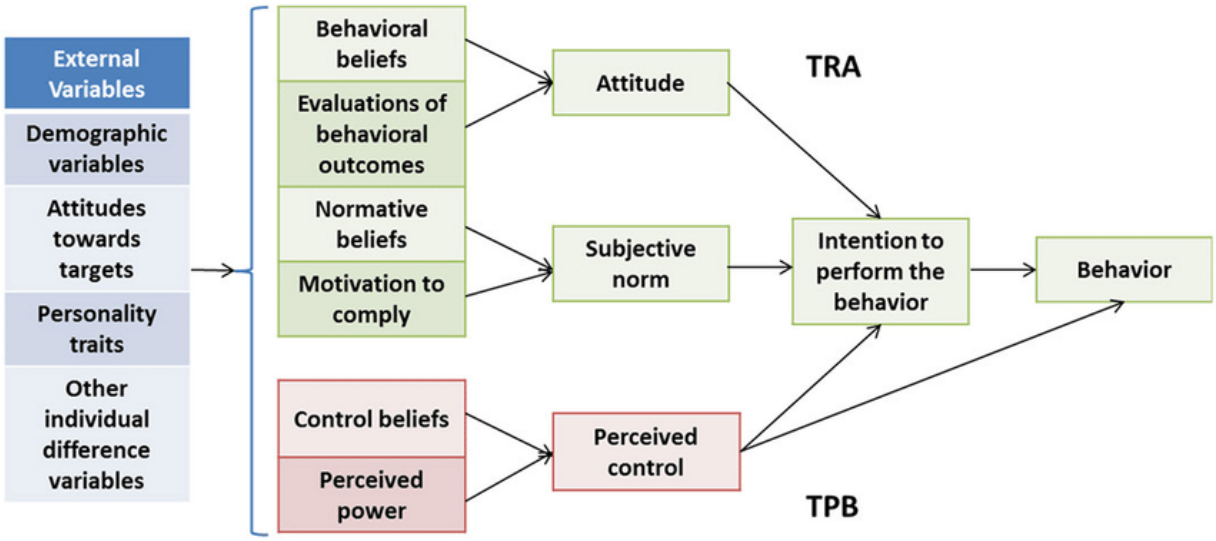
readings. Since the liver plays a major role in synthesizing CRP, incoming patients should be assessed for liver failure and other liver problems before performing the test. Another ongoing research indicates that CRP levels can be increased in postmenopausal women that are going through oral hormone replacement therapy (Shin et al., 2019). This fact should alert clinicians to be cautious in suggesting hormone replacement therapy to postmenopausal women because, as study shows, CRP levels can be found increased twofold if estrogen is administered orally, whereas there is no effect on CRP levels if estrogen is administered transdermally (Sproston & Ashworth, 2018). Extreme caution should be observed by practitioners who provide hormone replacement therapy to such patients since it increases the chances of thrombotic events, such as blood clots or stroke (Dipa et al., 2021). In addition, CRP levels can be elevated if a patient presents with rheumatoid arthritis, vasculitis, lupus, autoimmune disease, or chronic cardiovascular disease.

Conceptual Framework

For the purposes of this project, the theoretical model of the TPB was utilized. The theory was first introduced in 1985 and had strong bonds between the theory and its practical applications. Initially, the Theory of Reasoned Action (TRA) was developed first, and the TPB was built on its foundation and was seen as an improvement concept that would include perceived behavioral control. The TPB showed a correlation between a person's beliefs and followed behavior. The TPB argued that perceived behavioral control, subject norms, and intentional torts attitude, communicatively define a person's behavioral intentions and behaviors (Pourmand et al., 2020). The TPB can be considered as an extension of the TRA, adding the concept of perceived behavioral control, which, in its turn, can be defined as a person's perception of the difficulty or ease of performing a particular behavior (Pourmand et al., 2020).

The TPB found numerous practical applications in modern healthcare settings than other, more older models, such as Health Belief Model. The TPB is especially applicable in real-case scenarios and has shown to be effective when the actual control over the performance of the behavior and the probability of success is suboptimal (Pourmand et al., 2020). This project employed the TPB to outline essential variables that may influence the outcome of the evidence-based research related to the utilization of the CRP test in clinical practice. Figure 1 depicts the triad and the TPB, and the TRA (DeNicola et al., 2016).

Figure 1



Note. The green area shows the Theory of Reasoned Action; the entire figure shows the Theory of Planned Behavior (https://www.researchgate.net/figure/The-theory-of-reasoned-action-and-planned-behavior-Revised-from-Health-behavior-and_fig1_308784496).

The TRA is typically used to predict and explain behaviors based on intentions, norms, and attitudes. The TRA consists of the following elements: evaluations of behavioral outcomes, behavior beliefs that lead to attitude followed by normative beliefs, and motivation to comply, which points to subjective norms (DeNicola et al., 2016). Subjective norms and attitudes lead to the intention to perform a behavior that results in the behavior itself. The TPB can be viewed as

more comprehensive and superior to the TRA because of the fact that the TRA does not include the perception of people of the control that they have over the behavior. This is exactly the point where the TPB outlines control beliefs and perceived power. Both of them lead to perceived control and, after that, intention to perform the behavior, after which behavior itself occurs.

In terms of the practical application to the current project, it may mean the provision of CRP test results to a patient after a thorough physical assessment. It will provide justification for the clinician's actions and reassure the patient that such a decision is valid and trustworthy. The CRP test will provide additional auxiliary evidence of any general inflammation processes within the body and trigger a change in the provider's behavior in using CRP guidelines when considering antibiotic prescriptions.

Related Studies

Multiple studies investigated correlations between bacterial infections and elevated CRP levels and the diagnostic accuracy of CRP distinguishing viral infections versus bacterial infections (Escadafal et al., 2020). Systematic analysis of seven studies conducted mostly in Africa and Southeast Asia outlined that typically CRP levels in the human body are significantly elevated in the presence of bacterial infection in contrast to viral respiratory conditions (Escadafal et al., 2020). The reduction of antibiotic prescriptions because of CRP tests was also reported in multiple evidence-based scientific reports.

One of the reasons for misdiagnosis can be attributed to patient-related factors. In patients who smoke, adventitious lung sounds can be perceived as a result of inflammatory processes within the lungs and inconsequent treatment with antibiotics. False-positive diagnosis may trigger excessive and unnecessary treatment that can be harmful; on the other hand, a false-negative diagnosis may prompt clinicians not to initiate treatment in patients who need such

treatment the most (Hangaard et al., 2017). Misdiagnosis happens even to the most experienced physicians who perform a correct assessment and follow the guidelines of the particular healthcare institution (Patel et al., 2018). Correct assessment of ARTIs is imperative to accurately diagnose the acute inflammatory condition in primary care. Diagnostic errors made in primary care may confuse clinicians in acute care settings and lengthen the re-diagnostic process. In addition, comorbid conditions such as ischemic heart disease, acute coronary syndrome, lung cancer, asthma, and heart failure can contribute to errors in the diagnostic process (Boere et al., 2020a). Such factors as a set of symptoms, sex, ethnicity, obesity, and concurrent drug use can also be related to the wrong diagnosis (Hangaard et al., 2017). Interestingly, women remain to be more underdiagnosed with respiratory conditions than men, perhaps because some of the respiratory diseases were attributed only to men (Hangaard et al., 2017). In contrast, overdiagnosis of infectious diseases is also not an uncommon occurrence. Typically, there are specific guidelines or algorithms in primary care for patients with acute asthma exacerbations. According to one study, misdiagnosis events and overprescription of antibiotics occur in one-third of all patients with asthma (Kavanagh et al., 2019).

In the study conducted in 2021, researchers attempted to understand more clearly the importance of psychological factors influencing compliance with social distancing in this pandemic year, utilizing the theory of planned behavior and its analysis (Gibson et al., 2021). Some healthcare experts predict more pandemics coming in the future, and since effective vaccines and therapeutics are not always readily available to the public when these dangerous diseases occur, there is very beneficial to outline the role of nonpharmaceutical interventions and psychological variables of compliance with local and federal regulations (Mason & Friese, 2020). The TPB, if applied properly, can establish and maintain an effective framework for

predicting compliance with social distancing and other regulations. According to the TPB and the TRA, the intentions of individuals frequently are the root causes for the consequent attitudes and subjective norms. Perceived behavioral control can directly influence an individual's behavior. Many scientific evidence-based studies allude to significant empirical evidence supporting the practical implications of the TRA for predicting health behavior (Gibson et al., 2021). Five hundred and seven participants were involved in this study. During this study, researchers created an analytic model that highly resembles the TRA. This model is subjective and depicts five variables: attitudes, subjective norms, self-efficacy, intentions, and behavior. Attitudes, subjective norms, and self-efficacy variables may directly influence an individual's intentions. Intentions, in its turn, directly influence a person's behavior. It is important to emphasize that there is no reverse pathway in this model. In other words, behavior does not influence intentions, and intentions do not influence attitudes, subjective norms, and self-efficacy. Behavior is seen as an end result of one or more subjective factors. The study concluded that there are participants who had stable intentions exhibited a robust relationship between intentions and consequent behavior.

In a similar cross-sectional study, a group of researchers investigated patients diagnosed with hypertension for positive changes in their lifestyles and self-care behaviors using the TPB (Pourmand et al., 2020). The sample of patients in this study was also similar – 500 participants. In this evidence-based research, the scientists built their arguments on the concept that self-care management is one of the cornerstones to good health and well-being because an evaluative approach to physical changes and consequent decisions and if those observations would have a significant negative impact on hypertension management (Pourmand et al., 2020). The population used in this study was mostly from low to middle socioeconomic statuses. This

particular study consisted of three parts. Each part contained questions aimed at eliciting knowledge and behaviors related to hypertension management. For example, part one consisted of 23 questions divided into four sections: behavioral intention, perceived behavioral control, subjective norms, and attitude towards behavior. The seven-point Likert scale was utilized for the TPB questions' scoring. Essentially, scientists attempted to determine whether self-care behaviors, such as smoking cessation, can positively influence the patient's behavior and ultimately contribute to better management of hypertension. This research revealed that one of the most crucial determinants of performing self-care behavior is having control over such behaviors in this group of patients. For this reason, this approach can be viewed as an essential intervention aimed at enhancement of intention toward self-care behavior in this case scenario (Pourmand et al., 2020). It is applicable more so in vulnerable patients, such as women and the elderly.

Lykkegaard et al. (2021) conducted a cross-sectional study across primary healthcare settings to estimate the CRP cutoff levels with the aim of developing a universal protocol for antibiotic prescription practices for patients with various signs and symptoms of infectious conditions. This research lasted for approximately two years, between 2017 and 2019. In this study, participating general providers performed CRP tests on approximately 4600 patients. An earlier developed protocol was used to guide clinicians with antibiotic prescription practices. As a rule, antibiotics were prescribed when the CRP level was more than 20 mg/L (Lykkegaard et al., 2021). General practitioners were encouraged to take into consideration not only CRP results but also develop diagnosis and synthesis CRP lab values with careful physical examination and history taking. This research contributed to the lowest prescription of antibiotics in Denmark, where the study was conducted (Robertson et al., 2021). CRP levels between 150 mg/L and 300

mg/L or above were not considered. CRP test has not been performed on patients with such conditions as facial pain, ear pain, sore throat, abnormal lung sounds, cough, or dyspnea. This study performed CRP tests on relatively healthy patients and did not include patients with other non-respiratory infections (Cals & Ebell, 2018). Similar qualitative studies identified that typically, clinicians who were asked to participate in CRP test research requested some guidance on the interpretation of CRP values (Hardy et al., 2017). The implications of this particular research pointed out that wise antibiotic therapies remain the primary tool to address antimicrobial resistance. Patients who presented with a sore throat were more likely to undergo the Streptococcus rapid test rather than the CRP test. Overall, most patients with CRP levels of more than 40 mg/L were prescribed antibiotic therapy (Htun et al., 2019).

Researchers of another similar study conducted in Vietnam decided to go further and investigate the cost-benefit analysis of CRP tests in the management of infections. The study's goal was to assess the practicality of CRP testing in terms of financial implications for practice and assessment of reduction for an antibiotic prescription for communicable illnesses, by comparison, the monetary burden of antimicrobial resistance and incremental costs of CRP test (Lubell et al., 2018). In Vietnam, any patient can purchase antibiotics over the counter as antibiotic use is not restricted by the government (Bordier et al., 2018). In this study, multiple financial expenses were considered, and outcomes were recorded for evaluation. For example, the essential drivers for financial benefit to a primary care practice were the following criteria (Shrestha et al., 2018):

1. The out-of-pocket cost for the CRP test should range between 50 cents and three dollars.
2. Adherence to prescribed antibiotic therapy or symptomatic care is outlined by a physician when low CRP levels are detected. Approximately 65 percent of patients left the primary

care clinic in this study with recommendations for symptomatic care of respiratory complaints.

3. The price range for antibiotic therapy should not exceed 14 dollars per course.

While these criteria are for practical and positive net benefit for primary clinics is applicable to Vietnam, they may also be applicable to much primary care in urgent healthcare facilities within the United States. The idea is to create more or less general criteria for effective functioning of primary care settings in the United States with a positive net income. This study concluded that purchasing a CRP test machine for the clinic could cause some modest incremental costs at first. However, with consequent routine use, the CRP test can offer affordable price ranges of this test for patients who most likely will benefit from it.

A similar study conducted in England outlined that utilization of CRP tests when serving patients with respiratory infections in an outpatient healthcare setting can substantially reduce costs of the clinic while causing the reduction of unnecessary prescription of antibiotics in patients with upper ARTIs (Schneider et al., 2020). In the study, the authors pointed out antibiotic misuse and its consequences, antimicrobial resistance, frequency of re-consultation, probability of developing secondary infections, and ultimately increased costs for practices. Prescription of unnecessary antibiotics frequently includes avoidable costs: avoidable expenses; adverse health effects; indirect costs; severe antibiotic-related conditions, such as Stevens-Johnson syndrome and anaphylaxis; performance of diagnostic tests, such as throat culture; re-consultations and following treatments related to mild adverse effects or side effects of antibiotic therapies, such as diarrhea, nausea, allergies (Schneider et al., 2020). The researchers collected information on more than 15 million patients that visited primary health care settings in England each year. Despite general recommendations of the National Institute for Health and Care

Excellence (NICE) that advocated for delayed antibiotic prescription practices in cases when CRP levels are at a minimum or borderline, more than 50 percent of all consultations have resulted in actual antibiotic prescriptions (Schneider et al., 2020). The researchers concluded that only nine percent of those consultations would have resulted in appropriate antibiotic prescription therapies (Schneider et al., 2020). The whole premise of the CRP test benefits patients to a greater extent than primary care practices. Utilization of CRP test may ultimately benefit clinical practice as well by reduction of antibiotic misuse and reduction of the spread of antimicrobial resistance cases while ensuring the best individual patient outcome and securing healthcare funding.

The study conducted by a group of Vietnam researchers investigated the impact of antibiotic overprescription practices over the past five years (Bordier et al., 2018). Taking into consideration the viral etiology of most respiratory conditions in Vietnam, careless antibiotic prescriptions can bear grave consequences to the health of communities, rising costs of drugs, and serious antimicrobial resistance (Nguyen et al., 2020). The study concluded that more than 50 percent of all patients seen for respiratory infections were prescribed antibiotics (Hoa et al., 2017). In order to contain antibiotic resistance, which is the highest in Vietnam among neighboring Asian countries, multifaceted interventions should be developed to address the competence of Vietnamese healthcare providers and the effectiveness of their practices related to antibiotic prescriptions for various infections (McKinn et al., 2021). The researchers conducted a two-year study in the rural area of Northern Vietnam between 2010 and 2011. The goal was to provide multifaceted learning opportunities to local communities treating mostly children with communicable infectious diseases. Educational posters were distributed among popular community gathering places, and health fairs were organized to communicate directly with the

local population. However, the study evaluated not only the patient's response but the healthcare providers' strategies as well. Interventions indicated that healthcare providers had increased their knowledge about ARTIs and their etiology by almost 30 percent, in addition to major improvements in practical competence while treating mild cases of respiratory infections.

Hardy et al. (2017) argued that a limited number of diagnostic tests could be utilized in many health care settings while managing acute infections. This group of researchers investigated the views and attitudes of health care practitioners on CRP tests for acute respiratory conditions in family medicine in the United States. The study was conducted primarily on adult patients with respiratory infections. However, this qualitative study focused on 30 prescribing clinicians (Hardy et al., 2017). As the study design may imply, physicians' beliefs, attitudes, concerns, and recommendations were recorded in the outline in the conclusion. Even though the CRP test is not new in scientific communities, this study was the first to explore the attitudes of practitioners towards this test in various healthcare settings across the United States. Like other studies mentioned above, this study outlined that more than half of patients seen in outpatient care settings for ARTIs have been prescribed antibiotics unnecessarily (Hersh et al., 2021). The research team has developed a topic guide which was used to guide discussions with clinicians. This guide included semi-structured questions that had the goal of exploring clinicians' opinions related to the full utilization of CRP tests in healthcare settings, prior knowledge of CRP tests, and attitudes towards the utilization of on-site diagnostic tests to guide antibiotic prescription practices (Cooke et al., 2020). The study revealed that most positions had experience ordering CRP tests on an inpatient basis, but few of them had experience or knowledge of CRP tests for the workup of multiple infectious problems in primary care settings (Hardy et al., 2017). Overall, clinicians expressed the belief that abusive antibiotic therapies for managing ARTIs only

increased over the years (Laxminarayan et al., 2020). Most physicians viewed the CRP test as an educational opportunity to share the reasoning for antibiotic prescription practices with patients.

The research studies have one considerable trend. They all concur that the CRP test and the implications for antibiotic overprescription, misdiagnoses, antimicrobial resistance, and the rising cost of drugs remain under-investigated. These studies used different sample sizes and research designs. Nevertheless, the CRP test was viewed by most clinicians as an acceptable diagnostic tool to support decision-making related to infectious health problems (Lemiengre et al., 2018). In addition, most studies concluded that certain limitations should be applied while engaging patients to measure their CRP levels in primary care settings; these limitations may include consideration for using the CRP test on relatively healthy patients without multiple comorbid conditions, especially of cardiovascular origin. The cost-effectiveness of the CRP test remains debatable in the course of their primary care clinics in the United States and clinic workflows and integration of this test into daily routine practices (Hardy et al., 2017).

New, evolving research confirmed earlier studies that investigated the rationality of antibiotic therapies for infectious diseases by restating that in medical practices where are CRP test is increasingly used, statistical data reflected a significantly smaller number of patients who were prescribed antibiotic therapies after presenting with symptoms of various infections (Lykkegaard et al., 2021). Acute respiratory tract infections are the most common reason for the overprescription of antibiotics in primary healthcare facilities (Martínez-González et al., 2020). This fact is rightfully considered a major driver of antibiotic resistance (Fleming-Dutra et al., 2016). Taking into consideration that the majority of ARTIs are of viral origin and self-limiting by nature in most otherwise healthy individuals, most of these patients presenting with acute bronchitis, otitis media, rhinosinusitis, pharyngitis, acute sinusitis, and sore throat do not benefit

from antibiotic therapies (Schneider et al., 2020). Misdiagnosis and inappropriate prescription of antibiotics for patients with symptoms of ARTIs during routine visits in primary healthcare facilities can lead to increased incidence of complications, repeat consultations, adverse events, development of drug-resistant bacteria, and ultimately subsequent increases in healthcare costs (Dadgostar, 2019). Furthermore, the rates of antibiotic overprescriptions have been directly linked with the rates of antibiotic resistance at the individual, community, and national levels (Ramachandran et al., 2019). One of the top strategies to address these growing concerns and problems represents the implementation of CRP test primary healthcare protocols in facilities so antibiotic stewardship can be enhanced and promoted (Tonkin-Crine et al., 2017). Among other similar biomarkers, such as procalcitonin and ESR, the CRP test remains the most accessible and low-cost point-of-care test at the present day. This test prompts healthcare practitioners to differentiate material infections from viral inflammatory disorders (J. Teepe et al., 2017). The CRP test has demonstrated both accuracy and robustness when compared with other laboratory testing (Boere et al., 2020b). There are many practices that exist in relation to when the clinician should prescribe antibiotics for ARTIs and what CRP level cutoffs should be used to address the problem. According to cross-comparisons with existing literature, most researchers agreed that when the measured CRP level is less than 20 mg/L, clinicians should be advised against antibiotic therapies, provided that the client meets that criteria for initial workup (Lykkegaard et al., 2021). To meet the criteria, such patients may not have serious comorbid conditions, presenting with an illness duration of no more than 14 days, such as acute cough (Cals & Ebell, 2018). General practitioners requested certain guidance on how to interpret CRP values, as evidenced by multiple qualitative studies on this topic (Hardy et al., 2017). The values between 20 mg/L and 50 mg/L represent the so-called "gray area" and prompt further assessment and

judgment by the clinician. The CRP values above 50 mg/L require consideration of antibiotic therapy (Martínez-González et al., 2020). International and national guidelines point out that regardless of the CRP test value, the decision for antibiotic prescription should be carefully weighed and evaluated along with the patient physical examination and history (Moberg et al., 2020). Some physicians perform the CRP test even before the clinical assessment of the patient (Haldrup et al., 2017). However, clinicians should uphold the national standards for such tests because the cough symptom, for example, without proper assessment, can lead to premature conclusions and consequent misdiagnosis. Certain heart conditions, gastrointestinal disorders, allergies, and other internal and external factors can elicit the cough itself. This is why adequate physical and psychological assessment takes such an important role at the time of visit. The CRP test should be integrated into the clinical decision process by combining the patient's symptoms, diagnostic tests, laboratory test results, and other objective and subjective findings. In light of the global importance of remedies that address antimicrobial resistance that follows the consumption of antibiotics, there is a gradually increasing volume of evidence-based practice from empirical research in favor of performing CRP tests in ambiguous situations (Verbakel et al., 2019).

A recent study of CRP test and antibacterial use in patients who presented with symptoms of ARTIs concluded a narrative review of 21 most relevant studies that included observational and economic evaluations, cluster randomized controlled trials, and systematic reviews of randomized controlled trials (Cooke et al., 2020). It is worth noting that 12 European countries that followed CRP test guidelines and established point-of-care testing sites in the primary healthcare clinics in the conducted survey indicated that they had the lowest rates of antibacterial prescriptions in comparison to the countries that did not have such testing solutions (Robertson et al., 2021). Healthcare facilities can even further enhance the effect of such testing solutions by

engaging medical staff in internet-based training on enhanced communication skills, developing an interactive booklet, and conducting frequent workshops (Nouvenne et al., 2016). Moreover, this study conducted a thematic analysis of data on preintervention and postintervention patients. The researchers found overwhelmingly positive feedback and attitude toward CRP tests among healthcare workers and patients (Cooke et al., 2020). Healthcare practitioners have used the CRP test to support their clients' negotiations and legitimize ethical decisions in an increasingly restrictive antibiotic policy environment (M. J. Haenssgen et al., 2018). In another similar pilot study that investigated the impact of CRP tests on antibiotic prescription rights in local communities, a reduction in unnecessary antibiotic prescriptions by almost 90 percent was followed by high percentages of patient satisfaction (Wakeman et al., 2019).

Conclusion

Chapter two offered a literature review, a detailed explanation of the conceptual framework of the project, the search strategy, and the elucidation of the TPB. Related studies provided overwhelming evidence of the benefits of CRP test utilization in healthcare facilities. In the next chapter, methodological framework, project design, sample, setting, instrumentation, data collection, and management will be discussed and reviewed. The majority of reviewed literature strongly supports the idea of the CRP test in the management of ARTIs as of tool for the reduction of unnecessary prescription of antibiotics for viral or self-limited conditions.

Chapter Three: Methodological Framework

While meta-analysis of randomized controlled trials and systematic reviews provide statistical data and ongoing trends regarding the utilization of CRP tests, for example, in long-term care settings, studies investigated beliefs and attitudes of clinicians and patients alike towards the benefits of CRP tests. Studies listed in this project were primarily focused on the providers' attitudes about the benefits of the CRP test. The advantages of this project over similar scientific work can be found in summarizing such venues, such as antibiotic overprescription practices, rising antimicrobial resistance, rising drug costs that cause consequent non-compliance, and misdiagnoses of infectious diseases. Knowledge about general attitudes towards CRP tests in long-term care, finding its limitations, and working on improvement of the integration of such tests in various healthcare settings would be beneficial for many patients with complaints of respiratory origin of short duration, including patients with ARTIs with no more than two weeks' duration. Therefore, it would be only logical to address all these issues in the study with some numerical data as necessary. This project does not aim to collect statistical data about the number of examined patients or to count incidents of misdiagnoses.

Methodology

Medical records of symptomatic patients in skilled nursing facilities were examined and evaluated for a six-weeks period. These nursing units mainly admit older adults. Patients with a hospital admission within 30 days were excluded from this study to minimize potential cases of hospital-acquired ARTIs. Additional inclusion criteria were acute respiratory symptoms, such as pleuritic pain, hemoptysis, sputum, cough, dyspnea, and shortness of breath. Treatments, radiological findings, laboratory results, clinical characteristics, and outcomes were screened for and retrieved from electronic medical records. The patients' laboratory findings, clinical course,

and background were focused on their CRP levels at the time of illness. Patients with bacterial ARTIs CRP levels were compared to viral ARTIs and their corresponding CRP levels. Since occurrences of upper respiratory infections, such as tonsillitis and pharyngitis, are rare in adults, the investigation in this project aimed to perform a retrospective observational study in order to observe the role of CRP with a consequent diagnosis of bacterial or viral pneumonia in patients who displayed related respiratory symptoms.

Project Design

This DNP project used a descriptive quantitative design to observe providers' use of CPR testing for respiratory infection. The patient's electronic medical records (EMR) were reviewed to identify the patients who were treated with antibiotics for respiratory infection, had CPR testing and were diagnosed with a respiratory infection within a six-weeks period. A quasi-experimental design was chosen to promote antibiotic stewardship, with providers ordering a CRP test prior to treatment modalities. Providers were informed of the CRP guidelines; the providers completed a pretest prior to a PowerPoint presentation about the CRP and a posttest following the presentation. Additionally, medical records were reviewed to determine any change in antibiotic prescribing in response to CRP knowledge.

The implementation of this project aimed to minimize the prescription of antibiotics in self-limited or viral cases of ARTIs. Consequently, the project affected increased diagnostic accuracy and patients' quality of care, such as reduction of pharmaceutical costs, increased satisfaction and decreased antibiotic resistance within the communities.

Throughout the process of this project, Health Insurance Portability and Accountability Act (HIPAA) standards were upheld at all times. All related patient information is stored in secure locations on the computer, protected with passwords and encrypted.

All related provider and medical records data, whether hard copies of laboratory results or any other recorded data, were adequately stored and handled. Upon IRB approval, the goal is to have a minimum of five prescribers and patient records that indicated respiratory symptoms and a CRP test ordered.

Sample and Setting

This project employed a convenient sampling that included patients' medical records. The sampling provided data from medical records and pre- and posttest. The sample size of this project was sufficient to detect and elucidate the effect of the purpose of the project. This type of sampling is one of the most popular and widely used methods of clinical research in the healthcare field. It is a convenient, inexpensive, and timely method. In this type of sampling, providers are selected according to proximity and accessibility using the referral process. The sample size of the project included four providers. These participants were the advanced practice providers with the prescriptive authority: two nurse practitioners and two physician assistants.

Some related research suggested that the size of a sample should depend on analytic strategy, quality of interviews, theory, homogeneity of the sample, and the aim (Malterud et al., 2016). Unfortunately, there is no precut template to estimate the effective sample size so the researcher can reach accurate results (Serdar et al., 2021). While some argue that the small sample size may lead to a significant percentage of inaccuracies (Varoquaux, 2018), larger samples can also create issues in the interpretation of clinical impact and statistical significance (Serdar et al., 2021). The participants for this study were the providers**.** In addition, the patient's electronic medical records were reviewed to identify if they met the inclusion criteria. Exclusion criteria were patient records that indicated a medical history of asthma, patients younger than 50

years of age, and those who had CPR testing for other indications aside from respiratory infection.

The CRP laboratory tests can be used in inpatient units to identify sepsis and other acute infection, but only for short-term prognostic information (Ticinesi et al., 2017). One study showed the significance of such findings. The study was focused on relatively healthy elderly patients presenting with symptoms of bacteremia. Only approximately ten percent had elevated CRP levels; because of the ambiguity of data, current research indicates the need for specific cutoffs in elderly patients (Kuil et al., 2019). Medical records were screened using the "Filter" tab for medication, diagnoses, and laboratory studies. Six weeks were allocated for the implementation of the project, data collection, and analysis.

Instrumentation

Since the implementation of this project was intended to improve appropriate antibiotic stewardship and skilled nursing facilities, a pretest and posttest were created for clinicians to identify their knowledge about CRP guidelines in the pretest and their intended behaviors after a presentation in the posttest. A PowerPoint presentation was conducted after the pretest to provide educational as well as evidence-based information about CRP guidelines. The pretest was used to measure the responses of clinicians and included the following three questions:

1. In your panel of patients, will you often start them on antibiotics?
2. In patients with an acute respiratory infection, have you ordered CRP testing in the management of their care?
3. Will you consider using CRP testing in patients with acute respiratory infections?

The posttest contained the same questions and was distributed after the PowerPoint presentation.

Data Collection

This project's data collection was possible with the utilization of a medical database and software called "PointClickCare" (PCC). From the dashboard of each patient, the user may click on "Orders," and a list of all related medical and nonmedical orders will be displayed. From this page, the user can display numerous filters that allow them to narrow down the search and see even previously discontinued orders. This feature was valuable since antibiotics are normally prescribed for a relatively short period of time, and the user typically does not see them in the list of current medications. In this manner, the user can identify discontinued or completed medications along with ordered laboratory and diagnostic tests for each patient. This screening for antibiotics and relevant laboratory tests was manually completed for all patients. The time window of the search was six weeks.

Another method that was used in the search for medical data was to run the administration record report. In order to elicit results from this report, the user must signify what represents the search, such as medication administration records and laboratory results. Once that was selected, the user could specify the start date for the search to begin. After running the report, desired information was visible in a separate window.

Data Analysis Methods

All medical records were screened and evaluated with the help of the PCC. The data from the PCC were transcribed upon completion of the search into a Microsoft Word file. This was a time-consuming, tedious process. Upon completion of the search for eligible patients' records, the principal investigator transcribed the essential data into the computer's hard drive. While rechecking and evaluating data, the researcher completed the following: correcting any errors or discrepancies, omitting the name of the participant so the individual could not be identified, and

outlining any other related information that could affect the participant. Another duty of the principal investigator was to sum up the numerical data, such as the number of patients who were not tested for CRP and the number of patients who underwent this test. During the process of collecting data, handwritten notes were used. Once all the medical data were checked and screened, the principal investigator began the analysis of the data. This process refers to the detection of mostly similarities and contrasts that can be discovered through the evaluation of obtained data. It helped the principal investigator to develop an in-depth understanding of the content from the perspective of the clinicians. Obtained data were divided into two groups: in one group, patients that had been screened with CRP test before the prescription of antibiotics for the ARTIs, and the other – those patients that were prescribed treatment without prior test with the CRP. This process allowed the principal investigator to create trends and present the findings in a meaningful and coherent way.

Data Management Methods

Foreseeable risks may be associated with the inadequate storage of recorded data, whether on storage devices or in the computer system. At all times, HIPAA standards should be upheld to the best possible level. Transparency between providers and patients is an essential component of the overall success of the project. All related records and data in any form were stored in the lockable cabinet or safe. When in use, the data were under continuous, direct supervision. Collected data were saved into the Microsoft Word file on the computer's hard drive. For this reason, it only makes common sense to ensure the security of inputted data by creating strong logins and passwords. Cooperation with Internet security teams regarding their safe storage of data would be essential as well.

As to the management of CRP results, there are significant differences between this test utilization in inpatient and outpatient healthcare settings. Such data management is a cornerstone of quality care. It is essential to establish close monitoring of data to elicit error trends and patterns before the results are affected. The evaluation of CRP levels within the hospital can also be considered good practice if criteria for patients are observed. To this end, in long-term care facilities, healthcare personnel do not have to be concerned about comprehensive connectivity of all systems to the common network that provides data storage functions, collection and organizing of the information, and security of the server-based data.

Clinical data management implies that a quality-control strategy is in place in every health care setting that uses CRP tests to improve the testing process's safety, efficiency, suitability, and clinical outcome (Erasmus et al., 2021). Regardless of where CRP test results were delivered or generated, they must be timely, relevant, precise, and accurate to optimize clinical decision support (Erasmus et al., 2021). The quality control management process in outpatient healthcare facilities should include all stakeholders with appropriately assigned responsibilities.

Ethical Considerations

The research should bear important social value and should not pose more than minimal risk to all the participants (Thi Thuy Do et al., 2020). No information about participants was disclosed in any way. Participants' information was kept confidential. Collected data were kept encrypted and password-protected for three years and will be destroyed afterward.

Internal and External Validity

Internal and external validity allows the project's results to be applicable to the patients. The convenience sampling used in this project will have not only high internal validity because

of the objectivity of data and expertise of providers working with the elderly population but also high external validity. In other words, the evidence-based findings used in this project can be applied to the similar population in various other nursing homes. In this project, internal validity displayed related and accurate results for the representation of the truth in the sample of the population the project describes. Particularly, the principal investigator supports that this study has internal validity; in other words, implementing CRP tests in long-term healthcare facilities causes a substantial reduction in misdiagnosis and overprescription of antibiotics. After the establishment of internal validity, the results of this project were compared to similar research studies by different authors that took place around the globe. In this case scenario, the results of this project were scrutinized and compared to other clinical studies to evaluate whether the outcomes of similar research supported the implementation of CRP tests either in outpatient or inpatient healthcare settings. In their overwhelming majority, these similar research studies supported the idea of the generalizability of CRP tests into daily practice, especially within underserved communities. Internal validity is anticipated to indicate a low or unclear risk of bias. Intervention for the healthcare provider, whether the prescription of antibiotics or symptomatic care, depends on two factors: knowing the results of the CRP test to treat patients and upholding criteria for the patients' participation. Adequate quality control and implementation strategies such as adequate data analysis, data collection, proper sample size, and careful project planning help increase internal validity (Patino & Ferreira, 2018). External validity, in its turn, can be maximized by studying similar research in comparison with the project's final results. Potential threats related to the design and methods of this project can be related to the initial disbelief of some healthcare providers in CRP tests and their consequence on willingness even to try validating their assumptions.

Conclusion

By advancing this project, the goal is to demonstrate advanced levels of evidence-based care, system thinking, and advanced levels of clinical judgment. When considering CRP testing, healthcare leaders should provide guidance for patients that are going through complex situational transitions, mentor nurses and other healthcare personnel, and conduct comprehensive assessments. Communication and education of clinical staff and patients remain to be an important skill to master as it contributes to greater satisfaction of both clinicians and patients with outcomes of the visits and prescribed treatments. Integration of the TPB can be beneficial for virtually any skilled nursing facility as it provides foundations for clinical operations, judgment, and guidelines. The TPB can be and should be implemented in real care scenarios as it provides realistic, practical guidelines towards a smooth transition from theoretical underpinnings to the practicality of those statements. Overall, CRP testing presents more benefits than risks and is considered to be a relatively harmless and fast test that can be easily done in any primary or long-term health care setting. All applicable HIPAA standards and regulations must be upheld at all times during the implementation of the project. As an additional tool, the CRP test is already accepted in many primary health care settings in Europe. In fact, in many European medical offices, it has become a standard test to support medical decisions. CRP test should never be a standalone test for diagnostic purposes but to be used as a supplemental tool to support or contradict physicians' decisions. The CRP test can be a versatile tool for general practitioners who would like to embrace themselves in helping communities in underserved areas, as such clinics can be modified to mobile ones. Overall, incorporating CRP tests in a variety of healthcare settings showed a reduction in unnecessary antibiotic prescriptions (Haenssgen et al., 2018).

Chapter Four: Results and Discussions of Findings

The intention of chapter four is to provide the results of the data collection and analysis. Acute respiratory tract infections (ARTIs) typically occur in skilled nursing facilities throughout the entire year. The signs and symptoms of ARTIs in older adults may be more subtle than in adult patients. This subtlety creates a certain level of challenge for clinicians to not undertreat or overtreat these respiratory conditions. The challenge is to be able to outline the correct diagnosis for bacterial and viral ARTIs. The practitioners that work in skilled nursing facilities frequently prescribe unnecessary oral antibiotics for self-limited viral ARTIs. While initially, patients may feel generally better after the initiation of antibiotic therapy, if the real need arises for antibiotics in the future, those types of antibiotics may not be as effective as they could be. This is why this project offered a change in common practices. The utilization of the C-reactive protein (CRP) marker in long-term settings should prove itself a valuable asset at the disposal of nurse practitioners, physicians, physician assistants, and other clinicians with prescriptive authority.

The study by Boere and colleagues (2021), like many others conducted in the Netherlands, reported supportive conclusions. The CRP test for suspected respiratory tract infections can support a significant reduction in antibiotic prescriptions compared with standard care in nursing home residents (Boere et al., 2021). The findings from this study suggest that implementation of CRP tests before ordering antibiotics for ARTIs in nursing homes can contribute to the reduction of prescription of antibiotics therapies and therefore address antibiotic resistance within the communities.

The purpose of this section is to present and interpret the findings during the implementation stage, in addition to connecting these findings with the purpose of the project. Another purpose of this chapter is to provide the facts related to the findings of the project.

Summary of Methods and Procedures

The data about the patient's diagnosis, related orders, and laboratory tests, including imaging tests, were screened. The PCC software was used for these purposes. Data for all patients for each provider were screened individually and then recorded into the Microsoft Word file for future analysis, comparison, and extraction of relevant data. Furthermore, the retrieved data were categorized by each provider and their skilled nursing facility as they routinely attend and make their rounds.

Summary of Sample and Setting Characteristics

The sample consisted of four clinicians with prescriptive authority: two nurse practitioners and two physician assistants. There were two females and two males with experiences ranging from less than a year to more than eight years in practice. Originally, the initial PowerPoint presentation was provided to six clinicians; however, two clinicians were excluded from the sample because they were out of state. All 11 facilities where these providers were rounding are skilled nursing facilities that admit adults and geriatric populations.

Demographics

Two nurse practitioners and two physician assistants participated in this project. The first nurse practitioner is a female with five years of experience. She rounds two skilled nursing facilities. The second nurse practitioner is also female, with two years of experience. This provider visits four nursing homes. The third participant is a physician assistant with eight years of experience. He is male and rounds in two skilled nursing facilities. The fourth participant is also a male physician assistant with five years of experience; this clinician rounds in three nursing homes. These data are presented in Table 1.

Table 1

Demographic Characteristics of Participants

1) What is your profession?		N
	Physician	0
	DO	0
	NP	2
	PA	2
2) Years of experience?		5 years (median)
3) To which gender do you most identify?	Male	2
	Female	2
	Prefer not to answer	0
4) How would you best describe yourself?	American Indian or Alaska Native	0
	Black or African American	0
	Asian or Asian American	0
	Caucasian	4
	Native Hawaiian or other Pacific Islander	0
	Hispanic, Latino, or of Spanish origin	0
5) How many facilities do you oversee currently?		3 (median)

Note. This table describes the demographics of participating clinicians.

Pretests and Posttests

For each clinician, a pretest, a PowerPoint presentation, and posttest were provided in this order. The pretest was provided to assess some of the features of current practice, such as whether the provider prescribes CRP tests before ordering antibiotic therapies in patients with ARTIs. After that, depending on the amount of questions, a 20-minute presentation was provided with the review, discussion, and recommendations for antibiotic stewardship in nursing homes. The posttest was provided after the presentation. When the results of pretests and posttests indicated that consideration for using the CRP testing was 100% for patients with acute respiratory conditions, these findings are presented in Table 2.

Table 2

Summary of Pretest and Posttest

QUESTIONS	PRE-TEST		POSTTEST	
	Yes	No	Yes	No
1) In your panel of patients, have (pre-test)/will (post-test) you often start patients on antibiotics as: __a preventive measure	1	3	2	2
__ because of their other co-morbidities	1	3	2	2
__ avoid other complications	2	2	2	2
2) In patients with ARTI, have (pre-test)/will (post-test) you ordered CRP testing in the management of their care?	0	4	2	2
3) Will you consider using CRP testing in patients with ARTI?	2	2	4	0

Note. This table represents the pretest and posttest of clinicians who participated in the project.

Results

This section presents findings pertaining to antibiotic stewardship with the CRP of ARTIs in nursing homes. Findings will be presented in chronological order.

The first provider had 43 patients in four skilled nursing facilities. In the first facility, there was a total amount of 16 patients. Six of those patients had active COVID diagnosis, and in all of those cases, a CRP test was not done. In the second facility, there were six patients, but none of them had active ARTIs. There were 11 patients in the third facility. There were three patients identified with active respiratory problems. The first patient was diagnosed with chest congestion and was ordered antitussive and expectorant. The second patient was diagnosed with acute shortness of breath and wheezing and was prescribed a nebulizer treatment. In both of these cases, the provider did not order any x-rays or laboratory tests. Treatment was solely symptomatic, with no specific diagnosis made. The third patient was suspected of having pneumonia. CRP test was done and was equal to five. The laboratory used a scale for the CRP between five and ten, so it is considered normal. Antibiotic therapy was not initiated. In the fourth facility, records of ten patients were assessed. Two patients out of ten were suspected of having ARTIs. For the first patient, an inhaler was ordered, followed by an x-ray order. No CRP test was done for this patient. The second patient in that facility was diagnosed with acute respiratory failure with hypoxia along with acute pulmonary edema. A CRP test was ordered and read 2.1; in other words, twice the normal value (the reference range of the CRP value was less than 1.0); however, no antibiotics were ordered. Instead, the patient's oral Lasix was increased, and a three-month follow-up was scheduled.

The second provider had 15 patients in two skilled nursing facilities. In the first facility, out of six patients, one patient was diagnosed with septic shock with acute-on-chronic respiratory failure. The CRP was measured and was less than six, which is normal considering that the reference range for CRP values of that particular laboratory was less than or equal to 10 mg/L.

Even though CRP values were within normal limits, antibiotics were prescribed because of elevated values of lactic acid. In the second facility, none of those nine patients had any ARTIs.

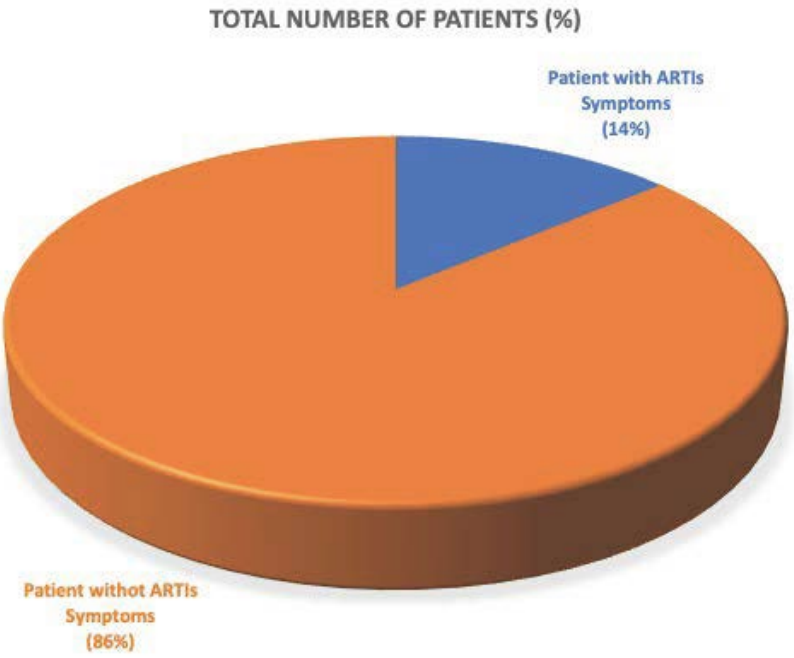
The third provider had 25 patients in two nursing homes. In the first facility, one patient out of all ten residents had a suspicion of upper respiratory infection. Consequently, the CRP test was performed, indicating a value of 4.9; it was almost five times higher than normal values since the laboratory identified normal values below 1.0 mg/dl. As a result, this patient was placed on a course of antibiotics. In the second skilled nursing facility, one patient out of all 15 assessed residents was diagnosed with COVID. This patient did not exhibit any signs and symptoms of respiratory origin; nevertheless, a CRP test was ordered and indicated a value of 24.17 mg/L, which is considered to be elevated since normal values for CRP was defined between zero and five. The patient was not ordered antibiotic therapy—the clinician correlated elevated CRP with the possible progression of COVID.

The fourth provider had 33 patients in three skilled nursing facilities. In the first nursing home, none of the 11 residents had any respiratory issues. Also, in the second nursing facility, none of the seven patients had any respiratory problems. In the third skilled nursing facility, there were two patients out of a total of 15 were found with respiratory conditions. The first patient had a suspicion of acute respiratory infection. CRP test was ordered, and the value read 1.27, which was normal considering that the normal CRP range for that laboratory was between zero and five. Antibiotic therapy was not ordered for this patient. The second patient in that facility had a suspicion of bacteremia. CRP test was performed with the final value of 6.1, which was slightly elevated considering that the laboratory defined CRP normal values between zero and five. This patient was diagnosed with pneumonia and minor left lung atelectasis. A course of

antibiotics was completed. The percentage of patients with ARTIs displayed in the following figure 2.

Figure 2

Total Number of Patients



Note. This pie chart represents the total number of patients' charts in percentage reviewed.

Overall, the charts of 116 patients were assessed. Seven CRP tests were ordered for seven patients. Out of seven ordered CRP tests, four tests turned out to be normal, and three were abnormal. Two out of three patients with abnormal CRP values were placed in antibiotic therapies. The following algorithm in Table 3 depicts statistical data and the workflow.

Table 3

Summary of Findings

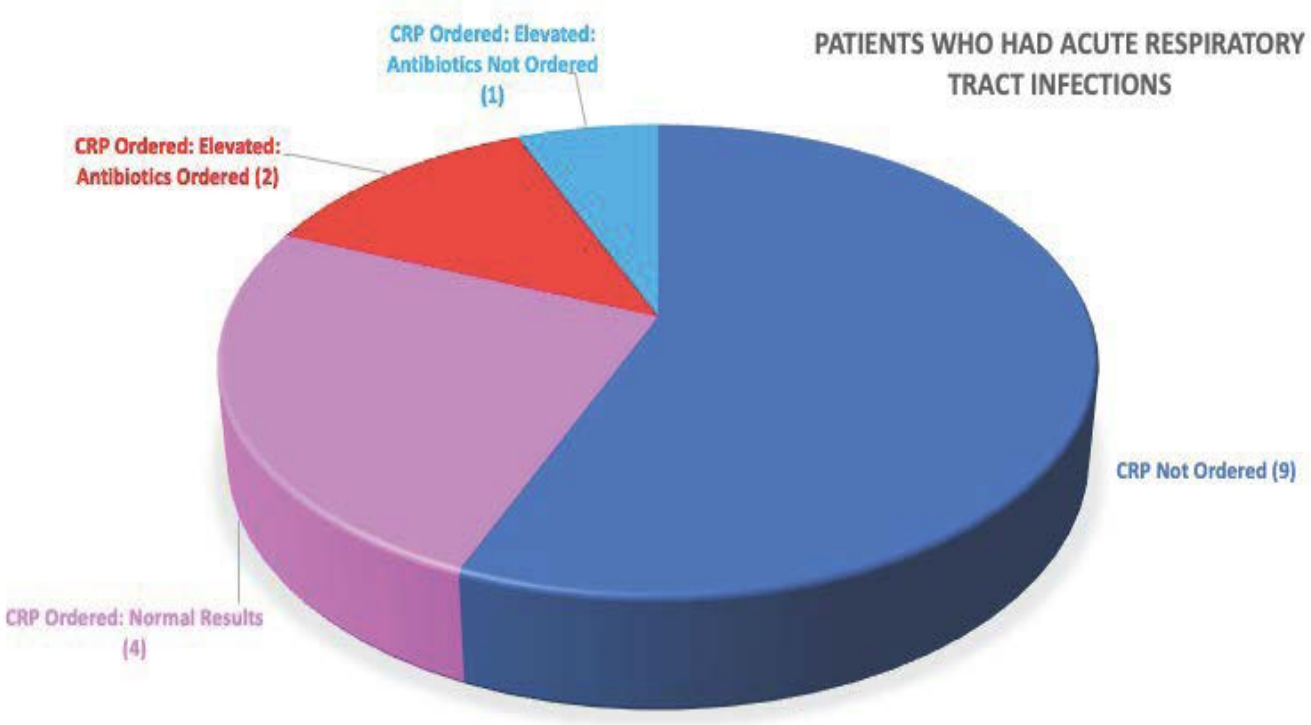
Number of Patient Chart Reviewed in PCC	Number of Patients who had ARTIs within the Implementation Phase	Number of Patient with ARTIs Symptoms who had CRP Testing	Number of Patients with ARTIs Symptoms who did not have CRP Testing	Results of CRP Testing	Number of Patients who was Started on Antibiotics because of Abnormal or Elevated CRP
116	16	7	9	4 Patients with Normal Result 3 Patients with Elevated CRP	2

Note. This table represents the process of screening patients' charts for significant data.

It was noted that, depending on the area, the facilities where providers practiced used three different laboratories to interpret CRP findings. That is why normal values for CRP tests were different. For example, in one of the laboratories identified within defined limits (WDL), values of CRP were less than one. Another laboratory identified WDL values of CRP less than five. Similarly, the third laboratory identified normal CRP values as less than 10. The probable cause for this is the geographical location of nursing homes. Some of the facilities are located more than a hundred miles away from each other. Consequently, administrations of those nursing homes contracted with local laboratories that operate in the area. While the majority of laboratory values reflect the same standards across all laboratory facilities in the area, the standards for some of the uncommon tests, such as CRP, may vary slightly.

Figure 3

Number of Patients with ARTIs during the implementation phase of the project



Note. This pie chart represents number of patients with ARTIs.

Implications for Nursing Practice

Findings of the implementation stage of the project suggest that following the CRP guidelines influences clinicians' decision-making for prescribing antibiotics for acute respiratory tract infections. Clinicians reported that having CRP values on file expands the array of the laboratory data they work with and adds to the objectivity of the assessment data. It is also increasing the chances of incidental findings while performing routine laboratory tests. Implementation of CRP tests in antibiotic stewardship programs allows providers to reduce costs and avoid unnecessary hospitalizations by performing proactive, prophylactic steps. In addition,

the long-term effect of following CRP guidelines by clinicians is decreased antibiotic resistance within the communities.

Summary

During the implementation stage of the project, a total sample of four clinicians with prescriptive authority was assembled together: two nurse practitioners and two physician assistants. Each clinician was provided with a PowerPoint presentation and phone calls with an explanation of the project, follow-ups with current progress, and analysis of data. As this project aimed to describe the common practices in prescribing antibiotics for ARTIs, the current standard practice in skilled nursing facilities was investigated and studied. Typical standard practice involves gathering subjective data or patient complaints, physical assessment, and ordering a chest x-ray followed by a prescription of antibiotics. It was noted that in all cases of respiratory complaints, a test for COVID was ordered. Clinicians tend to retrospectively review medical records at least three months to determine if antibiotics were ordered for a patient within the three-month period. If antibiotics were ordered within a three-month time window, a "stronger" antibiotic was prescribed as a result. These antibiotics are typically addressed a broad spectrum of bacteria, both from the gram-positive to the gram-negative spectrum. This fact presents another challenge in light of antibiotic-resistant strains; moreover, for pneumonia cases, for a few patients, the provider prescribed a combination of two oral antibiotics as common practice dictated. Unfortunately, antibiotic prescription practices for ARTIs are common occurrences in skilled nursing facilities, and antibiotic therapies are readily prescribed.

However, participating clinicians, once they were informed of the suggested guidelines, initiated a new practice of ordering CRP tests before the initiation of the prescription of antibiotics. Practitioners started ordering CRP tests as part of their workup for the ARTIs. As a

result, antibiotic prescription encounters have been reduced twofold. For patients with CRP levels between zero and five, antibiotics were not prescribed. Instead, symptomatic treatment was provided, such as Mucinex DM, Tessalon Perles, Robitussin solution, and in some cases, temporary nebulizer treatments or inhalers with a short course of steroids. During the period of six weeks, the principal investigator focused the efforts on optimizing the antibiotic prescribing behaviors among the clinicians promoting the use of the recommended guidelines for performing a CRP test prior to prescribing antibiotics for respiratory symptoms.

It was interesting to observe the theoretical model of the TPB in real clinical practice. Apparently, the suggested antibiotic stewardship and guidelines were frankly new to the participating providers. Probably, the deciding factor in adopting a new practice was the presentation of evidence-based practice of similar research for the past five or seven years.

The implications of the project for future research cannot be underestimated. The educational part of this process plays a central role when trying to influence providers' behaviors and attitudes towards the current practice of managing of ARTIs in nursing homes. The findings suggest reduced antibiotic prescriptions in patients with ARTIs once the antibiotic stewardship strategy has been initiated.

Conclusion

The CRP is a protein that is synthesized by the liver as a nonspecific response to inflammatory stimuli. The CRP test is a nonspecific test that generally points to bacterial infection when its values are beyond certain parameters. Medical practitioners with prescriptive authority are encouraged to consider utilization of the CRP test in their practice while facing ambiguous presentations of respiratory conditions. Certain standardized guidelines can be readily implemented in nursing homes to help providers choose the best diagnosis for their patients.

CRP tests for ARTIs can contribute to appropriate and prompt decisions pertaining to the prescription of antibiotics therapies or withholding thereof (Sproston & Ashworth, 2018). Multiple studies have shown that utilization of CRP tests in skilled nursing facilities adds diagnostic value to the evaluation of clinical signs and symptoms, even when predicting pneumonia or other bacterial respiratory tract infections (Teepe et al., 2017). Ultimately, there is a big probability that CRP test prescribed for the residents with ARTIs in skilled nursing facilities may result in a significant, clinically relevant, and safe reduction of antibiotic prescriptions in comparison with the standard practice of care; in addition, low mortality and low rate of occurrences of hospital admissions indicate safe use of CRP test (Boere et al., 2021).

Recommendations

One of the further recommendations would be advocating for improved healthcare policy. The reviewed literature is clearly lacking research in this direction. Healthcare providers should be actively engaged in partnerships with communities and local policymakers in order to create specific regulations and guidelines for CRP test implementation, especially in underserved communities. By influencing policies that can undue health burden or alleviate the health condition, healthcare providers could take an invaluable step towards meeting community needs, effectively addressing antibiotic or prescription practices, rising cost of healthcare, and antibiotic resistance. Further, similar implementation studies could help to investigate the effect of the utilization of CRP tests over the long-term period (Francis et al., 2020). Also, the patients' group size was relatively small to allow for firm conclusions. A longer period of time for implementation would most likely allow following more patients, thus drawing more accurate conclusions.

Chapter Five: Discussions and Conclusion

Antimicrobial resistance, rising healthcare costs related to antibiotics over prescription practices, and diseases associated with the overprescription of antibiotics, such as C. diff, represent a global, multifaceted phenomenon. Antibacterial resistance is not only a rising concern but can be considered a public health threat (Boere et al., 2021). The most vital reason for antimicrobial resistance is the inappropriate use of antibiotics (Boere et al., 2021). Inappropriate antibiotic overprescription practices are common in nursing home settings where most of the patients are frail older adults with weak immune systems. For serious ARTIs delayed antibiotic treatment is unacceptable and should begin soon as possible after a diagnosis has been made; however, it is often difficult for clinicians to differentiate serious illnesses from less serious ARTIs, such as acute bronchitis (Boere et al., 2021). One of the reasons for such difficulty is that older adults typically have less distinctive clinical presentations of the particular respiratory condition and limited pertinence and diagnostic resource availability (Fried et al., 2021). In other words, a chest radiograph or collection of sputum culture is not always happening for diagnostic purposes (Boere et al., 2021). Such diagnostic uncertainty frequently leads to the choice in favor of antibiotic therapies and to be better safe than sorry, which triggers unnecessary prescription of antibiotics therapies (Boere et al., 2021). The CRP test for ARTIs can contribute to appropriate and prompt decisions on whether or not to prescribe antibiotics. Establishing certain protocols that prompt clinicians to follow certain guidelines in regard to antibiotic prescription practices for ARTIs would help to decrease orders for antibiotics in nursing homes and contribute to higher standards of medical practice and patients' health. This project tried to elucidate the idea of whether following the CRP guidelines makes a difference in clinicians' decision-making for prescribing antibiotics for ARTIs.

Discussion of Findings and Best Practices

The unnecessary prescribing of antibiotics for acute respiratory infections is a current global and national problem. Overprescribing contributes to antibiotic resistance, escalating pharmaceutical drug prices, decreased patient satisfaction with care, and increased cost of follow-up appointments due to complications of antibiotic treatments. Antimicrobial resistance, for example, is a dynamic and ever-increasing problem that pauses a serious global threat of growing concern to human and environmental health (Aslam et al., 2018). To address the problem of antibiotic overprescription, a multifaceted approach should be taken, including continuous and refreshing education of clinicians with prescriptive authority. In addition, regulations should be established for monitoring antibiotic prescriptions as part of the policy in healthcare facilities. This is where CRP tests can be useful. The CRP is an inexpensive test that allows a clinician to detect and display a numeric value of the extent of inflammation that occurs within the human body because of infection. By upholding CRP guidelines, clinicians can reduce the amount of prescribed antibiotics for ARTIs.

Before the implementation stage of the project, current standard practice was assessed, particularly whether the clinicians used CRP tests for ARTIs before prescribing antibiotics therapies. Charts of 116 patients were screened for this information, and zero incidents of CRP testing were found. This fact was also confirmed by a pretest that was conducted before the presentation; all four providers had a negative response to the question that asked about the utilization of CRP test before ordering antibiotic therapies. After the presentation, all four providers stated that they would consider using CRP testing in patients with ARTIs in the future.

During the implementation stage of the project, the total amount of charts of the set of 116 patients was assessed. In the body of this project, the findings were presented in an

algorithm. Sixteen out of 116 patients presented with symptoms of acute respiratory infections. For seven out of these 16 patients, a CRP test was ordered. CRP values were within normal limits for four of these patients; in contrast, CRP values were abnormal for the other three patients. For two out of three patients with abnormal CRP values, antibiotics were ordered, and no antibiotics were ordered for one patient with an abnormal CRP value.

Even after the presentation of the CRP guidelines, clinicians did not order a CRP test for every patient with symptoms of ARTIs; however, for those patients for whom a CRP test was ordered, clinicians followed suggested CRP guidelines with the exception of one patient who tested positive for COVID and elevated CRP value was attributed to progression of viral disease, so the clinician did not order any antibiotic therapy for that patient. Overall, the results of this project can be described as informative because it reflects the practice of clinicians after the presentation of the CRP guidelines to them. The biggest limitation of this project was the limited timeframe. The implementation stage of this project was six weeks. For greater accuracy of the data, an extended timeframe should be considered for future similar projects.

The literature review of most current scientific studies showed overwhelming support for CRP tests for patients in various nursing facilities before the initiation of antibiotic therapies. This test contributes to antibiotic stewardship in skilled nursing facilities and yields high-level evidence.

The TPB played a major role in this project due to its practical relevance and significance. It contributed to a deeper understanding and interpretation of the project's findings. This theory helped to understand factors that caused practitioners to behave in a certain way. Particularly, this theory helped to investigate the root-cause analysis of what prompts physicians to change their standard practice and begin ordering CRP tests for ARTIs. A combination of the

education component along with current CDC recommendations influenced clinicians' decisions during the implementation stage of the project.

This project's findings re-emphasized ways to improve the management of antibiotic overprescription practices by reinstating the issue of overprescription and displaying a contrast between current standard practice and CDC recommendations for antibiotic stewardship in skilled nursing facilities. The results indicate that when the CRP test was ordered and implemented, clinicians did follow CRP guidelines before considering antibiotic therapies for patients.

Implications for Practice and Future Projects

In order to work with the data, the information should be available for collection from multiple healthcare facilities in which antibiotic stewardship is actively taking place. The plan for the next future similar project could be the creation of a system that would allow the principal investigator to have easy access to the relevant statistic data, such as a list of cases with ARTIs, the number of antibiotic therapies for those patients, and a number of repeated ARTIs within 30 days. Healthcare is a complex system in which, very often, there is no template for any given scenario. Each patient has unique circumstances and approaches to treatment. Nevertheless, the presence of certain guidelines in terms of antibiotic stewardship should help any given skilled nursing facility to advance antibiotic prescription practices for ARTIs to a new level. To this end, much education and follow-ups should be provided to prescribers with updates on current CDC recommendations. Local government officials should also be made aware of current healthcare problems in the area. For example, healthcare workers can reach out to their local congressman representing their district and convey local concerns. The voice of healthcare workers should be heard to make a real, practical change.

Plan for Dissemination

The dissemination strategies are focused on improving the well-being and health of patients in a variety of ways. The plan for this project is to be uploaded into the doctoral project repository, which represents an archive of curated documents. This database can help to disseminate DNP-generated content to all interested in this topic. The doctoral project repository can also help build the foundation for sustainable change in future practice. The findings will be presented to the clinicians who participated in this project. In addition, the essence of the project and its results can also be presented at professional conferences.

Sustaining Change

In order to sustain the change, the quality improvement initiative should become a new way of practicing rather than an added patch to a routine standard clinical practice (Silver et al., 2016). It is crucial to develop and sustain multisectoral cooperation between clinicians and the administration of healthcare facilities. Follow-ups are also necessary to ensure the integration of proposed changes into the routine clinical practice. One such intervention can be a presentation of this project to the group of providers at the staff meeting. Another important aspect of sustainable change is to be able to continuously adapt the content of the change to suit its context**Recommendations for Future Projects and Practice**

Currently, CRP testing does not reflect common medical practice in most skilled nursing facilities in the United States. The problem of antimicrobial resistance can be attributed to the overprescription of antibiotics for acute respiratory conditions. CRP testing can contribute to a reduction of antibiotic prescriptions for ARTIs. This project indicated that all four providers decided to engage in the following CRP guidelines in their practice when assessing and treating patients with ARTIs. Obtaining CRP values of patients should only serve as an additional

objective finding in the process of assessment. The CRP guidelines can be useful as a reference in nursing homes.

Actual DNP Essentials Met

DNP Essential I

Understanding the scientific underpinnings of the CRP test is essential for practice. This project revealed that many educational materials should be provided to show and refresh evidence-based practice from similar studies around the world. In addition, a significant amount of time was contributed to one-on-one workshops with medical providers with prescriptive authority to elucidate the importance of the implementation of the CRP test in real-case scenarios to improve patients' health status and quality of life. It was also discovered that a thorough explanation of the difference between common inflammatory markers, such as procalcitonin, CRP, ESR, and D-Dimer, should be provided to enhance clinicians' understanding of why specifically CRP should be ordered before considering options for antibiotics. This is when the theoretical underpinnings of the CRP test meet practical applications to improving antibiotic stewardship with real patients. This DNP essential emphasized the importance of utilization of science-based concepts to enhance and evaluate the best possible realistic healthcare delivery for patients.

DNP Essential II

This DNP project positively contributed to the current medical practice related to the treatment of ARTIs in skilled nursing facilities by translating, evaluating, and disseminating findings into practice. Our nation continues transitioning from an inpatient acute care model to an outpatient one. Therefore, the DNP's role in assimilating nursing practice and science should be emphasized since prescribers address the more complex needs of their patients. The

development of clinical practice guidelines for CRP values helped to design evidence-based interventions in terms of prescription or withholding antibiotic therapies and also to evaluate practice outcomes. Based on the project results, the improvement that addressed enhanced antibiotic stewardship and quality of life has been made.

DNP Essential VII

The medical theory of the CRP tests and numerous past studies about the utilization of this test for ARTIs have their foundation in risk reduction and health promotion. It is important to address commonly known virtues before medical complications occur because of the inappropriate use of antibiotics. The CRP test for ARTIs can be viewed as a prophylactic measure to clarify a patient's health status so the best care and treatment can be provided. In order to more accurately interpret and evaluate the impact of CRP guidelines on nursing homes, the antibiotic stewardship project should be expanded to many more skilled nursing facilities and nursing homes. Also, long-term studies generally provide more accurate results and data as well as feedback for improvements. This DNP essential also addressed psychological aspects while working with medical providers: the TPB is proved to be practical when trying to influence the decisions of clinicians as to suggested CRP guidelines and related treatment modalities. Ultimately, the antibiotic stewardship suggestions could be incorporated into a national health initiative Healthy People 2030, to help create adequate and realistic healthcare policies with the goal of improving the health and well-being of communities across the nation.

Conclusion

This project was implemented over a six-week period, including presenting guidelines, data collection, and data analysis. The analysis of data and the collaboration with the clinicians were considered successful. One of the crucial factors for success was a presentation of the project to the team of clinicians and further follow-up with their questions and explanations of the practical application of the project. Such a beginning provided greater cooperation from the medical team. This project also shed light on current standard practice when assessing and treating patients with ARTIs. All four clinicians expressed a greater understanding of antibiotic overprescription practice for ARTIs and agreed to consider ordering CRP tests for respiratory infections, especially in ambiguous situations when physical assessment alone cannot provide grounds for accurate diagnosis. To reflect on the research question, this project made a difference in clinicians' decision-making for prescribing antibiotics for acute respiratory tract infections should they follow the CRP guidelines. The concept of TPB helped to understand the motivation of clinicians to prescribe this test from a behavioral standpoint. In the future, similar research can focus on refining statistical data by broadening the time window for implementation and increasing the sample of clinicians.

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Appendices

Appendix A

Pre-survey Questionnaire

(Short description of the appendix, indent)

Provider 01:

1) What is your profession?
__ Physician __ DO __ NP __ PA

2) Years of experience? _____

3) To which gender do you most identify?
__ Male __ Female __ Prefer not to answer

4) How would you best describe yourself?
__ American Indian or Alaska Native
__ Black or African American
__ Hispanic, Latino, or of Spanish origin
__ Asian or Asian American
__ Caucasian
__ Native Hawaiian or other Pacific Islander

5) How many facilities do you oversee currently? _____

Please answer each question and circle your answers.

1) In your panel of patients, will you often start them on antibiotics as: ___ a preventive measure ___ because of their other co-morbidities ___ avoid other complications	Yes Yes Yes	No No No
2) In patients with acute respiratory infection, have you ordered CRP testing in the management of their care?	Yes	No
3) Will you consider using CRP testing in patients with acute respiratory infection?	Yes	No

Thank you for participating in this survey.

Appendix B

Post-survey Questionnaire

Provider 01:

Please answer each question and circle your answers.

1) In your panel of patients, will you often start them on antibiotics as: ___ a preventive measure ___ because of their other co-morbidities ___ avoid other complications	Yes Yes Yes	No No No
2) In patients with acute respiratory infection, have you ordered CRP testing in the management of their care?	Yes	No
3) Will you consider using CRP testing in patients with acute respiratory infection?	Yes	No

Thank you for participating in this survey.

Appendix C

Approval of the DNP Proposal

Doctoral Student: _Dimitri Shchadenko

_____

The DNP Project Team of the above-named Doctoral Student has met and reviewed the DNP Proposal entitled:

Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections

The DNP Project Team has determined that the proposed DNP is likely to:

1. Make a significant contribution to the field of knowledge;
2. Demonstrate the student's ability to perform independent research related to the DNP project;
3. Contain material worthy of publication in a form appropriate to the discipline.

We recommend acceptance of this proposal. It contains all appropriate content and forms.

DNP Project Team Member's Signatures:

Faculty Chair: __Dr_Deborah.Schiavone_ DocuSigned by: 5/27/2022 3411DF4ECE3543D... (Print, Sign, and Date)

Faculty Reviewer: ___Dr Sherry Raber_ DocuSigned by: 5/27/2022 4FE2E90A855249E... (Print, Sign, and Date)

Independent Reviewer: ___Dr Kelsee Browning_ DocuSigned by: 5/31/2022 FF7D65164ABD4C7... (Print, Sign, and Date)

Program Director Approval Signature:

Dr. Tracy Lookingbill DocuSigned by: 5/31/2022 65FAFFA22FD548B...

(Printed Name of Program Director of Representative) Date

Completed form should be submitted to ProjectConcert after all signatures are attained. Directions can be found in the DNP Handbook under "Instructions Uploading Documents to ProjectConcert."

Appendix B: Approval of the Final Project

Doctoral Student: __Dimitri Shchadenko_____ The Advisory DNP Project Team of the above-named Doctoral Student has met and reviewed the DNP entitled: Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections

The DNP Project Team has determined that the Project:

1. Makes a significant contribution to the field of knowledge;
2. Demonstrates the Student's ability to perform independent research related to the DNP Project;
3. Contains material worthy of publication in a form appropriate to the discipline.

We recommend acceptance of this Final Project. It contains all appropriate content.

Signature of the DNP Project Team Members

Faculty Chair name: Dr. Deborah Schiavone DocuSigned by: Deborah Schiavone 3411DF4ECE3543D... 11/3/2022 (Print, Sign, and Date)

Faculty Reviewer name: Dr. Sherry Raber DocuSigned by: Dr. Sherry Raber, DNP, MMHC, MSN, RN 8A4027EE52D4465... 11/3/2022 (Print, Sign, and Date)

Independent Reviewer name: Dr. Kelsee Browning DocuSigned by: FF7D65164ABD4C7... 11/3/2022 (Print, Sign, and Date)

Program Director Approval Signature:

Dr. Tracy Lookingbill DocuSigned by: Tracy Lookingbill 65FAFFA22FD548B... 11/7/2022 _____
(Printed Name of Program Director of Representative) Date

Completed form should be submitted to ProjectConcert after all signatures* are attained. Directions can be found in the DNP Handbook under "Instructions Uploading Documents to ProjectConcert."
***The Program Representative will be the Assistant Dean or Dean in the case that the Program Director is serving on the DNP Project Team.**

Appendix E

Permission Letter

CASCADIA

HEALTHCARE

June 21, 2022

Dear IRB Administrator,

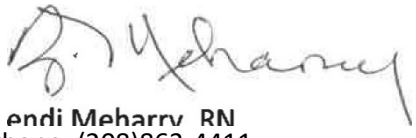
I have granted Dimitri Shchadenko, FNP-C, in fulfilling the requirements for the Doctor of Nursing Practice, to conduct the project, "Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections," in Cascadia Facilities located in Boise and Nampa, Idaho. I attest that I have the authority to grant such permission. I understand the purpose of the project will be focused on optimizing the antibiotic prescribing behaviors among the physicians promoting the use of the recommended guidelines for performing a CRP test prior to prescribing antibiotics for respiratory symptoms.

The Cascadia Healthcare will allow the following throughout the project: This project's data collection will be performed with utilization of the Electronic Health Records, such as PointClickCare (PCC). All related medical records, such as presence of diagnosis of acute respiratory condition, ordered CRP test, prescribed antibiotic therapies will be screened and evaluated with the help of PCC records. The data from the PCC will be transcribed upon completion of the search into Microsoft Excel file. In addition, pre- and post-questionnaires as well as PowerPoint Presentation will be conducted for the providers during the project's implementation.

The DNP Student will be required to follow all HIPPA, and Personal Health Information (PHI) policies and procedures related to obtaining, storing, and destroying HIPPA and PHI-protected data related to this project.

If the IRB has any concerns about the permission being granted by this letter of authorization, please contact me by email at zmeharry@cascadiahc.com

Sincerely,



Zendi Meharry, RN
Director of Clinical Operations
Cascadia Healthcare
Cell Phone: (208)863-4411

Appendix F

Participation Letter

Participation Invitation Letter

July, 2022

Dear Provider 01,

My name is Dimitri Shchadenko. I am currently enrolled in Aspen University's Doctorate in Nursing Practice Program. I kindly request your participation in a doctoral research study that I am conducting titled "**Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections.**" This DNP project aims to investigate whether implementing CRP tests in long-term care facilities can positively affect antibiotic prescription practices for acute respiratory infections. The use of the CRP test and antibiotic prescription will be explored.

The study involves a pre-test followed by a PowerPoint Presentation and a post-test in which you will be asked to share your opinions and current practice model about the CRP test for acute respiratory infections. Participation is entirely voluntary, and you may withdraw from the study anytime. The study is confidential; therefore, it does not require you to provide your name or other identifying information. Your participation in this research will be of great importance in identifying the role and utilization of CRP tests in long-term health settings that consequently may positively affect antibiotic prescription practices and help a healthcare provider determine treatment. Attached is the consent form for your signature. Before the presentation, the informed consent letter must be signed and returned to Dimitri Shchadenko via email at landilove@gmail.com. An additional copy of the consent can be provided to you.

Thank you for your time and participation.

Sincerely,

Dimitri Shchadenko, Family Nurse Practitioner, DNP Student
Email address: landilove@gmail.com
Aspen University | 4615 East Elwood St. Suite 100
Phoenix, AZ 85040 | Toll Free: 1-800-373-7814

Appendix G

Consent Form

Informed Consent Form

Title of Project:

Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections

Introduction

The purposes of this form are to provide you with information that may affect your decision as to whether or not to participate in this research and to record the consent of those who agree to be involved in the project.

Principal Investigator

Dimitri Shchadenko is inviting you to participate in a project that is part of the recruitment for a doctoral degree at Aspen University.

Purpose of the Project

The purpose of this project is to investigate whether the implementation of C-reactive protein (CRP) tests can influence antibiotic prescription practices. Acute respiratory tract infections (ARTIs) contribute to increased hospitalizations and exacerbation of comorbid conditions. In skilled nursing facilities, practically 50 percent of all acquired ARTIs are of viral origin. These respiratory pathogens include influenza A and B, metapneumovirus, and respiratory syncytial virus. Fever is not always an indicator of bacterial infection. Viruses are being detected in most cases of ARTIs in skilled nursing facilities. The research question of this project is to identify if following the CRP guidelines can make a difference in clinicians' decision-making for prescribing antibiotics for acute respiratory tract infections?

Eligibility

You are eligible to participate in this project if you are a clinician with prescriptive authority in the selected skilled nursing facilities.

Description of the Project Activity

The study involves a pre-test followed by a PowerPoint Presentation and a post-test in which you will be asked to share your opinions and current practice model about the CRP test for acute respiratory infections.

Risks

If you decide to participate in this project, risks may include minimal risk, which generally means that the anticipated risks involved in the project are not more significant than those ordinarily encountered in daily life or routine activities.

Benefits

Benefits of participating in this project include participants will learn more about CPR and its guidelines, and how it was utilized in the stewardship of antibiotics for acute respiratory infections.

Confidentiality

All information obtained in this project is strictly confidential unless disclosure is required by law. The results of this project may be used in reports, presentations, and publications, but you will not be identified. In order to maintain the confidentiality of your records, Dimitri Shchadenko will not use your personal information for any purposes outside this research project and will not include anything else identifying you in the project reports.

The people who will have access to your information are Dimitri Shchadenko and his project committee.

Your information will be secured with these steps: Data will be kept secure by password protection and data encryption. Data will be kept for three years, then, afterward electronic data will be deleted and paper data destroyed.

Withdrawal Privileges

It is okay for you to decline to participate in this project and you are free to stop participating at any time without penalty.

If you decide to stop participation, you may do so by sending an email to Dimitri Shchadenko at landilove@gmail.com.

Your decision will not affect your relationship with Aspen University or otherwise cause a loss of benefits to which you might otherwise be entitled.

Costs and Payments

There is no financial cost to you as a participant in this project, nor is there a payment for your participation.

Voluntary Consent

Any questions you have concerning the project or your participation will be answered by:

Name: Dimitri Shchadenko
Email: landilove@gmail.com
Telephone: number: 650.284.6595

Faculty Chair: Dr. Deborah Schiavone
Email: Deborah.Schiavone@aspen.edu
Telephone: (571)345-4492

If you have questions about your rights as a participant in this project, or if you feel you have been placed at risk, you can contact the Aspen Institutional Review Board at IRB@Aspen.edu.

By signing this form, you knowingly agree to assume any risks involved. Your participation is voluntary. A copy of this consent form will be offered to you. Your signature below indicates that you consent to participate in the above project.

_____	_____	_____
Participant's Signature	Printed Name	Date

Appendix H

HIPPA Form

HIPAA Authorization Form

Complete this form fully and acquire the necessary signatures. This form must be included with your IRB paperwork, if you are conducting research involving HIPAA related data. If you have any questions, contact the Aspen IRB directly at irb@aspen.edu.

A. Overview Information	
Investigator's Name: Dimitri Shchadenko	Email: landilove@gmail.com
Dissertation Chair's Name: Dr. Deborah Schiavone	Email: Deborah.Schiavone@aspen.edu
Title of Project: "Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections"	

In the following section, describe the nature of the HIPAA related data and provide a detailed explanation for each prompt.

B. Nature of the Data
Describe the nature of the data to be used (i.e., What personal health information will be collected?) Gender, age, lab/diagnostic tests (such as CRP, chest X-Ray), relevant diagnosis, antibiotic treatment
Explain how the personal health information (PHI) will be used in the study No personal biometric data will be used. Only clinician orders and diagnosis will be used
How will the PHI be gathered/accessed? Via PointClickCare (PCC)
How will the data be protected so that risk of disclosure, misuse and identification are minimized? Any relevant data will be stored on the hard drive, password-protected and encrypted.
What is the expiration date for permission to collect and access PHI data for an individual?
Is a consent form being used? - No If no consent form is being used, skip to section C.
Does the consent form include language stipulating that the PHI cannot be reused or disclosed to any other person(s) or entity or for other purposes beyond what the permission that is granted for the current research study only? - No

Does the consent form include information and permission about granting permission to access PHI data? - No
Does the consent form include language related to the expiration date for collecting and access the PHI? - No
Does the consent form include language about HIPAA and PHI in plain language that is easily understood? - No
Does the consent form include language related to the right to revoke authorization to use PHI data at any time, even after the data has been collected? - No

Complete the following section related to who has authority to grant permission to access the individual's PHI data.

C. Information about Individual Authorized to Grant Permission	
Who has authority to grant permission to collect, access, and store PHI data for the individual? ☐ *Individual ☐ *Representative of the Individual x *Organization ☐ *Court **If authorization requires permission from someone other than the actual individual for whom the PHI pertains, provide contact information below.*	
Full Name: Zendi Meharry, RN, Director of Clinical Operations	
Relationship to Individual: None	
Phone: 208.863.4411	Email: zmeharry@cascadiahc.com
Address: 2205 East Riverside Drive Suite 100, Eagle, Idaho 83616	

Applicant's Name: _____Dimitri Shchadenko_____

Date: _____6.13.2022_____

Appendix I

Faculty Advisor Assurance

Faculty Advisor Assurance

For Human Subject Research

1. Protocol	
Title: **Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections**	
Previous IRB Number, if known: N/A	
2. Principal Investigator (Student)	
Name: Dimitri Shchadenko	Department: Aspen University Nursing Student
3. Faculty Advisor	
Name: Dr. Deborah Schiavone	Department: Aspen University Nursing Adjunct Faculty
Phone: 571.345.4492	email: Deborah.Schiavone@aspen.edu
Faculty Advisor's Assurance Statement	

I am the faculty advisor for the student (Principal Investigator) submitting this protocol. By my signature, I certify that I have reviewed the protocol and believe that it is scientifically sound. Furthermore, I believe that the student has the necessary training, experience, and knowledge to conduct the DNP Project in a manner consistent with the regulations governing human subject research and sound research principles. I agree to:

- Oversee and monitor the conduct of this DNP Project by communicating regularly with the PI;
- Assist with the resolution of any problems or concerns encountered during the DNP Project;
- Assure that the Aspen IRB is notified at irb@aspen.edu in the event of an adverse event or protocol deviation.

I understand that as the faculty advisor I am responsible for the conduct of this DNP Project.

Deborah Schiavone *Deborah Schiavone* July, 4, 2022

Faculty Advisor Name and Signature Date

___ Dimitri Shchadenko _____ 6.13.2022

Principal **Investigator** Name and Signature Date

NOTE: If this application is sent from the PI's Aspen University email account, a hand written signature is not required. Please type in the name and date above.

Please upload form in Project Concert once completed

Appendix J

Immersion Site Agreement

1660 S. Albion St.
Suite 525
Denver, CO 80222

(303) 333-4224 – Phone
(303) 200-7428 – Fax
www.aspen.edu

Reissued DNP Immersion Approval Letter

June 2, 2022

Dear Dimitri Shchadenko

This letter serves as notification that you have completed the required documentation and are approved to start your DNP immersion hours at your project site ***TruHealth*** with your project preceptor ***Dr. K. Browning, DNP*** as you continue your project courses.

You may be required to upload this letter per course outline as one of the assignments and subsequent courses so be sure you save the approval letter in a safe place. This letter is valid for ***18 months*** from the issuance date. Please note the following:

1. Any change in your immersion site or preceptor you must notify the DNP Coordinator at dnpcoordinator@aspen.edu. You will be required to submit a new Preceptor Agreement, Preceptor CV and/or site agreement for approval to continue your project and submission of immersion hours. Once approved you will be issued a new DNP Immersion Approval Letter to provide to your Faculty Chair.
2. The Immersion Approval Letter will expire 18 months from the date of issue. If you have not completed the DNP program within 18 months of the issued date of the DNP Immersion Approval letter you must notify the DNP Coordinator at dnpcoordinator@aspen.edu.to request a new DNP Immersion Letter be issued for the duration of the program.

Best wishes as you continue your educational journey and complete this important learning experience at Aspen University.

Warm regards, Dr. Sherry Raber, DNP, MMHC, MSN, RN

Dr. Sherry Raber, DNP, MMHC, MSN, RN
DNP Program Coordinator/DNP Program Aspen University
(615) 393-4379

Appendix K

Preceptor Agreement

Appendix J: Preceptor Agreement

Aspen University - Preceptor Agreement – DNP Immersion
Student: Submit this completed form to Project Concert

I, Dimitri Shchadenko, have identified the following preceptor and he/~~she~~ agrees to serve as my site preceptor for this/these course(s) DNP 851-B, 852A,B. I verify that I have provided this preceptor with a copy of the Aspen University DNP Handbook on 2/2/22 (today's date).

Student's Full Name: Dimitri Shchadenko Student's Signature: DS

Preceptor's Information:

Preceptor's Full Name: Kelsee Browning

Agency Affiliation: Truhealth / Cascadia

Agency Address: 201 Jordan Rd, Ste 300, Franklin TN 37067

Position Title: Regional Director of clinical operations

Work Telephone Number: (385) 303-0204 E-mail Address: Kbrowning@ourtruhealth.com

Preceptor's Education: Degree (Highest Level Attained):

X DNP ____ Ph.D. ____ Ed.D. ____ MD

____ Other Doctoral Degree Specialization ____

RN License # (if applicable) 9234652-4405 State UT Expiration Date 1/31/24

Preceptor's Acknowledgement and Acceptance:

I agree to function as the immersion site preceptor. I have reviewed the DNP Handbook and accept the role and function as a preceptor. The information provided herein is true to the best of my knowledge.

KM Kelsee Browning 3/3/22
Signature *(No Typed Signatures)* Printed Name Date

Preceptor's Experience (Please attach and submit a 5-year resume or CV)

Immersion Site Information (Should be the Same as the Immersion Site Agreement):

Name of Site: Cascadia homes

Address: 2205 E Riverside Dr. Ste 100 Eagle, ID 83616

Telephone Number: 208-461-9100

ASPEN UNIVERSITY APPROVAL:

Signature: ____ Print Name: ____

Date: ____ Title: ____

Appendix L

CITI Completed Programs

CITI PROGRAM

Completion Date 08-Jul-2022
Expiration Date 07-Jul-2025
Record ID 50026451

This is to certify that:

Dimitri Shchadenko

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Information Privacy Security (IPS)
(Curriculum Group)
Students, Faculty, Admin
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Aspen University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w9caa77c7-da33-4356-a3e2-54016ac96663-50026451

CITI PROGRAM

Completion Date 27-Jan-2021
Expiration Date 27-Jan-2024
Record ID 40236485

This is to certify that:

Dimitri Shchadenko

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social Behavioral Educational Researchers
(Curriculum Group)
Social Behavioral Educational Researchers
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Aspen University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w06efdc99-6ccf-4422-a0b6-c4240e298e33-40236485

CITI PROGRAM

Completion Date 30-Sep-2021
Expiration Date 29-Sep-2024
Record ID 40236486

This is to certify that:

Dimitri Shchadenko

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Responsible Conduct of Research (RCR)
(Curriculum Group)
Social, Behavioral, and Education Sciences (RCR)
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Aspen University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w0ded069f-1426-4f6b-82b1-56d82505c4ca-40236486

Appendix M

IRB Approval Letter

Aspen University
4615 E. Elwood Street, Suite 100
Phoenix, AZ 85040
IRB@Aspen.edu

IRB Review Letter

IRB Case Number: DS071822DNP

Today's Date: 07/18/2022
Approval Expires on: 07/18/2023

Name of Principal Investigator: Shchadenko, Dimitri

Study/Project Title: Antibiotic Stewardship with the Use of C-Reactive Protein (CRP) for Treating Respiratory Infections

Category:

- ☒ Exempt
- ☐ Expedited
- ☐ Full Review

Action:

- ☒ Approved - The research/project activity may commence.
- ☐ Modifications Required - Review not complete due the following reasons:

- ☐ Disapproved – The application is complete, but the study/project does not meet all the criteria for approval for the following reasons:

As PI of this study/project you understand and agree to:

- Seek approval from the IRB **prior** to **any** changes to the approved protocol using the IRB Change Request Form
- Notify the IRB of any unexpected events or alterations in risk levels for participants immediately and no later than 48 hours of occurrence of such events using the IRB Events Reporting Form
- Request a continuation of approval if the study/project is to exceed the expiration date listed above using the IRB Continuing Review Form
- Notify the IRB of the completion of the study/project using the IRB Close Out Form

Failure to comply with these responsibilities may result in consequences including but not limited to suspension or termination of study/project.

Thank you for your concern regarding the protection of human subjects and best wishes as you begin your study/project implementation.

Signature Heather Frederick Digitally signed by Heather Frederick Date: 2022.07.18 11:42:50 -07'00'

Name Heather Frederick **Title** IRB Chair