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# Results of an Educational Intervention and Barriers to Antimicrobial Stewardship in a Skilled Nursing Facility

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This study was part of a quality improvement effort by 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 (All Facilities Letter 15-30, 2015; Skilled nursing facilities, 2015). In addition, this project provided a research opportunity for a doctoral nursing student with an interest in and passion for appropriate use of antimicrobials in nursing homes. This study is also among the very first, if not the first, to examine the impact of an educational intervention to licensed nurses on antimicrobial stewardship in a nursing home and to differentiate the licensed nurses.

The researcher defined antimicrobial stewardship as a set of activities and commitments by the community or, in this case, a facility 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.

The researcher utilized three methods of study: 1) an educational intervention presented to licensed nurses in October 2016; 2) a post-educational intervention Nurse Survey, which was collected in November and December 2016; and 3) a retrospective pre- and post-educational intervention medical records audit in September and November 2016 of residents reported as having an actual or potential infection. The educational intervention to licensed nurses consisted of information on SB 361, the definition of and need for antimicrobial stewardship, use of the McGeer-Stone Criteria, and an infection decision algorithm. The medical records audit measured antimicrobial use and adherence to standardized infection surveillance criteria, specifically, the McGeer-Stone Criteria.

The facility contained two nursing care areas: long-term units (LTUs) providing custodial care for elderly residents and staffed largely by Licensed Vocational Nurses (LVNs); and short-term units (STUs) providing post-acute rehabilitation for adults and staffed largely by Registered Nurses (RNs). This division enabled easy differentiation of licensed nurses and the impact of the educational intervention on adherence to infection criteria for the initiation of antimicrobial use. While there was a large increase in adherence to standardized infection criteria post-educational intervention, especially in the LVN staffed LTUs, this change was not statistically significant. However, a significant change ($p=0.007$) was noted in adherence to criteria by Nurse Practitioners (NPs) in the LTUs. The increase in adherence to criteria noted in the LTUs was due to a change in the prescribing behavior of the NPs and that NPs did not have prescribing capability in the STUs. NPs received the educational intervention, while other facility prescribers did not.

In conclusion, while educational efforts on antimicrobial stewardship in SNFs should include all licensed nurses and prescribers, concentrating such efforts on NPs and allowing them to practice in all areas of a SNF, may provide the greatest impact on antimicrobial stewardship programs in these facilities. It is also recommended that education of licensed nurses in antimicrobial stewardship begin in the nursing school curriculum.

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**References:**


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**Abstract Summary:**
An educational intervention on antimicrobial stewardship, use of the McGeer-Stone Criteria, and an Infection Decision Algorithm was presented to licensed nurses at a large California SNF. Pre and post-education medical records audits were done and a post-education Nurse Survey from licensed nurses was collected to determine the impact of education.

**Content Outline:**
**Oral Presentation Outline**

The State of California was the first to respond to Executive Order 13676 to control antimicrobial use Statewide. California began in 2014 with the passage of SB 1311 directing acute care hospitals to establish an antimicrobial stewardship program by 2015, and progressed to SNFs with the passage of SB 361, which went into effect January 2017 (AFL 14-36. 2014; AFL 15-30, 2015; Executive Order 13676, 2014). This project was part of one facility's efforts to comply with the new law and guidelines for antimicrobial stewardship in SNFs, as well as a research opportunity for a doctoral nursing student (AFL 15-30, 2015; Centers for Disease Control and Prevention, 2016).

**I. Introduction**

1. California Senate Bill (SB 361) requires all licensed SNFs have an antimicrobial stewardship program in place by January 1, 2017 (All Facilities Letter, 2015; Skilled Nursing Facilities, 2015). This study was part of an SNF quality improvement effort to inform their nurses of the law and of plans to implement an antimicrobial stewardship program.
2. Antimicrobials are a category of drugs that have been overused and misused, and are the most frequently prescribed medication in SNFs (Crnich et al., 2015; Executive Order 13676, 2014; Smith et al., 2008; Stuart et al., 2012). Poor stewardship of this vital resource places aged residents at high risk for adverse drug effects, Clostridium difficile infection (CDI), and colonization by drug resistant organisms (AFL 10-27, 2010; Crnich, Jump, Trautner, Sloane, & Mody, 2015; Smith et al., 2008; Stuart et al., 2012).
3. Despite the need for improved nursing home care for the rising numbers of elderly, current research in long-term care facilities tends to ignore the categories of licensed nurses working in them (Corazzini et al., 2015). Before determining methods to improve care, greater knowledge and understanding of the nurses working in these facilities is needed (McGilton et al., 2016).
4. This is the first known research effort examining antimicrobial stewardship in a U.S. SNF that differentiated RNs and LVNs.

**II. Literature Review**

1. Theoretical Framework

1. Nightingale Theory of Environmental Nursing helps us understand the role of the nurse in the milieu of the nursing home and the role of the nurse in changing the environment of the nursing home to benefit the resident (Masters, 2015; Selanders, 2010). In this case, attitudes, procedures, and education on the use of antimicrobials, an item in the environment that are beneficial, potentially harmful, and increasingly scarce, need re-examination and modification in order to improve the care of residents.
2. Roger's Theory of Diffusion of Innovation helps us understand the steps in adopting new procedures and communication channels in the working environment of the nursing home (Lee, 2004; Rogers, 2003; Sahin, 2006).
3. Studies of SNF Licensed Nurses and Antimicrobial Stewardship
    1. Most studies of antimicrobial stewardship in SNFs focus on medical providers and hint at the importance of the nursing staff (Crnich et al., 2015; Edwards, Drumright, Kiernan, & Holmes, 2011; Olans, Olans & DeMaria, 2016; Zimmerman et al., 2014). Scales' (2017) team, however, were the first in the U.S. whose focus were licensed nurses and medical providers. Questionnaires exploring attitudes toward antimicrobial stewardship were distributed to select nurses and medicate providers. Not all those selected chose to answer the questionnaire. Researchers did not differentiate between RNs and LVNs.
    2. Most studies of antimicrobial stewardship in long-term care facilities were conducted overseas and may have limited applicability to U.S. facilities. (Gillespie, Rodrigues, Wright, Williams, & Stuart, 2013; Cnich et al., 2016).
    3. Corrazzini et al. (2015) did extensive research into the environment of the SNF and promotes the need for research to differentiate the levels of licensed nurses. McGilton, et al. (2016) reviews the international recommendation that more research into LTC nursing is needed to determine those nursing competencies necessary in this setting before staffing and other issues that have been suggested to improve care can be determined. Corazzini and McGilton consider the current SNF environment in any country may be unconducive for optimal utilization of the education and training offered by the registered professional nurse.
    4. **C. Standardized Infection Criteria (The McGeer-Stone Criteria)**
        1. 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 quality improvement efforts (AFL 10-27, 2010; Lim et al., 2014; U.S. Department of Health and Human Services, 2013). 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, 2017; Olson, Stone, & Chinn, 2017; Smith et al., 2008; Stone et al., 2012).
        2. Stuart's Australian research team was the first to use the McGeer Criteria to determine antibiotic appropriateness in long-term nursing care facilities and the albeit their own modification of the 1991 Criteria (McGeer et al., 1991; Stuart et al., 2012). They conducted retrospective chart audits spanning 26 months in five RACFs (residential aged care facilities), which may be equivalent to SNFs here in the U.S. This study clearly demonstrated a need for antibiotic stewardship in nursing homes, and the usefulness of criteria for determining the initiation of antimicrobials.
        3. **D. Antimicrobial Stewardship in SNFs**
            1. Zimmerman's team of researchers (2014) conducted a quality improvement study and quasi-experimental trial over a nine-month period (March to November 2011) in twelve nursing homes in North Carolina. They concentrated on medical

providers and obtained dramatic success using 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).

2. Olson, Stone, and Chinn (2017) instigated their antimicrobial stewardship by enforcing use of standardized infection criteria (McGeer-Stone Criteria) prior to the initiation of antimicrobials and over a five-year period the use of antimicrobials dropped while residents experienced an improvement in overall health. Her hospital-based SNF team focused on team involvement in the stewardship program and did not differentiate the licensed nurses. Olson stated to this researcher that she felt her study did validate the use of infection surveillance criteria to help in the decision to initiate antimicrobials (Olson, 2017).

**III. Methodology**

1. This study employed three methods: an educational intervention, a retrospective medical records audit, and a post educational nurse survey.
    1. Educational Intervention to Licensed Nurses was presented in October 2016
        1. Antimicrobial Stewardship
        2. The McGeer-Stone Criteria
        3. Infection Decision Algorithm
2. Post-Educational Nurse Surveys were collected November through December 2016
3. Retrospective Audits of Medical Records were completed prior to (September 2016) and after (November 2016) the Education Intervention.
4. Study Design and Setting
    1. This was a quality improvement study of licensed nurses in a 378-bed SNF located in California.
    2. Setting. The facility is divided into two sections. The division of the SNF into six units staffed by Licensed Vocational Nurses (LVNs) and three units staffed by Registered Nurses (RNs) presented an opportunity to examine separately RN and LVN response to teaching on antimicrobial stewardship.
        1. Six long-term care units (LTUs) for elderly persons requiring assistance with activities of daily living and staffed primarily by Certified Nurse Assistants and LVNs.
        2. Three short-term rehabilitation or post-acute care units (STUs) for those recently discharged from the hospital and not quite ready to return to their residence or to an care facility. These units are staffed primarily by RNs and CNAs.
5. Ethics: The university Institutional Review Board (IRB) granted approval for this study. Participation in the Nurse Survey was voluntary, confidential, and not compensated. There was no interaction between the researcher and residents.

**III. Results and Discussion**

1. Educational Intervention
    1. Challenge of teaching licensed nurses in an SNF. This was a mandatory training program, since it also heralded the start of the facility's antimicrobial stewardship program. While not all staff nurses attended, a majority of the specialty nurses did respond. No unit managers attended. Physicians were informed of the study, but were not part of the educational intervention. However, nurse practitioners with prescribing privileges did attend.
    2. Ninety-one nurses participated in the Educational Intervention.
    3. Nurse Survey

1. The study population. Sixty-two nurses responded to the Nurse Survey. No significant differences between RNs and LVNs or between the LTUs and the STUs. Many gaps in responses.
2. Medical Records Audit
    1. Improved adherence to standardized criteria for use of antimicrobials was noted, but was not significant. Greater adherence to Criteria was noted in LTUs, where the NPs had prescribing privileges. However, there was a significant change (p=0.007) in nurse practitioner adherence to Criteria which was the major determinant of the elevation in adherence to criteria.
    2. Research Limitations
        1. Small sample – only one SNF participated.
        2. Lack of time on the part of many nurses and managers to attend the educational intervention or respond to the Nurse Survey. Most frequent reason given was being "too busy."
        3. Lack of or incomplete responses of licensed nurses to the Nurse Survey.
        4. Nurse Survey questions may have been difficult to understand or directions difficult to follow.

**IV. Conclusions and Recommendations**

1. Barriers to implementing Antimicrobial Stewardship
    1. High patient load resulting in lack of time or energy to complete the survey or attend the educational intervention.
    2. Lack of difference found between RNs and LVNs may be related to the nursing home environment delivery of care and that staff education and training tends to ignore the difference in scope of practice between RNs and LVNs.
    3. While the importance of stewardship is recognized, implement is yet to be achieved in this setting.
    4. Questionnaires may not be the most appropriate method of obtaining information about staff implementation of stewardship concepts.
    5. The nursing home setting may be unconducive to professional registered nursing practice.
    6. Recommendations for further research
        1. More research into the delivery of nursing care in long-term care facilities, especially nursing homes is greatly needed.
        2. Importance of research in long-term care facilities to differentiate the licensed nurses.
        3. Focusing SNF antimicrobial stewardship education and training on NPs may prove the most efficient.
        4. Education and training of nurses in antimicrobial stewardship may need to begin in the school curriculum.

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**Author Summary:** For the past 18 years, Dr. Escalona has worked in nursing homes providing care, education, training, and consultation on infection control topics. In 2014 she entered private practice and is the Nursing Director of Nightingale Senior Care, LLC providing consultation and education services to nurses, skilled nursing facilities, and consumer groups. A recent graduate of California State University, Northern Consortium Doctor of Nursing Practice Program, she presents today a portion of her doctoral research project.