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Antimicrobial Stewardship: Incentives and Barriers to Implementation in Skilled Nursing Facilities

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ABSTRACT

ANTIMICROBIAL STEWARDSHIP: INCENTIVES AND BARRIERS TO IMPLEMENTATION IN A SKILLED NURSING FACILITY

This study was part of a quality improvement effort of a Skilled Nursing Facility (SNF) to develop and establish an antimicrobial stewardship program to comply with recently enacted California State Senate Bill 361 (SB 361), which went into effect January 1, 2017 (Skilled nursing facilities, 2015). The division of the facility into two sections, one staffed largely by Licensed Vocational Nurses (LVNs) and another staffed largely by Registered Nurses (RNs) provided an study opportunity that easily differentiated the licensed nurses. This study used three methods: 1) an educational intervention to licensed nurses, 2) a post-educational intervention survey of licensed nurses, and 3), a retrospective medical chart audit of facility residents before and after the educational intervention. There was no significant difference demographic between LVNs and RNs. All agreed antimicrobial stewardship was important. While there was an increase in adherence to standardized infection criteria post-educational intervention, the most significant change was in the prescribing behavior by nurse practitioners (NPs).

In conclusion, concentrating educational efforts on NPs and allowing them to practice in all areas of a SNF, may provide the greatest impact on the success of antimicrobial stewardship programs in these facilities.

Gloria M. Escalona
May 2017

ANTIMICROBIAL STEWARDSHIP: INCENTIVES AND BARRIERS TO
IMPLEMENTATION IN SKILLED NURSING FACILITIES

By

Gloria M. Escalona

A project

submitted in partial

fulfillment of the requirements for the degree of

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APPROVED


For the California State University, Northern Consortium
Doctor of Nursing Practice:

We, the undersigned, certify that the project of the following student meets the required standards of scholarship, format, and style of the university and the student's graduate degree program for the awarding of the doctoral degree.

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CHAPTER 1: INTRODUCTION

Innumerable studies over the past decades have demonstrated antimicrobials to be misused and overused in long term care facilities (Crnich, Jump, Trautner, Sloane, & Mody, 2015; Lim, Kong, & Stuart, 2014; Liu, 2012; Rhee & Stone, 2014; Stuart et al., 2012). They are the most commonly prescribed medication in SNFs, and up to 75% of these may be for an infection the resident did not have (Centers for Disease Control and Prevention, 2016; Lim, Kong, & Stuart, 2014; Rhee & Stone, 2014). Inappropriate use of antimicrobials exposes the elderly resident to a higher risk for adverse drug reactions, *Clostridium difficile* infections, and the emergence of resistant organisms (He et al., 2014; Lim, Kong, & Stuart, 2014; Rhee & Stone, 2014). Even when warranted, antimicrobials ordered tend to be for the wrong drug, the wrong dose, or the wrong duration (CDC, 2016). Antimicrobials need to be recognized as a community resource and misuse as an environmental patient safety issue due to the potential for the development of resistant organisms, which places everyone at risk – the local and the global community (CDC, 2016; Executive Order 13676, 2014; Pollack & Srinivasan, 2014).

Every person has the right to appropriate and beneficial antimicrobial therapy. Antimicrobial stewardship then is a set of activities and commitments by the community to protect the use of antimicrobials in order to ensure appropriate

and optimal treatment of infections at the same time reducing the chance of resistant organisms and other adverse reactions.

California Senate Bill 361

The State of California was the first State in the U.S. to respond to Executive Order 13676 of September 18, 2014, which strongly recommended as soon as possible healthcare facilities and professionals join the battle to fight the rise of antibiotic-resistant bacteria (Executive Order 13676, 2014). Senate Bill 1311 required stewardship programs in acute hospitals and went into effect in 2015 (AFL 14-36, 2014). Senate Bill 361 (SB 361) followed and mandated by January 2017 antimicrobial stewardship programs be established all in California SNFs also known as nursing homes (AFL 15-30, 2015; SNF, 2015). This researcher sees antimicrobial stewardship as an enormous opportunity for SNF licensed nurses to assume a more active voice in advocating for their residents, to become models for the changing role of nurses, and to change the image of nurses working in these facilities (Boltz et al., 2008; Cabigao, 2009; Kennedy, 2014; Manning, Pfeiffer, & Larson, 2016).

The SNF nurses' understanding of how to apply standardized infection criteria and guidelines at point-of-care to determine appropriateness of antimicrobial use are novel independent nursing actions in SNFs. For SNF nurses' to assume these activities in stewardship programs requires education and training

(Loeb et al., 2001; Manning, Pfeiffer, & Larson, 2016; Olson, Stone, & Chinn, 2017; Stone et al., 2012). While education alone cannot suffice nor sustain a stewardship program, utilization of standardized infection criteria have been used effectively in SNFs to determine whether consideration of antimicrobials is appropriate (Gillespie, Rodrigues, Wright, Williams, & Stuart, 2013; Loeb et al., 2001; Loeb et al., 2005; Ohl & Luther, 2014; Olson, Stone, & Chinn, 2017). Therefore, the training and education of SNF staff nurses in utilizing standardized infection criteria has the potential of enhancing antimicrobial stewardship programs and nursing care in these facilities.

Crnich et al. (2015) observe the need for further research into antimicrobial stewardship programs for nursing care facilities and note various methodologies used and the few successful stewardship programs. In addition, many nursing home studies were conducted in foreign countries and may not be applicable in the United States (U.S.). The definition of a nursing home in another country may differ from that in the U.S., as are nursing home laws and regulations, staffing issues, terminology, social conditions, cultures, etc.

Urgent Need for Studies of Nursing Home Licensed Nurses

As the number of baby boomers reach the age of 65, there is increasing demand for improved care for the elderly, especially for residents of long-term institutional facilities such as nursing homes, SNFs, and short-term rehabilitation

facilities (Chen & Landefeld, 2007; Federal Interagency Forum on Aging-Related Statistics, 2012; Gilje, Lacey, & Moore, 2007; U.S. Department of Health and Human Services, 2013; Vincent, & Velkof, 2010; Wan, Breen, Zhang, & Unruh, 2010; White-Chu et al., 2009). In their study more than two decades after enactment of the landmark Nursing Home Care Reform Act of 1987, which established programs to monitor care in nursing homes, Wan, Breen, Zhang, and Unruh (2010) lament that there has been “little improvement” in nursing home care of the elderly.

Kennedy (2014) complains about the poor care given this frail and needy population and calls on improving nurse staffing in these facilities by hiring more RNs. Yet, while studies of nurses in acute hospitals demonstrated an increase in quality of care when the RN to patient ratio is high, more research is needed to determine the same effect in SNFs. Even, what constitutes a safe and health-enhancing staffing pattern in these facilities is yet to be determined (Corazzini, Anderson, Mueller, Thorpe, & McConnell, 2012; Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000; McGilton et al., 2016). Nursing homes tend to ignore the difference in scope of practice between RNs and LVNs, and researchers, too, tend not to differentiate between RNs and LVNs (Corazzini et al., 2012; Corazzini et al., 2015; McGilton et al., 2016). This limits the application of the study to the body of nursing knowledge in this setting. Corazzini, et al. (2015) describe this

general lack of differentiation between the roles of the licensed nurses, as adding to job dissatisfaction among nurses and to difficulties raising the quality of care to nursing home residents. McGilton, et al. (2016) blame this discordance on the heavily regulated SNF environment as inconducive and limiting to registered professional nursing practice.

Nursing homes present unique challenges for initiating new concepts such as antimicrobial stewardship (Crnich et al., 2015; Lim, Kong, & Stuart, 2014; McGilton et al., 2016). Signs and symptoms of infection and disease in the elderly resident tend to be atypical (Bonomo & Salata, 2002; High et al., 2009; Lim, Kong, & Stuart, 2014). Providers and diagnostic services are offsite and results may take two or more days to get back to the prescriber. Medical and nursing specialists are also generally lacking. Families and significant others have a heavy influence on the nursing and medical care rendered their loved ones, and SNF licensed nurses tend to be unaware of their own influence on medication prescriptions and stewardship (Edwards, Drumright, Kiernan, & Holmes, 2011; Gillespie et al., 2013; McGilton et al., 2016; Scales et al., 2017). Since antimicrobial stewardship is a new concept for healthcare professionals, and the growth of antimicrobial resistance continues unabated, the education and training of health care professionals, including SNF nurses in antimicrobial stewardship is urgent. This study project will add to this scant literature.

Purpose of the Project

This study was part of a quality improvement effort by an SNF to comply with recent legislation (SB 361) and to assist the facility in the development and implementation of their antimicrobial stewardship program, and to improve the quality of care to their residents (AFL 15-30, 2015). Under the aegis of the nursing department, this study assisted the facility in researching stewardship programs to help form program policies and procedures, to monitor antimicrobial use, to instruct appropriate staff in antimicrobial stewardship, and to quantify a measure of quality of care rendered facility residents. This study also explored the effect of an educational intervention to SNF licensed nurses on stewardship and possible incentives or barriers they might have in implementing the facility stewardship program. This study adds to the literature to improve the care of the elderly, especially those requiring SNF services, increase information on the role of nurses in antimicrobial stewardship, and in the implementation of evidence-based practices in nursing homes. This study project also adds to the scant literature on the differentiation of licensed nurses working in long-term care facilities.

CHAPTER 2: LITERATURE REVIEW

Theoretical Framework

The complex social and environmental culture of nursing homes is quite different from hospitals and other healthcare facilities, and affects healthcare decision making, including the use of antimicrobials (Crnich et al., 2015; Corazzini et al., 2015; Edwards et al., 2011; McGilton et al., 2016). The theoretical framework for this study centers on the environmental models of Florence Nightingale and Everett Rogers.

Nightingale's Environmental Theory of Nursing and Rogers' Theory of Diffusion of Innovations emphasize the importance of the relationships among people and things in the environment, and the communication channels in the adoption of innovations in this case stewardship and use of a relatively new assessment tool known as the McGeer-Stone Criteria. The utilization of standardized criteria such as the McGeer-Stone Criteria can assist in providing common terminology for inter-professional communications, and implementing appropriate antimicrobial use. Both Nightingale and Rogers emphasize the importance of the social milieu and proper communication among the actors – Rogers in adopting innovations, and Nightingale in viewing the comprehensive interplay of actions in the patient's environment in promoting health and healing. These theories can help explore the incentives and barriers in the process of

adopting these innovations, and facilitate the implementation of stewardship programs, and, perhaps, promote judicious use of antimicrobials.

Nightingale's Environmental Theory of Nursing

Florence Nightingale was an environmental nurse theorist and change agent (Hegge, 2013; Masters, 2015; Selanders, 1993; Selanders, 2010). She promoted nursing care that puts the patient in the best possible situation to heal themselves, which meant for the nurse to modify a patient's unhealthy environment to one that promotes healing (Hegge, 2013; Nightingale, 1859; Masters, 2015; Selanders, 1993; Selanders, 2010). In this effort, nurses must be educated and assertive enough to ask important questions, if they are to assist in reducing inappropriate exposure of patients to antimicrobials, reducing the adverse effects of therapeutics, and promoting a safer environment for their residents (Rhee & Stone, 2014; Stone et al., 2012). The CDC supports this environmental view of antimicrobials by insisting that

“Antibiotics are a shared resource: Antibiotic use in one patient can impact the effectiveness in another [and] if everyone does not use antibiotics wisely, we will all suffer the consequences” (Pollack & Srinivasan, 2014).

In addition, facilities must adhere to infection isolation guidelines requiring a strong consideration of the resident's environment, including the selection of

appropriate roommates to reduce direct and indirect transmission of resistant organisms (AFL 10-27, 2010; Siegel et al., 2007).

Crnich et al. (2015), Corazzini et al. (2012; 2015), and McGilton et al. (2016) describe in detail their insights into the difficulties presented by the structure and culture of the current nursing home environment. While Crnich et al. (2015) describe a complex set of factors impinging on the decision to order antibiotics and the barriers to successful implementation of an effective stewardship program; they hint that nurses may be the major barrier. Regardless of various factors, the nurse moves unwaveringly toward obtaining the prescription (Crnich et al., 2015). Crnich et al. (2015) and Stuart et al. (2012) agree that a general adherence to criteria can help facilities better manage their antibiotic usage. McGilton, et al. (2016) cite over-regulation as the major environmental barrier to full registered professional nursing practice and suggest additional research to determine methods of alleviating this stress and to elicit those professional nursing competencies needed in SNFs now and in the future.

Discussions with the director of nursing of the study facility resulted in the Old Infection Decision Algorithm shown in Figure 1, illustrating the pattern of facility nurse decision making prior to the educational intervention in this DNP project (Cabigao, personal communications, February 2016). As seen in the algorithm there is little regard for environmental or other factors that may mitigate

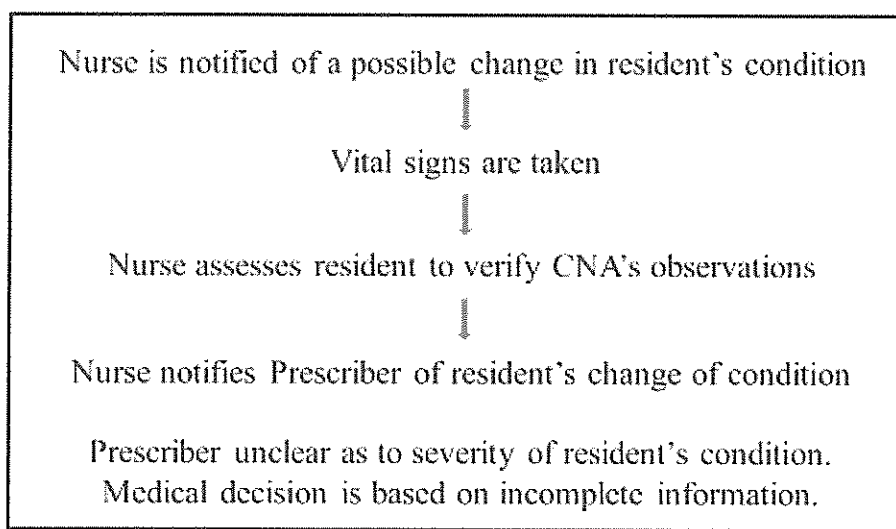


Figure 1 – Old Infection Decision Algorithm

the need for chemotherapeutics. Since the majority of licensed nurses in an SNF are LVNs, requiring them to perform comprehensive assessments of residents presenting with a change in condition would be outside their scope of practice (Corazzini et al., 2012; Corazzini et al., 2015; Licensed Vocational Nurse Scope of Practice, 2002; Vocational Nursing Practice Act, 2015). This limitation of the majority of SNF nurses, applies an undue burden of responsibility upon the LVN, at the same time limiting the ability of the RN to operate at their highest functional capability (McGilton et al., 2016). Instead enacting another law or regulation to fill this gap, completion of a form or the utilization of a tool such as the McGeer-Stone Criteria that addresses pertinent observations may be more efficient. The process of antimicrobial stewardship, itself, may pave the road for enabling RNs to

utilize their education, training, and critical thinking skills to their fullest in these facilities.

Standardized infection surveillance criteria have been available since 1991 and revised in 2012 to adhere with current evidence-based studies and guidelines (McGeer et al., 1991; Stone et al., 2012). Use of a standardized tool can help nursing practice by systematizing observations and assessments, improving reporting and documentation of infection signs and symptoms, and communicating more complete information upon which a prescriber can base a clinical decision (Cabigao, 2016; Stone et al., 2012).

Nightingale's Environmental Theory appreciates the role of the nurse as part of a team of professionals or rather, an organizational system, that considers the preferences of the resident and family, organizes the environment and organizational system to benefit residents, and adequately communicate the condition of residents to ensure the most beneficial and appropriate health care for their patients.

Rogers' Diffusion of Innovation Theory

Originally designed to examine acceptance of technological innovations, Rogers considers the relationships among the employees, and the communication channels in the work environment as instrumental in the adoption of innovations, in this case antimicrobial stewardship. Several studies have shown the utility of

Rogers' theory in other fields, including nursing (Lee, 2004; Melnyk & Davidson, 2009; Rahman, Applebaum, Schnelle & Simmons, 2012; Rodgers, 2003; Starkweather & Kardong-Edgren, 2008). Rogers' theory dovetails well with Nightingale's environment theory, due to its reliance on the social environment as influential in adoption of the innovation. The primary innovation in antimicrobial stewardship is the use of infection criteria at the nursing point of care to assess appropriateness of antimicrobials (Stone et al., 2012). Point of care is defined as that place where the nurse meets the patient and must make a decision regarding that patient's nursing care (Courtney, Demiris, & Alexander, 2005; Henly, 2014).

Characteristics of the Innovation. Rogers (2003) describes important characteristics of the innovation, which can lead to easy adoption or non-acceptance and, which the study facility tried to adhere to as their stewardship program advanced (Rahman et al., 2012; Rogers, 2003; Sahin, 2006). These situations are:

- 1) **The innovation is advantageous to the work situation.** This step is also the initial Core Element (Leadership) in the CDC standard for antimicrobial stewardship (CDC, 2016). These Core Elements comprise the standard used by the California Department of Public Health to assess compliance with SB 361 (AFL 15-30, 2015). According to Rogers unless this initial step is acknowledged, the

effect of the innovation will not be recognized and its practice value will diminish. This step emphasizes the importance of nurse leaders in guiding and mentoring nurses in the application of antimicrobial stewardship concepts in the clinical setting. Education and training in antimicrobial stewardship was offered to all facility nurses and all nurse leaders, including NPs. An ongoing challenge to the stewardship program will be that of encouraging Charge Nurses, nurse managers, program directors, supervisors, and other nurse leaders to help staff recognize when their stewardship efforts affected care.

- 2) **The innovation is compatible with current practice.** As much as possible antimicrobial stewardship forms and procedures were built on existing forms and procedures in the hope that fewer changes in current procedures would lead to greater and quicker licensed nurse acceptance of the stewardship program.
- 3) **The innovation is easy to use and understand.** The educational intervention included a brief introduction to antimicrobial stewardship, the revised infection surveillance criteria, the new infection decision algorithm, a few case studies, and time to answer any number of questions attendees might have. A handout of the revised infection surveillance criteria or McGeer-Stone Criteria and

the new infection decision algorithm (Figure 2) were developed, and given as handouts to each nurse attending the in-service and to new hires. A summary of the revised infection surveillance criteria were laminated and posted on each nursing unit. However, this form has since undergone several revisions due to changes in medical recommendations and staff suggestions to make them easier to use and understand.

- 4) **The innovation is given an experimental or trial period.** While there was no time for an formal trial period, staff were informed they could begin using the criteria and forms prior to January 2017 in order to become accustomed to them, and that comments and suggestions would be appreciated. Stewardship forms and procedures continue to be revised as comments and suggestions are received.
- 5) **The innovation has observable results in the clinical situation.** While nurses can be told that stewardship will result in improved care, this outcome might only be seen after use on a specific resident or after a period of time. If nurses use the criteria regularly and acknowledge the outcome as related to their use of criteria, they may recognize the results more immediately and continue using the

innovation, i.e. become full Adopters of the innovation. Therefore, the role of nurse leaders in encouraging stewardship activities in the nursing staff and mentoring their nurses in these concepts is highly important for the successful adoption of stewardship concepts.

Types of Adopters of Innovation. Rogers defines “Adopters” according to their willingness to try new activities or things. He describes five types of “Adopters” (Innovators, Early Adopters, Early Majority, Late Majority, and Laggards) and five stages of adoption (Knowledge, Persuasion, Decision, Implementation, and Confirmation). In helping design and implement the facility stewardship program, this researcher and the designated facility person in charge of the antimicrobial stewardship program were the Innovators. Early Adopters are those who underwent training, gained *knowledge*, and tried the forms and procedures. Their positive reports regarding use of the forms and procedures can *persuade* enough staff nurses to transform into Early Adopters and, thus, form an Early Majority to *implement* the program fully. The Early Majority in turn can persuade the rest of the staff to form the Late Majority and *confirm* facility adoption of the program. Laggards are those not fully persuaded to adopt the innovation. Laggards can be dangerous in an organization due their potential for undermining efforts for change.

As the deadline for implementation of SB 361 closed and the new forms replaced the old ones on the facility computer system, nurses had to use the new forms and procedures. The leadership had the least exposure to the new forms, the least experience with specific program tasks, did not attend the educational intervention, and, therefore, were most in danger of becoming the Laggards in the facility stewardship program, if not properly educated in or supportive of the change.

Implementing the concepts of antimicrobial stewardship into standard SNF practice may require a major change in the SNF system of nursing practice (Corazzini et al., 2012; Corazzini et al., 2015). While the need is recognized, such changes have yet to be delineated due to the scant research on SNF nurses and nursing practice in these settings (Crnich et al., 2015; Corazzini et al., 2012; Corazzini et al., 2015; Edwards et al., 2011; Wan et al., 2010). A recognition of the theories of both Nightingale and Rogers can assist in the implementation of antimicrobial stewardship measures by emphasizing the importance of the environmental milieu and promoting the communication of a more complete picture of the resident's change in condition to key health care providers. This study will add to this scant literature.

Review of the Literature

While the body of literature on stewardship in nursing homes is growing, most studies were conducted overseas, few examined the use of standardized criteria, fewer focused on licensed nurses, and fewer, yet, differentiated the licensed nurses.

Scales' (2017) team were the first in the U.S. that looked at SNF licensed nurses and antimicrobial stewardship. Researchers designed a self-administered questionnaire to discover the attitude of nursing home nurses and medical providers towards antimicrobial stewardship. They invited a maximum of six nurse leaders and six medical providers from thirty-one nursing homes in North Carolina to respond to their questionnaire. The nurses chosen were the director of nurses, the infection control nurse, and senior nurse supervisors (either RNs or LVNs). Medical providers were three physicians, and three NPs or physician assistants with high nursing home caseloads in these facilities. Nurses received a paper copy, while medical providers could use Qualtrics, a computer software, questionnaire program available online through their university.

Not all those selected chose to answer the questionnaire. Of those invited, 182 nurses and 50 medical providers responded. Researchers did not differentiate between RNs and LVNs, and did not conduct chart audits to determine if the attitudes reported by the nurses and prescribers were translated into actual

practice. Researchers reported specialty medical providers held a greater commitment to promoting stewardship than nurses or other providers.

Both the Centers of Medicare and Medicaid Services (CMS) and the California Department of Public Health (CDPH) recognize the importance of standardized infection definitions in facility quality improvement efforts (AFL 10-27, 2010; Lim et al., 2014; U.S. Department of Health and Human Services, 2013). Originally designed for infection surveillance in SNFs, standardized infection definitions have been demonstrated to be both valuable and efficacious in the diagnosis and treatment of common infections among elderly residents of SNFs (Juthani-Mehta, et al., 2007; Lim, Kong, & Stuart, 2014; Liu, 2012; Olson, Stone, & Chinn, 2017; Zabarsky, Sethi, & Donskey, 2008). While their use in clinical practice as the sole determinant of antimicrobial appropriateness remains questionable, the body of knowledge supporting their use in SNF stewardship programs is growing. They are also included in current professional guidelines and recommendations for establishing infection prevention and control programs in SNFs (AFL 10-27, 2010; Olson, Stone, & Chinn, 2017; Smith et al., 2008; Stone et al., 2012). As early as 1995, Marx and Mulligan found standardized infection definitions (the McGeer Criteria) valuable in their facility and recommended its use (Marx & Mulligan, 1995). Henneman, Gawlinski, and

twelve nursing homes in North Carolina. Six facilities were the controls and six experienced an extensive and prolonged educational intervention. Their quality improvement strategy for reducing antibiotic prescriptions obtained dramatic success. They attributed the success of their program to the commitment of the medical staff. Since the medical staff were largely employees of a single medical group dedicated to long-term care, the group had a professional, economic, and emotional investment in the twelve facilities and in the success of the program. Researchers recognized that replication of their study would be difficult with facilities having medical personnel who were less invested in the facility.

This study inspired the use of an educational intervention and chart audits to measure application of the education in this DNP project. However, Zimmerman's team focused on the Loeb Minimum Criteria for the Initiation of Antibiotics, rather than the McGeer or McGeer-Stone Criteria (Loeb et al., 2001; Loeb et al., 2005; McGeer et al., 1991; Stone et al., 2012).

Fleet's team designed a form called the RAMP (Resident Antimicrobial Management Plan), which combined elements of both the Loeb and the McGeer Criteria to measure antimicrobial appropriateness, and proceeded to test its utility in nursing homes (Fleet et al., 2014). This seventeen-month prospective study in thirty nursing homes in London, England found the use of their form could increase compliance with infection criteria and other salient components of their

stewardship program. A pre-intervention chart audit and three point-prevalence chart audits demonstrated a significant reduction in the use of antimicrobials over the course of the study.

CHAPTER 3: METHODOLOGY

This study employed three methodologies: an education intervention, a post-education nurse survey, and a retrospective chart audit.

Research Setting

The facility chosen for this research project was an urban 378-bed SNF in Northern California. The SNF has two major areas: six long-term units (LTUs) providing custodial care for elderly persons and staffed largely by Licensed Vocational Nurses (LVNs); and three short-term units (STUs) providing rehabilitation for post-acute patients and staffed largely by Registered Nurses (RNs). This facility was chosen because of its size, delineation of RNs and LVNs, employment of a large number of licensed nurses, and their director of nurses held a research doctorate in nursing and was willing to participate in both my research and education. Over the past few years, the facility had undergone numerous changes: downsizing, implementation of electronic medical records, changes in major vendors, and restructuring of several departments, especially the nursing department. While these changes challenged the leadership, the primary nursing leadership remained stable. In 2015, the facility had to establish a new program, an antimicrobial stewardship program in response to SB 361.

The Education Department presented in-services to nursing staff in March 2016 to inform them of the new law and to introduce the doctoral nursing student

who would assist the facility with the development and initial implementation of their antimicrobial stewardship program. According to the director of nurses, there had not yet been a direct research study of the nursing staff at this facility, so this researcher was breaking new ground. It is my hope that this project will be the first among many research projects at this facility.

In this setting, the study sample are the licensed nurses working in the SNF.

The Educational Intervention

The Educational Intervention was presented to all shifts, on all nursing units, including newly hired licensed nurses, in October 2016. The educational intervention presented to nursing staff was under the auspices of the facility Education Department, who also scheduled the in-services. The educational department posted the program as mandatory, since it, also initiated the first phase of the facility antimicrobial stewardship program.

The Educational Intervention consisted of the following:

1. An introduction to antimicrobial stewardship and SB 361 compliance;
2. A New Infection Decision Algorithm to assess residents presenting with a change in condition that may indicate an infection (as shown in Figure 2);
3. Introduction to use of infection surveillance criteria known as the McGeer-Stone Criteria (see Appendix A); and
4. Documentation of the resident's signs and symptoms.

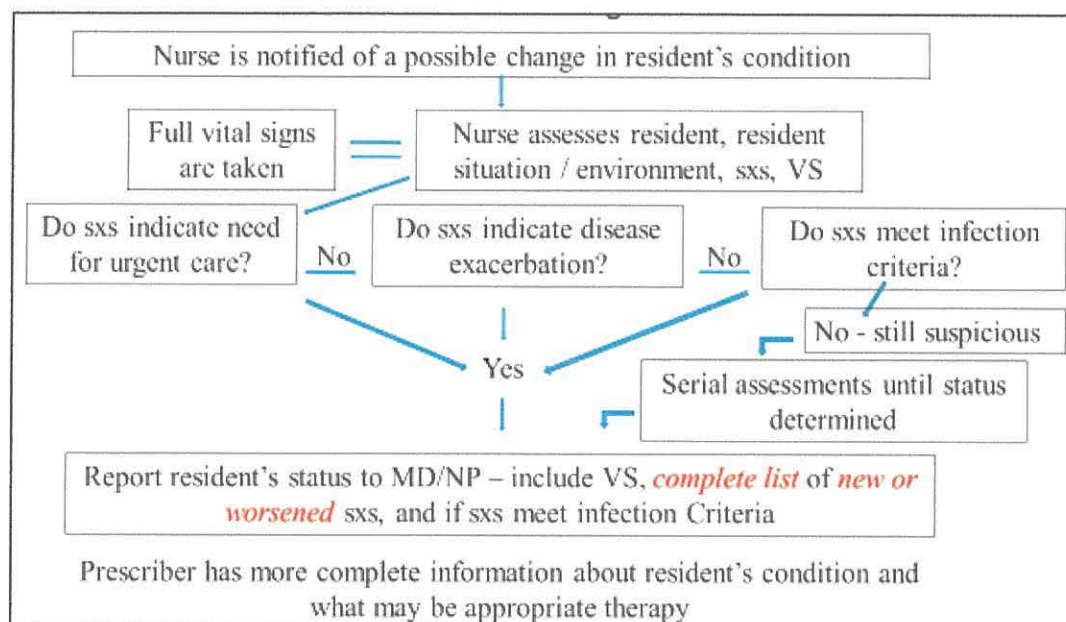


Figure 2 – New Infection Decision Algorithm

New Infection Decision Algorithm. Note the New Infection Decision Algorithm (Figure 2) breaks the old decision process (Figure 1) into several logical steps to remind the nurse what information to collect, what should be considered, and in what order.

Infection Surveillance Criteria Summary Form. The educational and assessment tool, called the Long Term Care Infection Surveillance Criteria Summary Form, combined the McGeer-Stone Criteria with some features of the Loeb Criteria and AFL 10-27 (AFL 10-27, 2010; Loeb, 2001; Loeb, 2005; Stone et al., 2012). This form underwent several revisions during the span of this study in response to staff and attendee requests, suggestions, and medical updates. For example, Bloodstream Infections (BSI) was changed to Sepsis and contains the

qSOFA (quick Sepsis-associated Organ Failure Assessment) scoring (Jacob, 2016; Singer et al., 2016). The most recent update of this two-page tool is in Appendix A. The form was distributed during the educational intervention and to new hires, and was laminated and given a permanent place on each nursing unit. This form may need to be revised periodically, as new guidelines are developed to ensure the tool remains a method of assisting the SNF nurses in their practice of evidence-based nursing. Nurses were encouraged to document the signs and symptoms, and whether or not they adhered to the McGeer-Stone Criteria.

PowerPoint Presentation. The educational intervention program included an interactive PowerPoint presentation that also discussed several case studies. The number of case studies could change or be eliminated, depending upon available time. The presentation was about fifteen minutes and could last as long as an hour, depending on time and the number of case studies discussed or number of questions from attendees.

Although, mandatory, not all facility nurses attended. Four CNAs (Certified Nurse Assistants) inadvertently attended one session, and stated the program was very interesting and informative. Participants included the NPs with medication prescriptive authority in the LTU. During this study period, NPs did not prescribe in the STU.

The PowerPoint presentation was not given to nurse managers, supervisors, or physicians. These individuals were introduced to the stewardship program through a short ten-minute discussion, and question and answer period at their respective meetings the following December 2016. At this meeting, they received copies of the Long Term Care Infection Surveillance Criteria Summary Form.

While all physicians had heard of antimicrobial stewardship, some had no training in it. Some had heard of the Loeb, but not the McGeer-Stone Criteria, and some had not heard of either. A few physicians received training previously in stewardship at another SNF and requested copies of the Loeb Criteria, which was part of that previous training. As a result, summaries of both criteria were distributed to physicians at their meeting. It was decided that chart audits would measure adherence to either the Loeb or the McGeer-Stone Criteria to determine if either or both demonstrated a change.

As the antimicrobial stewardship program developed, licensed nurses received additional educational in-services to keep them informed of the program's progress and their role in it. An educational program on antimicrobial stewardship, which includes information on SB 361, the New Decision Algorithm, the McGeer-Stone Criteria, and use of the new forms and procedures, continues as part of the facility's orientation of newly hired licensed nurses. An updated PowerPoint presentation on antimicrobial stewardship is also part of the on-going

education of licensed staff nurses and the orientation of new hires. At the beginning of each educational session by this researcher, attendees (all licensed nurses and many new nursing school graduates) were asked if they had heard of antimicrobial stewardship and the answer was invariably, “No. What is that?”

Post-Educational Intervention Nurse Survey

The nurse survey was distributed and collected in November and December 2016. (A copy of the two-page form is in Appendix B.) The two-page nurse survey consisted of forty-two questions mostly in check boxes: a set of demographic questions, three sets of five-point Likert Scale questions, and a final section to explore possible barriers to their implementation of stewardship. Nurses received the survey on their respective units, and a copy placed in the mailboxes of the nursing leadership. The survey was generally completed and returned immediately after; some were collected later, and a few disappeared. The nurse leadership eventually received a second copy, since none had returned. At their request, NPs were emailed a copy and all were returned.

Retrospective Chart Audit

A retrospective chart audit of facility residents presenting with one or more signs or symptoms of an infection was conducted to determine antimicrobial use a month before the educational intervention (September 2016) and after the educational intervention (November 2016) to determine adherence to Criteria. A

copy of the two-page chart audit form is in Appendix C. Data collected on residents included demographics, signs and symptoms, and whether or not the signs and symptoms met infection surveillance criteria.

Ethical Considerations

Participation in the Nurse Survey was voluntary, confidential, and not compensated. Nurses were asked not to put their names on the survey instrument. This project was approved by the university Institutional Review Board (IRB). Since this was a quality improvement effort, the facility did not deem approval from their IRB committee as needed.

CHAPTER 4: RESULTS

Study Sample

While ninety-one attended the educational intervention in October 2016, only sixty-two (62) nurses responded to the Nurse Survey – 25 RNs and 37 LVNs.

Demographics

As seen in Table 1, the nurse survey revealed no significant difference between the demographics of RNs and LVNs. RNs and LVNs were comparable in age, career length, educational level, and ethnicity. Many received their education and training outside the U.S., indicating language and culture may have affected their responses to the Nurse Survey. About a third of RNs and LVNs were under 30 years old, about a quarter had one or fewer years of licensed nurse experience, and almost half had 20 or more years of nursing experience. It would seem that nurses spent a few years in this field and then went elsewhere. The surprise was finding more than half of the LVNs (54%) held baccalaureate degrees as did more than half of the RNs (60%). It was not clear how many had received their degrees overseas. RNs, however, tended to achieve higher levels of education.

Staffing, Time, and Career Length. The number of residents a nurse may be assigned on any shift in the LTU ranged from 20-43 with a mode of 20-22. LVNs were dominant in the LTU. The number of residents a nurse may be assigned on any shift in the STU ranged from 17-37 with a mode of 19. RNs were

Table 1

Demographics of the Licensed Nurses

	RN's	LVN's
Age	25-68 years (28%<30 years)	23-60 years (32%<30 years)
Ethnicity	Asian 84%	Asian 68%
Gender	Female 84%	Female 86%
Highest level of Education	AA 32% Baccalaureate 60% Masters 4% Doctorate 4%	AA 11% Baccalaureate 54% Vocational School 35%
Where trained	USA 23% Philippines 13% Other 64%	USA 37% Philippines 19% Other 44%
Country of Original Licensure	USA 56% Philippines 32% Other 12%	USA 62% Philippines 32% Other 5%
Career Length	<1 year 24% >20 year 44%	≤ 1 years 22% >20 years 45%
Position	Staff Nurse 64% Charge Nurse 12% Supervisor 12% Other, includes certified RNs 12%	Staff Nurse 100% Charge Nurse 0% Supervisor 0%
Usual Shift	Day 24% Day / Eve 8% Eve 32% Eve / Night 0% Night 8%	Day 16% Day / Eve 3% Eve 41% Eve / Night 5% Night 30%
Employment Status	Full-Time 84% Per Diem 6% On-Call 4%	Full-Time 76% Per Diem 22% On-Call 3%
Has a second job	No 72% Yes 28%	No 76% Yes 24%
Ever worked in an acute hospital	No 84% Yes 8%	No 84% Yes 14%
Usual unit assigned	LT 4% ST 72% Multi 24%	LT 86% ST 5% Multi 5%
# of residents assigned today	Range 17-37 (3 responded zero) Mean 17.8 Median 19 Mode 19	Range 20-44 Mean 26.1 Median 24 Mode 20 & 22

dominant in the STU. Note that three RNs responded zero to the question regarding number of residents assigned them. When asked, one nurse answered zero because they had not had the time to determine how many residents they had been assigned. The larger ration of RNs per LVNs in the STU was due to the higher acuity of the residents, and the need for the skilled assessments and critical thinking RNs are educated and trained to provide. However, while the need for rapid and comprehensive assessments are needed in the sub-acute areas, over 80% of licensed nurses had not had acute care experience and may be less experienced with the variety of acute medical conditions and processes that may present in the sub-acute setting. In fact, almost a quarter of licensed nurses were at the very beginning of their careers. How this may affect their resident assessment and time management skills as well as their confidence and knowledge in applying these skills in this setting is unknown.

Nurse Leaders. At least three nurse supervisors and the NPs attended the educational intervention program and responded to the nurse survey. No higher-level nurse leader attended the educational intervention program or responded to the nurse survey. How this may affect the results of the nurse survey, the implementation of antimicrobial stewardship, or the use of infection criteria by the nursing staff is unknown.

Eliciting Incentives and Barriers

All respondents reported having attended an in-service or other program on antimicrobial stewardship, supported antimicrobial stewardship, and agreed stewardship was important. There were mixed though insignificant findings in nurse application of what had been taught in the educational intervention. Unfortunately, the section of the nurse survey meant to elicit barriers or difficulties in performing their new stewardship role (Question 42) was largely incomplete or blank, which invalidated the question. There were no significant differences found between RNs and LVNs or between the STUs or LTUs.

In some cases whole sections of the nurse survey were blank or inadequately answered, including the demographic section. One nurse asked if they could include their time as a nurse's aide. It is not clear if other respondents did include their time as a nurse's aide. The questions may not have been understood, or did not include the needed vocabulary to express the nurse's choice. Table 2 is an example of the scattering of answers. This section concerned whether the nurse used the criteria, used what they had learned in the in-service, and if they felt supported in their trial of antimicrobial stewardship. There was no significant difference noted between the LVNs and RNs.

Table 2

Responses of Licensed Nurses to Nurse Survey Questions 37-41

Questions 37-41	# of LVNs						Blank	# RNs					
	0	1	2	3	4	5		0	1	2	3	4	5
37 How often have you called or received an antibiotic order for a resident?	4	7	9	4	4	7		3	1	6	3	2	7
38 How often have you used criteria to assess a resident for a possible infection?	5	6	4	6	6	8	1	2	0	3	3	8	6
39 How often have you faced barriers or problems practicing what you learned?	7	4	6	8	5	6		5	2	6	3	3	2
40 How often have you felt supported in using what you learned?	2	3	2	8	8	10	1	1	1	6	4	5	5
41 How often have you discussed antibiotic stewardship with a physician or NP?	11	4	8	4	2	6		6	1	5	3	2	4

Retrospective Chart Audits

The retrospective review of resident's medical records was to determine the level of adherence to standardized criteria before and after an educational intervention to licensed nurses. While there appeared to be a significant difference

between adherence to criteria between September and November and between the STUs and the LTUs, the chi square unveiled a different story.

Among prescribers, the rate did increase – in September 36.8% met Criteria and in November 72.7% met Criteria. However, the chi square demonstrated no significant statistic difference between November and September ($p = 0.44$) or between the STU and LTU ($p=0.144$), or among the physicians. The level of significance or p value at the 0.05 or 0.01 was not met. While NPs did not prescribe in the STU, the number of NP prescriptions meeting criteria in the LTU jumped from zero to eleven. The chi square revealed this change as very significant ($p = 0.007$). Therefore, the difference in the percent change between September (36.8%) and November (72.7%) is related to the prescriptive action by the NPs. The NPs received formal stewardship training by this researcher, while the physicians did not.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

This study presented significant challenges and may help explain the reason there are so few studies differentiating the licensed nurses in long-term care. The participants in the study had a difficult time answering the survey questions. The turnover at this facility also affected the results of the study.

The Challenge of Conducting Research in SNFs

Attendance at the Educational Intervention

During the course of the study, nurse turnover was high. It was not clear if the nurses taught in October were still there in November or December. Even though the educational intervention was mandatory, not all nurses attended and few in nurse management. Training of physicians was not included in the educational intervention. NPs received the training, while physicians did not. What impact the absence from training by nurse leaders and prescribers have on sustaining stewardship, facilitating the application of stewardship practice, or removing barriers to stewardship practice in this facility remains to be determined.

Completing the Nurse Survey

No pre-study or pilot study was conducted to determine if the questions in the nurse survey were valid or easy to understand. The lack of a significant difference in demographics between the LVNs and RNs, lack of a significant difference between the responses of the LVNs and RNs, and the invalidation of

core questions in the nurse survey affects the applicability of this study to other facilities.

The nurse survey may have been too long or required more time to reflect on the answers. Many nurses rushed through the form. Nurses answered the nurse survey on the units, while they were still working, and, generally not during their breaks or lunches. Therefore, nurses could be easily distracted and completing the form was not a high priority. Some forms were for later pick-up, and, still were not returned or recovered. None of the forms placed in the facility mailboxes of the nurse leadership were returned. NPs were emailed forms and all were returned. Other methods may be needed to solicit the return of questionnaires in this setting, or, perhaps, written questionnaires are not feasible in this setting.

The questions on barriers may not have been understood or the vocabulary to describe nurse experience was not there. Lack of sufficient results from this section of the survey was the most disheartening part of this study. This section was a disappointment, since the barriers to stewardship could not be elicited, validated, or clarified. English language skills may be an issue among licensed nurses in this nursing home setting. While data analysis continues, if this nurse survey were to be used again, the questions would need rewording, and perhaps a pilot to help clarify the questions or facilitate understanding by an ethnically diverse nurse population as found in this SNF.

Utilization of Standardized Criteria

Although some physicians had training in another set of infection criteria (the Loeb Criteria), which was not taught to licensed nurses, it could be that the level of antimicrobial use demonstrated in the study was indicative of the baseline level of stewardship by facility physicians or an increase since their previous training. The fact that NPs were able to significantly raise their adherence to criteria and significantly influence the overall adherence to criteria, could mean that physicians can also raise their adherence to criteria significantly higher. How adherence to criteria affects actual antimicrobial use is yet to be determined.

Influence of Frontline Nurses

What remains unclear in this study is the relationship of training given to staff nurses to change in antimicrobial use. Did training staff nurses impact stewardship at all? The literature is filling with opinions, anecdotes, and reasons for the importance of including frontline nurses in stewardship efforts (Gillespie et al., 2013; Hawking, Ashiru-Oredope, Northeast, & McNulty, 2014; Manning, Pfeiffer, & Larson, 2016; Olans, Olans, & DeMaria, 2016; Royal College of Nursing, 2014). However, if staff nurses are to have a more active role in stewardship, as recommend, then greater demonstration of the effect of their stewardship practice is needed. Future studies must include staff nurses and separate LVNs from RNs in order to determine the level of influence nurses exert

on the decision to use antimicrobials as well as who and what activities are most helpful. It may be more efficacious for educational interventions on stewardship to intensify efforts on prescribers rather than on facility nursing staff. The literature suggests nurses as frontline health care workers and intimate patient caregivers can influence antimicrobial use; and nurse use of standardized criteria can improve documentation and inter-professional communication of the residents' condition (Crnich et al., 2015; Crnich et al., 2013; Edwards, Drumright, Kiernan, & Holmes, 2011; Hawking et al., 2014; Manias & Street, 2000; Manning, Pfeiffer, & Larson, 2016; McGilton et al., 2016; Olans, Olans, & DeMaria, 2016; Royal College of Nursing, 2014).

This study in this facility was not able to demonstrate any influence that frontline SNF nurses, despite an educational intervention, had, if any, on antimicrobial use. The knowledge, ability, and resources of frontline nurses to influence antimicrobial usage remains hidden in this setting. The significant contribution to stewardship made by NPs, who received the same educational intervention as the staff nurses is important to note. The role of NPs in stewardship in nursing homes deserves further exploration.

Recommendations

The general applicability of this study is limited in large part to its small sample size (only one SNF). No pre-study or pilot study was conducted to

determine if this facility was a typical SNF for the area or industry. The facility characteristics are likely different from other SNFs, which limits the applicability of study findings to other facilities or other groups of SNF licensed nurses.

More studies of licensed nurses in SNF facilities are needed and these studies should differentiate RNs and LVNs. This study may also add to the literature supporting the concept of long-term care facility environments as possibly limiting the ability of RNs to achieve full practice potential, as a staff nurse, supervisor, or even NP (McGilton et al., 2016). Facilities should also determine whether their job descriptions for licensed nurses consider the levels of nurses and their different scopes of practice. The attempt of this study to engage unit-based / point-of-care nurses in stewardship practice was unsuccessful due in part to poor or lack of response to pertinent questions on the nurse survey. Stewardship training for nurses may need to begin in the nursing school curriculum.

One of the main concerns nurses had in participating in the in-services and completing the Survey was time. The high patient load endemic to long-term care nursing was discussed and remains in need of additional research and strategies for resolution (Corazzini et al., 2012; McGilton et al., 2016). If nurses are so busy they are unable to take time to attend short mandatory educational programs or participate in quality improvement studies, the quality of nursing practice will

suffer and the turnover of RNs continue to hamper efforts to raise the quality of care in these facilities (Corazzini et al., 2012; McGilton et al., 2016).

Written surveys may be inadequate for drawing out incentives and barriers to adoption of innovations such as stewardship in this setting. Interviews may improve the quality and perhaps, too, the quantity of data. If this survey was repeated, the nurse may need to be taken off the unit in order to have a quiet time to consider each question and not be rushed to answer. The questions in this study survey will also require rewording.

All prescribers should be included in stewardship training. In fact, all staff, residents, families, and visitors should be educated in antimicrobial stewardship (CDC, 2016). Education and training in stewardship should include the McGeer-Stone Criteria as a guide for initiating antimicrobials. In addition, more engagement of NPs in SNF antimicrobial stewardship programs in nursing homes is strongly recommended. Participation of NPs in the stewardship program for residents in all areas of an SNF should be strongly considered.

Final Reflections

Conducting this research was extremely interesting and informative. Teaching the staff was a joy. Staff were intelligent and asked pertinent and important questions. There were some interesting comments, which were not in the written questionnaire and could not be discussed further at the time. Perhaps

these statements can be explored in another study. One recent RN graduate disparagingly stated the in-service made them feel they were “back in school.” I was not able to clarify why feeling “back in school” was an unhappy feeling to that person. Another recent RN graduate stated the McGeer-Stone Criteria form looked like “a cheat sheet” from school and planned to use it the same way they did in school. One RN stated nurses could not do stewardship “because nurses don’t make diagnoses.” A supervisor stated the nurse’s “job is to do what the doctor orders and that’s it!” Another disconcerting statement from an RN was that they did not know how to answer the last question (Question 42), but not because antimicrobial stewardship was not interesting or not important:

[stewardship] “is very important. But, before, we just did what the doctor ordered. Now we are asked to think and ask questions. This is new. I will need more information to continue asking questions. With how busy I am, though, I’m afraid I won’t have time to think or ask questions.”

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APPENDICES

APPENDIX A: LONG TERM CARE INFECTION SURVEILLANCE
CRITERIA

LONG TERM CARE INFECTION SURVEILLANCE CRITERIA

SUMMARY FORM – MARCH 1, 2017

Compiled by G. Escalona, DNPc, MS, RN, PHN, APRN, CFCN, CFCs

CAUTI – At least 2

(NO alternate site of infection and catheter in place at least 14 days or [NHSN definition] chronic indwelling catheter was removed within the last 2 days)

1. Positive urine culture of any organism(s) a significant colony count is considered $> 10^2$ colony-forming units/mL of 1 or more bacterial species in a single catheter urine specimen.
2. At least 1
 - a) Meets Fever Criteria, rigors OR new onset hypotension
 - b) Change in mental or functional status AND leukocytosis (*Constitutional SxS*)
 - c) Suprapubic or CVA tenderness or pain – Pain Level _____
 - d) Pain, swelling, or tenderness of the testes, epididymis, or prostate – Pain Level _____
 - e) Purulent discharge from around the catheter

UTI – At least 1 PLUS

1. Positive urine culture if
 - a) From a midstream clean catch specimen – consider contaminated if > 2 organisms grow
 - b) From in & out catheterization
2. Acute dysuria (alone meets Loeb Criteria)
3. Pain, swelling, or tenderness of the testes, epididymis, or prostate – Pain Level _____

Fever or leukocytosis – At least 1

No fever or leukocytosis – At least 2

- a) Suprapubic or CVA tenderness or pain – Pain Level _____
- b) Gross hematuria
- c) Marked increase in incontinence
- d) Marked increase in urgency
- e) Marked increase in frequency

COMMENT: If resident *ONLY* has a change in the appearance of urine, e.g. dark, cloudy, pus present, foul smelling urine, and *NO* other SxS of infection

Suggested Plan of Care

1. Place on I&O for 72 hours
2. Encourage fluids for about 4 hours (200-500 ml) – If starts to clear, continue until normal clarity and monitor
3. Provide immediately one of the following
 - a) shower, bath
 - b) gentle cleansing of peri-area with soap and copious amounts of clean, fresh water
 - c) examine peri-area for wounds, trauma, e.g. cuts, skin tears, etc
4. Change underwear and linens on bed and sitting cushions
5. Determine root cause of low fluid intake and take appropriate corrective action
6. Notify healthcare provider if no improvement or develops SxS of infection

COMMENT: Antibiotics are *NOT* appropriate for Colonization or Asymptomatic Bacteriuria (ASB)

Definition of Colonization

- Positive culture
- *NO* localized signs or symptoms
- Does *NOT* fit Criteria

Asymptomatic Bacteriuria (ASB)

- Positive culture
- *NO* localized signs or symptoms
- Does *NOT* fit UTI or CAUTI Criteria
- Change in appearance of urine without any localized signs or symptoms (SxS), e.g. dark, cloudy, foul smelling urine, or pus in urine of resident who does not have an indwelling urinary catheter

COMMENT: UROSEPSIS

- UTI without localizing symptoms
- At least one blood culture specimen / isolate is the same as the organism isolated from the urine specimen culture
- *NO* alternate site of infection

TO COLLECT A URINE CULTURE SPECIMEN

Voided specimen – obtain MIDSTREAM clean catch

- In female residents the same organism must be in 2 consecutive voided specimens
- Repeat C&S if results in > 2 organisms
- Midstream means do not stop urine flow! Catch specimen while stream of urine is still flowing – MIDSTREAM

In and out catheterization – cleanest method of specimen retrieval

- Accept results with any number of organisms

Post-treatment cultures for cure are *NOT* recommended.

CONSTITUTIONAL SxS: FEVER CRITERIA

For residents ≥ 65 years old

- Single temp $> 37.8^{\circ}\text{C}$ ($> 100^{\circ}\text{F}$) oral
- Single temp $> 1.1^{\circ}\text{C}$ (2°F) over baseline from any site
- Repeated oral temp $> 37.2^{\circ}\text{C}$ (99°F) OR rectal temp $> 37.5^{\circ}\text{C}$ (99.5°F)

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<p>Common Cold Syndromes / Pharyngitis – At least 2</p> <ol style="list-style-type: none"> 1. Runny nose or sneezing 2. Stuffy nose (i.e. congestion) 3. Sore throat or hoarseness or difficulty in swallowing 4. Dry cough 5. Swollen or tender glands in the neck (cervical lymphadenopathy) 	<p>Influenza-Like Illness (ILI) – Fever Plus At least 3</p> <ol style="list-style-type: none"> 1. Chills 2. New headache or eye pain 3. Myalgia 4. Malaise or loss of appetite 5. Sore throat 6. New or increased dry cough
<p>Pneumonia or Bronchitis – 1 Constitutional SxS Plus</p> <ol style="list-style-type: none"> 1. Change in Mental Status (<i>Constitutional Symptom</i>) 2. Change in Functional Status (<i>Constitutional Symptom</i>) 3. Meets Fever Criteria (<i>Constitutional Sign</i>) 4. Meets Leukocytosis Criteria (<i>Constitutional Sign</i>) <p>Pneumonia – CXR Positive Plus At least 2</p> <p>Bronchitis – CXR Negative Plus At least 3</p> <ol style="list-style-type: none"> a) Cough b) Sputum production c) Reduced O² sat _____ d) Pleuritic chest – Pain Level _____ e) Respiratory rate of > 25 _____ f) New or changed lung exam – Describe in Clinical Notes 	<p>COMMENT: (see Loeb, 2001 and Loeb, 2005)</p> <ul style="list-style-type: none"> • If no outbreak and resident presents with cough and a fever – do not use empirical antibiotics – Target antibiotics by analyzing C&S results • Obtain CBC with differential if considering antibiotics • Fever and the sudden onset of new pleuritic chest pain are an indication for transfer to the hospital to rule out pulmonary embolus • Consider CHF in residents with acute respiratory symptoms and signs <p>CONSTITUTIONAL SxS: LEUKOCYTOSIS CRITERIA</p> <ul style="list-style-type: none"> • Neutrophilia: > 14,000 leukocytes/mm³ OR • Left Shift: > 65 bands or 1500 bands/mm³ <p>To calculate ANC = (Segmented + Band neutrophils) x WBC Then remove decimal point to find Absolute Neutrophil Count (ANC)</p>
<p>Gastro-Intestinal Tract – At least 2</p> <ol style="list-style-type: none"> 1. Within last 24 hours <ol style="list-style-type: none"> a) Liquid or watery stools > 3 = # of stools _____ b) Vomiting > 2 = # of vomiting episodes _____ 2. At least 1 <ol style="list-style-type: none"> a) Stool specimen positive for a pathogen b) Abdominal tenderness – Pain Level _____ c) Nausea # of episodes _____ 	<p>COMMENT: Clostridium difficile Infection (CDI)</p> <p>“Primary episode” of CDI = occurred without any previous history of CDI, or one that occurred > 8 weeks after ONSET of the last episode of CDI</p> <p>“Recurrent episode” of CDI = occurred ≤ 8 weeks after the onset of the last episode as long as symptoms from the last episode had already resolved</p>
<p>Skin Infection – At least 2</p> <ol style="list-style-type: none"> 1. Maculopapular rash with or without itching (suspect Scabies) 2. Raised white patches on inflamed mucosa or plaques on oral mucosa (suspect Candidiasis) 3. Vesicular rash (suspect herpes) 4. Epidemiologic linkage to a lab confirmed case 5. Physician, NP, or PA diagnosis, or lab confirmation (scraping or biopsy) 	<p>Cellulitis / Wound Infection – wound, skin, or soft tissue site</p> <p>If pus draining at site – At least 1</p> <p>If no pus present at site – At least 4</p> <ol style="list-style-type: none"> 1. Heat at the affected site 2. Redness at the affected site 3. Swelling at the affected site 4. Tenderness or pain at the affected site 5. Serous drainage at the affected site 6. Change in Mental or Functional Status 7. Fever or Leukocytosis
<p>Ear / Sinusitis</p> <p>If pus draining at site – At least 1</p> <p>If no pus drainage at site – At least 2</p> <ol style="list-style-type: none"> 1. Ear redness 2. Ear pain – Pain Level _____ 3. Diagnosis by physician, NP, or PA of ear infection 	<p>Eye or Conjunctivitis – At least 1</p> <p>(Not due to allergy or trauma)</p> <ol style="list-style-type: none"> 1. Pus from one or both eyes present at least 24 hours 2. Conjunctival erythema with or without itching or pain 3. Conjunctival pain present at least 24 hours – Pain Level _____
<p>Sepsis is a medical emergency! – Notify healthcare provider ASAP!</p> <p>Sepsis / Septicemia – At least 2</p> <ol style="list-style-type: none"> 1. Suspected, probable, or laboratory-confirmed infection <ol style="list-style-type: none"> a) High risk – Lung, UTI, GI, or Skin infection b) High alert – chills, extreme pain, clammy/sweaty, SOB, rapid pulse 2. quickSOFA / qSOFA score of 2 points or more <ol style="list-style-type: none"> a) Tachypnea – Respirations > 22 _____ (score 1) b) Change in mental status or Glasgow Coma Scale <15 (score 1) c) Systolic BP < 100 _____ (MAP dropping < 70) (score 1) 	<p>Fever of Unknown Origin – At least 2</p> <p>(When a resident has fever and no obvious focus of infection)</p> <ol style="list-style-type: none"> 1. Meets Fever Criteria 2. Delirium or rigors <p>CONSTITUTIONAL SxS: FEVER CRITERIA</p> <p>For residents ≥ 65 years old</p> <ul style="list-style-type: none"> • Single temp >37.8° C (>100°F) oral temp • Single temp >1.1°C (2°F) over baseline from any site • Repeated oral temp >37.2°C (99°F) OR rectal temp >37.5°C (99.5°F)
<p>CONSTITUTIONAL SxS: Acute change in FUNCTIONAL STATUS</p> <p>Decreased ability or interest in ADLs requiring additional support for</p> <ul style="list-style-type: none"> • Bed Mobility – to move in bed or assist in changing position • Transferring • Locomotion / Ambulation – to move around facility • Dressing • Toileting • Personal Hygiene • Eating – to feed him/her self or to be fed 	<p>CONSTITUTIONAL SxS: Acute Change in MENTAL STATUS</p> <p>Demonstrate ALL the following:</p> <ul style="list-style-type: none"> • Acute onset • Fluctuating course • Inattention • Disorganized thinking OR altered level of consciousness (LOC)

APPENDIX B: NURSE SURVEY FORM

NURSE SURVEY

This Survey is part of a student research project at California State University Northern California Consortium Doctor of Nursing Practice Program. Your participation is very important to the success and applicability of this research to other long-term care nurses and facilities. Your participation will not affect your job or job position. Other than the satisfaction of having participated in this important research project, you will not be compensated for participating. Results of this study will be shared in a general presentation to staff. If you have any questions about this research project, please contact the Principle Investigator, Lori Rodriguez, PhD, FNP at **408-924-3146** or lori.rodriguez@sjsu.edu

Please answer the following questions and return this Survey by placing it in the attached envelop and leaving it at the Nursing Station in the box for the Nursing Office. Returning this Survey constitutes consent to participate. Your responses are entirely confidential. Please do **NOT** put your name on this Survey or the envelope. Completing this questionnaire should only take about 10-15 minutes of your time. You can add greatly to the quality and applicability of this research by answering all questions and being as candid as you can. Thank you for your help.

1. Are you currently licensed as an RN LVN
2. What is your primary race or ethnicity? White Asian Pacific Islander
 Hispanic or Latino Black or African American Native American Other _____
3. Gender Female Male Other _____
4. Age _____
5. Highest *Non-Nursing* Education Preparation High School Vocational School AS/AA
 BS/BA MS/MA PhD Other _____
6. Highest *Nursing* Education Preparation Vocational School AS/AA
 BS/BA MS/MA PhD/DNP Other _____
7. Year of graduation from your primary or initial nursing program _____
8. Country where your initial nursing license was received _____
9. Total number of years working as a paid nurse _____
10. Total number of years working in long term care / Skilled Nursing Facility / Nursing Home _____
11. Total number of years working at this facility _____
12. Total number of years working in your current position at this facility _____
13. Current Position Title _____
14. Shift you are generally assigned to Day Evening Night Other _____
15. Current Employment Status Full Time Part Time Per diem /On call Other _____
16. Do you have a second paying nursing job outside this facility? NO YES
17. Have you ever worked in an acute non-psychiatric hospital setting? NO YES I still am
18. Nursing Unit usually assigned G2 G3 G4 G5 F1 F2 F3 K1 K2 Other__
19. How many residents have been assigned to you today? _____

	This year – did you	NO	YES
20	Attend an in-service on infection surveillance Criteria at this facility?		
21	Attend a conference, seminar, webinar, home study or other CEU offering on infection surveillance Criteria that was <i>not</i> at or sponsored by this facility?		
22	Did you attend an in-service on antibiotic stewardship at this facility?		
23	Did you attend a conference, seminar, webinar, home study or other CEU offering on antibiotic stewardship that was <i>not</i> at or sponsored by this facility?		

For questions number 24-36, please answer all questions on a scale of 1-5:

1 – No or Not Important 2 – Occasionally 3 – Sometimes 4 – Most of the time 5 – Yes or Very Important

From what you have learned about <i>Antibiotic Stewardship</i>		1	2	3	4	5
24	Is antibiotic stewardship important for your nursing practice?					
25	Do you feel it important for you to understand more about antimicrobial stewardship?					
26	How important is antimicrobial stewardship to the way you practice nursing?					
27	Do you feel nurses, like yourself have a role in antimicrobial stewardship?					
28	Is it important for you to feel supported in using what you learned about antimicrobial stewardship?					
29	Is it important for you to be able to ask a resident’s physician or nurse practitioner (NP) questions about their order/s?					
30	Do you feel comfortable asking a resident’s physician or NP questions about their antimicrobial order/s?					

Since your educational program / in-service on <i>Infection Surveillance Criteria</i>		1	2	3	4	5
31	Did the program or in-service present material important for your nursing practice?					
32	Was it important for you to understand more about infection surveillance Criteria?					
33	Was it important for you to learn how to use?					
34	Was the educational program or in-service important in helping you feel more comfortable changing the way you practice nursing?					
35	How important is it to use the Criteria when assessing residents for infection?					
36	Is it important for you to use evidence-based information in your nursing practice?					

Since your educational program / in-service on <i>Infection Surveillance Criteria or Antibiotic Stewardship</i>		# Times					
		0	1	2	3	4	≥ 5
37	How often have you called or received an antibiotic order for a resident?						
38	How often have you used the Criteria to assess residents for a possible infection?						
39	How often have you faced barriers or problems practicing what you learned?						
40	How often have you felt supported in using what you learned?						
41	How often have you discussed antibiotic stewardship with a physician or NP?						

42. Besides lack of time, what barrier/s or problem/s did you face trying to use the infection surveillance Criteria? (Please rate each from 1 – 10, with 1 being the greatest barrier and 10 being the least.)

- | | |
|--|-------------------------------|
| ___ Not enough knowledge to apply the information | ___ Lack of interest |
| ___ Lack of support from other nurses / Co-workers / supervisors | ___ Difficult to use or apply |
| ___ Not important for me to do, since someone else will do this | ___ Lack of support from NP |
| ___ Lack of support from Medical Director or other physicians | ___ Not a priority to do |
| ___ Insistence of Resident, family, or significant other to use antibiotic | |
| ___ Other (Please describe) _____ | |

APPENDIX C: MEDICAL CHART AUDIT FORM

MEDICAL RECORDS AUDIT FORM

Research # _____ Date Reviewed _____

1. Nursing Unit G2 G3 G4 G5 F1 F2 F3 K1 K2 Psych Unit Other _____
2. Age _____
3. Gender Female Male Other _____
4. Ethnicity White Asian Hispanic or Latino Black or African American
 Native American Philippines / Pacific Islands Other _____
5. Date of admission _____
6. Last admission was from Hospital _____ ER SNF /LTCF
 B&C /AL /IL Home Other _____
7. Date of infection onset _____
8. Infection onset <72 hours after admission (CAI) >72 hours after admission (HAI)
9. Prescriber title Medical Director Resident's Attending NP Other _____
10. Prescriber's indication for antimicrobial
 - Respiratory** – Common Cold Syndromes/Pharyngitis, ILI, Pneumonia, LRT
 - UTI** – Resident without a chronic indwelling catheter
 - CAUTI** – Resident with a chronic indwelling catheter
 - Skin** – Cellulitis, scabies, Fungal, Herpesvirus, Conjunctivitis
 - Ear / Sinusitis** – Ear infection, Sinusitis
 - GI** – gastroenteritis, norovirus, CDI **BSI – Septicemia**
11. Did the **antibiotic** order meet the Loeb Minimum Criteria? NO YES N/A
12. Did the resident meet the Revised Infection Surveillance Criteria? NO YES N/A
13. If yes – category of infection according to Revised Infection Surveillance Criteria
 - Respiratory** – Common Cold Syndromes/Pharyngitis, ILI, Pneumonia, LRI
 - UTI** – Resident without a chronic indwelling catheter
 - CAUTI** – Resident with a chronic indwelling catheter
 - Skin** – Cellulitis, scabies, Fungal, Herpesvirus, Conjunctivitis
 - Ear / Sinusitis** – Ear infection, Sinusitis
 - GI** – gastroenteritis, norovirus, CDI **BSI – Septicemia**

14. C&S ordered NO YES N/A

15. C&S obtained NO YES N/A After 1st dose of antibiotic given

16. C&S results No growth Normal flora Mixed flora gram + gram – N/A

17. C&S organism/s name _____ N/A

18. CXR Positive Negative N/A

19. Other tests Positive Negative N/A

20. Antimicrobial/s for this infection episode

Name of Antimicrobial	Route	Days of Therapy	Spectrum	Adverse Reaction	48-72-Hour Drug Review Recorded
1 st	<input type="checkbox"/> Oral <input type="checkbox"/> IV / Parenteral <input type="checkbox"/> G-Tube <input type="checkbox"/> Other -		<input type="checkbox"/> Broad <input type="checkbox"/> Narrow <input type="checkbox"/> Targeted	<input type="checkbox"/> NO <input type="checkbox"/> YES -	<input type="checkbox"/> NO <input type="checkbox"/> YES
2 nd	<input type="checkbox"/> Oral <input type="checkbox"/> IV / Parenteral <input type="checkbox"/> G-Tube <input type="checkbox"/> Other -		<input type="checkbox"/> Broad <input type="checkbox"/> Narrow <input type="checkbox"/> Targeted	<input type="checkbox"/> NO <input type="checkbox"/> YES -	<input type="checkbox"/> NO <input type="checkbox"/> YES
3 rd	<input type="checkbox"/> Oral <input type="checkbox"/> IV / Parenteral <input type="checkbox"/> G-Tube <input type="checkbox"/> Other -		<input type="checkbox"/> Broad <input type="checkbox"/> Narrow <input type="checkbox"/> Targeted	<input type="checkbox"/> NO <input type="checkbox"/> YES -	<input type="checkbox"/> NO <input type="checkbox"/> YES

21. Clinical Outcome Infection improved Infection did not improve Chronic infection

Admitted to hospital Sent to ER and returned same day Died

Infection resolved with new antimicrobial Other _____