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Facilitating Implementation of In-Room Whiteboards in the Skilled Nursing Environment Using the PARIHS Framework

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FACILITATING IMPLEMENTATION OF IN-ROOM WHITEBOARDS IN THE SKILLED NURSING ENVIRONMENT USING THE PARIHS FRAMEWORK

by

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The application of research to practice is a difficult task to successfully carry out for many healthcare professionals and organizations. The Promoting Action on Research Implementation in Health Services (PARIHS) framework is a tool that acts as an implementation guide for translating research evidence to practice. This study explored the use of an adapted version of the PARIHS framework as a guide to implementing in-room whiteboards in a skilled nursing facility (SNF) on their short-term rehabilitation wing. While the utility of in-room whiteboards has been demonstrated in the acute care setting, there are few studies of their use in SNFs. This study also aimed to determine whether in-room whiteboards might improve the SNF's patient safety measures, including numbers of falls and rehospitalizations.

Data were collected on the 33-bed short-term rehabilitation unit of the SNF. Two pre-implementation meetings were completed with the SNF leadership team that involved discussing the PARIHS framework and establishing plans for implementation, while recognizing not only the strengths of the facility, but also potential barriers to implementation. A follow-up meeting was conducted with the leadership team seven and a half months after whiteboard implementation to debrief on the intervention, and the utility of the PARIHS framework for planning the intervention.

Results indicated that, while some members of the leadership team found the PARIHS framework to be useful, others found it to be cumbersome to use. They also noted that the

COVID-19 Pandemic made it challenging to keep up with timely maintenance of information on the boards. However, they indicated that when the boards were used effectively, it aided in the speed and ease of information exchange. Although previous studies in the acute care setting have shown that whiteboards improved patient safety, there were no significant changes noted in the safety outcome measures of falls and rehospitalizations.

In conclusion, it appears that the PARIHS framework could be useful as a guide for implementing research evidence into a SNF setting; however, further study in additional facilities with other leadership teams is necessary to confirm its utility. In addition, future research should continue to explore the effects of whiteboard use on patient safety measures in SNFs, as the conduct of this study was affected by the pandemic.

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CHAPTER I

INTRODUCTION

Use of evidence-based practice (EBP) in healthcare organizations is linked to improved patient care and better health outcomes.[1] Most professions have a strong body of knowledge gained through case studies, clinical research, and meta-analyses, yet the application of EBP to practice is often delayed.[1] Successful implementation of EBP benefits not only the patient, but also the healthcare organization as a whole by producing better outcomes and controlling costs.[1]

Besides the desire to provide the best care possible, healthcare facilities face tightening regulations from insurance companies to provide quality care as positive outcomes become more closely tied to reimbursement rates.[2] Today's healthcare reform financially incentivizes positive outcome measures for a wide variety of services. When healthcare providers apply EBP, the likelihood of better outcomes increases, yet there continues to be a gap between research and practice in many healthcare professions.[1]

Application of EBP to typical settings is noted to be difficult for a number of reasons, including lack of time for research, lack of access to EBP, and difficulty translating research into clinically meaningful action.[3] Healthcare organizations and healthcare providers continue to struggle with consistent and timely translation of research to practice. When attempts to implement EBP do occur, the outcomes can be highly variable. This is often due to failure to use proven, systematic implementation strategies.[4] Implementation science is a newer sector of research that involves application of strategies for systematic implementation of EBP to improve uptake.[5] Transfer of research knowledge to practice is challenging, but adapting the intervention to be

implemented into routine practice shows some promise.[6] This customization involves examining the characteristics of the implementation environment while also considering the barriers to implementation for the specific organization.

The Promoting Action on Research Implementation in Health Services (PARIHS) framework is an approach to implementation science with foundations in acute care nursing practice.[6] The PARIHS framework allows for investigators to assess the unique facets of individual healthcare facilities in regard to likelihood of successful implementation of EBP. Perry et al. investigated the suitability of the PARIHS framework for implementation science in senior care settings (skilled nursing facilities or nursing homes), finding the framework to be a good fit.[6]

Background of the Problem

When considering implementation science in healthcare, it is important to be aware of the predominant challenges. Effective communication is a barrier in many healthcare environments. Communication breakdown or miscommunication is a leading cause of inadvertent patient harm, which contributes to poor quality of care and lack of safety in caring for elderly adults.[7] In hospital settings, communication failures are estimated to be the root cause of over 70% of cases of inadvertent patient harm with over 75% of those cases resulting in death.[7]

Skilled nursing environments are not exempt from barriers to safety and quality of care. Elderly individuals in long-term care facilities tend to be relatively fragile and at high risk for adverse events, including medication errors, falls, and pressure ulcers.[8,9] These adverse events occur with high incidence; a 2014 Centers for Medicare and Medicaid Services (CMS) report stated that 1 of 3 skilled nursing facility (SNF) residents was affected by an adverse event within

the first 35 days of their stay.[10] Safety and error-prevention in healthcare is a constant challenge for care providers, but the risks and concerns are increased in skilled nursing environments.[11] Methods to reduce adverse events and risk of resident harm can be beneficial in improving safety and quality of life for SNF residents. In addition to communication failures, skilled nursing facilities (SNF) face the challenge of high rates of staff turnover.

Retention of direct care workers in long-term care facilities has been a long-standing issue in the U.S.[12] There exists a staff turnover rate of between 40% and 75%, or higher.[13] Excessive levels of staff turnover can have a negative impact on the quality of care in SNFs, although studies differ on the level of impact.[14] Many SNF environments resort to use of agency staff (nursing staff employed by a third-party company that is contracted to cover vacancies within SNFs) to fill open shifts when staffing issues arise. Research indicates that there is a significant relationship between using higher rates of agency staff and reduced quality of care.[15] Agency staff members are not generally familiar with individual facility systems, policies, or residents, which results in a lower quality of care and reduced adherence to communication systems. The alternative to using agency staffing can be mandatory overtime, which involves requiring facility employees to extend their shift length in order to meet appropriate staffing levels in order to care for the number of residents in the facility. The consequences of mandatory overtime are over-working regular SNF staff and job fatigue, which can have a negative impact on resident safety and can cause an increase in adverse events.[16] Whether an agency caregiver is contracted, or a full-time employee is overworked, the negative effects of staffing challenges are detrimental to the residents.

Furthermore, we know that healthcare delivery organizations are complex with many stakeholders and factors to be considered, especially when exploring improvement projects.

Healthcare organizations in America struggle with patient safety, soaring costs of care, and inconsistent application of evidence-based practice.[17] To make improvements, researchers must utilize systematic approaches that consider underlying barriers to quality and safety.

The Joint Commission and Agency for Healthcare Research and Quality both uphold the significance of effective communication in improving patient safety and patient experience.[18] Effective communication can be improved through standardizing and simplifying communication amongst healthcare professionals. A streamlined approach to communication can reduce harm and improve safety culture in SNFs.[7] Structured methods for simple communication and information exchange in healthcare environments may be a viable method, not only for reducing inadvertent harm to residents, but also to lessen the cognitive burden or workload on caregivers.

When considering methods for improving communication in healthcare environments, Nadzam[19] suggests being mindful of the following aspects:

- Choose a user-friendly method
- Ensure minimal time and effort required to use
- Convey comprehensive information efficiently
- Encourage multidisciplinary collaboration
- Limit the possibility for errors in communication.

Traditional and electronic whiteboards meet the guidelines laid out above. Many acute care hospitals utilize whiteboards as a communication tool designed to reduce cognitive burden and improve communication for nurses and caregivers through the simplistic nature by which information is shared. The in-room whiteboard allows providers to share important information in an easily readable and accessible format that enhances communication. Better communication leads to improved treatment results, increased staff motivation to achieve quality, and higher

patient satisfaction.[20] It can also help to improve the speed of communication by having important patient information readily available when needed. Whiteboards allow for important information to be displayed in plain view without the need for login to electronic health record (EHR) systems. Furthermore, having vital information displayed where it is easily accessible allows for a caregiver to refer to the information they need when they need it rather than attempting to recall care plan details while assisting a resident.

Visual display of information can help to alleviate the mental workload for clinical staff members.[21] Mental workload (or cognitive-load), in this regard, is referring to how much information a staff member is required to remember related to each individual's care. Reduced mental workload and less reliance on provider recall may result in decreased risk of human error. In addition, easily accessible information within a resident's room might prove to be especially helpful in SNFs where high turnover rates and presence of agency staff result in a consistent stream of new caregivers who are likely unfamiliar with individual resident needs.

Whiteboards come in a wide variety of shapes, sizes, and designs, but the primary purpose of each is to facilitate communication of important information relative to patient care. Some whiteboards are intended to be utilized solely by healthcare providers while others are intended to be a collaborative tool for communication between providers and patients. In-room or bedside, whiteboards are utilized to display pertinent information, such as patient transfer status and the need for assistive devices. Research shows promise for the in-room whiteboards to increase hospitalized patients' satisfaction with nursing care, patient perception of nursing attitudes, and improved promptness and need fulfillment when responding to a call light.[22] In this study, we seek to better understand the use of whiteboards in healthcare environments and how they can impact communication and patient care.

Statement of the Problem

Communication failures are a long-standing burden in healthcare environments that result in preventable harm to individuals.[23] Coupled with staffing issues, the negative impacts on consistency and quality are unavoidable. However, standardizing and simplifying communication are shown to reduce harm to residents and improve safety to better serve individuals.[7] Visible display of information in healthcare environments has the advantage of requiring minimal effort and time from users while also being readily accessible. This is beneficial for all individuals, not just those who are familiar with the resident. A traditional dry-erase whiteboard is a cost-effective and well-used visual display used in healthcare environments. Whiteboards have been well-researched in acute care settings with positive perceptions of usefulness by staff members and patients alike. However, little empirical research has been focused on the implementation process behind whiteboards across healthcare settings or the quantitative impacts on safety, especially in skilled nursing environments.

Study Purpose

The purpose of this study is to prospectively plan the implementation of in-room white-boards through an assessment of factors that impact successful implementation and then carry out the process with the implementation team. Furthermore, the study will examine the effects of the in-room whiteboards on safety measures, including falls and rehospitalizations. The use of the PARIHS framework as an assessment along with the impressions of the study participants will guide the systematic implementation and evaluation of in-room whiteboards in a SNF.

The PARIHS framework proposes that successful implementation of any given inter-vention is a function of the supporting evidence for the evidence-based practice to be implemented,

the context of the implementation, and the methods by which the change is facilitated. There are multiple sub-elements that make up each factor, and these sub-elements are rated by stakeholders in one application of this framework. These stakeholders are familiar with the study environment and work together to reach a consensus rating for each sub-element. In this study, included stakeholders are members of the leadership team at the study facility, including the departments of nursing, case management, therapy, and life enrichment. Unanimity on each item is reached through discussion and collaboration to determine if the sub-elements will support (high rating) or hinder (low rating) successful implementation. The likelihood of successful implementation increases as more sub-elements are rated as high.[24]

Research Question

This study aims to answer the following research question: Is there a significant change in safety outcome measures following four months of use of in-room whiteboards? The research study will allow for examination of the potential influence of in-room whiteboards on facility measures that are tracked daily and in nearly all SNF environments. In addition, this study will provide an overview of the planning process for implementation of the whiteboards through use of the PARIHS Framework.

Study Significance

This study intends to fill a gap in research related to ability of in-room whiteboards to impact safety and quality measures in the skilled nursing environment. Although a significant amount of research related to use of whiteboards in healthcare exists, the evidence is primarily qualitative and is extremely limited outside of acute care settings. With reimbursement linked to

positive healthcare outcomes, organizations need to find efficient and affordable means to improve quality and effectiveness of care. Furthermore, this study intends to serve as an exemplar of implementation research in SNFs through systematic means, specifically, the PARIHS framework.

Conclusion

Skilled nursing facilities continue to have a strong need for scientific research to support EBP across a variety of concepts, but specifically in the area of communication. This study investigates a potential method for improving communication exchange between healthcare workers and residents. In-room whiteboards offer a low-cost option for organizations to facilitate improved communication for residents and amongst caregivers. With use of the PARIHS framework, this study works toward improving implementation of EBP while also aiming to improve communication and safety in the SNF environment.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Using whiteboards in healthcare environments to facilitate communication is not a novel concept. Both electronic and traditional versions of this intervention have been utilized in many different hospital departments including emergency, labor and delivery, oncology, and general medical wards. The majority of research indicates that whiteboards can be useful in improving communication and information exchange in hospital environments. This chapter offers a review of the relevant literature related to the use of multiple types of whiteboards in healthcare to facilitate communication.

Search Description

The following databases were selected and searched based on their relevancy to healthcare research: Scopus, PubMed, CINAHL, and Proquest Health. Search terms were intentionally broad in order to gain a wide collection of articles for review with any association of whiteboard use for patient care. Each search involved the use of the key terms “patient” and “whiteboard.” The search was conducted to detect these keywords in any portion of the identified resources including the title, abstract, and full-text information. Results were then filtered by document type (articles and reviews) and language (English). Then, the title and abstract of each article was screened and those not relevant to the research topic were excluded. Articles with abstracts that contained relevant search terms were exported for further review. Full-text articles were evaluated

for eligibility based on the criteria of research pertaining to whiteboard use in healthcare. Any articles pertaining to this criterion were included in the literature review. The final list of relevant articles was evaluated for duplicates in comparison to all database search results. Duplicates were eliminated and unique results were retained.

Full-text review of the final pool of articles resulted in retention of 66 relevant articles and elimination of 35 irrelevant articles. A number of studies relative to electronic whiteboards (e-whiteboards) were eliminated due to their primary focus on the provider's interactions with the boards or technological design, rather than the tool's ability to improve communication and/or safety. Articles were also eliminated if the research purpose was not focused on improving communication, patient care, workflow, or efficiencies through the use of whiteboards within in-patient healthcare environments. Studies that examined the use of whiteboards in outpatient environments or that used whiteboards solely for educational purposes were eliminated from the literature review. The search was originally conducted in September of 2017 and was updated periodically over the course of three years with the most recent update completed in August and September of 2020. Table 1 below documents the final search results.

Table 1

Number of Studies Identified in the Literature Review

Database	**Initial results**	**Filtered by document type and language**	**Excluded due to poor relevancy**	**Unique results retained**	**Deemed pertinent**
Scopus	203	150	84	66	50
PubMed	113	111	49	16	9
CINAHL	78	68	9	13	4
Proquest Health	59	38	22	6	3
Total relevant articles					66

Theoretical Framework

Communication failures in healthcare environments are associated with lower patient satisfaction ratings and unfavorable outcomes for patients.[25] The Joint Commission reports that 65% of sentinel events (events that result in death or serious harm) can be attributed to communication failures.[26] Improving communication can improve quality of care and patient satisfaction, which is associated with reduced hospital readmission rates.[27] Hospital readmission rates are a key safety indicator used to measure quality in healthcare environments. The Institute for Healthcare Improvement promotes whiteboard use, and there are a number of studies supporting their efficacy.[26]

The premise of this study is to explore the feasibility of using whiteboards in skilled nursing environments, since research thus far has been exclusive to hospital use. Research from a wide variety of specialties supports the use of whiteboards as a method for communicating in hospital environments, but the idea of this tool being applied to skilled nursing environments has yet to be formally explored. The following review of literature details the outcomes, benefits, and barriers of utilizing whiteboards in healthcare environments. We will also examine recommendations for implementation of whiteboards.

Review of the Literature

Section One: Whiteboard Use

The literature review procured 66 articles exploring the use of whiteboards relative to communication within medical settings involving inpatient care. Healthcare practitioners have used both traditional whiteboards and electronic whiteboard systems to enhance communication

and workflow. All of the reviewed studies examined whiteboards that had been utilized in hospital environments. Research with whiteboards in outpatient environments was eliminated from the search and research in regard to whiteboards in SNF environments was not found. The primary themes or topic areas from the identified articles included: (1) using whiteboards as a means to share information and improve communication, (2) using whiteboards to enhance patient satisfaction, (3) use of electronic whiteboards in healthcare, and (4) guidelines to direct the format and implementation of whiteboards.

Information Sharing and Improved Communication

Traditional whiteboards are a broadly used, low-cost tool in acute care settings that have been used to enhance communication between providers and patients.[25] There are generally two different approaches to using whiteboards in acute care: unit whiteboards versus 'in-room' or 'bedside' whiteboards. Unit whiteboards tend to be much larger in size than in-room whiteboards and are usually centrally located within healthcare departments so that all staff members can view the information they display. This type of whiteboard is usually focused on patient logistics and interdisciplinary communication. Unit whiteboards are only utilized by organization staff members and are not accessible by patients or family members. The in-room whiteboard is placed within each patient room and contains important information for and about the patient. The in-room whiteboards tend to include information necessary for the patient and for the provider. They act as a means of communication between the patient and the providers rather than a provider-to-provider communication tool. Research thus far has examined both in-room and unit whiteboards.

To explain further, large unit whiteboards often assist in tracking patients and informing providers of current status, resident needs, and upcoming procedures. These are also helpful in organizing the admission process in labor and delivery and in emergency departments (EDs).[28] This style of whiteboard has been used to coordinate discharges and available bed counts.[29–31] Unit whiteboards are helpful in strengthening communication and supporting a team approach to patient care in the monitoring of patient flow through medical units[32,33] The boards are usually placed in a hallway or huddle space that acts as a central hub for information sharing. This area is only accessible by hospital staff in order to uphold patient privacy as governed by the Health Insurance Portability and Accountability Act (HIPAA).

Across a variety of specialties, whiteboards have been implemented as one piece of a larger improvement project targeting better communication and patient-centered care.[34–38] Hollesen et al.[34] effectively used whiteboards as one artefact in a quality improvement project to reduce infant asphyxia at birth. Another study utilized whiteboards as part of an improvement project for visual display of patient information regarding diabetes management in order to successfully reduce hypoglycemia in preoperative diabetics.[35] In-room whiteboards have also been utilized in an improvement study to reduce falls and pressure ulcers, along with bedside handovers and other quality inititives.[39] Xiao et al.[40] found whiteboards to be a functional tool within operating rooms for improving communication, awareness, and collaboration, along with other interventions.

A study by Harper et al.[36] involved implementing a bundle of patient-centered interventions, one of which was the in-room whiteboard. Narrative responses from nursing staff were analyzed and one of the identified themes was ‘passing the baton,’ which referred to handoffs at shift change that were completed at bedside with the whiteboard being updated at that time.[36] The

staff reported that the bedside whiteboards were an incredibly important element and that the whiteboards acted as a form of accountability for the shift-to-shift report.[36] Multiple studies document the improved handoff of patients from provider to provider with the use of whiteboards as a guide.[30,36,39,41–43]

Studies also differentiate between patient and provider opinions of the usefulness and purpose of whiteboards. In a survey of healthcare providers who incorporated whiteboards into their daily routine, the providers felt the in-room whiteboards had the potential to improve teamwork, communication, and patient care.[26] The whiteboards increase involvement in care from multidisciplinary team members.[44] They permit communication and information sharing between providers even when all providers are not present, allowing for synchronous and asynchronous communication.[40,45] In terms of patient handover, the whiteboards "provide focus, information and structure for discussions" (p. 49).[46] In-room whiteboards are an instrumental piece of daily rounds for improving communication and patient satisfaction.[47]

Whiteboards have the benefit of being accessible at a glance by any care provider.[46] A caregiver can easily view a variety of details about the patient's care plan, status, or needs. "The use of a whiteboard has been shown to be effective for recording salient patient information and functioning as a communal memory tool" (p. 139), allowing for information sharing across time.[41] The whiteboards also have the advantage of being simple to use by providers, families, and patients without any specific technical skills or training.

A final benefit of the traditional whiteboard is that it is a relatively low-cost intervention. Prices vary by board size and manufacturer, but Carlin[22] estimated implementation of a single whiteboard would cost approximately $40 for a 24-inch by 36-inch board. With the reasonable

cost and ease of acquisition, whiteboards can be a viable option for nearly any healthcare organization.

When examining the impact of whiteboards as a tool for communication and collaboration, it is important to consider what barriers or shortcomings exist. Nowacki et al.[18] investigated the use and functionality of whiteboards across four inpatient units at a pediatric hospital. The four primary reasons for lack of use of the whiteboard or incomplete information sharing were insufficient writing space, too many categories to complete, unspecified responsibility for whiteboard upkeep, and forgetting to update the board.[18] The study procedures involved revising the whiteboard layout and designating responsibility for completion in order to overcome the identified barriers.[18] The study goes on to offer whiteboard layout and implementation recommendations, which will be discussed later in this paper.

Patient Satisfaction

A survey of patients on a general medical ward found a significant increase in patient satisfaction with communication after whiteboards were implemented on the unit.[48] Current research has discovered that use of the whiteboards improves a patient's awareness of the individuals on their medical team, details related to their clinical care, and patient understanding of goals.[22,27,49–51] Patients were also more satisfied with their treatment when residing in hospital rooms with whiteboards in use.[27,49] Devlin et al.[52] found that patients felt that the in-room whiteboard allowed them to be more involved in their care while hospitalized. As part of an improvement project, patients rated in-room whiteboards as helpful in putting them at ease and improving discharge preparedness.[53] Patients surveyed by Carlin[22] reported an improvement in response to

call-lights, periodic checks from nursing staff without request, and improved manner of nursing staff following implementation of bedside whiteboards.

When asked about who generally updates or changes information on in-room white-boards, patients reported that nurses are observed to use the whiteboards more than physicians.[54,55] The most valued information by patients included provider names, current date, information about upcoming procedures, and the goals of care.[47,51,54] Ninety-five percent of the surveyed patients rated the whiteboards as helpful and 92% reported using them frequently during their stay.[54] Family members were more likely to engage in writing information or questions on the in-room whiteboards when informed of the purpose by healthcare providers.[55]

A systematic review published in 2017 explored bedside visual tools and their impact on improving satisfaction in medical settings. In a broad sense, the study found that using visual tools has a positive influence on communication.[25] The study reiterated the findings from Singh et al.[48] and Sehgal et al.[26] reporting that whiteboards have a positive impact on communication and patient satisfaction.[25] The review states that visual tools serve as a means to display information for patients and family members that can be updated throughout the day and interacted with as needed.[25]

Exploring Electronic Whiteboards

In addition to the traditional whiteboard research, the literature review generated multiple articles that investigate how electronic whiteboards (e-whiteboards) can improve information sharing in a variety of healthcare environments from the emergency department (ED) to the intensive care unit (ICU). Information sharing may be as simple as communicating care providers' names to patients or as complex as tracking the status of surgical rooms and the location of patients throughout the hospital. The e-whiteboard is a newer spin on the traditional whiteboard.

Electronic whiteboard use has been growing in popularity as the capability for interfacing the whiteboard with EHR systems grows and also as a means for collaboration between healthcare providers.[56–58] Electronic whiteboards are a tool to share information in real-time for efficient patient management.[59–62] Technology in medicine continues to grow as it is seen as a resource to improve care coordination, safety, and efficiency.[63] It is important to investigate e-whiteboards when considering whiteboards as a tool for improving communication as the research demonstrates e-whiteboards to be an effective and promising tool.

Halvorsen et al. implemented an e-whiteboard system with the intent of improving information sharing and collaboration between healthcare providers.[59] As the study progressed, additional departments outside of clinical care were added as users because they found the e-whiteboard was helpful in improving efficiency for ancillary departments, such as dining services and housekeeping, as well.[59] The study utilized a lightweight technology (LWT) paradigm, which involves the use of common technology easily managed by adept, everyday users and not requiring implementation or management from information technology (IT) professionals.[59] This LWT approach was favored because it allowed for efficient communication of simple information while also being user-friendly and accessible to end users.[59] However, the researchers found that communication of complex information was much less successful through the applied intervention.[59] This study supports the use of visual displays of information for real-time information exchange for healthcare providers in a simple, user-friendly way.

Similar to the traditional whiteboard, studies indicate that the e-whiteboard can be helpful in patient handover from provider to provider, although findings have been mixed.[64] The e-whiteboard is also a valuable resource for improving patient flow through the hospital and improving workflow for providers while also reducing wait times.[65–67] Interviews of providers

who trialed an e-whiteboard simulation felt that the tool could improve communication, reduce EHR log-ins, and make providers more rapidly aware of new patient information.[68–72] One study also found that being able to access patient information on an e-whiteboard within the patient room significantly increased the amount of time nurses spent with the patients and decreased the amount of time spent at the control desk (or nurse's station).[73] Furthermore, a reduction in EHR throughout a provider's day may be a time-saving and efficiency-improving benefit of whiteboards that provide visual access to information.

Abujudeh et al.[74] specifically outlined the differences between an e-whiteboard and a traditional whiteboard in regard to communication in EDs. Five areas were compared: ease of use and legibility, data management, triage function, data tracking, and distribution and assistance in quality management.[74] The most significant differences noted were that the e-whiteboard offered no challenges with legibility and had more capacity to share large quantities of information.[74] The e-whiteboard also allowed for triaging, remote accessibility, and ability to track data for quality management.[74] The study highlighted the benefits and advantages of an e-whiteboard over a traditional whiteboard. Alternatively, Patterson et al.[75] studied e-whiteboards in two Veterans Affairs EDs with findings indicating that physicians in the studied units were less likely to use the e-whiteboard than the traditional whiteboard. The study also noted more inaccuracies on the e-whiteboards than the traditional whiteboards, which may be attributed to clinician management of the traditional boards versus clerical management of the e-whiteboards.[75] Taneva et al. found that, even though providers were satisfied with the e-whiteboard functionality, the team's acceptance and uptake of technology seemed to negatively impact adoption of the e-whiteboard.[76] In addition, the complexities of the e-whiteboard platforms required additional staff training time and support from IT.[77] Information related to the cost of various electronic

whiteboard applications was difficult to locate in the literature review. Estimated or exact costs were not readily shared in the reviewed articles, but with the need for a computer system or tablet it is clear that the cost to implement electronic whiteboard systems would far surpass $40 per patient room. It is important to consider context, culture, and cost when evaluating the feasibility of implementing an e-whiteboards system.

In summary, e-whiteboards are a provider-centered tool that can improve collaboration and assist with information exchange. Studies demonstrate that e-whiteboard systems that are user-friendly and updated in real-time are more advantageous, but individual provider acceptance and organizational structure may impact uptake of the e-whiteboard. Although a helpful tool in managing patient flow, improving communication, and increasing collaboration, the e-whiteboard tends to be more provider-focused than patient-centered. The e-whiteboard approach also appears to be most preferred in fast-paced ED environments where patient status and location changes more rapidly.

Whiteboard Implementation Recommendations

Sehgal et al.[26] proposed a set of guidelines for future whiteboard implementation projects. To be effective with whiteboard use, the authors recommend that whiteboards be in clear view of the patient, dry erase markers be fastened to the board, and that structured templates are created before implementation.[26] Singh et al. placed the boards at standing eye-level and also utilized a whiteboard template.[48] Location of the board should be optimized in regard to visibility by providers and staff and also with consideration of ease of access.[78] Whiteboards that are not strategically placed can be a barrier to adoption and use. The templates provide structure and context for users and should include some orientation information, such as the day and date.[26] It

is also helpful to include the names of the patient, nurse, and physician.[26] Other recommended information for the template is the goal for the day, the anticipated discharge date, family contact information, and a section for patients and families to write questions for the providers.[26] Additional study recommendations were for nursing staff to be primarily responsible for maintaining the boards and that a system be created for auditing the whiteboards.[26] It is also vital to be mindful of what information is being exchanged and the visibility of the whiteboard in order to uphold security of patient information.[64]

A further consideration when implementing use of whiteboards is to consider the environment or culture of the organization. A team must be open to and accepting of the visual tools and they must be engaged in the process.[45] Additionally, there must be consistent follow up from leadership to enforce accountability and to remedy identified barriers.[79] The use of whiteboards is most successful when they are used as part of a rounding routine and are referred to multiple times throughout the day.[80] A planned or pre-meditated approach to implementation and use of whiteboards is likely to increase their use and effectiveness.[80]

Section One Summary

Traditional and electronic whiteboards both show promise as tools for improving communication and collaboration in healthcare environments. Each type of whiteboard has advantages and disadvantages that were identified through the literature review. When considering the option of using whiteboards as a strategy to improve communication in the SNF environment, it is important to consider both functionality and feasibility. Traditional whiteboards have the advantage of being user friendly with virtually no training required to utilize the communication tool. Additionally, implementation does not require consultation of IT or other departments and can

generally be carried through by the clinical team. Another important consideration is the affordability of a traditional whiteboard versus e-whiteboard; the traditional whiteboard is low-cost and likely more attainable for healthcare organizations from a financial perspective. Traditional whiteboards also have the benefit of being a patient-centered communication tool that increases collaboration between the patient and the healthcare team, leading to better care outcomes. Currently, the literature does not contain research regarding the use of whiteboards in SNF environments. However, based on the information gathered, the implementation of white-boards in the skilled nursing environment seems feasible and has the potential for increasing effective communication in an attempt to reduce adverse events.

Section Two: Whiteboard Use in Skilled Nursing

Despite the broad variety of research articles reviewed, information about the use of whiteboards in skilled nursing environments is lacking. Thus far, research related to whiteboards has been almost exclusively in hospital environments. Short-term rehabilitation wings in skilled nursing environments usually contain patients who have discharged from the hospital after an unexpected medical event or surgery. These patients likely become accustomed to the widespread use of whiteboards in the hospital environment and would easily adjust to a SNF room with an in-room whiteboard of similar purpose.

Based on the literature review, whiteboards have had positive impacts on communication and patient satisfaction. Whiteboards have also been utilized as an aid in improvement studies to improve safety and reduce adverse events across a variety of populations. Research is needed to determine if the same intervention can be applied in SNF settings and have similar results. Although a previous study conducted in a SNF did not reveal significant differences in safety

measures pre- and post-whiteboard implementation, that facility had a low number of adverse events to begin with, which may have led to a ceiling effect (Lubbers & Shuster, in preparation).[81] The study did reveal that nursing staff found the whiteboards to be an effective way to manage resident needs at shift changes. Communication barriers are a large contributor to decreased safety in SNF environments and whiteboards are a simple, low-cost intervention that have proven useful in improving communication. More research is needed to determine if it is a viable and effective option in more geriatric-focused settings. Additionally, research of in-room whiteboards continues to develop and it is important to begin to add quantitative research to the wide array of qualitative research that currently exists.

Section Three: Implementation Science

In order to produce high quality care, control costs, and improve patient outcomes, healthcare organizations must learn to effectively implement evidence-based practice (EBP). EBP is becoming continually more important for organizational success as today's healthcare reform ties strong outcome measures to reimbursement rates.[2] Efforts to implement EBP can have highly variable effects which are often underpinned by a failure to use proven theories to support the efforts.[1] To improve the likelihood of success in implementation of EBP, it is recommended that the intervention be assimilated into routine care practices.[6]

A variety of frameworks have been established to assist with the translation of research to practice. One particular approach emerged early: Promoting Action on Research Implementation in Health Services (PARIHS), which is designed to facilitate the transfer of EBP to practice.[82] One way the PARIHS framework guides investigators is by assessing an organization to determine the likelihood of success in implementing EBP based on a number of factors that are important to

implementation. The PARIHS framework originated as a technique utilized in acute care nursing practice, but has been shown to be a good fit for application of EBP in skilled nursing environments.[5,6] The PARIHS framework is an easy and clear guide for implementation of EBP that can be especially helpful to those with limited experience in implementation science.[4] However, some researchers feel that the framework lacks specificity which gives way to a variety of interpretations of the core concepts.[4]

The original PARIHS framework has been adapted over time by a variety of research teams in order to better operationalize the framework in practice.[83] The adaptation of the PARIHS framework that was applied in this study is a product of research conducted by Stetler et al. The adaptations of the PARIHS framework were intended to overcome identified limitations, including lack of clarity and specificity of concepts, lack of detail about critical components to the framework, and lack of satisfactory evaluation measures.[83] Stetler et al.'s adaptation of the PARIHS framework aims at improving the functionality of the PARIHS framework as a prospective tool for planning implementation projects rather than a retrospective analysis tool.[83]

To apply the adapted version of the PARIHS framework, researchers and stakeholders work together to evaluate three components vital to any implementation project: the supporting evidence, the context of the implementation, and the methods by which the change is facilitated.[6] The main elements of the PARIHS framework include the evidence, context, and facilitation.[6] In addition, each main element is further described by sub-elements. Appendix A provides an overview of the sub-elements of each element along with descriptors for rating the quality of each sub-element (high, mixed, and low) and the criterion used to assign a descriptor.

Stetler and colleagues'[83] adaptions to the PARIHS framework were further simplified by Hill et al.,[5] which acted as the model and guide for the present study and is described in further

detail here. The first PARIHS element of ‘evidence’ consists of three sub-elements: research evidence, clinical experience, and patient experience. Users consider what evidence there is to support the use of the proposed intervention for the study including quantitative, qualitative, and mixed methods studies.[5] If there are any guidelines published about the intervention, those should also be examined.[5] In order to achieve a ‘high’ rating, the intervention must be well-researched and supported by the literature through randomized controlled trials or through documented guidelines for application.[5] In the sub-element of clinical experience, a ‘high’ rating indicates that the participants or stakeholders are mainly supportive of the intervention based on their personal knowledge or interaction with the intervention.[5]

The second element in the PARIHS framework is ‘context,’ which incorporates leadership, culture, and measurement, and gives us a closer look at an organization’s characteristics and internal workings. The leadership sub-element requires rating of the organization, resource distribution, and clarity of roles for the leaders of the organization.[5] Culture is rated based on strength of morale, supportiveness of the team, and opportunities for innovation.[5] The sub-element of measurement involves analysis of current organizational systems for accountability and performance.[5]

The final element of the PARIHS framework is facilitation and is made up of characteristics, role, and style. These sub-elements are rated in regard to the individual who is chosen as the principal facilitator of the intervention project. The sub-element characteristic is rated high when the facilitator is known to exhibit respect, credibility, and empathy from their team.[5] The role of the facilitator is considered the second sub-element of facilitation and involves determination of the facilitator’s ability to be a strong supporter of the intervention with well-defined

responsibilities.[5] And the final sub-element, style, examines the facilitator's tendency toward consistency, flexibility, and adaptability, which are characteristics that support implementation.[5]

Each sub-element is discussed and rated as low, mixed, or high by the involved stakeholders. Consensus is reached through discussion and collaboration to determine if the evidence, context, or facilitation sub-elements will support (high rating) or hinder (low rating) successful implementation. The likelihood of successful implementation increases as the number of highly rated sub-elements increases.[3]

The PARIHS framework was selected for the present project because of its appropriateness for research in SNFs and for its ease of use regardless of researcher experience level. The literature review indicated that evaluating the context of environments prior to whiteboard implementation is an important measure; the PARIHS framework includes context evaluation as one of the three main factors for successful implementation. Use of the framework will add structure and guidance for the implementation of whiteboards in the SNF environment in order to enhance the likelihood of successful acceptance of the intervention.

Study Aim and Hypothesis

This study aimed to investigate the feasibility and benefits of whiteboards in the skilled nursing environment as a communication tool. The study utilized the PARIHS framework as a guide to implementation. It can be difficult to measure the impacts of in-room whiteboards objectively, as evidenced by most of the current research examining perceived impact of whiteboards by clinical staff or patients. For this study, two mandatorily recorded safety measures (falls and rehospitalizations) have been measured. The advantage of these outcome measures is that they are already collected by skilled nursing facilities as part of regulatory requirements. In

this manner, the study did not require the facility to collect additional data points. It also made it possible to examine what impact whiteboards may have on common safety and quality measures. Lastly, the study aimed to further support the use of the PARIHS framework in skilled nursing and long-term care environments.

Because whiteboards have been a successful tool in acute care settings, it was assumed that they would also be a useful communication tool in skilled nursing. At this time, there remains a large gap in the literature related to whiteboard use in SNFs. This project aimed to explore whiteboard use in long-term care. It was hypothesized that the in-room whiteboards would be strategically implemented with guidance from the PARIHS framework and that a significant positive change would be shown in the safety outcome measures.

CHAPTER III

METHOD

Setting and Sample

Approval for the study was obtained from Western Michigan University's Human Subjects Institutional Review Board (HSIRB) prior to study initiation via exempt review (see Appendix B). The study was conducted at a skilled nursing facility (SNF) in Kalamazoo, Michigan. The facility has both short-term and long-term units with a total of 118 beds. The study was conducted on the short-term rehabilitation wing of the facility where individuals are admitted following a hospital stay for rehabilitation and nursing care with the plan to return to their home environment once recuperated. The study participants were employees of the facility who held administrative level positions. This included any individual whose role involved leadership and supervision of other employees in the study facility. The selected departments were nursing, life enrichment, and case management. Other care staff members and residents of the SNF were not directly included in the study and were not considered participants.

The SNF previously utilized whiteboards to facilitate communication but removed the whiteboards more than a year prior to the current study due to inconsistent upkeep and frustration from residents and families regarding inaccurate information on the whiteboards. The SNF leadership team expressed interest in reinstalling in-room whiteboards within their short-term rehabilitation unit. They desired a method by which to implement the whiteboards with more structure and accountability for upkeep. The organization's Vice President of Operations issued

permission for the study to take place at the selected facility and authorized contact with the leadership team through their organizational emails.

The participants were recruited via email with a brief overview of the study, the anticipated timelines and directions to complete the informed consent document. The informed consent document was attached to the email for review and signature. All participants gave their consent for participation prior to inclusion in the study. A total of 8 individuals were invited to participate, all of whom obliged.

Procedures

This study was carried out in three phases. The first phase of the study involved using the PARIHS framework as an aid to understanding what barriers to the implementation of whiteboards existed in the SNF and how whiteboard use could be optimized by analyzing key elements known to impact successful implementation. The second phase of the study involved placement of the whiteboards and collection of safety outcome measures. This phase of the study aimed to examine what objective safety outcome measures may be influenced by the use of in-room whiteboards in skilled nursing environments. The final phase of the study involved a focus group debriefing session with the leadership team in regard to the PARIHS framework and the in-room whiteboards.

Phase One

One initial step of employing the PARIHS framework is to review the available evidence related to the intervention to be implemented. The original intention was for the participants and student investigator to have a round table discussion face-to-face in a conference space at the study facility. However, due to the COVID-19 Pandemic, it was necessary to conduct all meetings

virtually as visitor access to the facility was prohibited. Study procedures allowed for four, one-hour sessions for the participants and student investigator to move through the PARIHS framework prior to whiteboard implementation.

The team meetings involved moving through the framework by examining the evidence, context, and facilitation factors that impact successful implementation. These virtual meetings allowed for screen sharing of PARIHS sub-element definitions as outlined by Hill et al.[5] The initial meeting began with introduction and explanation of the PARIHS elements and sub-elements with respective descriptions. At the onset of the meetings and during the rating of sub-elements, the leadership team was encouraged to view descriptions of each sub-element from the 2017 study by Hill et al., specifically, Table 1 from the study.[5]

The student investigator presented the current evidence related to the use of in-room whiteboards in medical settings to fulfill the PARIHS requirement for review of applicable evidence relative to the intervention. The other sub-elements were presented, and group discussion revolved around each. As the conversation subsided, the student investigator asked for the group's rating of each sub-element using the low, mixed, or high descriptor as presented in Appendix A; the leaders would discuss the sub-element briefly, and then come to a consensus on their rating as a group (individual ratings were not collected).

Information related to hanging location, design, and recommendations for facilitation were shared with the leadership team, as well. Only two of the one-hour sessions were required for the leadership team to successfully analyze and rate each sub-element of the PARIHS frame-work. The table in Appendix C was adapted from Balbale et al.[84] to fit the purposes of this study and was utilized as a format for field notes taken by the student investigator.

Phase Two

The facility director of nursing and assistant director of nursing designed the whiteboard layout and devised a plan for staff education. The selected whiteboard size was 24-inches by 36-inches, which was consistent with a number of studies utilizing in-room whiteboards in acute care. The cost per room was less than $25, which included the whiteboard, a marker, an eraser, and Velcro adhesive to adhere the marker and eraser to the whiteboard.

After all necessary materials were assembled, the whiteboards were placed in the rooms on the rehabilitation unit. A total of 32 boards were placed in the facility with attempts to standardize the hanging location from room to room. The selected location was on the wall opposite the bed at eye-level for ease of viewing upon entering the room and limited ability to view information from the hallway. See Appendix D for the facility-designed whiteboard layout.

Phase two also involved the collection of patient safety-related data as an outcome measure to examine impacts of the in-room whiteboards. These data were obtained for a total of eight months: the four-month period prior to whiteboard implementation and the first four-month period during which the whiteboards were being used. The data consisted of de-identified information regarding numbers of falls and rehospitalizations. These measures were selected due to their replicability and the high likelihood of most SNFs tracking these data points. The Agency for Healthcare Research and Quality encourages the selection of outcome measures that do not create a burden on staff members.[85] Data collection intentionally did not interrupt day-to-day workflow or add additional burden to staff members. Further justification for the selected outcome measures is based on information from the literature review that indicates that whiteboards can be helpful in efforts to reduce adverse events, including falls.[39] All falls within the facility

were tracked via staff member incident report as part of their normal protocol. Rehospitalizations are monitored by the facility for 90-days after discharge.

Phase Three

The final phase of the study involved reconvening the leadership team in a focus group interview hosted via teleconferencing, which was to be held at four months post-implementation. The student investigator initiated the focus group by displaying the PARIHS framework sub-elements with descriptions from Hill et al.[5] Questions were posed to the group and presented in order, as outlined in Appendix E. The student investigator moved to the next question once each team member had the opportunity to share their thoughts or when conversation regarding the question subsided, whichever came first. The discussion was audio recorded and field notes were taken by the student investigator. A full transcription of the discussion was recorded following completion of the focus group for theme analysis.

Data Analysis

Phase one of the study involved working through the PARIHS framework to determine facilitators and barriers to implementation of the whiteboards. This process, analysis of the transcripts, and excerpts from leadership team's discussions will be shared in the results section of this paper. Safety outcome measure data were analyzed with descriptive statistics and the Wilcoxon Signed-Rank Test. These data were readily available within the SNF's electronic data system and were retrieved by the director of nursing. No specific controls were utilized in this study as the overarching goal was to gain insight into the feasibility of whiteboard use within the

SNF environment guided by the PARIHS framework. Statistical significance was set at the customary level ($p \leq 0.05$).

The focus group interview was the final phase of the study and offered the opportunity for the leadership team to share their perceptions of the intervention and use of the PARIHS framework as a guide to implementation. The meeting transcripts for the initial meetings were analyzed using thematic content analysis with a deductive approach to identify themes in the leadership team's communication surrounding the PARIHS framework. With a strong body of literature supporting in-room whiteboards and detailing common barriers to success, a deductive approach aided in identifying themes that support evidence from the literature. Essentially, the deductive approach involves generating themes based on what has been discovered in the research.[86]

CHAPTER IV

RESULTS

PARIHS Framework Meetings

Leadership Meeting: Session One

Seven of eight facility leaders participated in the initial meeting and five leaders participated in the second meeting involving application of the PARIHS framework as a guide to plan the implementation of in-room whiteboards. The team worked through each sub-element in order, with the guidance of the student investigator. In the initial meeting, of the nine sub-elements, no items were rated as low, six items were rated as mixed, and three items were rated as high.

When discussing the sub-elements encompassed in *Evidence*, the team reached a number of significant conclusions. The team understood and acknowledged the strength of the current body of *Research* relative to in-room whiteboard use. The sub-element of *Clinical Experience* spurred the most conversation, bringing up negative experiences that team members had previously with in-room whiteboards. The team noted that the previous experience in the same facility included problems with accountability for whiteboard maintenance and consistency of the information shared on the boards. In particular, expectations for upkeep were not clear nor regularly enforced. This led to frustration from staff, residents, and family and eventual termination of use. The leadership team anticipated that these problems would continue to be barriers to success, despite the systematic approach to planning provided by the PARIHS framework. Multiple team members shared how they had experienced in-room whiteboards having positive impacts on patient experience when used appropriately.

A primary component of in-room whiteboard use that was identified during the discussion surrounding the sub-element *Clinical Experience* was the variety of whiteboard layouts that had been experienced by the group. In the study facility, there was no layout or set requirement for information to be shared on the whiteboards they had previously utilized. The team reported that the therapy team would often write the residents' schedule for the day, but there was no other consistent information shared from room to room. Individuals who had experienced whiteboards at other organizations reported more structure with clear layouts and expectations, which was reported to enhance compliance.

The critical element in the PARIHS framework of *Context*, which considers the leadership, culture, and existing measurement strategies of the implementation site, was discussed next. The team recognized that strong leadership, good morale, and an engaged team are important to the implementation process as these directly impact staff buy-in and accountability for task completion.[45,79] They also recognized the current obstacles in their facility including new leaders with less familiarity with the staff and history of whiteboard use, some challenges with staff acceptance of change, and the team's challenge in holding staff members accountable for whiteboard upkeep in the past. The element of *Context* was identified as the greatest area of challenge for the leadership team and required the most planning and evaluation.

The element of *Facilitation* was rated as high overall by the leadership team, which indicated their confidence in the selected facilitator of the implementation project. The team felt the facilitator possessed the necessary qualities that aid in successful implementation. The leadership team again recognized the importance of staff buy-in and they felt this facilitator was equipped as the direct supervisor of the team members who would be interacting with the whiteboards.

Sub-elements rated as mixed included *clinical experience, patient experience, leadership, culture, measurement,* and *characteristics,* with noted areas for improvement detailed in Table 2 below. The student investigator reiterated these sub-elements to the team at the end of session one. They made plans to meet separately and create strategies and processes to remedy the areas that needed to be strengthened before implementation. Of the three main elements of the PARIHS framework—*Evidence, Context,* and *Facilitation*—the leadership team displayed the most confidence in *Facilitation*, which speaks to their confidence in their team's ability to implement change and have clearly defined roles through the process.

Table 2

PARIHS Sub-Elements Rated as Mixed with Relevant Comments from the Leadership Team in Regard to Potential Barriers

PARIHS element	**PARIHS Sub-element**	**Improvement area / area of challenge**
Evidence	*Clinical experience*	• History of boards not being utilized with consistency at this facility • History of challenge in consistent updates of boards • Team rounding and hand-offs between shifts is helpful in increasing timely updates of information • Buy-in from staff is important
	Patient experience	• Can relieve frustration for residents • Offers consistency from acute care to long-term care • Families and residents appreciate the boards if updated
Context	*Leadership*	• New leadership team, excited to make changes
	Culture	• Some team members are habitual 'resistors' • Recent staffing changes • Explaining the 'why' helps with buy-in for staff
	Measurement	• The leaders stated they were currently in the process of rolling out new systems for tracking team compliance with task completion and overall accountability
Facilitation	*Characteristics*	• Leaders need to discuss who will be the main facilitator

Leadership Meeting: Session Two

The second meeting served as a checkpoint to review what plans and procedures had been established to counteract or remedy those sub-elements that had been rated as ‘mixed’ and could potentially impact the success of the project. The team shared the implementation plan, whiteboard layout (Appendix D), and upkeep processes at the second session. The nursing team created a layout that offered a strong format for exchange of specific information with little training required. Their layout met many of the criteria suggested by the relevant research including a structured template, orientation information, anticipated discharge date, and provider names.[11,48] The layout was also guided by previous research[81] and knowledge of whiteboard layouts from area hospitals.

The team detailed their procedure for whiteboard upkeep, including the schedule for updates and which team members were dedicated to updating each section of the whiteboard. See Appendix F for the color-coded assignments for whiteboard updates assigned to the different departments. The team planned for dissemination of the whiteboard procedures at daily huddles with their staff and created a tiered plan for auditing. The assistant director of nursing planned for the unit manager, the elected implementation facilitator, to audit the boards daily for one week, weekly for four weeks, and then move to a once monthly audit schedule. The team also ensured that each room was equipped with a marker and eraser attached to the board to eliminate lack of necessary resources as a reason for limited board use. These methods were meant to ease board use in terms of consistent content for users and provision of readily available tools to update the information.

Transcript Analysis Results for Sessions One and Two

Using thematic content analysis, significant themes were identified in the initial meeting, including the need for board maintenance to be incorporated into daily workflow, clearly defined roles, and staff buy-in. The leaders felt strongly that the level of the team's engagement in the process would be strongly linked to the success of the project. There was also consensus that being clear as to who was responsible for updating each section of the board would be instrumental in consistent upkeep and accuracy of the information. These deductive themes of clear expectations and team buy-in were identified during the first session and corroborated evidence from the research.

Another theme centered around removing obstacles and creating a system that facilitated consistent and accurate updates of information on the whiteboards. The leadership team discussed how their previous experiences had suggested that completing rounds was helpful for accountability and verification of accurate information. This involved team members going room to room to examine the boards and record updates at shift change to act as a hand-off of the patient's care to the next shift. The nurse manager would then round on the rooms spontaneously to correct errors and connect with team members who were not updating the information in a timely manner. Multiple team members indicated that consistency of updates was very important so that the information is accurate for staff and residents. Research supports this type of shift-to-shift hand-off as a facilitator to success when using in-room whiteboards.

Leadership Meeting: Session Three

Following study conclusion, three of the seven leaders who participated in the initial sessions participated in a debriefing session. This included the facility administrator, director of

nursing, and assistant director of nursing. Two of the recruited eight leaders were no longer employed at the organization and the other three leaders were not available to participate, including the unit manager who had acted as the study facilitator. Due to complications from the COVID-19 Pandemic, the session was held approximately three months later than originally planned, i.e., seven and a half months post-implementation of the whiteboards. The session began with a brief review of the PARIHS framework. Table 1 from Hill et al.[5] was again displayed for the leadership team members. Interview questions were presented to the group both verbally and through visual display by the student investigator, progressing from question one through question seven, as displayed in Appendix E.

The leadership team reported mixed feelings relative to the PARIHS framework as a guide to the implementation project. One leader felt the framework offered a nice outline and was helpful in analyzing the process, while another leader felt the framework was cumbersome to work through. A main theme that emerged from the discussion was that consistency with board upkeep was challenging due to the unique consequences of the pandemic. The team had initially discussed requiring team rounding from room-to-room at shift change but was unable to effectively carry out this process due to isolation restrictions enacted due to COVID-19 cases within the facility.

In regard to whiteboard upkeep, the leaders reported that the therapy department was most consistent in keeping information updated; specifically, transfer status and diet. Less consistency was observed in the areas managed by nursing staff, including names of the certified nursing assistant (CNA) and nurse and the date. The case manager was responsible for completing the ‘Tentative Discharge Date’ section, but this was erratically completed as a result of limited entry to isolation rooms in order to reduce unnecessary exposure to COVID-19. The medical

records department was responsible for updating the section relative to upcoming appointments, but they too faced barriers relative to the pandemic. The sections of ‘Unit Manager,’ ‘Case Manager,’ ‘My Room #,’ and ‘My Phone #’ stayed constant throughout the intervention period and did not require updates. The team noted that some departments demonstrated more consistency and buy-in than others, which directly impacted upkeep. The leadership team expressed that their intentions for auditing whiteboard accuracy and team accountability for accurate maintenance were significantly impacted by the regulations and precautions imposed by COVID-19.

Some positive findings reported by the team included the ease and speed of information exchange for team members when the boards were used effectively. The assistant director of nursing reported that information may typically take a day or longer to be communicated to all team members, but when the whiteboards were updated at the point of service (i.e., therapy), the team members were aware of the change in status or diet much more quickly. She also reported that she personally noticed a reduction in inquiries about resident transfer statuses from CNAs. With the in-room whiteboards, team members were able to view the information instantaneously as therapy generally updated the whiteboard immediately with their recommendations.

Two team members expressed contradictory views regarding whiteboard maintenance that should be examined. One of the leaders reported that the whiteboards were not updated consistently by the floor staff because it was too time consuming, but another leader later stated that it did not seem to take much additional time to perform updates. It is unclear why the first team leader thought it was too time consuming, because there were multiple departments involved in updating the information leaving each profession only one or two sections to modify on each whiteboard on a daily basis. The team stated in the initial meeting that they saw time required for

updating as a potential barrier. Unfortunately, the final meeting discussion did not help to determine if the additional time was or was not significantly burdensome.

When asked about staff perceptions, the team did not have any information to share other than feelings that the care team would express similar opinions to what the leadership team had expressed thus far. They were also unable to report on family perceptions and experiences with the whiteboards due to visiting constraints resulting from the pandemic at the time of the study. The team did note occasional resident frustration with accuracy of information, specifically in the 'Upcoming Appointments' section. Whiteboard layout and durability were reported to be satisfactory with no recommended changes for future studies.

Safety Outcome Measures

Fall and re-hospitalization data for the four months prior to whiteboard implementation and the four months after implementation were obtained from the facility at the end of the 4-month post-implementation period. Wilcoxon Signed Rank tests did not yield statistically significant differences when comparing numbers of falls and rehospitalizations before and after whiteboard implementation. Comparison of fall rates yielded $p = 1.00$ and a corresponding z-score of .00. Analysis of rehospitalizations resulted in $p = .26$ and $z = 1.13$. Descriptive statistics for the safety outcome measures are displayed in Table 3.

Table 3

Falls and Rehospitalizations Pre and Post Intervention

Variable	Total reported	Mean per month	Range
Pre-intervention falls	49	12.25	9 -15
Post-intervention falls	49	12.25	7 - 15
Pre-intervention rehospitalizations	17	4.25	4 - 5
Post-intervention rehospitalizations	24	6	2 - 9

This study showed that implementation of in-room whiteboards in a skilled nursing environment is feasible and the process can be guided by the PARIHS framework. The study also showed that over a four-month intervention period, the in-room whiteboards may not impact safety outcome measures, such as falls and rehospitalizations. Although questions remained, the investigator gained some understanding of successes and barriers that exist to successful use of in-room whiteboards in the SNF environment.

CHAPTER V

CONCLUSION

This study yielded mixed results with regard to the use of the PARIHS framework for planning the implementation of an evidence-based clinical intervention in a SNF. As noted in the Results, the post-implementation focus group interview with the leadership team revealed differing attitudes toward the use of the PARIHS framework, with some feeling that it was useful and others feeling that it was cumbersome to use. There was also mixed success with regard to the actual implementation of the whiteboards. Although there were no changes in the quantitative outcome measures, when implemented as planned, the whiteboards were successful in providing current information regarding the SNF residents and were viewed positively by staff, replicating findings from previous studies conducted in acute care. In addition to the occurrence of the COVID-19 pandemic, which clearly affected the conduct of the study, another factor that may have influenced team leaders' perception of both the PARIHS framework and the implementation of the whiteboards is the facility's previous negative experience with in-room whiteboards. Cook and Sheets (2011) note that personal "equipoise" is when a clinician has no pre-conceived notion regarding the ability of one or more interventions to have a better outcome over another, and this equipoise is critically important when conducting research into clinical interventions.[87] The lack of equipoise results in bias (although the choice in this study was not between two treatments, but rather between the implementation of whiteboards or not i.e., treatment or no treatment).

Despite the fact that the team acknowledged the research support for the use of white-boards and their need to be unbiased, the facility's previous negative experience with in-room

whiteboards may have influenced some team members' attitudes regarding whether it was worth investing time into using the PARIHS to plan an implementation they did not believe would work at their facility. Two of the leaders who had previous positive experiences with in-room whiteboards at other facilities acted as advocates in the pre-planning sessions, but their actual involvement once the whiteboards were implemented was relatively limited due to their assigned roles at the facility. The leaders primarily overseeing the intervention were those who had previous negative experiences with in-room whiteboards in the same facility. As noted earlier, some of the team leaders felt that the barriers that were encountered with the previous installation of whiteboards would continue to be a problem for this study (e.g., consistent maintenance of information). Data from a study by Rycroft-Malone and colleagues[24] also supports the notion that a robust evidence base is insufficient to induce practice change in the face of individual attitudes and emotional responses to the change. Furthermore, despite the team's confidence in the facilitator, she failed to participate in the leadership team meetings. The team connected with the facilitator outside of the study meetings, but it is likely that her lack of participation in the structured meetings had a negative impact on the overall success of the intervention.

Despite potential bias toward the intervention, the study demonstrated that the PARIHS framework was effective in guiding the leadership team to identify strengths and weaknesses in the framework elements of evidence, context, and facilitation. This allowed the team to formulate a concise plan for the whiteboard layout, hanging location, access to necessary materials, roll-out procedures, and maintenance protocols. Overall, the conversations in the leadership discussion sessions corroborated findings from the literature review regarding barriers and facilitators to in-room whiteboard use, including the ability to keep information on the board updated.[18] The

PARIHS framework allowed for objective analysis of the culture, current procedure, and leadership characteristics with open discussion of strengths and weaknesses.

There were no differences in the numbers of falls and rehospitalizations from pre- to post-whiteboard implementation. This is contradictory to some of the research in the acute care setting,[27] but replicates the findings of the study conducted in a SNF by Lubbers and Shuster (in preparation).[81] However, the reason for the negative finding may be different for the two SNF studies. In the first study, it was hypothesized that there was a ceiling effect, because the facility had a low number of these adverse events at the onset of the study. Therefore, one of the reasons for selecting the SNF for the current study was that it did not have similarly low numbers of these adverse events. In the current study, the leadership team was not able to implement their audit plan for the whiteboards due to the pandemic, so they were used inconsistently. As a result, the ability of the whiteboards to reduce falls and rehospitalizations was not thoroughly tested. Moreover, the research in acute care demonstrating that in-room whiteboards can be helpful in reducing falls employed other interventions coupled with the whiteboards, such as team rounding between shifts and ensuring that there was a patient handoff between the team members with the whiteboard incorporated.[39] This study intended to employ these additional practices, but challenges arose when isolation precautions were enacted in the building due to COVID-19.

Limitations

As noted earlier, the current study was affected by the pandemic, with facility restrictions affecting the logistics of the investigation. Moreover, changes in care resulting from a pandemic can negatively affect the healthcare workers who are responsible for implementing a new

intervention. For example, contact precautions and the resulting patient isolation can induce delirium and depression in patients and amplify psychosocial needs in those caring for them .[88–90]

Healthcare workers who are providing care during the COVID-19 pandemic have been shown to demonstrate depression, anxiety, insomnia, and distress, with women being especially vulnerable to these symptoms.[91] Moreover, even prior to COVID-19, nurses working in the SNF environment were shown to have higher levels of burnout and job dissatisfaction than nurses in other healthcare settings.[92] Thus, SNF staff who are already burned out may find implementing a new intervention to be a burden, even an intervention that might help make the job easier. Asking them to do so during a pandemic may be perceived as especially burdensome. With regard to the PARIHS framework, the pandemic could certainly be viewed as a challenging implementation context.[24]

Future Research

It is recommended that future research into whiteboard use in the SNF setting consider employing the PARIHS framework as a guide for planning implementation due to its success in this study. It is also recommended that study facilitators consider a longer data collection period coupled with shift-to-shift rounding for consistent whiteboard updates, since this was proven to be beneficial in the research. It would also be very useful to include call-light presses and response times in future research as an additional quantitative outcome measure to determine if the in-room whiteboards can have any significant impact on decreasing the number of presses and/or the shortening the duration of time a resident awaits assistance. It would be helpful to conduct the research in SNFs with Medicare star ratings below five to avoid the ceiling effects observed in the Lubbers and Shuster (in preparation) investigation.

It is recommended that future research go beyond testing the feasibility of in-room whiteboards and more closely examine how the intervention can be used to improve communication in SNF environments. Measuring perceived impacts on communication from both the resident and employees' viewpoints would be beneficial. It would also be helpful to understand whether the in-room whiteboard adds or alleviates burden on care team members, particularly given the greater job dissatisfaction and burnout experienced by SNF nurses as compared to those in acute care.[92] The existing literature on e-whiteboards revealed that workflow was improved,[65–67] but it would be valuable to know if this positive outcome extends to SNF environments.

Another highly important area to explore is that of patient satisfaction. Previous studies in the acute care setting indicated that in-room whiteboards may be able to assist in improving patient satisfaction.[20,21] Significant other and family perceptions of the in-room whiteboard should also be explored. It is also recommended that future studies look at the perceived impacts the in-room whiteboards have on communication between providers and between residents and providers.

In summary, although there were major challenges to conducting this study, the data demonstrate that the PARIHS framework can be an effective and easy to use tool for planning the implementation of an evidence-based intervention in the SNF environment. Moreover, the strong evidence regarding the benefits of using whiteboards in acute care support the continued exploration of their use in the SNF setting. Whiteboards are a relatively simple to use and cost-effective means for improving patient safety, satisfaction, and communication.

Appendix A

Table 1. Criteria Used to Rate PARIHS Constructs for the PARIHS Assessment[5]

PARIHS constructs and subelements with conceptual definitions*	Low	Mixed	High
Evidence			
Research: Findings from quantitative, qualitative, or mixed method studies and/or published guidelines recommendations.	Perceived as weak.	Perceived as descriptive or anecdotal.	Perceived as strong, supported by randomized controlled trials or guidelines.
Clinical experience: Knowledge derived from personal or the clinical experiences of others that is embedded in practice and intuitive in nature.	Mainly unsupportive.	Divided or support is mixed.	Mainly supportive.
Patient preference: Patient information including previous experiences, preferences, and perceptions.	Not incorporated into any aspects.	Incorporated in some aspects.	Incorporated in most aspects.
Context			
Leadership: High level, mid-level, and front-line supervisors or team leaders with direct/indirect influence on implementation.	Poor organization, poor resource distribution, and undefined roles.	Mixed aspects of organization, resource distribution, and role definition.	Strong organization, appropriate resource distribution, and well-defined roles.
Culture: Local values and beliefs regarding local approaches to a particular behavior or clinical practice.	Morale is poor, local consensus is unsupportive, limited opportunity for innovation.	Morale is mixed, local support is mixed, some opportunity for innovation.	Morale is strong, local consensus is supportive, multiple opportunities for innovation.
Measurement: Existing systems or processes for monitoring group or individual-level performance related to a particular behavior or clinical practice.	No auditing of or feedback on group and/or individual performance.	Some auditing of and/or feedback on group and/or individual performance.	Ongoing auditing of and/or feedback on group and/or individual performance.
Facilitation			
Characteristics (of facilitator): Individual exhibits characteristics of a local expert or opinion leader essential for role as facilitator.	No exhibition of or commendation of respect, credibility, or empathy.	Some exhibition of or commendation of respect, credibility, or empathy.	Exhibition of or commendation of respect, credibility, and empathy.
Role (of facilitator): Behaviors and actions expected of the facilitator including ability to support implementation.	Undefined or unclear and ability to support implementation is weak.	Loosely defined or somewhat clear and limited ability to support implementation.	Well-defined and clear and ability to support implementation is strong.
Style (of facilitator): Possession of characteristics that facilitate or support implementation.	Strict, inflexible, inconsistent, and/or nonadaptive.	Some flexibility, consistency, and adaptability.	Mainly flexible, consistent, and adaptive.

Appendix B

WMU Human Subjects Institutional Review Board Approval Letters

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: April 13, 2020

To: Linda Shuster, Principal Investigator
Ashley Lubbers, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: IRB Project Number 20-04-14

This letter will serve as confirmation that your research project titled "Facilitating Implementation of In-room Whiteboards in the Skilled Nursing Environment Using the PARIHS Framework: A Mixed Methods Approach" has been **approved** under the **exempt** category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved.
You must seek specific board approval for any changes to this project (e.g., ***add an investigator, increase number of subjects beyond the number stated in your application, etc.***). Failure to obtain approval for changes will result in a protocol deviation.

In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

The Board wishes you success in the pursuit of your research goals.

A status report is required on or prior to (no more than 30 days) April 12, 2021 and each year thereafter until closing of the study. The IRB will send a request.

When this study closes, submit the required Final Report found at https://wmich.edu/research/forms.

Note: All research data must be kept in a secure location on the WMU campus for at least three (3) years after the study closes.

251 W. Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293, FAX: (269) 387-8276

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: November 5, 2020

To: Linda Shuster, Principal Investigator
Ashley Lubbers, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: WMU IRB Project Number 20-04-14

This letter will serve as confirmation that the changes to your research project titled "Facilitating Implementation of In-room Whiteboards in the Skilled Nursing Environment Using the PARIHS Framework: A Mixed Methods Approach" requested in your memo received November 4, 2020 (to add post-intervention focus group interview; revise data analysis plan to include only information regarding number of falls and rehospitalizations) have been approved by the Human Subjects Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: **April 12, 2021**

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Appendix C

Field Note Format With Respective PARIHS Elements and Sub-elements

PARIHS Element	PARIHS Sub-element	Rating (low, mixed or high)	Description / Discussion Notes
Evidence	Research		
	Clinical experience		
	Patient experience		
Context	Leadership		
	Culture		
	Measurement		
	Characteristics		
Facilitation	Role		
	Style		

Appendix D

Facility Designed Whiteboard Layout

<table>
<tr><td colspan="3">My preferred name

Today is</td></tr>
<tr><td>My Team</td><td>Transfer Status</td><td>Tentative Discharge Date</td></tr>
<tr><td rowspan="3">Nurse

CNA

Unit Manager

Case Manager/ Ext.</td><td>Diet</td><td rowspan="2">Other / Notes</td></tr>
<tr><td>Upcoming Appointments</td></tr>
<tr><td>My room #</td><td colspan="2">My phone #</td></tr>
</table>

Appendix E

Focus Group Questions

1. What was your impression of the PARIHS Framework as an aid to planning this project?

2. What was hard about using in-room whiteboards and keeping information consistently updated and accurate?

3. What seemed helpful in using in-room whiteboards and keeping information consistently updated and accurate?

4. Can you describe any processes in place for updating in-room whiteboards on a daily basis?
    a. Who is involved? Therapy, Charge Nurse, Case Manager, CNAs,
    b. How is updating handled when there are new physician orders?
    c. What would help this process go easier or smoother?
    d. Do you think that staff on the floor would agree with you?

5. Are there aspects of the in-room whiteboard that could be improved upon?
   e.g. Physical appearance, organization, included information

6. What feedback did you receive from nursing staff about whiteboard use?

7. Did you perceive or observe any improvement in communication, prevention of adverse events or improvement in resident satisfaction after the whiteboards were implemented?

Appendix F

Facility Designed Whiteboard Layout With Responsibility Designations

My preferred name Today is to be updated at the beginning of the shift

My Team	Transfer status	Tentative discharge date
Nurse to be updated at the beginning of the shift	to be updated upon admit by the nurse To be updated after eval and with any changes within 24 hours by therapy	to be updated ASAP
CNA to be updated at the beginning of the shift	Diet to be changed prior to next meal	Other/Notes
Unit Manager to be updated at the beginning of the shift		
Case Manager/Ext. To be updated within 24 hours of Admit or when a change occurs	Upcoming Appointments to be updated daily/PRN	Medical Records Case Manager Nursing Therapy

My Room # My phone #

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