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Improving the Quality of Electronic Documentation in Critical Care Nursing

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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Project Submitted in Partial Fulfillment

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Abstract

Electronic nursing documentation systems can facilitate complete, accurate, timely documentation practices, but without effective policies and procedures in place, a gap in practice exists and quality of care may be impacted. This systematic review of literature examined current evidence regarding electronic nursing documentation quality. General systems theory and the Donabedian model of health care quality provided the framework for the project. Electronic databases PubMed and the Cumulative Index of Nursing and Allied Health were searched for articles addressing electronic nursing documentation practices. The Cochrane systematic review methodology was used to analyze the articles. Articles were excluded if published before 2001 or not in the English language. The search revealed 860 articles of which 35 were included in the final review. Most studies were quasi-experimental involving multiple interventions such as clinical decision support (CDSS), education, and audit and feedback specific documentation foci. The most reported outcomes were an improvement in documentation completeness and correctness. A multifaceted intervention strategy consisting of CDSS, education, and audit and feedback can be used to improve electronic documentation completeness and correctness. Policies and procedures regarding documentation practice should support the intended outcomes. Electronic documentation systems can improve completeness, but care should be taken not to depend on the quantity of documentation alone. Further research may shed light on the importance of concordance or plausibility, and the truth of documentation and ultimately how that can impact social determinates of health and social change.

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Dedication

Heather, Gabz, and Dawson, thank you for being the perfect family. Heather, thank you for being supportive and with me with every celebration and frustration. I could not have done it without you. Gabz and Dawson, thank you for understanding the "quiet" evenings and occasional fatherless Saturdays. You both never complained and always supported me.

Mom, you are my ultimate mentor, inspiration, and the foundation for everything that I have accomplished. As a youth, I never had a dream that I would be a nurse, much less go on to receive my doctoral degree. You were always there, and I thank you for that. This paper is dedicated to you.

Dad, thank you for being there for me throughout my youth. You taught me the importance of respect, and more importantly, the respect for what the nursing profession has done. I am sorry that you are not here to see this, but I know you have always been at my side. Thank you, sir.

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Section 1: Nature of the Project

Nursing documentation is the legal and historical account of the nursing process and reflects the quality of the care provided (Urquhart, Currell, Grant, & Hardiker, 2009). The nursing process has been defined as the core components of clinical decision-making and is essential to nursing practice (American Nurses Association, 2017a). Poor quality documentation practices are a deviation from the standard of care and can result in patient harm (Arrowood et al., 2013). Nursing documentation policies and procedures are used to support documentation practices, but must be updated and relevant to the care area (Arrowood et al., 2013). Outdated or incomplete policies and procedures can have a negative impact on documentation practices and quality of care (World Health Organization, 2007).

The doctorate in nursing practice (DNP) practicum site's critical care unit (CCU) implemented their first nursing information system (NIS) over 15 years ago, which included the hospital's generic electronic health record documentation policy to support documentation practices. Since then, the quality of documentation has not been optimal, and existing policies and procedures to support documentation practices have not proven to be effective (L. Kinzie, personal communication, September 18, 2015). The CCU nurse manager understands the relationship between quality documentation and care, and is concerned the quality of care may be at risk (L. Meyer, personal communication, September 18, 2015).

Changing documentation practices to improve the quality of documentation involves changing organizational policies and procedures regarding practices. Those

who are closest to the change must be engaged in the process (Leadership Paradigms, n.d.). Positive social change is seen when those who are impacted by the change improve NIS documentation practices, which influences the quality of documentation, coordination of care, and nursing practice (Keenan, Yakel, Tschannen, & Mandeville, 2008).

The purpose of this DNP project was to conduct a systematic review of best practices used to develop policies and procedures that support quality critical care documentation practices. Primary source articles from online databases and from selected article reference lists were retrieved and reviewed. The final output for this DNP project consists of recommendations for strategies that can be used to update the CCU's documentation policies and procedures.

Problem Statement

Practice Problem

The CCU's documentation policy and procedures are outdated. The documentation quality is not optimal, and the quality of nursing care is in question (L. Kinzie, personal communication, September 18, 2015). The existing policy has not been updated to fully support documentation practices (L. Kinzie, personal communication, September 18, 2015). Updated and relevant evidence-based policies and procedures to support quality documentation and the delivery of quality care are required, or patient errors and treatment delays could result (Bowman, 2013).

Local Relevance

The CCU has a standard of care that includes documentation frequency requirements, but it does not include any quality assurance measures to ensure documentation adherence, nor does it include strategies to support documentation practices. Additionally, the policy and procedures do not include mechanisms to ensure other quality issues such as documentation completeness, correctness, and timeliness (L. Kinzie, personal communication, September 18, 2015). CCU quality issues have been described as documentation being (a) omitted, inaccurate, or inappropriate; (b) fragmented; and (c) difficult to find (L. Kinzie, personal communication, September 18, 2015). Low quality documentation can impact the communication and coordination of care between clinicians, and can have regulatory and legal consequences.

Communication and coordination of care. The quality of documentation can impact the coordination of care and communication between clinicians. Inaccurate or omitted information can result in duplicative care, or in the case of medication administration, an overdose (Bowman, 2013). The CCU's existing policy does not include peer-reviewed chart audits. Peer-reviewed chart audits are a quality assurance measure used to monitor and correct adherence issues with documentation completeness and accuracy and can improve the quality of documentation (Nelson, 2015). Organizations that use peer-reviewed charting audits as a quality assurance measure facilitate quality documentation practices (Bowman, 2013). The CCU nursing informatics staff shared several examples in which the standard of care was not fully documented. This was significant because lack of documentation indicated the care was

not provided. Several causes were attributed to the lack of documentation, including staff not knowing where to chart the required documentation and high priority data elements being lost within other content (L. Kinzie, personal communication, September 18, 2016).

The CCU's documentation policy does not include guidance or controls on the use of previously charted data. Data can be carried forward from the previous hour and can be used to efficiently chart information that has not changed, but this can lead to quality issues when misused. The American Health Information Management Association recommends organizations put policies in place to control when previously charted information can be used, and advocates for the initial entry to be charted by the individual providing the care (Arrowood et al., 2013). In one local example, a registered nurse carried over data into her shift from the prior shift, inadvertently documenting incorrect information that did not reflect the care provided (L. Kinzie, personal communication, September 18, 2015). The existing documentation policy is incomplete and does not address the use of carry forward data.

Regulatory and legal concerns. Regulatory and legal consequences are also a consideration for addressing the local practice problem. The CCU's policy does not address mechanisms to display high priority assessment items, leading to omitted documentation. Regulatory agencies such as The Joint Commission or other groups that require a retrospective look at documentation practices use documentation as a representation of the care provided. Care that is not documented is considered to not have been provided and can negatively affect site surveys. In legal cases, lack of

documentation can result in tort awards (Bowman, 2013). The CCU's lead nurse informaticist, during a routine chart audit, noted instances in which interventions known to reduce or eliminate hospital-acquired infections (HAIs) were lacking proper documentation (L. Smith, personal communication, September 18, 2015). Failure to document the required HAI interventions indicates a failure to provide the required care, contributing to a potential HAI. HAIs are costly to organizations and a burden to national health care expenditures with an estimate annual cost of $9.8 billion (Zimlichman et al., 2013). The Centers for Disease Control and Prevention (2016) recommended best practice process measures (practice bundles) as a standard to reduce or eliminate HAIs and to act as a guide to nursing practice. Fragmented or poorly defined HAI bundles can lead to omitted documentation, but grouping and highlighting HAI interventions within the NIS can improve documentation practices and adherence to best-practice interventions (Hermon et al., 2015; McNamara, Adams, & Dellit, 2011; Munaco, Dumas, & Edlund, 2014). Failure to document HAI interventions can result in an organization losing its accreditation or settling a legal case. Policies and procedures addressing human factors and usability techniques can support and improve documentation practices (Lesselroth & Pieczkiewicz, 2011).

Nurses and organizations can be legally responsible for documentation that does not reflect the standard of care (Canadian Nurses Protective Society, 2007; Simborg & Roudsari, 2008). In a Court of Appeals case in Texas, a plaintiff was awarded $245,000 because nurses failed to document routine patient bed positioning (Columbia Medical Center Subsidiary v. Meier, 2006). Organizations that include strategies such as frequent

chart audits can reduce the risk of potential lawsuits based on lack of documentation (Dearmon, n.d.). Controls such as policies and procedures should be in place to ensure documentation reflects the care provided, reducing the risk of inaccurate documentation (Bowman, 2013).

Significance to Nursing Practice

This doctoral project was significant to nursing practice because updated policies and procedures to sustain high quality CCU documentation practices can ultimately support the nursing process. Nursing practice is known for preventing, promoting, and improving health within populations (American Nurses Association, 2017b). Low-quality documentation undermines the validity of the nursing process and ultimately what nursing contributes to health care (Bowman, 2013). Optimal documentation practices can accurately reflect nursing practice and contribute to coordinated, safe, high-quality care (von Krogh, Nåden, & Aasland, 2012). A synthesis of best practice procedures to modernize outdated CCU policies can support nursing documentation and practice.

Purpose

The purpose of this DNP project was to synthesize best-practice evidence relevant to CCU documentation policies and procedures that can be recommended to modernize the CCU's existing documentation policy. A gap in practice exists when existing documentation policies and procedures do not support quality documentation practices. This DNP project was designed to address this gap.

The following questions were developed to guide this practice project: What evidence-based literature exists to support quality CCU electronic nursing documentation

practices? What evidence-based literature can be used to update the existing CCU nursing electronic documentation policy and procedures?

I addressed this gap by conducting a systematic review of scholarly literature for relevant strategies to recommend updates to the existing CCU's documentation policy and procedures. A cursory review of the literature suggested evidence-based strategies that were used to update existing policies, including peer-reviewed chart audits (Nelson, 2015; Shabestari & Roudsari, 2013; von Krogh et al., 2012), bundling and displaying (highlighting) important assessment content (Hermon et al., 2015; McNamara et al., 2011; Munaco et al., 2014), and requiring standardized nursing language in documentation (Saranto et al., 2014).

Nature of the Doctoral Project

The purpose of this DNP project was to conduct a systematic review as outlined by the *Cochrane Systematic Review Handbook* and modified for the scope of this project paper. The review methodology included defining the review questions; developing a search strategy; selecting, excluding, and reviewing relevant articles; collecting and analyzing data; and presenting and reporting results (Higgins & Green, 2011). The literature search included primary sources of evidence, and articles were selected from the Cumulative Index of Nursing and Allied Health Literature, PubMed, and reference lists from other authors' primary research. The search strategy included consistent key words, date ranges, and search limiters. Articles were excluded if they were (a) not written in English, (b) published before 2001, (c) not peer reviewed, and (d) not full text. Abstracts were reviewed and articles were included or excluded based on relevance to the

topic of strategies used to improve or support documentation quality for nurses using a computerized system. Included articles were read in full. Section 3 of this project includes a complete description of the sources of evidence and the search strategy used. Section 4 includes the results.

Retrieved articles were organized and analyzed in a consistent manner. I used Docear to manage references (Docear, n.d.), and Microsoft Word and Microsoft Excel to organize content (Microsoft, n.d.). Additionally, I used the PRISMA methodology to capture the study selection procedure (PRISMA, 2015). Selected article data were presented in table format. A more detailed description of the approach can be found in Section 3. Information tables are found in the appendices.

Significance

Stakeholders

The outcome of this DNP project has the potential to impact various stakeholders including individuals who update existing electronic documentation policies and procedures. Stakeholders also include individuals or groups making decisions for the planning of documentation practice changes, those directly involved in implementing CCU policy and procedures, and those indirectly related to documentation practices. Each group of individuals may be impacted differently.

Nursing leadership or other individuals responsible for making decisions for policy and procedure change would initially be impacted. Decision-makers need to ensure that new changes align with the organization's mission and goals. Additionally, changes should be evaluated for cost-benefit considerations (Rodreck, Patrick, & Adock,

2013). Finally, leadership would be responsible for resourcing and guiding the individuals who would be operationalizing the changes.

Individuals responsible for operationalizing or implementing procedure changes, such as CCU leadership, nursing informatics staff, project leads, CCU staff RNs, providers, and allied staff, would also be impacted. Policy changes require coordination between CCU and allied staff. Individuals responsible for implementing new documentation procedures will be required to assign resources, set up education and training sessions, and monitor compliance. The CCU implementation team would also be responsible for ensuring CCU policy changes do not conflict with the hospital's existing policies.

The bedside CCU nurse is another primary stakeholder for nursing documentation policy changes. Documentation policy and procedure changes would directly affect nursing practice. Additionally, the CCU staff may be required to do additional peer-reviewed audits or be active in additional procedural changes.

Finally, those individuals who use nursing information may be impacted by policy changes. Coordination of care with allied clinical staff such as providers, respiratory therapists, and social workers may improve because of higher quality documentation (Keenan et al., 2008). Accurate information displayed in a useable format for other professionals as well as between nurses can facilitate prompt and informed responses (Jefferies, Johnson, & Griffiths, 2010). Quality management and organizational leaders may see an improvement in documentation practices and potentially in the quality of care. Nursing documentation represents nursing practice and captures clinical decision-

making. Individuals who use clinical information for secondary purposes such as research and litigation may have more trust in the validity of the documentation (Weiskopf & Weng, 2013).

Potential Contributions

This DNP project has the potential to contribute to nursing practice by offering CCUs computerized documentation strategies to support quality nursing documentation, the nursing process, and the quality of nursing care. Project recommendations may be used to update the existing documentation policy and procedures and may be shared with similar practice areas. Modernized policies are essential to support documentation quality assurance and quality documentation practices, and to provide a structure to facilitate the nursing process (Bowman, 2013).

Potential Transferability

Similar practice areas within the medical center may benefit from the outcome of this DNP project. Recommendations could be shared with similar practice areas to update their policies and procedures. Other practice areas within the hospital, such as inpatient wards, may also benefit from a revision and update to their policies. The overall hospital documentation policy should be considered for revision to ensure content is relevant to all practice areas.

Implications for Positive Social Change

Well-planned documentation policies and procedures can improve the quality of documentation, coordination of care between clinicians, and nursing practice (Keenan et al., 2008). The outcome of this project may improve documentation practices within the

CCU. Additionally, high-quality documentation practices within the CCU may serve as a model for the organization and effect social change across the institution. Evidence-based documentation policies and procedures may be shared by similar practice areas or modified by other disciplines.

Summary

The quality of nursing documentation in the CCU is not optimal, and there is a local concern that quality of care may be impacted. Quality issues have been described as documentation being (a) omitted, inaccurate, or inappropriate; (b) fragmented; and (c) difficult to find. Documentation policies and procedures should be updated and support quality documentation practices. The CCU's existing policies and procedures are outdated and not fully relevant to electronic documentation systems. The purpose of this DNP project was to conduct a systematic review and synthesize best-practice evidence relevant to documentation policies and procedures that can be recommended to modernize the CCU's existing policy. A standardized methodology for collecting, analyzing, and synthesizing evidence was used. The outcome of this project has the potential to improve the quality of the CCU's documentation practices and ultimately the delivery of high-quality, safe patient care. In Section 2, I describe the concepts, models, and theories that were used in this project. Additionally, I detail the CCU's background and this project's significance to nursing practice. Finally, I describe my context and relationship to the CCU.

Section 2: Background and Context

The CCU's documentation policy and procedures are outdated. The documentation quality is not optimal and the quality of nursing care is in question (L. Kinzie, personal communication, September 18, 2015). The existing policy has not been updated to fully support documentation practices in the CCU (L. Kinzie, personal communication, September 18, 2015). Updated and relevant evidence-based policies and procedures to support quality documentation and the delivery of quality care are required to prevent patient errors and treatment delays (Bowman, 2013).

The purpose of this DNP project was to synthesize best-practice evidence relevant to nursing electronic documentation system. A gap in practice exists when existing documentation policies and procedures do not support quality documentation practices. This DNP project was designed to address this gap. Section 2 includes the background and context for this project. First, the concepts, models, and theories used to support this project plan are described. Second, I provide evidence to support a change in practice and the significance to nursing practice. Finally, I describe the background and context for the local CCU and my role in the project.

Definitions

Project Guiding Models

General systems theory and the Donabedian (1988) model of health care quality were the guiding frameworks for this project. Additionally, Rogers's (2010) diffusion of innovations was considered. Finally, Lewin's change theory represented how general systems theory and the Donabedian model were operationalized (Schein, 1996).

General systems theory (GST), was founded by von Bertalanffy, focuses on a systems structure rather than its function, and interactions within or changes to parts of a system can affect process and outcomes (Hammond, 2003). The Donabedian model for medical quality uses GST as a framework and focuses on the quality of health care. Donabedian (1988) stated that health care outcomes are influenced by the quality of directly linked processes and structures used to support the outcome. Kelly (2013) suggested that although Donabedian's model defines structure as processes influencing outcomes, creating structures and processes must begin with outcomes, and processes needed to meet the outcomes must be defined and implemented . Nursing documentation is a representation of the care provided, and documentation practices (processes) are influenced by organizational structures. Implementing evidence-based structures such as relevant documentation policies and chart audits can facilitate documentation practices and support patient outcomes.

Change theory provided a foundation for improving documentation practices. Rogers's theory of diffusion posits that organizational and culture change starts with the innovators and early adopters, or those most influential in effecting change. As positive outcomes are seen, others adopt the practice and embed it within the culture (Rogers, 2010). Lewin's change theory supported this project by describing how forces such as evidence-based policies and procedures push change forward. Barriers, or forces pushing against change, can be removed by management or stakeholders. Once the outdated processes are removed, new practices can be implemented (Nursing Theories, 2011).

Definition of Quality

High quality nursing documentation has been defined by many authors and professional organizations, but one of the most established definitions for data quality was data that meet the specific reasons for recoding the information for specific users and specific needs (Juran, as cited by Weiskopf & Weng, 2013). Weiskopf and Weng (2013) conducted a systematic review to define quality documentation and found several consistent themes. Quality documentation was defined as being complete, correct, timely, concordant, and plausible (Weiskopf & Weng, 2013). Completeness was measured against a gold standard, such as a standard of practice, and was of high quality if all elements were present. Correctness also was associated with a gold standard and was of high quality if the documentation was true. Concordance, plausibility, and timeliness were associated with the context of other charted data and had less of an impact on data quality (Weiskopf & Weng, 2013). For the purposes of this project, documentation quality was defined as data that are complete, correct, concordant, plausible, and timely.

Nursing Electronic Documentation Systems

Nursing information systems are a type of electronic documentation system that facilitates the management of clinical data and documentation of the nursing process (Biohealthmatics, 2006). Nursing information systems have also been labeled hospital or clinical information systems, nursing documentation systems, electronic health records, or electronic documentation systems (Payne, 2013). Though each type may have different functionalities, they all support the nursing documentation process.

Relevance to Nursing Practice

Supporting and improving nursing documentation practices is important to nursing practice. Nursing documentation has been a fundamental part of nursing practice since Florence Nightingale and has expanded to all aspects of the nursing process (Iyer, Levin, & Shea, 2006). Health care documentation continues to become more complex with the implementation of electronic documentation systems (Kuhn, Basch, Barr, & Yackel, 2015). Unlike paper documentation processes in which the amount of documentation is limited by the size of the paper and letter font, electronic documentation systems allow for infinite amounts of data elements. When the CCU upgraded their nursing information system in 2011, over 30,000 data elements were introduced, and over 1000 concepts have been added (L. Kinzie, personal communication, September 20, 2015). Nursing staff at the CCU have voiced dissatisfaction with the amount of required documentation and have complained of information overload (L. Kinzie, personal communication, September 20, 2015).

Information overload is a phenomenon that occurs when the frequency, complexity, or amount of information exceeds an individual's cognitive capacity, resulting in lower quality decisions and potential error (Speier, Valacich, & Vessey, 1999). The concept of information overload has existed since the creation of books at the turn of the millennium and has proliferated with the advance of technology and computers (Blair, 2011). Nursing information systems inform, facilitate, and allow for the documentation of clinical decision-making, but without evidence-based strategies to support quality documentation practices, errors may result (Bowman, 2013).

The Federal Aviation Administration and National Aeronautics and Space Administration are well known for investigating and implementing strategies to reduce information overload and support improved decision-making (Federal Aviation Administration, n.d.; National Aeronautics and Space Administration, 2008). Similarly, strategies have been developed to support clinicians in decision-making by reducing information overload or increasing cognitive capacity. For example, Cima et al. (2011) used Six Sigma/Lean processes to reduce information frequency and improve individual capacity by removing redundant documentation elements and implementing standardized nomenclature. Additionally, clinical reminders or triggers put in place to remind a nurse that care should be completed and/or documented can increase the capacity of an individual (Pickering, Herasevich, Ahmed, & Gajic, 2010). Implementing smart clinical reminders can remove some of the cognitive load associated with remembering to accomplish a task and can facilitate decision-making. Chart audits by peers can also reduce complexity by informing the reviewer and reviewee of specific documentation requirements (Bowman, 2013; Nelson, 2015).

A gap in practice exists when existing strategies are not used to support quality documentation practices. Evidence-based structures and processes around documentation practices, such as implementing standardize nomenclature, alerts or reminders, and peer-reviewed audits, can be included in organizational policies and procedures. A rigorous, systematic review of relevant strategies to support documentation practices may be used to facilitate and modernize existing policies and procedures and improve the delivery of

care. The output of this project may address outdated or irrelevant nursing documentation policies and procedures.

Local Background and Context

The CCU implemented their first nursing information system in 2000, which was upgraded in 2011. Policies and procedures to support documentation practices were initially developed from previous paper processes and focused more on the standard of care and documentation frequencies. Since then, the quality of documentation has not been optimal, and existing policies and procedures to support documentation practices have not proven to be effective (L. Kinzie, personal communication, September 18, 2015). The existing policies and procedures do not include any quality assurance measures to ensure documentation adherence nor do they include strategies to support documentation practices. The policies and procedures do not include mechanisms to ensure other quality issues such as documentation completeness, correctness, and timeliness (L. Kinzie, personal communication, September 18, 2015). The CCU's nurse manager understands the relationship between quality documentation and care and is concerned that quality of care may be at risk (L. Meyer, personal communication, September 18, 2015).

The CCU is a Veteran's Health Administration hospital whose primary focus is to provide high quality care to the veteran population (U.S. Department of Veterans Affairs, 2015). The quality of nursing care is of primary importance and is represented and reflected by the quality of nursing documentation (L. Kinzie, personal communication, September 18, 2015). Though the organization is not accountable for some of the same

reimbursement issues associated with the Centers for Medicaid and Medicare Services, the organization still must meet the expectations of accrediting organizations such as The Joint Commission, and more importantly to the American public and veteran population (L. Meyer, personal communication, September 18, 2015).

Veterans Health Administration (VHA) hospitals share a common electronic health record called the computerized patient record system (CPRS). CPRS is used by all clinical and administrative staff in support of the veteran population. The application's foundation is the same across the VHA, but each hospital can customize things such as the templates nurses use to document. The facility's CCU also uses a clinical information system (CIS) from the private sector. The CIS is presented like a spreadsheet and includes nursing concepts (assessments, observations, etc.) organized as rows and charted in columns of time. Some data elements such as hospital-acquired infection bundles and pressure ulcer documentation have been somewhat standardized across all VHA hospitals, but local data collection and monitoring practices remain local (L. Kinzie, personal communication, September 18, 2015). A critical care standard of care exists, which includes assessment and observation requirements. Additionally, the facility has an electronic documentation policy in place that the CCU follows, but it is specific to the CPRS. Finally, the facility is subject to some of the same documentation requirements for The Joint Commission and actively monitors performance measures (L. Meyer, personal communication, September 18, 2015).

Role of the DNP student

I am a master's prepared registered nurse with a background in informatics and have worked for the Department of Veterans Health Administration for approximately 18 years. I worked at the local CCU from 1998 until 2003 and for the hospital until 2010, filling several clinical roles including critical care staff RN, clinical applications coordinator, and critical care unit CIS administrator. In 2010, I was offered a position at the network level working on several informatics projects. I saw opportunities to support clinical workflow by improving documentation. There were opportunities to remove redundancies and non-value-added documentation practices. I have a professional relationship with the individuals named in this article and was given a recommendation to address the documentation quality issues using evidence-based practice. Providing best-practice recommendations that the facility could use to improve documentation practices would benefit the facility, but the project was not within the scope of my professional position within the organization. Additionally, I serve at a national level recommending standardized nursing terminologies that could introduce bias. I plan to mitigate this risk by implementing transparent, generalized, and consistent search and analysis methodologies. I do not have any known conflicts or competing interests, disclaimers, or disclosure information to note.

Summary

General systems theory and the Donabedian model of health care quality posit a relationship between parts of a system the expected outcomes. According to the Donabedian model, outcomes are a product of the structures and processes put in place to

support the end results. Structures and processes grounded in evidence can support nursing documentation practices and ultimately the quality of nursing care. The CCU has a standard of care in place but does not have formalized policies and procedures to support quality documentation practices. Though I have a relationship with the Veterans Health Administration CCU and experience in nursing informatics methods and principles, I controlled for bias through a consistent and transparent systematic review methodology. In Section 3, I describe the collection and analysis methodologies used in this systematic review.

Section 3: Collection and Analysis of Evidence

The CCU's documentation policy and procedures are outdated. Nursing documentation quality is not optimal, and the quality of nursing care is in question (L. Kinzie, personal communication, September 18, 2015). The existing policy has not been updated to fully support documentation practices in the CCU (L. Kinzie, personal communication, September 18, 2015). Updated and relevant evidence-based policies and procedures to support quality documentation and the delivery of quality care are required to prevent patient errors and treatment delays (Bowman, 2013). The purpose of this DNP project was to synthesize best-practice evidence relevant to CCU documentation policies and procedures that can be recommended to modernize the CCU's existing documentation policy.

The CCU uses a VHA-wide electronic record and commercial clinical information system to document nursing care. The CCU must meet some of the same documentation performance measures required through The Joint Commission accreditation. The CCU must also meet documentation requirements implemented VHA-wide and is accountable to the community standards. Documentation represents the nursing care provided.

Section 3 addresses the core components of a systematic review based on a modified version of the *Cochrane Systematic Review Handbook* methodology. The review methodology includes defining the review questions; developing a search strategy; selecting, excluding, and reviewing relevant articles; collecting and analyzing data; and presenting and reporting results (Higgins & Green, 2011).

Practice-Focused Questions

The purpose of this DNP project was to synthesize best-practice evidence relevant to CCU documentation policies and procedures that can be recommended to modernize the CCU's existing documentation policy. A gap in practice exists when existing documentation policies and procedures do not support quality documentation practices. I addressed this gap by conducting a systematic review for relevant policies and procedures and recommended updates to the existing CCU's documentation policy and procedures.

The following questions were developed to guide this practice project: What evidence-based literature exists to support quality CCU electronic nursing documentation practices? What evidence-based literature can be used to update the existing CCU nursing electronic documentation policy and procedures? Electronic documentation systems have been defined as electronic systems that allow nurse staff to document care. These systems include nursing, hospital, or clinical information systems; electronic health records; and nursing documentation systems. Documentation quality has been defined to include the qualities of completeness, correctness, timeliness, plausibility, and concordance. The search methods used to identify evidence to support quality documentation practices are described in the following sections.

Search and Analysis Methodologies

The Cochrane systematic review methodology includes (a) defining the review question and criteria for article inclusion and exclusion, (b) carrying out the search, (c) selecting studies and data, (d) assessing risk of bias, (e) analyzing data and undertaking meta-analyses, (f) addressing reporting biases, (g) presenting results, and (h) interrupting

results and drawing conclusions (Higgins & Green, 2011). For the purposes of this review, a modified version of the Cochrane methodology was used. Assessing and addressing reporting bias was not completed. Additionally, a meta-analysis was not appropriate for this review because of the lack of clinical trials (see Higgins & Smith, 2011).

Sources of Evidence

The purpose of this DNP project was to synthesize best-practice evidence relevant to CCU electronic documentation policies and procedures that can be recommended to modernize the CCU's existing documentation policy and improve the quality of nursing documentation. A systematic review was performed for primary sources of evidence to inform this recommendation. Primary sources included peer-reviewed, published and unpublished, original research. Though systematic reviews address secondary sources, relevant systematic reviews were screened and included as appropriate (see Higgins & Green, 2011). Evidence included findings from quantitative, qualitative, and mixed-methods studies. Analysis and synthesis of information were used to develop a robust, updated documentation policy and procedure.

Search Methodology

Articles were selected from the Cumulative Index of Nursing and Allied Health Literature, PubMed, and reference lists from other authors' primary research. The search strategy included consistent key words including *electronic documentation systems* and *definition of quality* and *nursing documentation*. Electronic documentation synonyms included *information systems, nursing information systems, clinical information systems,*

or *nursing record systems*. Documentation quality terms included *quality*, *completeness* or *complete*, *correctness* or *correct*, *concordance* or *concordant*, *plausible*, and *timeliness* or *timely*. Finally, *nursing documentation* was included as a key word. Consistent key words were the primary search input with medical subject headings (MeSH) and CINAHL headings. The detailed search logic is presented in Appendix A.

Scope of Literature Search

The CCU implemented their first nursing information system in 2001; therefore, literature from 2001 to 2016 was searched. Articles were included if (a) the authors addressed nursing documentation practice quality, (b) the articles were related to nursing documentation, and (c) the articles were relevant to electronic documentation systems. Articles were excluded if they were (a) not written in English, (b) published before 2001, (c) not peer reviewed, (d) not full text articles, and (e) not related to nursing documentation. Additionally, articles focusing on quality improvement after transitioning from a paper system to an electronic system were excluded.

Articles were selected for initial review based on the title and abstract. Relevant articles were then be read in full and included or excluded based on the selection criteria. To ensure an exhaustive search, I screened reference lists for additional articles.

Data Collection and Evaluation

Evidence was analyzed and synthesized using a modified version of the Cochrane methodology. Selected articles were recorded in Microsoft Excel and analyzed in Microsoft Word tables. The column headers included the (a) first author and year, (b) aim, (c) sample and setting, (d) design/method, (e) interventions, (f) findings, (g)

limitations, and (h) documentation quality measure addressed (see Appendix B). Additionally, articles were noted for their levels of evidence based on the methodological design outlined by Melnyk and Fineout-Overholt (2011) (see Appendix C).

The PRISMA methodology was used to capture the study selection procedure. The total number of articles from PubMed, CINAHL, and additional sources were noted. Duplicates were removed and articles were screened by title and abstract and excluded based on relevance. Additionally, articles were read in full and included or excluded based on relevance. The total number of relevant articles included in this study was 35. The search detail is provided in Appendix D.

Summary

The CCU's electronic nursing documentation policy and procedures are outdated and do not support high-quality nursing documentation. The purpose of this systematic review was to search for evidence-based strategies to support high-quality electronic nursing documentation practices. The search and analysis methodology included a consistent and exhaustive search using primary sources from the Cumulative Index of Nursing and Allied Health Literature, PubMed, and relevant article reference lists. Data were collected, analyzed, and evaluated. Evidence was graded using Melnyk and Fineout-Overholt's (2011) model. Section 4 summarizes the results of the systematic review.

Section 4: Findings and Recommendations

Electronic nursing documentation systems are not only an evolution of nursing paper records, but are robust tools capable of supporting and improving the nursing process and the quality of care. To reap the benefits that electronic documentation systems offer, relevant and updated structures and processes like documentation policies and procedures should be in place (Bowman, 2013). The project site upgraded its nursing information system in 2011 using the previous documentation support structures developed years earlier. Since 2011, the quality of documentation has not been optimal, and there has been concern that the quality of care may be impacted (L. Kinzie, personal communication, September 18, 2015). A gap in practice exists when policies and procedures used to support quality documentation practices are outdated or irrelevant. The purpose of this systematic review was to analyze and synthesize best-practice evidence used to support quality nursing documentation practices and to present the project site with the results.

The following questions were developed to guide this practice project: What evidence-based literature exists to support quality CCU electronic nursing documentation practices? What evidence-based literature can be used to update the existing CCU nursing electronic documentation policy and procedures? Primary sources of peer-reviewed evidence were used to inform this paper. Articles from PubMed, Cumulative Index of Nursing and Allied Health Literature, and reference lists were searched and screened. Articles were included if they met the inclusion criteria.

Search terms included *electronic system documentation*, *definition of quality*, and *nursing documentation*. The detailed search criteria can be found in Appendix A. Studies dealing with strategies used to support nursing documentation with electronic systems were included and analyzed. The study results are presented in Appendix B. The data analysis and evaluation table included the first author and date, aim of the study, methodology, applied interventions, study results, limitations, quality documentation measure, and level of evidence. Findings are summarized in the following sections.

Findings

Search Results

The literature search yielded 726 studies, of which 11 duplicates were removed. An additional 134 articles were secured from author references and screened for eligibility. One hundred and twenty-nine articles met the initial selection criteria and were read in full. Ninety-four articles were excluded based on lack of relevance, resulting in 35 studies for this review. See Appendix D for the study selection procedure.

Included Studies

Two systematic reviews were included in this review. Borgert, Goossens, and Dongelmans (2015) reviewed 47 studies for strategies used to implement intensive care unit electronic care bundles. Most of the studies were quasi-experimental (49%) involving prospective cohorts (38%). The most frequent implementation strategy was education (86%) followed by electronic reminders (71%), and audit and feedback (63%). Borgert et al. did not address quality documentation measures or whether the strategies were effective. The second systematic review focused on quality improvement strategies

used to reduce health care associated infections. Thirty studies were included, and most were quasi-experimental designs focused on multiple interventions to improve adherence to HAI reduction protocols (Mauger et al., 2014). Strategies that had the most effect on adherence included audit and feedback, electronic reminders, and education (Mauger et al., 2014).

The remaining 33 studies shared similar themes. The quasi-experimental pre-post intervention design was the primary methodology (n=24). One randomized controlled trial, two retrospective studies, and six descriptive studies were included. Most studies (n=21) addressed multiple strategies to examine documentation quality. The primary strategies included clinical decision support (n=20), education (n=14), and audit and feedback (n=8). Additionally, redesigned or optimized templates (n=5), standardized terminologies (n=2), and the addition of new hardware or technology (n=5) were used. In most studies (25), researchers explored strategies targeting specific issues. Issues included hospital-acquired conditions (n=8), risk assessments (n=2), and specific guidelines (n=8). Five studies addressed improving documentation in specific areas including emergency department (Nielsen, Peschel, & Burgess, 2014), operative care (Reyes, Greenbaum, Porto, & Russel, 2016), post-anesthesia care (Olsen, 2013), home health agency (Nelson, 2015) and telephone triage (North et al., 2014). The remaining five studies focused on nursing documentation models such as the VIPS (Darmer et al., 2006) and KPO model (von Krogh et al., 2012), on nursing terminology (Thoroddsen, Ehnfors, & Ehrenberg, 2011), and on overall documentation compliance (Collins & Wagner, 2005; Sockolow, Rogers, Bowles, Hand, & George, 2014).

Documentation quality was defined and measured in many ways. Studies focused on documentation completeness (n=30), correctness (n=10), timeliness (n=7), concordance (n=1), and plausibility (n=1). Sixteen studies focused on more than one measure, and one study addressed all five measures (Sockolow et al., 2014).

Study Outcomes and Limitations of Included Studies

Most studies (n=25) indicated an improvement in one or more documentation quality measure. Carroll, Dykes, and Hurley (2012) found a significant improvement in fall risk assessment documentation completeness in an intervention unit compared with a control unit (89% vs 64%, $p < .0001$) after implementing a combined strategy of education, visual aids, and clinical decision support. Bouyer-Ferullo, Androwich, and Dykes (2015) found an improvement in documentation completeness of peripheral nerve injury assessment. Bouyer-Ferullo et al. also observed an improvement in the use of correct terms using structure templates with standardized terminologies. Sandau et al. (2015) found similar improvements in correctness by using auto-calculation fields within electronic templates. Timeliness was also addressed. In a qualitative observation study, Yeung, Lapinsky, Granton, Doran, and Cafazzo (2012) recommended point of care vital signs devices to reduce transcription error rates and improve the timeliness of the data capture. Wager et al. (2010) noted improvements in accuracy and timeliness of vitals data in an observational study for individuals using point-of-care technologies. However, Sockolow et al., 2014 found that point-of-care technologies may be a barrier to documentation based on the situation.

Several studies showed small or no significant improvements. Holden (2014) found no significant difference in central line bloodstream infection bundle compliance after a single educational intervention. Holden noted that the bundle elements were not clustered, which Hermon et al. (2015) considered an effective strategy. Additionally, Wu et al. (2013) found significant changes in only three of 25 measured documentation items after implementing a handoff template and point-of-care technologies. Wu et al., noted the results may have been influenced by the level of technology adoption in the facility. In a retrospective case-based study, Olsen (2013) reported mixed improvements in documentation quality after redesigning a postoperative template. In another study, lack of randomized controlled trials and implementation of multiple independent variables were noted as potentially limiting factors due to confounding variables (Pan, Meng, Gibbons, & Strayhorn, 2009).

Implications

Quality of documentation was the primary focus of the interventions in this review. Quality of documentation represents the quality of the nursing process and is a proxy for the quality of care. Completeness was an overarching measure of documentation quality, and was defined in the studies in many ways such as adherence, compliance, accuracy, correctness, and consistency. The results of this review were consistent with a systematic review on data quality assessment that showed 64% of the included studies favored completeness for the definition of documentation quality followed by correctness (60%) (Weiskopf & Weng, 2013). This has implications for nursing and social change. The implication is that if the care was documented (complete),

then the care was done. Unfortunately, the measure of completeness does not reflect the care effort. Documentation adherence is a proxy for care. Documentation may prompt the nurse regarding actions that should be taken or present the best clinical guidelines to follow, but documenting care is not the same as providing care; more importantly, documentation does not address the quality of care provided. Information systems can automate charting elements like auto-populate fields or carryover data from a previous cell, but without careful consideration and understanding of potentially negative consequences, information systems may reduce the quality of documentation while increasing completion measures (Bowman, 2013). The measures previously used as proxy measures for quality care may contribute to errors, lapses in care, or death (Bowman, 2013).

Recommendations

The following recommendations were developed from the analysis and synthesis of articles. Many of the strategies used to support quality documentation practices in paper-based systems are relevant and effective in electronic systems. An education strategy should be coupled with multifaceted interventions, but education alone may not have a substantial effect (Holden, 2014). Documentation audits and feedback can improve the completeness and timeliness of documentation (Wainwright, Stehly, & Wittmann-Price, 2008) and should be done in conjunction with peer review (Nelson, 2015), automatic report generation, and real-time one-to-one feedback (Jacobson, Thompson, Halvorson, & Zeitler, 2016). Additionally, audit and feedback processes should be automated using clinical decision support systems (CDSS). Automated

processes can be used to detect the absence of important documentation and inform nursing staff at the point of care via visual dashboards (Pageler et al., 2014; Nielsen et al., 2014), visual cues or prompts (Jacobson et al., 2016; Lytle, Short, Richesson, & Horvath, 2015), and mandatory template fields (Jadav, Lloyd, McLauchlan, & Hayes, 2009). Adequate assessment of the risks and value associated with triggers, reminders, alerts, and technologies like hard stops (mandatory items) should be weighed against the value they add, the number of them in use, and the burden to nurses (Sockolow et al., 2014). Clustered or standardized bundles, clinical guidelines, or high-priority data elements strategically placed within the documentation system should be used when appropriate (Hermon et al., 2015; Olsen, 2013; Richardson et al., 2016). Documentation content quantity, quality, location, and usefulness should be evaluated on a recurring basis and optimized, redesigned, or removed if unused or if there is no value added (Darmer et al., 2006; Jacobson et al., 2016; Olsen, 2013; Richardson et al., 2016). Finally, guided templates, a type of CDSS, should be used when the intent is to facilitate decision-making and support complete and correct documentation practices (Alvey, Hennen, & Heard, 2012; Carroll et al., 2012; Fossum, Ehnfors, Svensson, Hansen, & Ehrenberg, 2013; Pageler et al., 2014; von Krogh et al., 2012).

Limitations of this Review

This study has several limitations. First, the choice of key words may have limited the search results. PubMed and CINAHL subject headings were used to inform this review during the planning stage, but during the review stage, authors used a wide variety of terms to describe information systems and quality. For example, *completeness* was

defined at least five different ways. Second, this review was limited to nursing documentation and electronic systems. Nurses share similar workflow and documentation processes as physicians and allied health professionals. Quality documentation strategies used in other professions may have informed this review but were excluded. Researchers in industries such as aerospace and human factors engineering have conducted studies that apply strategies to reduce cognitive load and increase human performance (Beasley et al., 2011; Harrington, 2015; Russ et al., 2010). Third, education was listed as a potentially effective strategy to improve documentation completeness in electronic systems, but successful strategies used to improve documentation practices in paper-based systems may have been missed. Finally, most studies in this review included a quasi-experimental design with multiple independent variables, reducing the influence of specific interventions.

Strengths and Recommendations for Future Research

This review contributes to a growing body of knowledge addressing the definition of documentation completeness, a measure of quality (Mauger et al., 2014; Weiskopf & Weng, 2013). This review revealed the tendency to report positive improvements in adherence or completeness in documentation practices and exposed the limited number of studies addressing the truthfulness of the data (correctness, concordance, and plausibility). Only one study, a descriptive study focusing on nursing electronic documentation needs, noted value in the truthfulness of the data. This finding challenges the purpose of nursing documentation as a useful tool in the communication of care versus administrative or defensive charting (Bowman, 2013). Further research could be

helpful in comparing interventions with documentation process measures and outcome measures. Future studies could also provide insight on other documentation quality measures such as timeliness, concordance, and plausibility. Due to the differences in definitions of documentation quality and nursing electronic documentation systems, future projects may benefit from a more robust search criteria or less restrictive exclusion criteria.

Section 5

Dissemination Plan

The purpose of this project was to address a gap in practice associated with policies and procedures used to support quality nursing documentation practices. The results were intended to inform local nursing leadership on updated or new strategies that can be used to support or improve existing strategies. The analysis and synthesis of information in this study may be used to address potential gaps in existing documentation practices. The synthesized results are the primary output of this project, which will be provided to the project site leadership via this review paper.

The primary audience for the output of this project was the organization's sponsors. The individuals involved in sponsoring and supporting this review were the project site team members, including the unit manager, informatics specialists, and site mentors. Future implementation efforts that may arise from this project were beyond the scope of this review, but efforts could promote change to the CCU's documentation policy and procedures associated with documentation. The facility leadership may also use the results of this study to implement structure or process changes throughout the organization.

Reflection

My Doctorate in Nursing Practice (Informatics) program started in 2013 as an extension of my master's project. My aspirations were to apply my knowledge and experience to improve nursing practice by optimizing workflows using technology. I learned that a person cannot jump in and try to fix a problem. The individual must

evaluate the problem and search for best-practice evidence that can be applied in practice. As I progressed through my doctoral program, I understood the value of evidence and its use in persuasion and problem-solving. I found value in working with executive leadership, colleagues, and staff. This knowledge and the skills I have gained in practice have helped me professionally and in my doctoral program.

My profession is nursing and my specialty is informatics. My profession is a support role in most cases. I support the nurses and providers who support our customers. There are some colleagues in my profession who support the customers directly, but from my experience, most nursing informaticists work for hospital organizations or other industries and support nurses and allied staff. Over the past few years, I have seen several unique issues with informatics. One issue I have struggled with is the definition of *nursing practice* as it relates to informatics. From my experience, nursing informatics, even though it has been around for over 20 years, is still relatively unknown to non-informatics staff. My practice has a foundation in nursing but includes technology and nursing informatics principles and methods. The idea that my practice looks different than most registered nurses is a challenge I have faced over the course of this program. It is an area I plan to address within the scope of my position. My goal is to support those who support our customers directly using my nursing foundation, clinical experience, and nursing informatics practice. The output of this project is the start of an extraordinary journey.

Summary

Documenting nursing care was stressed early on by Florence Nightingale and is an essential component of the nurse's process and coordination of care. The quality of documentation represents the quality of nursing care; if the documentation is absent or inappropriate, the quality of care may be poor. The implementation of technologies has exposed nurses to potentially useful tools to support the nursing process, but the complexities associated with these tools can have a negative impact. Some of the strategies used to support quality nursing documentation before computerized systems are still effective, but because of the technologies available, organizations cannot implement previously useful strategies without evaluating the system nurses are using. Existing strategies should be evaluated and/or combined with new and relevant strategies to support quality documentation. Additionally, care should be taken when defining *quality* as documentation that is complete. Technologies can be easily used to automate completion. Other measures such as correctness, timeliness, concordance, and plausibility should be considered in conjunction with completeness. Organizations should ensure that completion of a documentation bundle in the electronic world is a valid proxy measure for the linked outcome. Future research can be conducted to confirm this finding or address the relationship between other documentation measures and patient outcomes.

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Appendix A: Detailed Search Logic

**Variants for Quality, Nursing documentation, and nursing information systems

((((((quality [All Fields] OR completeness [All Fields]) OR correct [All Fields]) OR timely [All Fields]) OR plausible [All Fields]) OR concordant [All Fields])

AND

((“nursing”[Subheading] OR “nursing”[All Fields] OR “nursing”[MeSH Terms] AND (“documentation”[MeSH Terms] OR “documentation”[All Fields])))

AND

((((“hospital information systems”[MeSH Terms] OR (“hospital”[All Fields] AND “information”[All Fields] AND “systems”[All Fields]) OR “hospital information systems”[All Fields]) OR ((“nursing”[Subheading] OR “nursing”[All Fields] OR “nursing”[MeSH Terms] AND (“information systems”[MeSH Terms] OR (“information”[All Fields] AND “systems”[All Fields]) OR “information systems”[All Fields]))) OR ((“nursing records”[MeSH Terms] OR (“nursing”[All Fields] AND “records”[All Fields]) OR “nursing records”[All Fields] OR (“nursing”[All Fields] AND “record”[All Fields]) OR “nursing record”[All Fields]) AND systems[All Fields])) OR (clinical[All Fields] AND (“information systems”[MeSH Terms] OR (“information”[All Fields] AND “systems”[All Fields]) OR “information systems”[All Fields])))

Appendix B: Data Analysis and Evaluation

First Author Date	Aim Setting/Sample	Design Intervention	Results	Limitations Documentation Quality Measure	LOE
Carroll et al., 2012	To evaluate the effectiveness of an electronic fall prevention toolkit for fall risk documentation	Randomized Controlled Trial	Significant increase in fall assessment documentation (89% vs 64%; *P* <.0001). Significantly higher number of fall documented prevention interventions present on the study group. No difference in the presents of completed intervention documentation	Only studied on 8 wards All patients on selected wards received the intervention No blinded control	II
	4 hospitals, 2 wards from each hospital, 364 patient records sampled	CDSS: Guided Template (automated and printed) (Fall prevention toolkit) Bed poster, patient education		Completeness	
Borgert et al., 2015	To determine the strategies used to implement care bundles in adult ICU settings and to assess the effects after implementation.	Systematic review	47 Studies included. Methods, Pre-Posttest intervention (49%), Prospective cohort (38%), Retrospective (6%), Interrupted time studies (4%), Longitudinal (2%)	Bundle definitions, restricted to English, no randomized studies found, overall methodology of included studies were considered poor	III
	Studies reporting central line, ventilator or sepsis bundles, implementation strategies used and compliance levels	N/A	Combination of strategies used, education (86%), electronic reminders (71%, and audit and feedback (63%)	Did not specifically address	
Mauger et al., 2014	To discover what quality improvement strategies, raise adherence to evidence-based preventive interventions to reduce hospital acquired infections (HAI)	Systematic Review	30 (26 articles) Studies met inclusion criteria. Most studies were quasi-experimental designs. All but three studies combined interventions. Audit and	None noted	III

	Studies describing implementation strategies to increase adherence with ≥ 1 of the evidence-based preventive interventions for HAIs	N/A	feedback with provider reminders as well as audit and feedback alone, with organizational change and provider education had the most effect on adherence	Completeness	
Borgert et al., 2016	To investigate the difference in effect on transfusion bundle compliance between two Audit and Feedback (A&F) strategies to implement the transfusion bundle.	Pre-Post Intervention, comparison group	Transfusion bundle compliance for Team 2 significantly improved over Team 1 (OR 4.05, CI 1.62-10.08, P < .001)	Short study duration	III
	Two nursing teams consisting of 63 and 62 registered nurses respectively. Intensive care unit within a university hospital	Team 1: A&F Team 2: A&F + timely feedback		Completeness	
Bouyer-Ferullo et al., 2015	Improve knowledge and quantity and quality of nursing documentation related to peripheral nerve injury (PNI)	Pre-Post intervention	Improvement in documentation completeness for PNI interventions from 63% to 92%. Improvement in documentation correctness. Increased knowledge for PNI documentation requirements	Small sample size, different pre-posttest intervention sample size	III
		Education CDSS: PNI assessment screen		Completeness Correct	
Browne et al., 2004	To improve the compliance of initial and ongoing risk assessment documentation, and accuracy of care plans using embedded weights.	Pre-Post intervention	Improved ongoing assessment and reassessment documentation compliance, improvement in high risk assessment documentation completeness and correctness, improved accuracy of nursing care plan	None noted	III
	1250 beds across 7 hospital system, unknown participants	CDSS: Auto populating fields, auto calculations,		Completeness Correct	

			documentation		
Darmer, et al., 2006	To describe nurse's adherence to the VIPS Model by evaluating the quality of nursing assessment and the quantity of completed nursing care plans	Pre-Post Intervention, Retrospective analysis	Nursing documentation quality significantly improved over the course of the study (p=.0001). Partial initial patient status documentation completeness improved (93% vs 100%). Documented nursing status at discharge (15% vs 76%), Nursing diagnosis documentation (38% vs 55%), Nursing goals (7% vs 48%), Nursing interventions (38% to 57%)	Documentation monitoring instrument is a rough guide to quality and favors nursing care plans.	III
	Four study sites throughout the facility to include cardiology, neurology, urology, and oncology. Nurses who remained on the site over the three-year period were included in the study.	Education Enhanced care plans based on VIPS Model, Continuous documentation audits, and direct program supervision		Completeness Correct	
Esper et al., 2015	To evaluate oncology nurse practitioner's documentation adherence to quality oncology practice initiative measures post intervention	Pre-Post Intervention	Improvement documentation of all quality measures post intervention implementation	Small sample size, limited to one hospital and one specialty division.	III
	18 oncology nurse practitioners within a university hospital	Education Interactive case studies "Smart Phrases" Reminder emails		Completeness	
Fossum et al., 2013	To investigate a computerized decision support system and an educational program's implementation strategies for nursing documentation practice on pressure ulcers and malnutrition	Pre-Post Intervention with 2 intervention groups (IG) and one control group. Group 1 received pressure ulcer education and the use of clinical decision support (CDSS), intervention	IG1 and IG2 improved documentation completeness and comprehension of pressure ulcers over the control group	Within group (non-randomized) intervention, wide confidence intervals, non-standardized electronic documents between nursing homes	III

		group 2 received education only, control group received no additional interventions.			
	Resident records from 15 Norwegian nursing homes. 150 pre-intervention records, 141 post intervention records. Interventions were applied to all registered nurses and aides within the study group	IG 1: CDSS (Guided templated) and education IG2: education only Control group: no additional interventions		Completeness	
Hermon et al., 2015	To describes the use of an electronic tool to monitor and feedback process compliance in conjunction with introducing central line insertion packs to tackle catheter-related bloodstream infections	Pre-Post Intervention, segmented regression analysis	Increased bundle compliance rate from 2006 to 2008 (55% vs 100%) and sustained compliance of 100% from 2008 to 2014. Significant difference ($p<0.05$) between baseline infection rates and introduction of feedback on bundle compliance	Confounding variables	III
	10 Bed Intensive Care Unit within a 500 bed general hospital in South Wales	Focused charting bundle Audit and feedback (monthly) Introduced a new standardized insertion kit		Completeness	
Jacobson et al., 2016	To standardize and streamline inpatient documentation requirements related to pressure ulcer (PU) assessment, prevention, and treatment	Pre-Post Intervention	Documentation completeness: Turning, >90%, Pressure Point (PP) checks on admission (86% vs 93%), Daily PP checks (70% vs 99%), Patients at risk, PP checks 2x/day (63% vs 93%), Heel Prevention, +18% over 12 months, Rewrapping compression bandages	Specific documentation system and local processes reduce outcome generalizability	III
	1200+ bed level 1 trauma center 100% of all RN's within a	Education Redesigned charting elements CDSS: electronic reminders Audit and 1:1 feedback Compliance reports		Completeness Timeliness	

			decreased by 6%, Overall avoidable pressure ulcers decreased by 67%		
Jadav et al., 2009	To describe the outcome of interventions used to improve pain score documentation and the provision of analgesia	Pre-Post Intervention	Significant increase in Pain score documentation (74% vs 97%), No significant difference in analgesia offering (73% vs 66%), decrease in opiate use (32% vs 10%). Authors noted that increased pain score documentation did not improve the provision of analgesia	The decrease in opiate administration could have been influenced by the nurse practitioner's ability to order non-opiate narcotics. There was no information given regarding the level of pain scores pre-intervention compared to post intervention	
	United Kingdom Emergency Department	Education Flyers/Posters CDSS: Mandated fields		Completeness	
Lytle et al., 2015	Improve documentation of fall risk assessments, clinical outcomes, and nursing satisfaction	Pre-Post Intervention	Admission documentation improved from pre-intervention (92.73% vs 98.86%), Shift documentation increased (93.25% vs 94.69%, plan of care initiation for admission and shift assessment decreased respectively (77.1% to 62.5% and 75.22% to 60.35%)	All facility falls were not counted in pre/post data collection and analysis. Only unit level data (vs patient level data) was collected and could have skewed the results. No specific demographic or hospital condition were isolated and tested.	III
	16 medical and surgical units in a 938 Bed hospital, 1 medical and surgical unit was selected as a retrospective comparison	CDSS: 2 Reminders, 1 alert		Completeness Timeliness	

Nelson, 2015	To compare the increase in nursing clinical documentation compliance in a home health organization between staff receiving only education and staff receiving education with participation in chart audits.	Pre-Post Intervention	Staff who participated in chart audits improved documentation practices.	Small number of participants, limited training	III
	Licensed practical and registered nurses work within a home health agency.	Peer-reviewed audits and Feedback		Completeness	
Nielsen et al., 2014	To identify whether the use of real-time feedback improved the quality of documentation of essential elements by registered nurses in an emergency department setting	Pre-Post Intervention	Improvements were found in initial pain assessment by (4%), administration of blood components by (44%), immunization status documentation by (54%), height by (28%), and the Braden Scale by (78%)	Several potential confounding variables	III
	Urban medical center emergency department, 89,521 records were reviewed for compliance w/ 16 documentation items	CDSS: Visual dashboard Additional interventions such as job aids, changes in electronic templates, barrier removal, 1:1 documentation review		Completeness Timeliness	
North et al., 2014	To implement clinical decision support to improve nurse telephone triage documentation	Pre-Post Intervention, concurrent control group. 1 pre-intervention cohort, 1 Intervention group w/ Clinical decision support, 1 control group during intervention, no	Significant improvement in triage documentation in intervention group compared to concurrent control groups	Retrospective chart audit may miss the quality of triage because the documentation may not reflect the actual triage given.	III

		CDSS			
	Primary Care practice, 25 nurses.	CDSS: Guided template		Completeness	
Pageler et al., 2014	To test the hypothesis that successful implementation and adoption of an EMR-enhanced checklist tethered to a real-time unit wide dashboard would decrease CLABSIs in the PICU. The secondary hypothesis was that this intervention could improve care provider team communication and knowledge.	Pre-Post Intervention	CLABSI rates/1000 line days decreased (2.6 vs .07, P = .029). Improved compliance CLABSI bundles	Outcome causation cannot be established because of quasi-experimental design, CLABSI efforts were already underway and limits the study in distinguishing the effects of these efforts. Confounding variables. Documentation may have reduced the dashboard's effectiveness.	
		CDSS: Dashboard (point of care) CDSS: Electronic reminders CDSS: Guided templates Real-time corrections for non-documentation compliance		Completeness Timeliness	
Pan et al., 2009	To determine whether a five-component intervention to improve EHR data entry would increase the completeness of data, particularly height, weight, and blood pressure needed to diagnose metabolic syndrome	Pre-Post Intervention	There was a statistically significant increase in the recording of height from pre-test to post-test (46.6% versus 96.7%, P <0.001) and the recording of blood pressure from pre-test to	Limited generalizability, no control group to rule out confounding effects	III

	Two family medicine residency training clinics serving mainly African-American patients in Atlanta, Georgia, United States. Subjects Four nurses and four certified medical assistants attended pre-test, intervention, and post-test sessions. Four nurses and four certified medical assistants	Education Audit and Feedback Upgraded equipment purchase (Height/weight) Optimized data entry	post-test (96.8% versus 99.2%, P <0.05).	Completeness	
Pun et al, 2005	To implement sedation and delirium monitoring via a process improvement project and to evaluate the challenges of modifying intensive care unit (ICU) organizational practice styles	Pre-Post Intervention Prospective observational cohort	RASS and CAM-ICU documentation compliance post intervention VUMC (RASS) 94.4% (n=23,200) VA (RASS) 99.7% (n=5403), VUMC (CAM-ICU) 90% (n=8166) VA (CAM-ICU) 84% (n=1871), improved correctness of scores Nurses reported a high degree of comfort and satisfaction with the use of the CAM-ICU and RASS instruments	No control or pre-implementation data presented for comparison of documentation adherence. Only conducted in two MICUs	
	The medical ICUs at two institutions: the Vanderbilt University Medical Center (VUMC) and a community Veterans Affairs hospital (York-VA). Subjects: 711 patients admitted to the medical ICUs for >24 hours and followed over 4,163 days during a 21-month study period. 64 registered nurses were involved in the intervention.	Education Posters Post intervention survey		Completeness Correct	
Reyes et al., 2016	To improve documentation of quality metrics by applying multiple clinical documentation improvement (CDI) interventions	Pre-Post Intervention	Documentation delinquency decreased by 85%, Surgical Care Improvement program compliance increased (66% vs	Inability to confirm similar pre- and post - CDI patient populations	III

			97%), improved accuracy of Severity of illness, Risk of Mortality, and Case mix index scores. Increase in hospital surgical charges		
	A New Mexico University hospital level 1 trauma center's surgery department 71 Surgeons, 50 Surgery residents and 27 Advanced practice providers/practitioners were selected	Education 1:1 Case review studies, Mobile device support, posters/tip sheets, auto-CDSS: auto-populated note templates, dictation software		Completeness Correct	
Richardson et al., 2016	To determine whether the electronic health record implementation of stroke-specific nursing documentation flowsheet templates and clinical decision support alerts improved the nursing documentation of eligible stroke patients	Pre-Post Intervention	Redesigned flowsheets improved nursing documentation in 5 out of 6 measures. CDSS: Nursing reminder did not show an improvement in nursing documentation pre-post intervention	Automatic data pull could have excluded studies because of patient discharge timing. Lack of education may have impacted the results. Documentation alerts may have been missed by nursing because of their physical location on the screen. Nurses had to scroll down to view them and may have missed the triggers	III
	Seven certified stroke center emergency rooms across a Multi-state urban healthcare system. Nursing documentation audits evaluated pre (n=2293) and post (n=2588) intervention. Pediatric records were excluded	Redesigned Flowsheet to include disease-specific evidence-based content CDSS: reminders		Completeness Timeliness	
Rogers, 2013	To determine if a process could be built to accurately capture present-on-admission (POA) pressure ulcers (PU)	Pre-Post Intervention	A statistically significant change (2010: $P < .01$, $z = 2.507$; 2011: $P < .01$, $z = 2.632$) was found for POA; Hospital acquired conditions also had a statistically	No controls for acuity, at the start of the study, a new set of medical residents started and may have impacted the results, lack of education may	

			significant change (2010: P = .02, z =2.411; 2011: P < .01, z = 2.781)	have impacted identification of stage I versus stage 2	
	An acute-care, 333-bed hospital in the Midwestern United States	CDSS: Reminder		Completeness	
Sandau et al., 2015	To examine effects of education and computerized documentation enhancements on QTc interval documentation.	Pre-Post intervention		Generalizability may be limited because of the specific EHR used in correlation w/ barcode medication administration.	III
	10-hospital health care system, 3232 Nurses	Education CDSS: Nurse electronic alert Automatic calculation of QTc in electronic health records after nurses had documented heart rate and QT interval		Completeness Correct	
Thoroddsen et al, 2011	To describe sustainability and changes in content and completeness of documented nursing care after implementation of nursing terminologies and a computerized system in nursing practice	Pre-Post Intervention Measured at Pre (T1), and Post (T2 and T3)	Care plan documentation improved significantly from 77% at T1 to 88% at T2 ($P < .001$) and to 89% at T3 from pre-intervention audit (n=291) and T2 and T3 respectively (n=299 and n=281). Documented signs as symptoms increased from T1 (30%) to T2 (63%)	Study could not isolate improvement on specifically standardized terminologies versus standardized care plans. Authors note generalizations cannot be made. No control group used,	III

	800 bed university hospital in Iceland. Sampled charts are from 41 inpatient wards	Education, Standardized nursing terminologies and standardized care plans	and to T3 (74%). Documentation of related factors increased from T1 (17%) to T2 (69%), and to T3 (82%). Documented nursing interventions increased from 71.1% to 96.8% (T2 to T3)	Completeness Correct	
von Krogh et al., 2012	To test the impact of the quality assurance, problem solving and caring (KPO) model on nursing documentation completeness, comprehensiveness and consistency at three time periods	Pre-Post Intervention Pre-intervention (T1), end of model implementation (T2), and one year after implementation (T3) model	Improvement in documentation completeness from baseline (P<0.001), comprehensiveness (P<0.001), and consistency (P<0.001). No noticeable effect from CDSS	None noted by author	III
	5 psychiatric wards, 177 records	Guided template		Completeness Correct	
Wahl et al., 2010	To measure the effectiveness of an education intervention on documentation compliance w/ joint commission ICU core measures for ventilator acquired pneumonia as well as blood glucose levels	Pre-Post Intervention	Compliance for documented core measures Improved over 1 year study period Individual measures Glucose levels <150 (62% vs 91%), Vent weaning parameters (13% vs 71%), HOB at 30d (32% vs 100%), GI prophylaxis (32% vs 95%), DVT Prophylaxis (68% vs 97%)	Positive results may not have been caused by education alone.	III
	Ten bed surgical intensive care unit	Education		Completeness	

Wu et al., 2013	To determine whether the use of a standardized mobile inter-shift handoff system would affect the quality of nursing documentation	Pre-Post Intervention	Of the 25 documentation elements, only three measures had a significant change from baseline. Pain assessment documentation completeness increased (67.5% vs 87.7%), Correct abbreviations (71.9% to 84.2), and Reassessment documentation decreased (73.7% vs 56.1%). Results were similar when looking at department level data	Compliance rates could have been influenced by level of technology adoption	III
	19 inpatient units within a hospital (1200 bed) in Taiwan, 225 chart audits	Redesigned documentation template, point of care mobile workstations		Completeness	
Holden, 2014	To evaluate nursing documentation compliance rates with central line bundle adherence, and to determine if the CLABSI rates significantly decreased post central line bundle educational intervention	Retrospective-Prospective analysis	No significant different in pre-post education on CLABSI bundle compliance	Short duration of study, audit of all studies was not feasible, bundle items were not in one location, pre-post intervention infections were not collected.	IV
	Hospital Intensive Care Unit, 100 randomly assigned chart audits, 47 Pre-intervention, 53 Post-intervention	Education		Completeness	
Olsen, 2013	Investigate and improve the quality of specific postoperative documentation in association with patient discharge from the PACU.	Retrospective case-based study	Postoperative score template was done for 67.3% of scores. Scoring in subcategories was documented in 90% cases with some specific categories consistently being missed.	Audits can be time consuming and may be a limit to the studies method	IV
	49 patient charts from several departments within a hospital in Denmark	Redesigned documentation template		Completeness	

Alvey et al., 2012	To test the use of clinical decision support to improve documenting and staging pressure ulcers	Descriptive study	64% of the nurses accurately documented correct PU stages (n=79/129) 87% of RN's (n=27) staged correctly	Small sample, lack of pre-intervention comparisons, simulation w/ pictures versus real pressure ulcers	VI
	500 Bed regional referral hospital, 31 nurses, including RN, LPN and students	CDSS: Guided template		Correct	
Collins, 2005	To implement a near-real-time dashboard to monitor documentation compliance	Descriptive Study	Near 100% documentation adherence for first 3 years after implementation.	Internally developed application.	VI
	Hospital system. No identified population	CDSS: Near real time dashboard		Completeness Timeliness	
Sockolow et al., 2014	To develop empirical data on how nurses used an evidenced-based nursing information system (NIS) and to identify challenges and facilitators to NIS adoption for nurse leaders	Descriptive Study	Location of the documentation system important based on the scenario. Systems located inside the room or outside the room only, did not meet all situations. Software system which required lots of scrolling could impact documentation completeness. Too many guidelines made it hard to find the appropriate guideline. Electronic memory prompts facilitated documentation. Copy forward made documentation easier, but required validation to not	Anonymity may have contributed to a lack of potential differences in opinion associated with demographics of participants, results may not be generalizable because of participant sample.	VI
	12 Nurses from a 3-hospital system	Scenario-based user testing, think aloud method, questionnaire		Completeness, Correct, concordant, and plausible	

			inadvertently add incorrectness. Some documentation was made easier with checkboxes. Lack of reminders, like triggers for patient falls, could contribute to key documentation requirements.		
Wager et al., 2010	To measure the accuracy and timeliness of vital signs data during three different stages of clinical documentation system implementation.	Observational time study of three groups, paper-based medical system (P1), clinical information system documentation outside of the room (P2), clinical information system at the point of care (P3)	P3 intervention significantly improved the accuracy and timeliness of documentation ($P < 0.05$)	To reduce Hawthorne effect, known observers were used. Authors also did not control for differences between nurse's individual error rates. There were some patient safety concerns during P2, which reduced the number of sampled vital sign observations	VI
	709 bed medical university level 1 trauma, 270 vital sign documentation observations recorded.	N/A		Completeness Timeliness	
Wainwright et al, 2008	To measure the effect of an automated feedback system on trauma resuscitation documentation	Descriptive Study	Improved documentation Staff are more accountable and comfortable with peer mentoring.	None noted by author	VI
	Level 1 US based trauma setting, no sample listed for participants	Audit and Feedback		Completeness	
Yeung et al., 2012	To characterize the nursing practices of vital signs collection and documentation to inform strategies for improving workflow design.	Qualitative ethnographic analyses and quantitative time-motion study	Author recommends point of care computers. Nurses documenting on electronic systems spent more time to	Limited time for observations, vital sign observations were taken at the beginning of the shift and documentation	VI

			document, used work arounds to maintain information reducing the time vital sign data were available in the electronic system	events may have taken place over the 12 hour shift, reducing the amount of observed documentation results	
	5 inpatient wards in three tertiary hospitals in Toronto and Ontario, Canada, 24 registered nurse participants	Observations, shadowing		Correct Timeliness	
LOE=Level of Evidence					

Appendix C: Levels of Evidence

- Level 1 - Systematic review & meta-analysis of randomized controlled trials; clinical guidelines based on systematic reviews or meta-analyses
- Level 2 - One or more randomized controlled trials
- Level 3 - Controlled trial (no randomization)
- Level 4 - Case-control or cohort study
- Level 5 - Systematic review of descriptive & qualitative studies
- Level 6 - Single descriptive or qualitative study
- Level 7 - Expert opinion

Source: Melnyk, B.M. & Fineout-Overholt, E. (2011). Evidence-based practice in nursing and healthcare: A guide to best practice. Philadelphia: Lippincott, Williams & Wilkins

Appendix D: Study Selection Procedure