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EFFECTS OF IMPLEMENTATION APPROACHES ON OUTCOMES OF QUALITY IMPROVEMENT INITIATIVES IN HEALTHCARE SETTINGS

BY

Tokunbo Olukoya

A doctoral project subject submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirements for the degree Doctor of Health Administration in the College of Health Professions

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EFFECTS OF IMPLEMENTATION APPROACHES ON OUTCOMES OF QUALITY IMPROVEMENT INITIATIVES IN HEALTHCARE SETTINGS

BY

Tokunbo Olukoya

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I dedicate this research to my wife Adekunbi, my sister Dayo Olutunde, my mom Winnifred, and my sons Michael, Daniel, and Emmanuel.

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By
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Abstract

There is staggering gap between the number of studies about evidence-based practices (EBP) and the application of such research in clinical settings. Even when research has been implemented, the routine rate of absorption into daily practice remains low once implementation funding and resources are depleted. The Institute of Medicine (IOM) published a report on the quality of healthcare in America and described closing this gap as one of the key fundamental changes necessary for America's healthcare system (IOM, 2001).

This research explores the obstacles that impede dissemination and implementation (D&I) by surveying healthcare organization leadership at various healthcare settings. This research explores approaches commonly used to implement evidence-based interventions (EBI) as well as the effect of training healthcare staff

implementation science. Lack of communication and leadership involvement emerge as the major barriers to successful D&I of EBI.

CHAPTER 1

INTRODUCTION

Background and Need

There is a significant gap between discovery of evidence based interventions (both clinical and technological) and the application of these discoveries in healthcare settings (Brownson, Colditz, & Proctor, 2012). In 2001, The Institute of Medicine (IOM) published a report on the quality of healthcare in America and described closing this gap as one of the key fundamental changes that need to be made to America's healthcare system (IOM, 2001). Bergman & Beck (2011) concluded that too often, clinical research has not appreciated the exigencies of practice and patient populations that facilitate or impede widespread adaptation of implementation.

The National Institutes of Health (NIH) have defined dissemination and implementation sciences separately: Dissemination Science is the purposive distribution of information and intervention materials to a specific public health or clinical practice audience. The intent is to spread information and the associated evidence-based interventions. Implementation Science is the study of methods to promote the integration of research findings and evidence into healthcare policy and practice (NIH, 2012). Multiple definitions and inconsistencies exist when researching dissemination and implementation as a testimony to the newness of this field of study (Meissner et al., 2013).

This research examines the clinical implementation and dissemination of research discovery and evidence based intervention into applicable practices. It also reviews implementation frameworks in literature and organizational factors that aid continued quality improvement. This research surveys doctoral students in Doctor of Health Administration (DHA) programs at the Medical University of South Carolina (MUSC) on experiences with clinical implementation process in their respective organizations and seeks to understand the effect of training on dissemination and implementation. Because of the diversity of MUSC's student body for the doctoral program at the College of Health Professionals, the survey questions aid in understanding how different types of health care facilities translate research into practice, and the outcome can further help determine how an educational institution can help reinforce D&I research, publication, and funding priorities.

Problem Statement

The major goal of dissemination and implementation science is to understand and address the obstacles that impede proper dissemination and implementation of evidence-based interventions. Evidence-based interventions encounter a series of problems at various stages of the implementation process, some of which are related to communication before, during, and after implementation, and lack of information about the healthcare structure.

Research Questions

1. What is the current level knowledge and utilization of dissemination and implementation theory across the survey population?

2. What are the current challenges and barriers to implementation and dissemination across these healthcare settings?
3. How important is dissemination and implementation knowledge and training within healthcare organizations?
4. How can executive and graduate healthcare administration programs integrate dissemination and implementation into the curriculum?
5. Is there a correlation between successful implementation and particular approaches used for the evidence-based intervention implementation?

Population

The MUSC College of Health Professions doctoral students in the executive, interpersonal, and information systems groups both current and past are the target population for the research survey. These groups represent administrative, clinical, and technical leaders with oversight of introduction and control of the policies and of evidence-based practices at difference levels of healthcare organizations. The target population is involved in healthcare settings that include community care settings, stand-alone healthcare practices, accountable-care practices, governmental organizations, and small and large private healthcare organizations.

The diverse mix of the intended survey group have leadership roles in healthcare facilities. The survey includes open-ended questions that allow survey respondents to identify and introduce information that can be generalized or support further review.

Assumptions

The researchers have selected current and past DHA students, as they represent administrative, clinical, and technology roles at various healthcare settings. We assume this survey respondent mix sets up a correspondingly diverse mix of organizational, cultural, and leadership style variations that reveal application of different dissemination and implementation frameworks.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The Ovid search engine was used for the literature search for this research. Ovid provides access to hundreds of professional journals, articles, books, and multimedia platforms. Several search criteria were used to identify research works completed on dissemination and implementation (D&I), organization setting, evidence-based medicine (EBM), and education curriculum in implementation science. Over 65 articles were reviewed for this research, and several books were studied with special reference to D&I research in healthcare by Brownson, Colditz, & Proctor (2010).

Due to the diversity of views on this topic, organizing a literature review based on past and current articles is essential in order to highlight healthcare organizational efforts to disseminate research knowledge in clinical settings., as broad differences in implementation processes characterize the healthcare delivery community; accordingly, our literature searches were formatted to collect articles from a variety of areas of healthcare research. It was also important to understand the collegiate educational curriculum and healthcare provider continuing education process that is available to introduce EBM into daily practice.

The gap between EBM and clinical application of discoveries has been addressed in different research fields, with varying recommendations on how to close the gap.

Although different frameworks have been described for how to best disseminate and implement EBM, little evidence is available describing the success of each of the different frameworks. Analyzing why an implementation process succeeded in one clinical setting and failed in another is not a simple task; more research into D&I science is required to create a fundamental theory that can be applied based on the different healthcare settings and service mix that will be described and studied in this research.

The review of the historical background of diffusion, dissemination, and implementation provides insight into how discoveries have been moved from research to bedside over the decades. Several terms have been used over the decades to describe dissemination and implementation, some of which represent variations of organizational change, such as *knowledge translation, knowledge management*, *translational science*, and *comparative effectiveness research*.

The major purpose of this research is to evaluate the effects of common approaches to implementation on the spread and sustainability of evidence-based discoveries. We also want to know if training healthcare professionals, either in college or through professional courses, influences implementation success.

Historical Background of Diffusion, Dissemination, and Implementation

Diffusion. Implementation science found its beginnings in what is now known as diffusion, several accounts of which exist from as early as 1902, when the French judge cum sociologist Gabriel Tarde (1903) explained diffusion as a societal-level phenomenon in a book entitled *The Laws of Imitation*. The book identifies an S-shaped curve in cumulative adoptions over time, as well as the importance of opinion leadership in promulgating that distribution (Dearing, 2008). Several decades later, political

philosopher Georg Simmel addressed how a social network position affects what individuals do in reaction to innovations in his book *The Web of Group Affiliations* (1955).

In 1943, a report by Ryan and Gross on diffusion of hybrid seed corn in two Iowa communities set the paradigm for many hundreds of future diffusion studies by emphasizing individuals as the locus of decision, adoption as the key dependent variable, a centralized innovation change agency that employs change agents, and the importance of different communication channels for different purposes at different times in the individual innovation-decision process. The Ryan and Gross article propelled diffusion studies to center stage among rural sociologists, and it made application of diffusion a tool for agriculture (Dearing, 2008).

The concept of diffusion spread in the field of public health during the 1950s, 1960s, and 1970s through federal agencies as a way to centralize administrative control and substantive expertise. Knowledge flowed from the core to the periphery with the objective of lessening the burden on public health officials (Dearing, 2008). Diffusion process was used locally and internationally to facilitate treatment of communicable diseases and infections.

Evert Rogers' *Theory of Diffusion of Innovations* (1962) influenced the general understanding of diffusion in the early 1950s. Rogers proposed four main elements that influence the spread of new ideas: (1) the characteristics of the innovation, (2) communication channels, (3) the time it takes individuals to accept new ideas, and (4) characteristics of the social system itself (Kitson et al., 2001).

Some other areas of interest that have helped propel the implementation and transfer of knowledge are briefly described below as *Evidence Based Medicine (EBM), Knowledge Translation (KT),* and *Knowledge Management (KM)*..

Evidence Based Medicine (EBM). The first recorded Evidence Based Medicine (EBM) in the United States occurred in 1992 with a series of articles in the *Journal of the American Medical Association* (Jonas et al., 1999). Evidence-Based Healthcare (EBH) was developed by Pearson et al. in 2005 as a methodological framework of the Joanna Briggs Institute model through the group's involvement in dissemination, implementation, and evaluation of evidence-based guidelines in clinical settings, and an examination of scientific and professional literatures.

The concept and application of EBM was popularized by Dr. David Sackett (Luce et al., 2010), who defined the practice of evidence-based medicine as integrating individual clinical expertise with the best available external clinical evidence from systematic research and individual patients' predicaments, rights, and preferences in making clinical decisions about their care (Sackett et al., 1996). A broader definition of EBM by Eddy (Luce et al., 2010) was also adopted by the Institute of Medicine Roundtable on EBM, incorporating the development of evidence-based policies and guidelines, as well as cost effectiveness (Eddy, 1997, 2005; IOM, 2009).

In 1997, Porter & Warner concluded that various internal obstructions (institutional and/or individual) may preclude effective implementation of EBM. Skills required for EBM are not traditionally part of medical training. The economics of healthcare and time restraints may deter the application of real EBM into clinical practice although external review may be appropriate and helpful.

The Institute of Medicine (IOM) published a report in 2001 on the quality of healthcare in America, which described closing this gap between knowledge through research and application as one of the fundamental changes needed in America's healthcare system. Bergman & Beck (2011) conclude that too often, clinical research has not appreciated the exigencies of practice and patient populations that facilitate or impede widespread adaptation of implementation.

In the public health sector of the United States, dissemination and implementation of public health policies and standards remains a challenge (Ogbolu & Fitzpatrick, 2003). This challenge is particularly true for minorities, who have been noted to receive fewer services than the majority population, contributing to well-documented inequities in healthcare and health disparities (Smedley et al., 2003; McGlynn et al., 2003).

Knowledge Translation (KT). Knowledge Translation (KT) is a term that was commonly used to describe the process of putting knowledge into action (Kitson et al., 2001). KT has been defined by the Canadian Institute of Health Research as a dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically sound application of knowledge to improve the health of Canadians, provide more effective services and products, and strengthen the healthcare system. The process takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity, and level of engagement, depending on the nature of the research and the findings, as well as the needs of the particular knowledge user (CIHR, 2004).

Knowledge Management (KM). Knowledge Management is another theory for understanding how knowledge migrates across boundaries in professional, geographical,

and political circles (Carlile, 2004). The effective use of knowledge is to facilitate groups of volunteers and likeminded workers to share information informally as a community-of-practice team (Wenger, 1996). The conceptualization framework of Kolb (1984) highlighted the importance of individual and group learning.

Comparative Effectiveness Research (CER). CER generates evidence on the effectiveness, benefits, and harms of treatments, with the objective of improving healthcare (IOM, 2009). CER also seeks to answer questions about the impact of an intervention, treatment, or exposure on outcomes or effectiveness by conducting secondary analyses of data collected during the normal course of healthcare (Berger et al., 2009).

CER plays a unique role in the dissemination and implementation of research. It is a new way of conducting and synthesizing the benefits and harms of different interventions and strategies to prevent, diagnose, treat, and monitor health conditions in clinical settings to improve patient's health outcomes (Glasgow & Steiner, 2012). CER's main strengths are in the areas of research comparison, flexibility in research design, rich data sources, and relevant outcomes that can be disseminated and implemented in clinical practices.

Translation of CER evidence into clinical practice is determined by its full dissemination and implementation. Several funding efforts have sought to boost CER learning about barriers to D&I. These include the 2009 American Recovery and Reinvestment Act (Benner et al., 2010) and the Patient Protection and Affordable Care Act of 2010, which established the Patient-Centered Outcomes Research Institute (PCORI) (Garber, 2011).

Glasgow and Steiner shared some characteristic features that can help simplify decision making when determining research outcomes: (1) Is the research practical? (2) Is application of the research representative of participants, settings, staff, and subgroups? (3) Does the research compare conditions and real alternatives? (4) Were costs and economic data determined? (5) Is the outcome applicable to multiple audiences? (6) Were internal and external validity addressed? (7) Is the result and report transparent?

An NIH-funded Clinical and Translational Science Award rewards institutional study aimed at identifying ongoing practices and opportunities for improving national CER translation through D&I, finding five emerging themes after completing key informant interviews: (1) lack of institutional awareness, (2) insufficient capacity, (3) lack of established D&I methods, (4) confusion among stakeholders about what CER actually is, and (5) limited funding opportunities (Morrato et al., 2013).

The blue highway on the NIH roadmap for practice-based research is a clear indication of strategies that can improve transfer of healthcare research from basic science to clinical practice with a coordinated pathway for success. The blue highway starts at the basic science research of preclinical studies and animal research, which is translated to human study (T1) by Phase 1 and 2 clinical trials, human clinical research, controlled observational studies, and Phase 3 clinical trials. Guideline development, meta-analyses, and systematic review form the basis of translation to patients (T2) in practice-based research, through guided D&I research. The knowledge is translated to practice (T3) as clinical practice. Clinical practice addresses delivery of care to the right patient at the right time while identifying new clinical gaps and questions related to practice (Westfall et al., 2007).

Definition of Dissemination and Implementation

The National Institutes of Health (NIH) define dissemination and implementation sciences separately: Dissemination Science is the purposive distribution of information and intervention materials to a specific public health or clinical practice audience. The intent is to spread information and the associated evidence-based interventions. Implementation Science is the study of methods to promote the integration of research findings and evidence into healthcare policy and practice (NIH, 2012). Multiple definitions and inconsistencies exist when researching dissemination and implementation as a testimony to the newness of this field of study (Meissner et al., 2013).

A 2013 Titler et al. article on dissemination and implementation studies on the perspective of principal investigators (PIs) described implementation strategies, challenges, and lessons learned from conducting an interdisciplinary nursing quality research initiative (INQRI). The PIs interviewed for the research identified four ideas that can promote sustainability of dissemination and implementation: (1) integrating EBP into electronic health records, (2) embedding the practice as part of the system's policies and procedures, (3) presenting the study results to the practice sites so they can see their success, and (4) providing a training manual for use in educating other clinicians on their sites.

The major premise of dissemination and implementation science is to understand the obstacles that impede proper dissemination and implementation of evidence based intervention. Other contributors to this area of research such as Cochrane (1999) discussed effectiveness and efficiency. Rogers (2003) introduced the theory of diffusion of innovations. Lomas (1993) asked the question "Who should do what?" in his 1993

article “Diffusion, Dissemination, and Implementation.” Van de Ven et al. (1999) identified organizational level implementation as a process that moves innovation to successful routinization. The process is generally nonlinear, characterized by multiple shocks, setbacks, and unanticipated events.

Dissemination and Implementation Frameworks

Evidence-Based Medicine presents additional challenges, as decision making in healthcare is a complex process. Using systematically collated evidence to encourage patterns of care that do more good than harm is essential. It should be recognized that randomized, controlled trials have been regarded as the gold standard for evaluating the effectiveness of health interventions. Moreover, it is unrealistic for practitioners to keep abreast of the approximately four million articles which are added to the biomedical literature annually (Vines, 1995).

CER evidence is only useful to the degree to which it is fully disseminated and implemented—in other words, translated into clinical practice. Several funding initiatives have been undertaken over the past several years to jumpstart CER, research and address barriers to its D&I, including the 2009 American Recovery and Reinvestment Act (Benner et al., 2010); and the Patient Protection and Affordable Care Act of 2010, which established the Patient-Centered Outcomes Research Institute (PCORI) (Garber, 2011).

A dissemination and implementation framework is based on understanding the organizational setting and healthcare setting culture study before identifying how to introduce the evidence-based practices. An organizational framework can dictate full implementation or partial implementation while studying the effect of customizing implementation to the organizational setting and culture. Implementation of a “full

package" (Simons, Rozek, & Serrano, 2013, p. 182) was applied in the VA setting for Prolonged Exposure (PE) with optimal outcomes (Karlin et al., 2010).

Implementation Frameworks

There are different frameworks popularly used for dissemination and implementation, although some of the frameworks share model design elements. We explore some of the models, as well as describe some of the implementation approaches, below.

Multidimensional framework model. Karlin & Cross (2013) examine The Veterans Health Administration's (VHA's) multidimensional model and specific strategies involving policy, provider, local systems, patient, and accountability levels for promoting the national dissemination and implementation of evidence-based psychotherapies (EBPs) in VHA. The article also identified lessons learned and next steps for further promoting EBP delivery and sustainability in the VA healthcare system.

PARiHS framework. Promoting Action on Research Implementation in Health Sciences (PARiHS) is a theoretical development that uses the elements of evidence, context, and facilitation to propose implementation of evidence-based interventions (Kitson et al., 2008).

Educational framework. Sherman et al (2007), recognizing the lack of education procedure for education in change management for staff and providers during evidence-based practice implementation, developed a five-step, systems-based practice for teaching by (1) determining providers' educational needs, (2) developing educational materials, (3) developing educational intervention, (4) implementing the intervention, and (5) monitoring intervention effectiveness. Overall, the project was determined to be

partly successful at changing providers' behavior, but with little success at implementing an educational plan.

Microsystem framework model. The microsystems conceptual framework is another style of implementation strategy that can be used to implement evidence-based practice if it is a small, organized, patient care unit with specific clinical purpose, set of patients, technologies, and practitioners who work directly with these patients (Nelson et al., 2002).

PCORI dissemination and implementation framework. A D&I framework draft completed by multidisciplinary team for PCORI identified stakeholders' engagement at the beginning of PCORI and CER research as one of the factors that can help improve implementation speed of PCORI and CER evidence. The PCORI framework includes (1) evidence assessment, (2) audience identification and partner engagement, (3) dissemination, (4) implementation, and (5) evaluation. The framework further identified the need for a D&I repository for successful and unsuccessful implementation processes that should be respectively replicated or avoided. One limitation to successful implementation suggested in the framework draft is the lack of a "one size fits all," approach, particularly when underserved populations are the subjects of research (Esposito et al., 2015, p. 4).

Veterans Health Administration (VHA). VHA implementation science application has proceeded over decades, and several of the tools and frameworks that have been applied to move research to the clinical setting are addressed below. The VHA organizational structure and setting plays a unique role in the spread of EBM, with 158

hospitals aligned in 23 Veterans Integrated Service Networks (VISNs) for regionalized control.

Provider-level barriers to EBM in the VA healthcare system include limited provider knowledge of skills in the intervention, providers having only limited exposure to intensive, competency-based training in EBPs beyond education available at the graduate and postgraduate levels (Karlin & Cross, 2013). Therapists too often overestimate their ability to deliver EBPs, and clinician self-reports of their implementation of the therapy are poorly correlated with behavioral observations of the therapy sessions (Brosan, Reynolds, & Moore, 2008).

The VHA multidimensional model focuses on (1) national policy requirements, (2) provider training and support, (3) organization clinical infrastructure and buy-in, (4) patient-level clinical implementation, (5) system-wide promotion of "pull' and "push" strategies, (6) accountability through monitoring, and (7) evaluation of implementation impact analysis (Karlin & Cross, 2013).

Previous research results on the effect of monitoring and training has provided significant improvement in patient outcomes resulting from treatment by Cognitive Behavioral Therapy for Depression (CBT-D) in the Department of Veterans Affairs. The implementation of the protocol by newly trained CBT-D therapists is associated with significantly improved patient outcomes as evidenced by large decrease in depression and improvements in quality of life (Karlin et al., 2012).

Consolidated Framework for Implementation Research (CFIR). The CFIR Construct follows a strategically planned flow (cfirguide, 2015) that addresses (1) intervention characteristics, (2) outer setting, (3) inner setting, (4) characteristics of

individuals, and (5) process of planning, engagement, execution, and evaluation as elaborated in Appendix A.

The Colorado Research on Implementation Science Program (CRISP). This University of Colorado eBook gives researchers and practitioners a user's guide to D&I. The manual explains why D&I is important, provides definitions, theories, and concepts. One section addresses strategies and tools for designing successful D&I interventions, offering recommendations for evaluation design. The book concludes with tips for successful D&I for researchers and practitioners (Crispebook, 2015).

Synthesis of Conceptual Models

Many of the conceptual framework models used to implement evidence-based interventions and models used to analyze the success of the interventions have been described briefly. Several of the models share design characteristics as well as implementation approaches, and the approach selected for an implementation effort can affect the success of the implementation project. Table 1 identifies implementation framework models, design characteristics, implementation approaches, and common approaches across a variety of framework models.

Table 1: *Implementation framework models and common approaches*

Framework Model	Model Design Characteristics	Implementation Approaches	Practical Tasks
Diffusion of Innovations	Knowledge acquisition, Persuasion, Decision, Implementation, Confirmation	Innovation, communication channels, time, social system	1. Communicate or reach out to stakeholders. 2. Understand the

Framework Model	Model Design Characteristics	Implementation Approaches	Practical Tasks
PARiHS	Evidence, context, facilitation	Research, clinical experience, patient experience, local knowledge, culture, leadership, evaluation, characteristics, role, style. Implementation intervention design model	clinical setting. 3. Work with clinical representatives to select implementation approach. 4. Appoint on-site implementation agent. 5. Engage leaders. 6. Implement. 7. Evaluate after implementation.
PRECEDE – PROCEED	Diagnosis, implementation, evaluation	Phase 1- Social diagnosis Phase 2- Epidemiological, behavioral, and environmental diagnosis Phase 3- Educational and Ecological diagnosis Phase 4- Administrative and Policy diagnosis Phase 5- Implementation Phase 6- Process Evaluation Phase 7- Impact Evaluation Phase 8- Outcome Evaluation	
PRISM	Practical, robust implementation and sustainability model	Practical, implementation and sustainability	
RE-AIM	Reach, efficacy, adoption, implementation, maintenance	Post implementation evaluation process	
CFIR	Intervention characteristics, Outer setting, Inner setting, characteristics of individuals	Consolidated Framework for Implementation Research.	
PCOR	Evidence assessment, audience identification and partner engagement, dissemination, implementation, evaluation	Context, engagement, evaluation	

The common approaches identified in Table 1 represent some of the implementation features that are identifiable during the implementation process. Healthcare facilities involved in implementation of evidence-based intervention can summarize how well the project was communicated to their teams. Those features which are observable represent the basis of survey questions. Survey respondents are categorizing by how much and how successful common approaches were when applied during the intervention implantation.

Table 2: Research questions linked to survey items

Research Questions	Question Purpose	Question Target Audience
<u>Research Question 1</u>		
What is the current level of knowledge and utilization of D&I theory in healthcare settings?		
Question 2: Are you familiar with any implementation framework	D&I familiarity	All Respondents
Question 3: Familiarity with specific D&I framework	D&I familiarity	All Respondents
Question 9: Time respondent's become involved in EBI	D&I familiarity	Respondent that has participated in EBI
Question 10: Specific product implemented	D&I familiarity	Respondent that has participated in EBI
Question 11: Identified role of survey participant in EBI project	D&I familiarity	Respondent that has participated in EBI

Research Questions	Question Purpose	Question Target Audience
Question 12: Identified common approaches used in EBI project	D&I familiarity	Respondent that has participated in EBI
Question 14: Reason for selecting the common approach most important to project	D&I familiarity	Respondent that has participated in EBI
Research Question 2		
What are the current challenges to D&I?		
Question 7: D&I challenges in respondent's HCO	HCO challenges	All Respondents
Research Question 3		
How important is D&I knowledge and training?		
Question 4: Addresses D&I formal training	training	All Respondents
Question 5: Addresses D&I formal training- provided by HCO	training	All Respondents
Question 26: Organization provided individual or team training before EBI	training	Respondent that has participated in EBI
Question 27: Organization provided individual or team training during EBI	training	Respondent that has participated in EBI
Question 28: Organization provided individual or team training after EBI	training	Respondent that has participated in EBI
Research Question 4		
How can D&I program be integrated into healthcare and educational settings?		
Question 6: Graduate program training suggestions- open-ended question	graduate program	All Respondents

Research Questions	Question Purpose	Question Target Audience
Research Question 5		
Is there a correlation between successful implementation and common approaches used for EBI implementation?		
Survey respondent's perceived success of EBI project questions		
Question 24: EBI was successfully implemented	success	Respondent that has participated in EBI
Question 25: reason for success- open-ended question	success	Respondent that has participated in EBI
Communication questions		
Question 15: EBI team communication before implementation	communication	Respondent that has participated in EBI
Question 16: EBI team communication during implementation	communication	Respondent that has participated in EBI
Question 17: EBI team communication after implementation	communication	Respondent that has participated in EBI
Understand organization's culture questions		
Question 18: EBI team understood organization's culture before implementation	understand culture	Respondent that has participated in EBI
Question 19: EBI team understood organization's culture during implementation	understand culture	Respondent that has participated in EBI
Question 20: EBI team understood organization's culture after implementation	understand culture	Respondent that has participated in EBI
Leadership Engagement questions		

Research Questions	Question Purpose	Question Target Audience
Question 21: EBI team work with front line staff	leadership engagement	Respondent that has participated in EBI
Question 23: Organizational leaders were engaged in this implementation	leadership engagement	Respondent that has participated in EBI
Question 25: Organizational implementation lead appointed	leadership engagement	Respondent that has participated in EBI
Question 26: Organization implementation lead selection process	leadership engagement	Respondent that has participated in EBI
Implementation approach questions		
Question 22: Implementation purpose was clear to all employees	clarity	Respondent that has participated in EBI

Effect of Organizational Setting

In 1997, Porter and Warner concluded that various internal obstructions (institutional and/or individual) may preclude effective implementation of EBM. Skills required for EBM are not traditionally part of medical training. Economic and time restraints may deter the application of real EBM into clinical practice, but external review may be appropriate and helpful.

Mancia and Zanchettie suggested in 1999 that medicine should be based as much as possible on scientific evidence. Moving medicine from being perceived as an art toward its acceptance as a science has been the goal of the last centuries, and emphasizing the need can have important educational value.

Change management processes are unique to each organization's profile. Cameron and Quinn (2011, p. 75) used the organizational culture assessment instrument (OCAI) to highlight attributes in an organization that make up the core of its unique organizational profile. A healthcare organizational profile will fall into one of the four organizational culture categories: (1) the clan culture, (2) the adhocracy culture, (3) the market culture, and (4) the hierarchy culture. Understanding the unique culture of the healthcare industry in general and then the specific culture of the organizational setting can help researchers and investigators develop better implementation strategies for healthcare organizations.

Educational Factors

Khan and Coomarasamy (2006) suggest clinically integrated teaching as the best way to improve evidence-based medicine behavior in practice, but it does not automatically lead to implementation of good teaching and learning practices. Integration of EBM teaching for postgraduate junior doctors in everyday clinical practice is uncommon and remains a challenge (Hatala et al., 2006; Oude-Rengerink et al., 2012).

Oude-Rengerink (2014) surveyed on-the-job EBM teachers in Europe and found that important barriers for teaching EBM in clinical practice were lack of teaching time in a busy practice, lack of curriculum requirements for teaching EBM, and lack of computer access in clinics and wards.

The relevancies of educational programs that introduce graduate medical students to activities that will help develop effective medical curriculum cannot be over-emphasized. Henry, Holmboe, & Frankel (2013) highlighted the need for a communication competencies approach to teach graduate medical students, as well as

offering practical suggestions for implementing those competencies to ensure safe and effective skills among residents.

Gonzales et al. (2012) published an approach to training healthcare professionals in D&I science using a conceptual framework, while also proposing competencies for training. The article identifies three principles for the training framework as (1) behavior change among providers and patients, (2) engagement of stakeholder organizations, and (3) sustained improvement. The courses developed by the authors are currently used at the University of California, San Francisco for interdisciplinary team training in clinical research.

A UCLA/RAND Center study agrees with the generally conceived view that research objectives may be unique, but that the limitations faced by researchers are not unique when trying to disseminate and implement programs in community-based health facilities (Mendel et al., 2008). The common issues researchers face include (1) translating interventions of evidence-based practices, (2) preserving scientifically validated components of evidence-based practices, (3) obtaining buy-in from various stakeholders in the settings over which researchers and implementers have little control, and (4) sustaining the intervention beyond the initial demonstrations and funding (Mueser et al., 2003).

The role of contextual factors in the spread and dissemination of evidence-based practices has been well documented (Mueser et al., 2008; Strang & Soule, 1998). The UCLA/RAND Center study highlighted contextual factors that can influence the spread of innovations: (1) norms and attitudes of individual and organizational stakeholders; (2) organizational structure and processes including differences in mission, size, decision-

making process, and service officered; (3) resources; (4) policies and incentives; (5) networks and linkages; and (6) media and external change agents, of which the latter three factors represent sources of information and influence which can be helpful to researchers when disseminating and implementing evidence-based practices (Mueser et al., 2008).

The UCLA/RAND Center study took place in 2008, before the introduction of CER, PCOR, and other centralized initiatives towards dissemination and implementation. It concluded that researchers require additional sets of skills to adequately transport health interventions into real-world situations. In addition, the frameworks developed may not be completely applicable for all forms and levels of implementation efforts. They are considered basic organizational tools for which implementation settings and organizational dimensions play a key role in determining which tools will be applied (Mueser et al., 2008).

Wilson & Kurz (2008) identified institutionalization through continuous quality improvement (CQI) as an approach to integrate an intervention into an organization. The article also suggests that breakdown in intervention adoption reduces when grant funding—external support for the implementation and intervention effort—is reduced or removed. That interest in the evidence-based intervention is reduced once external resources are removed is a direct contradiction of a successful change management process.

Conclusion

There exists in implementation science a need for more research tailored towards identifying frameworks that best fit unique clinical settings in healthcare. This research

analyzes responses from healthcare leaders on choice of implementation conceptual frameworks applied in their organizations and their outcomes. The research also reviews growing interest in implementation science graduate and continuous education for healthcare professionals as a benefit for healthcare in general.

Graduate and post-graduate courses are currently not geared towards implementation science for current or future healthcare providers. Quality information about the benefits of implementation science as a course of study is not yet popular in academic institutions. The present survey, as well as corresponding research, sheds light on the perspective of healthcare leaders on instituting implementation science curriculum.

This study seeks to add to the growing body of knowledge on D&I of evidence-based practices. This study delves into the effects of clinical settings on dissemination, implementation, and the level of adoption over time. It is general knowledge that interest in new practices is high at the beginning, especially when external funding and resources are made available to the effort.

CHAPTER 3

METHODOLOGY

Study Design

More information is needed in the field of D&I science, such as the use of different implementation frameworks and the educational benefits of both academic study of implementation and continuing education programs for healthcare professionals. The survey questions assess respondents' knowledge of the conceptual framework used in implementation, as well as their interest in implementation science courses and curriculum for healthcare professionals.

Choice of Research Design

Dissemination, implementation processes, and implementation educational curriculum are new fields of study that require more exploration and solutions to pitfalls in framework application. The research design that helps answer some of the question of D&I frameworks is exploratory research (Shi, 2008). This research process assists with analyzing survey information. The present study presents a survey to collect information that is unattainable through other data sets (Culler et al., 2011).

Operational Definitions

This survey asked healthcare professionals demographic questions about the healthcare organizations in which they are employed. The questions were then specific about implementation processes in their organizations, implementation framework

applied to the implementation they have participated in, success and challenges of the implementation, and the effect if any of trained implementation professional on staff.

Survey Development

The questionnaire was developed under the supervision of a project chairperson. Survey questions were developed based on common approaches from several frameworks for D&I. Based on the literature review, we identified the common elements across the most popular D&I frameworks (Table 1), we sought to survey respondents on their knowledge and use of the common elements, as well as any challenges to implementation. In addition, we inquired on the amount of training related to D&I and the respondents' level of involvement in an evidence based quality improvement intervention. Finally, we asked about the perceived success of the intervention and the respondents' opinions related to future D&I training. The survey includes demographic questions about each respondent's healthcare organization. See Appendix B for a complete list of survey questions. The survey was initially tested by a sample of three experts to assess clarity of directions, question wording, appropriateness of content related to research objectives, and potential improvements. The final survey is six pages including, 33 questions, featuring multiple-choice, yes/no, fill-in-the-blank, and Likert scale questions. Ten questions elicited response using a 5-point Likert scale with options ranging from strongly disagree (1 point) to strongly agree (5 points), respondents had seven chances to add comments through a series of open-ended questions that shed light on perspectives that were not previously understood. Seven multiple-choice, five yes/no, and four yes/no/don't know questions were asked in the survey. The first page of the survey included an introductory cover page explaining the study, as well as definitions of terms

that may be unfamiliar or terms that can have more than one definition depending on context. The survey was administered in English only. After the first week, a reminder was sent to all participants, along with a second reminder after the second week. Table 2 links the study research questions with each survey item and the research area each question addresses.

Sample Selection

This study uses convenience sampling (Shi, 2008) from the current students and alumni of the MUSC DHA program. The participants consist of clinicians, clinician executives, medical administrators, hospital administrators, and healthcare information technology leaders. The survey was emailed to participants in December 2015 with two follow-up emails in January 2016 to secure greater response.

Survey Administration

The survey instrument was administered utilizing Research Electronic Data Capture software (REDCap). REDCap is a software toolset and workflow methodology for electronic collection and management of research and clinical trial data (Harris et al., 2007; Harris et al., 2008). REDCap provides secure, flexible, web-based applications, including real time validation rules with automated data type and range checks at the time of entry. Exports are made available for several statistical packages including SPSS, SAS, STATA, and Microsoft Excel. The system allows the research team to create online surveys and engage respondents using a variety of notification methods.

Recruitment and Respondents

The Medical University of South Carolina's College of Health Professions has a combined total of 230 students and alumni, who were the survey sample population and were sent an email containing an introductory letter with a brief description of the research and the 33-question survey. Respondents could not be identified, as the survey was anonymous. The study was approved by Medical University of South Carolina's IRB-I in accordance with 45 CFR 46.101 (b)(2) as exempt from Human Research Subject Regulations.

Statistical Analysis

Descriptive statistics were used to analyze data collected from the survey; percentage, means, medians, and percentile ranges were used to examine responses to each survey question. To understand the importance of a response across the response population, *t* tests were applied to examine statistical significance of differences in mean; percentage values were examined using chi-square tests. For survey items with a Likert scale responses (questions relating to communication, leadership involvement, and organizational inclusiveness) responses were combined. The top two Likert-choice response categories (strongly agree and agree) were grouped, while the bottom three (neutral, disagree, and strongly disagree) were also grouped together. *P* values of less than .05 were interpreted as statistically significant. Survey data were analyzed using IBM's SPSS software version 16.0.

To examine the relationship between perceived project success and D&I, statistical relationship testing was completed using ANOVA; for example, we examined the relationship between communication and perceived success of the implementation. The communication mean was calculated based on good communication (strongly agree

and agree) and poor communication (neutral, disagree, and strongly disagree). For each of these relationships, we examined the dependent variable of perceived success with the D&I factors.

Table 3 Abbreviated Independent Variable Names

Abbreviated names	Survey Question
IMPQ1	The implementation team communicated effectively with stakeholders before the implementation?
IMPQ2	The implementation team communicated effectively with stakeholders during the implementation?
IMPQ3	The implementation team communicated effectively with stakeholders after the implementation?
IMPQ4	The implementation team understood your organizational culture before the implementation?
IMPQ5	The implementation team understood your organizational culture during the implementation?
IMPQ6	The implementation team understood your organizational culture after the implementation?
IMPQ7	The implementation team worked with a front line staff in selecting the implementation approach
IMPQ8	The purpose of the implementation approach was clear to all employee
IMPQ9	Organizational leaders were engaged in this implementation
IMPQ10	The intervention was successfully implemented

In cases where the same survey item was asked for different time periods (before, during and after implementation) we aggregated the score from the three related survey items. For example, the communication variable is a composite score for: Did the EBI team communicate effectively with stakeholders before, during, and after the implementation (see Appendix B for research survey questions breakdown)?

Finally, qualitative content analysis was used to identify common themes and develop categories across the open ended survey items.

Limitations

The survey sample is a representation of health professionals and leaders, but it is not an exhaustive group. The sample includes broad diversity of age, gender, and geographical representation. However, the results may not be generalizable.

Due to power limitations from only 24 respondents who had both participated in a project to spread EBI and who had completed all of the survey questions, we were unable to control for multiple variables.

CHAPTER 4

RESULTS AND FINDINGS

A total of 230 DHA students and alumni received the dissemination and implementation survey questionnaire, of which 61 responses were received at the end of a two-week survey period. The final survey response rate was 27%. The breakdown of the employment demographic information of survey participants is shown in Table 4.

A majority of respondents worked for non-government multi-hospital healthcare organizations. Twelve respondents were employed in government healthcare organization and stand-alone hospitals; 15 respondents were employed in non-government owned multi-hospital healthcare organizations, and 22 respondents were employed in other forms of healthcare establishment (see Table 4).

Table 4

Survey participant healthcare organization demographic information.

Types of organization		
Responses	Frequency	Percent
Government HCO	12	20
Non-government multihospital HCO	15	25
Other	22	36
Standalone hospital	12	20
Total	61	100
Other types of organization		
Responses	Frequency	Percent
Accountable care organization	2	9
Academic Institution	5	23
Healthcare consulting	6	27
Insurance	2	9
Medical device provider	1	5
Pharmaceutical	1	5
Private healthcare business	4	18
Research	1	5
Total	22	100

When asked about their familiarity with D&I frameworks, the majority (59%) of respondents had heard of at least one framework. Thirty-six respondents were familiar with implementation frameworks used for D&I and were thus eligible to continue with the survey questions asking about their experiences with D&I (Table 5), while the

remaining 25 respondents ended and submitted the survey. When respondents were asked to describe their familiarity with any of the most common D&I frameworks, 35 respondents were familiar with at least one of the frameworks (Table 6).

Table 5

Familiarity with any implementation framework

Familiar with any implementation framework		
Responses	Frequency	Percent
No	25	41
Yes	36	59
Total	61	100

Table 6

Familiarity with at least one listed framework

Familiar with any implementation framework		
Responses	Frequency	Percent
No	26	43
Yes	35	57
Total	61	100

Of the eight common frameworks identified, Patient-Centered Outcome Research (PCOR) was identified by 29 respondents, more than any other framework (Table 7). None of the respondents was familiar with Promoting Action on Research Implementation in Health Services (PARiHS).

In addition to the provided list of frameworks, three respondents identified additional frameworks types: IHI's framework, DMAIC, Lean Six Sigma, and Quality Enhancement Research Initiative (QUERI).

Next we asked respondents about their background and education in D&I. Twenty-one respondents had had formal training in D&I, while nine respondents confirm that D&I training was provided by their employer. The majority of respondents stated that program/project management would be important instruction to include in a graduate program.

Table 7

D&I framework familiarity

D&I framework familiarity		
Responses	Frequency	Percent
CFIR	26	43
Diffusion of Knowledge	35	57
PARiHS	0	0
Precede-Proceed	3	5
PCOR	29	48
PRISM	7	12
Re-Aim	7	12
Other	3	5
Total	61	100

Table 8

Respondent participation in a project designed to spread EBI

Ever participated in EBI project		
Responses	Frequency	Percent
Blank	1	2
No	36	59
Yes	24	39
Total	61	100

The open-ended format for the questions on helpful implementation skills for graduate program and challenges associated with D&I yielded extensive comments (see Appendix C). Respondents identified several value added programs such as project management, program management, negotiation, and leadership as important training that could be integrated into a graduate healthcare administration program. Several respondents also provided comments that are noteworthy "it would be helpful to learn how to compose an implementation team. We are taught how to create buy-in but how do we create the initial team."

We categorized the challenges into four themes based on area of concerns to respondents, management being the most common, followed by organizational communication. One of the respondents provided the following comment "Biggest challenge is the allocation of resources to implement a change that may or may not be directly correlated to an organizational strategy and building the executive and downstream sponsorship to carry the implementation to fruition."

A total of 24 respondents had participated in a project designed to spread EBI (Table 8), and 21 respondents became involved in the process in less than 3 months from start of the implementation project (Table 9).

As shown on Table 8, 24 respondents have participated in a project to spread EBI and were eligible to continue the survey, to discuss common approaches used for the implementation project (Table 10). The common approaches to EBI are general tools the implementation team uses to address the organization and design of the EBI project. Table 11 indicates the common approaches that were most important in the project. The most common responses were the EBI team's reaching out to stakeholders (27.3%) and the EBI team engaging with facility leaders (22.7%). Also common were EBI team understanding of facility clinical setting (13.6%) and evaluation after implementation

Common approaches to implementation applied to the EBI (22 respondents)

(13.6%)

Table 9

At what point in the project implementation did you become involved?

Point involved		
Responses	Frequency	Percent
Less than 3 months	21	88
6-12 months	1	4
1-2 years	2	8
Total	61	100

Table 10: *Common approaches to implementation applied to the EBI*

	Frequency	Frequency (%)
EBI team communicates or reaches out to stakeholders	19	86
EBI team understands the clinical setting of the facility	18	82
EBI team worked with clinical representatives to select implementation approach	13	59
EBI team and stakeholder appointed on-site implementation coordinator	13	59
EBI team engaged facility leaders.	19	86
EBI team implemented the intervention.	14	64
EBI team evaluation after implementation.	18	82

Table 11: *Common approach most important in the project*

Which of the common approaches was most important in your project? (select one)		
	Frequency	Frequency (%)
EBI team communicates or reaches out to stakeholders.	6	27.3
EBI team engaged facility leaders.	5	22.7
EBI team evaluation after implementation.	3	13.6
EBI team implemented the intervention.	1	4.6
EBI team understands the clinical setting of your facility.	3	13.6
EBI team worked with clinical representatives to select implementation approach.	4	18.2
Total	22	100

To examine the relationship between successful EBI implementation and factors that might be responsible for the success, inter-item correlations were calculated for the ten Likert scale items on the implementation (Table 12). Almost half of correlations (22 of 45) were significant at the .05 level, including eight of the nine correlations with

IMPQ10, which measured whether respondents thought the implementation was successful (Table 12). A multiple regression was performed to determine which factors might have contributed to successful implementation.

Table 12: *Correlation between EBI implementation success and perceived success factors*

Correlations

		IMPQ1	IMPQ2	IMPQ3	IMPQ4	IMPQ5	IMPQ6	IMPQ7	IMPQ8	IMPQ9	IMPQ10
IMPQ1	Pearson Correlation	1	.623**	.464*	.414	.338	.313	.553**	.388	.621**	.666**
	Sig. (2-tailed)		.002	.030	.056	.124	.156	.008	.074	.002	.001
	N	22	22	22	22	22	22	22	22	22	22
IMPQ2	Pearson Correlation	.623**	1	.541**	.172	.379	.561**	.417	.376	.232	.605**
	Sig. (2-tailed)	.002		.009	.443	.082	.007	.054	.085	.299	.003
	N	22	22	22	22	22	22	22	22	22	22
IMPQ3	Pearson Correlation	.464*	.541**	1	.487*	.519*	.482*	.252	.525*	.208	.519*
	Sig. (2-tailed)	.030	.009		.021	.013	.023	.257	.012	.352	.013
	N	22	22	22	22	22	22	22	22	22	22
IMPQ4	Pearson Correlation	.414	.172	.487*	1	.512*	.235	.517*	.320	.238	.512*
	Sig. (2-tailed)	.056	.443	.021		.015	.293	.014	.146	.287	.015
	N	22	22	22	22	22	22	22	22	22	22
IMPQ5	Pearson Correlation	.338	.379	.519*	.512*	1	.478*	.351	.545**	.246	.434*
	Sig. (2-tailed)	.124	.082	.013	.015		.025	.110	.009	.270	.044
	N	22	22	22	22	22	22	22	22	22	22
IMPQ6	Pearson Correlation	.313	.561**	.482*	.235	.478*	1	.421	.097	-.067	.553**
	Sig. (2-tailed)	.156	.007	.023	.293	.025		.051	.666	.767	.008
	N	22	22	22	22	22	22	22	22	22	22
IMPQ7	Pearson Correlation	.553**	.417	.252	.517*	.351	.421	1	.316	.099	.659**
	Sig. (2-tailed)	.008	.054	.257	.014	.110	.051		.152	.662	.001
	N	22	22	22	22	22	22	22	22	22	22
IMPQ8	Pearson Correlation	.388	.376	.525*	.320	.545**	.097	.316	1	.445*	.380
	Sig. (2-tailed)	.074	.085	.012	.146	.009	.666	.152		.038	.081
	N	22	22	22	22	22	22	22	22	22	22
IMPQ9	Pearson Correlation	.621**	.232	.208	.238	.246	-.067	.099	.445*	1	.485*
	Sig. (2-tailed)	.002	.299	.352	.287	.270	.767	.662	.038		.022
	N	22	22	22	22	22	22	22	22	22	22
IMPQ10	Pearson Correlation	.666**	.605**	.519*	.512*	.434*	.553**	.659**	.380	.485*	1
	Sig. (2-tailed)	.001	.003	.013	.015	.044	.008	.001	.081	.022	
	N	22	22	22	22	22	22	22	22	22	22

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Inter-item correlations between this reduced set of variables were also calculated (see Tables 13-17). All four of the independent variables had significant zero-order correlations with IMPQ10. Four of the six correlations among the independent variables were also significant.

Table 13: *Regression*

Regression

Descriptive statistics

	Mean	Std. deviation	N
IMPQ10	4.27	.767	22
Understand	12.7273	1.98042	22
Communication	16.1364	2.51274	22
IMPQ8	3.68	1.129	22
IMPQ9	4.32	.780	22

However, when all four independent variables were entered simultaneously, only the communication scores (COMMUNICATION) and the measure of organizational leader engagement (IMPQ9) remained significant.

Table 14: *Correlations of communication and understanding scores*

Correlations

		IMPQ10	UNDERSTAND	COMMUNICATION	IMPQ8	IMPQ9
Pearson Correlation	IMPQ10	1.000	.647	.795	.380	.485
	UNDERSTAND	.647	1.000	.716	.407	.182
	COMMUNICATION	.795	.716	1.000	.520	.317
	IMPQ8	.380	.407	.520	1.000	.445
	IMPQ9	.485	.182	.317	.445	1.000
Sig. (1-tailed)	IMPQ10		.001	.000	.041	.011
	UNDERSTAND	.001		.000	.030	.209
	COMMUNICATION	.000	.000		.007	.075
	IMPQ8	.041	.030	.007		.019
	IMPQ9	.011	.209	.075	.019	
N	IMPQ10	22	22	22	22	22
	UNDERSTAND	22	22	22	22	22
	COMMUNICATION	22	22	22	22	22
	IMPQ8	22	22	22	22	22
	IMPQ9	22	22	22	22	22

Table 15

Correlation model summary

Model Summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.854a	.729	.665	.444

a. Predictors: (Constant), IMPQ9, Understand, IMPQ8, Communication

Table 16

Anova result of communication and understanding scores

ANOVAa

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	9.013	4	2.253	11.432	.000b
	Residual	3.351	17	.197		
	Total	12.364	21			

a. Dependent variable: IMPQ10
b. Predictors: (Constant), IMPQ9, Understand, IMPQ8, Communication

Table 17

Coefficient of Communication and understanding scores with project success

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	-.810	.793		-1.021	.322			
	UNDERSTAND	.078	.070	.202	1.109	.283	.647	.260	.140
	COMMUNICATION	.196	.060	.641	3.273	.004	.795	.622	.413
	IMPQ8	-.122	.107	-.180	-1.137	.271	.380	-.266	-.144
	IMPQ9	.320	.140	.325	2.279	.036	.485	.484	.288

a. Dependent Variable: IMPQ10

CHAPTER 5

DISCUSSION

This research set out to determine the current level of knowledge and utilization of D&I theories, as well as barriers to EBI implementation. We have also attempted to determine implementation skills that graduates would like to see as part of a healthcare administration graduate program curriculum, and levels of D&I training within healthcare organizations. The final question for this research was to determine whether there is a correlation among successful implementations of common approaches used in EBI implementation. Two clear themes, communication and management commitment, emerge from the present research.

Sixty percent of healthcare professional in some form of leadership position have not been involved in EBI implementation; indeed, the lack of leadership involvement in EBI implementation was well noted in the open-ended question in the survey (see Appendix 5). Among the common challenges associated with D&I cited by respondents were “lack of effective physician leadership,” “leadership buy-in and resource commitment,” “lack of key leadership buy in,” “leadership teams are hesitant,” “buy in from all other parties. Admin, clinicians, etc.,” and “building the executive and downstream sponsorship.” One respondent writes with precision, “Engaging medical staff leadership to lead change is another challenge but offers one of our best opportunities to change the healthcare model.” Lack of leadership involvement can thus be identified as one of the major current barriers to D&I, irrespective of the healthcare

setting. This was also concluded by Porter & Warner (1997) and is borne out by each of the statistical measures presented in the present study.

While survey respondents see leadership involvement in EBI as one of the challenges facing successful EBI implementation, they identify communication as another key factor that can help improve success rate of EBI, citing "interdisciplinary communication," "identifying all stakeholders and ensuring information is received and read," "educating the target staffs," "dissemination of the study information to the right levels of the organization," "lack of email accounts for all staff," and "communication silos," as barriers (see Appendix C).

We have explored respondents' perspectives on the key factors of successfully implementing EBI. The majority stated communication, followed by leadership engagement, as being most important to the success of a project. A key implication of this research for healthcare organizations is the necessity of effective leadership engagement for successful implementation of EBI.

We have examined the relationship between completing a successful project and EBI implementation as they are affected by communication, understanding, clear approach, and leadership engagement, which are statistically significant to the success of an implementation project. We know that one or more of the variables is related to the success of the project (see Table 16). As shown on Table 15, 66% of the success of EBI project is based on the same four variables. When all statistical analyses are examined, communication and leadership engagement stand out.

Nearly half of survey respondents were familiar with Patient-Centered Outcome Research (PCOR) implementation framework. The Patient-Centered Outcomes Research

Institute (PCORI) is an independent, nonprofit, nongovernmental organization authorized by Congress in 2010 to improve the quality and relevance of evidence available to help patients, caregivers, clinicians, employers, insurers, and policy-makers make informed health decisions (PCORI, 2014). PCORI was instituted along with the Patient Protection and Affordable Care Act of 2010, and this might account for the popularity among healthcare professionals.

PCORI operates under the understanding that traditional medical research has not been able to improve key health outcomes and as such has identified critical research questions, funded patient-centered comparative clinical effectiveness research (CER), and disseminated the results effectively to patients, patient's family members, and clinicians. CER not only informs the patient about the care that is available for a particular disease or condition, it also provides information about which approach to care might work best given patients' unique circumstances and preferences (PCORI, 2014).

Reaching the patient with a comparative analysis of alternative treatment will have lasting implication on how patient discuss care options with their care providers and will raise the level of awareness of both patient and family members on available options.

The quest for knowledge in healthcare is ever continued. When survey respondents were asked to identify the implementation skills that would be helpful to include in a graduate program (see Table 18), responses were overwhelmingly in favor of additional training in project management, program management, negotiation, and leadership. One respondent related, "Familiarity with those concepts by administrators would go a long way in bridging the communication gap between researchers and decision-makers at the local level" (see Appendix 4).

Conclusions/Implications

Effective communication and stakeholder/leadership engagement are required for the successful implementation of EBI, this research shows that about 40% of healthcare leaders are aware of a D&I framework and only about 40% have actually been involved in a D&I project to implement a EBI.

Survey respondents have provided real insight when asked about implementation skills that would be helpful to include in a graduate program. Among the training interests suggested by respondents are various management training, leadership engagement techniques, and communication skills. As the field of D&I continues to develop in the administrative and clinical settings of healthcare, it will be important to develop curricula that spark interest and generate support by both the medical society and healthcare leadership.

Based on respondents' insights revealed in this survey, employers will get better EBI outcomes by providing a mixture of management and communication training to employees regularly. Such training will be especially helpful close to the implementation of major EBI projects. Educational institutions offering healthcare administration graduate program should be encouraged to attract a mixture of clinical healthcare providers, as well as healthcare administrators and leaders, into team activities that foster collaboration. It is also important to encourage the inclusion of project and program management curricula in such programs.

Several factors were identified in a correlation analysis as likely to aid successful EBI implementation, which include understanding organizational structure and culture and a clear implementation approach, but most especially effective communication with

stakeholders, and organizational leadership engagement. A successful EBI implementation will most likely benefit from a mixture of carefully selected implementation approaches based on knowledge of the organizational culture of the healthcare organization.

Appendix

Appendix A

Consolidated Framework for Implementation Research (CFIR) constructs: constructs characteristics

Construct	Short Description
I. INTERVENTION CHARACTERISTICS	
A. Intervention Source	Perception of key stakeholders about whether the intervention is externally or internally developed.
B. Evidence Strength & Quality	Stakeholders' perceptions of the quality and validity of evidence supporting the belief that the intervention will have desired outcomes.
C. Relative Advantage	Stakeholders' perception of the advantage of implementing the intervention versus an alternative solution.
D. Adaptability	The degree to which an intervention can be adapted, tailored, refined, or reinvented to meet local needs.
E. Trialability	The ability to test the intervention on a small scale in the organization, and to be able to reverse course (undo implementation) if warranted.
F. Complexity	Perceived difficulty of implementation, reflected by duration, scope, radicalness, disruptiveness, centrality, and intricacy and number of steps required to implement.
G. Design Quality & Packaging	Perceived excellence in how the intervention is bundled, presented, and assembled.
H. Cost	Costs of the intervention and costs associated with implementing the intervention including investment, supply, and opportunity costs.

Construct	Short Description
II. OUTER SETTING	
A. Patient Needs & Resources	The extent to which patient needs, as well as barriers and facilitators to meet those needs, are accurately known and prioritized by the organization.
B. Cosmopolitanism	The degree to which an organization is networked with other external organizations.
C. Peer Pressure	Mimetic or competitive pressure to implement an intervention, typically because most or other key peer or competing organizations have already implemented or are in a bid for a competitive edge.
D. External Policy & Incentives	A broad construct that includes external strategies to spread interventions, including policy and regulations (governmental or other central entity), external mandates, recommendations and guidelines, pay-for-performance, collaborative, and public or benchmark reporting.
III. INNER SETTING	Short Description
A. Structural Characteristics	The social architecture, age, maturity, and size of an organization.
B. Networks & Communications	The nature and quality of webs of social networks and the nature and quality of formal and informal communications within an organization.
C. Culture	Norms, values, and basic assumptions of a given organization.
D. Implementation Climate	The absorptive capacity for change, shared receptivity of involved individuals to an intervention, and the extent to which use of that intervention will be rewarded, supported, and expected within their organization.

Construct	Short Description
1. Tension for Change	The degree to which stakeholders perceive the current situation as intolerable or needing change.
2. Compatibility	The degree of tangible fit between meaning and values attached to the intervention by involved individuals, how those align with individuals' own norms, values, and perceived risks and needs, and how the intervention fits with existing workflows and systems.
3. Relative Priority	Individuals' shared perception of the importance of the implementation within the organization.
4. Organizational Incentives & Rewards	Extrinsic incentives such as goal-sharing awards, performance reviews, promotions, and raises in salary, and less tangible incentives such as increased stature or respect.
5, Goals and Feedback	The degree to which goals are clearly communicated, acted upon, and fed back to staff, and alignment of that feedback with goals.
6. Learning Climate	A climate in which: a) leaders express their own fallibility and need for team members' assistance and input; b) team members feel that they are essential, valued, and knowledgeable partners in the change process; c) individuals feel psychologically safe to try new methods; and d) there is sufficient time and space for reflective thinking and evaluation.
E. Readiness for Implementation	Tangible and immediate indicators of organizational commitment to its decision to implement an intervention.
1. Leadership Engagement	Commitment, involvement, and accountability of leaders and managers with the implementation.
2. Available Resources	The level of resources dedicated for implementation and on-going operations, including money, training, education, physical space, and time.

Construct	Short Description
3. Access to Knowledge & Information	Ease of access to digestible information and knowledge about the intervention and how to incorporate it into work tasks.
IV. CHARACTERISTICS OF INDIVIDUALS	
A. Knowledge & Beliefs about the Intervention	Individuals' attitudes toward and value placed on the intervention as well as familiarity with facts, truths, and principles related to the intervention.
B. Self-efficacy	Individual belief in their own capabilities to execute courses of action to achieve implementation goals.
C. Individual Stage of Change	Characterization of the phase an individual is in, as he or she progresses toward skilled, enthusiastic, and sustained use of the intervention.
D. Individual Identification with Organization	A broad construct related to how individuals perceive the organization, and their relationship and degree of commitment with that organization.
E. Other Personal Attributes	A broad construct to include other personal traits such as tolerance of ambiguity, intellectual ability, motivation, values, competence, capacity, and learning style.
V. PROCESS	
A. Planning	The degree to which a scheme or method of behavior and tasks for implementing an intervention are developed in advance, and the quality of those schemes or methods.
B. Engaging	Attracting and involving appropriate individuals in the implementation and use of the intervention through a combined strategy of social marketing, education, role modeling, training, and other similar activities.

Construct	Short Description
1.Opinion Leaders	Individuals in an organization who have formal or informal influence on the attitudes and beliefs of their colleagues with respect to implementing the intervention.
2. Formally Appointed Internal Implementation Leaders	Individuals from within the organization who have been formally appointed with responsibility for implementing an intervention as coordinator, project manager, team leader, or other similar role.
3. Champions	"Individuals who dedicate themselves to supporting, marketing, and 'driving through' an [implementation]" [101] (p. 182), overcoming indifference or resistance that the intervention may provoke in an organization.
4. External Change Agents	Individuals who are affiliated with an outside entity who formally influence or facilitate intervention decisions in a desirable direction.
C. Executing	Carrying out or accomplishing the implementation according to plan.

D. Reflecting & Evaluating	Quantitative and qualitative feedback about the progress and quality of implementation accompanied with regular personal and team debriefing about progress and experience.

Appendix B

Implementation skills helpful in a graduate program

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
Program Management and Lean Methodologies	Program Management	Lean methodology		
I was the lone researcher in my cohort; the remainder were administrators from non-academic hospitals. Our approaches to problem-solving were complimentary, but theirs were frequently more specific to their department, where my training was broader. Of course the most critical part of implementation (as your study is researching) is moving low p values from bench to bedside. There are huge challenges in deciding what the most important 'metrics' are, and how to evaluate successes. Based on my experience the one additional course I would advocate for in the DHA program is one on comparative effectiveness analysis (CEA). Familiarity with those concepts by administrators would go a long way in bridging the communications gaps between researchers and decision-makers at the local level.	Comparative effectiveness analysis			
Negotiation skills especially with physicians. Skills in developing models to measure progress in implementation.	Negotiation skills	Implementation progress model		

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
I have been out of the DHA program for a few years, so the curriculum may have changed - I do not recall covering any dissemination techniques in our quality course, so certainly if it does not exist in the curriculum today, I would add it to the course.	Dissemination techniques			
Communication skills for inter-professional audiences in large organizations	Communication skills			
Examples of how this has been implemented in various organizations	Implementation examples			
Project management and metrics/analytics	Project management	Metrics analysis		
Be an effective leader who is respected by the hospital and medical staff associated with their organization. The primary problem leaders have today is a lack of talent and effectiveness.	Effective leadership			
1. Leadership in promoting the value of EBI's 2. 'Marketing' the importance of EBI's. 3. Describing the factors in which evidence based practice is essential, e.g. reduced LOS, reduced readmissions, increased reimbursement	Leadership promotion	Marketing EBI	Articulating EBI	

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
An overview of critical implementation skills for specific health care settings and differing health administration roles.	Implementation skills			
How to move clinical investigation outcomes to the policy stage for actual change.	Knowledge transfer			
Provide instruction on types of methods and examples of best practices.	Best practice instructions			
Practical change implementation and sustainment tools.	Change implementation	Sustainable tools		
Project planning and management	Project planning	Project management		
A) Methods to engage physicians and advanced clinicians in literature review B) Theories in knowledge transfer C) Change Management	Physician engagement	Knowledge transfer	Change Management	
Change management skills, communication skills information management/analysis research skills quality management	Change Management	Communication skills	Information Management	Quality Management
Identification of processes and personpower that would enable research into EBP's, choice to implement, and eval of EBP's in healthcare delivery	Process evaluation	Choice of implementation skills		

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
Transformational change skills set and the science of spread.	Transformation Change Management			
Change management skills leadership skills Team STEPPS training Lean training	Change Management	Leadership skills	Lean training	
Understanding of dissemination concepts and techniques Review of 'best practice' initiatives Review of evaluation for efficaciouness	Dissemination techniques	Evaluation techniques		
Basic training on dissemination techniques as well as how to partner with physicians and hospital leaders to implement.	Dissemination techniques	Leadership partnership		
General information on the programs and their clinical settings. Process and procedures.	Process evaluation	Procedure evaluation		
Understanding Systems processes	Systems processes			
It would be helpful to understand how the introduction of evidence based care will impact the patient experience and how it changes the metrics that hospitals use to measure performance	Performance measures			
How to effectively structure implementation in a organization.	Implementation procedure			

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
Value of using most recent innovation.	Innovation value			
Methods of dissemination, and stories that provide examples of what did and did not work.	Dissemination techniques	Practical examples		
Team-building and facilitation skills to organize and lead teams of professionals including physicians, nurses and other clinicians as well as non-professional staff. Training in efficiency techniques and philosophies including lean and six sigma	Leadership techniques	Lean and Six Sigma		
Through understanding on project management skills and developing expectations for potential outcomes	Project management	Expectation development		

Appendix C

Challenges associated with D&I of EBI

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Time	Time			
There are no formal processes or organizational commitment to attain such processes	Lack of formal processes	Lack of Organizational commitment		
I believe that the biggest challenge is that a small rural medical staff does not want to lead innovations. They prefer to do what is common, well researched, and trustworthy. They prefer to let someone else be the early adopters.	Resistance to leading change			
There is always a gap between the researcher and the clinician. We researchers say: 'the evidence shows that if we implement x, then y will happen'. But the clinicians say: 'we can't do this/this won't work in my population because/we don't have the resources because. I think mandates within the ACA are improving some of these issues, but it boils down to interdisciplinary communication, and alignment of care expectations.	Lack of interdisciplinary communication			

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Resistance to change and lack of effective physician leadership	Resistance to change	Lack of effective Physician leadership		
Conflicting research as well as research that is very limited in scope.	Conflicting research	research with limited scope		
Identifying all stakeholders and ensuring information is received and read	Stakeholder identification	Active communication		
Collecting data and analyzing. I work in a non-primary care specialty.	Data collection	Data analysis		
Lack of evidence-based research related to health services management For our clients: Disagreement among clinicians on 'best practice' research outcomes Leadership buy-in and resource commitment	Leadership buy-in	Lack of evidence-based research	Disagreement on best practise	
Educating the target staffs.	Staff education			
1. Culture---old practices 2. Training and skill set 3. Competing org priorities 4. Uncertainty where to begin 5. Lack of key leadership buy in	Culture	Training	Competing organization priorities	Lack of leadership buy-in

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
As consultants, we are not responsible for implementing. We advise and educate leadership and organizations. The challenge, from our perspective, is educating leadership teams and emphasizing the importance of D&I in driving decision-making. Often times, leadership teams are hesitant because they are mistaken that this would require additional expenses or resources that they are not willing to invest.	Leadership education			
Dissemination of the study information to the right levels of the organization. Desire to stick with what has been practice over time.	Disseminating to right levels of the organization	sticking to old practice		
Large scale organization. different specialties and needs, large geographic footprint.	Large scale organization	Differences in needs	Large geographic footprint	
Getting people to understand the value of evidence based research and to develop willingness to make new practices and standards of care part of their everyday routine.	Understanding evidence-based research	Accepting new practices		
Lack of email accounts for all staff. Staffing shortages.	Lack of stakeholder information	Staff shortages		

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
It is a challenge to maximize the effectiveness of such programs because of the real or perceived barriers between the different health care professions in the hospital.	Lack of agreement between physician groups			
It typically takes too long and rarely is formalized/standardized.	Time commitment	Lack of standardization		
communication silos	Lack of communication			
Buy in from all other parties. Admin, clinicians, etc.	Buy-in from Clinician and administration			
A) Agreement of clinicians B) processes for obtaining agreement C) information systems to monitor practice patterns	Clinician agreement	Information systems to monitor practice		
Ensuring employed are committed to its success.	Staff commitment to success			
Difficulty with change, extreme deferring to wishes of MD's, lack of structure for introducing and tracking changes	Difficulty with change	Deferring to doctor's wishes	Lack of structure to introduce and track change	

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Generally, employees sometimes feel like ideas for change originate at the top and get pushed down to the masses which sometimes viewed as forced change. Better to hatch the ideas at the implementation level, allow the evidence to be researched and incubate there allowing for self-discovery, and provide support and encouragement for dissemination and implementation that came from the bottom.	leadership forced changes	Employee driven change		
Physician resistance to change and Evidence Based Medicine (driven by CMS) Some departments in hospital still work in silos	Physician resistance to change	Interdepartmental silos		
Understanding effective teaching/education/dissemination styles Needing to 'practice' those knowledge points				
No physician leaders to take up the cause. This needs to be a partnership between Administrators and Physicians.	Physician leadership	Physician/ leadership partnership		
Facility and staff size.	Organization size	Staff size		
Time for training away from regular work obligations, follow up, orientation to change, and consultation.	Training time	Follow up	Orientation to change	Consultation
Might not do it regularly.	Frequency			

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Time	Time			
The organization is so large that some regional areas are better at dissemination and implementation than others.	Organization size			
Desire to change	Desire to change			
We are a group of 880 independent physicians. We have to provide financial incentives which are funded through grants, shared savings or risk contracts with upside. Sometime money runs thin and it is particularly difficult to maintain focus when you do not have the physician's attention.	Lack of funds	Lack of physician buy-in		
It is a military clinic and the medical health system is not set up well for dissemination of EBI. Dissemination of general information is fast and effective, and could easily be adapted to send out EBI.	Organization setup			
In small hospital environments (and likely all hospital environments), physicians typically regard themselves as individual players responsible for their patients and outcomes. Bringing physicians and staff together to understand participate in a team environment is a significant challenge to healthcare in general (but is beginning to evolve). Engaging medical staff leadership to lead change is another challenge but	Physician/ leadership partnership	Team agreement	Physician leadership buy-in	Training and education

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
offers one of our best opportunities to change the healthcare model. Individuals need team training as well as exposure and education regarding best practices and strategies for implementing best practices EBI				
Biggest challenge is the allocation of resources to implement a change that may or may not be directly correlated to an organizational strategy. and building the executive and downstream sponsorship to carry the implementation to fruition.	Organizational strategic alignment	leadership engagement		
Although our organization understands that outcomes strategies need to be designed and implemented, more time is spent in reactionary mode.	Leadership procrastination	Reactional leadership mode		

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APPENDICES

APPENDIX 1

Survey Questions

This survey is for the completion of a Doctoral project examining dissemination and implementation science and the effects of educational curriculum on the successful implementation of evidence-based interventions (EMI).

Definition of dissemination: is the purposive distribution of information and intervention materials to a specific public health or clinical practice audience. The intent is to spread information and the associated evidence-based interventions.

Definition of implementation: is the introduction of evidence-based interventions into healthcare policy and practice

Evidence-based intervention (EBI): are treatments that have been proven effective through outcomes evaluations

1. What type of health care organization do you work for?
    a. Small standalone clinic
    b. Standalone hospital
    c. Multihospital healthcare organization
    d. Government healthcare organization
    e. Other

2. Are you familiar with any implementation framework used to disseminate EBI
    a. Yes
    b. No

3. Are you familiar with the frameworks used for the dissemination? (Check all that apply)
    a. Diffusion of knowledge
    b. Promoting Action on Research Implementation in Health Services (PARiHS)
    c. PRECEDE – PROCEED
    d. Practical, Robust Implementation and Sustainability Model (PRISM)
    e. Reach Effectiveness Adoption Implementation Maintenance (RE-AIM)
    f. Consolidated Framework for Implementation Research (CFIR)
    g. Patient-Centered Outcomes Research (PCOR)
    h. If other, please list the implementation frameworks

4. Have you had any formal training in implementation science?
    a. Yes
    b. No
    c. Don’t know

5. Does your organization provide education on spread of evidence based practices?
    a. Yes
    b. No
    c. Don't know

6. What implementation skills would be helpful in a graduate program, such as the DHA?
7. What are the challenges associated with dissemination of EBM in your organization?
8. Have you ever participated in a project designed to spread evidence based practices within your organization?
    a. Yes
    b. No
9. At what point in the project implementation did you become involved in the process?
    a. Less than 3 months
    b. Less than 6 months
    c. Less than one year
    d. Less than two years
    e. Over two years

10. What product was implemented? Comment:
11. What role did you play in the implementation process?
    a. Observer
    b. Implementation leader
    c. Implementation team member
    d. EBM user
    e. Others:

12. Below is a list of common approaches to implementation, check all items on the list that applied to the organization EBM dissemination you were involved with
    a. Communication within team
    b. In-depth understanding of your clinical environment by the team
    c. Collaboration with clinical representative
    d. Site specific implementation coordinator appointment
    e. Leadership engagement
    f. Post implementation evaluation

13. Which of the common approaches was most important in your project? (select one)
    a. Communication within team
    b. In-depth understanding of your clinical environment by the team
    c. Collaboration with clinical representative
    d. Site specific implementation coordinator appointment
    e. Leadership engagement
    f. Post implementation evaluation

14. Why is the approach you selected most important to you for EBM implementation?

For the following questions rate your agreement on the following statement:

15. The implementation team communicated effectively with stakeholders before the implementation? (Implementation team: a formalized or informal assemble of people working on a project for a unified outcome
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

16. The implementation team communicated effectively with stakeholders during the implementation? (stakeholder: healthcare providers or other employees that will be using the intervention e.g. doctors, nurses, administrators)
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

17. The implementation team communicated effectively with stakeholders after the implementation
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

18. The implementation team understood your organizational culture before the implementation
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

19. The implementation team understand your organization during the implementation
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

20. The implementation team understand your organization after the implementation
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

21. The implementation team worked with a front line staff in selecting the implementation approach
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

22. The purpose of the implementation approach was clear to all employees:
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

23. Did you have an organizational implementation lead during this implementation?
    a. Yes
    b. No
    c. Don’t know

24. How was the local implementation lead selected for this implementation?
    a. Clinical position within the organization
    b. Leadership position
    c. Education qualification
    d. Unknown
    e. Others:

25. Did you receive implementation training as a team or individually before the implementation process?
    a. Yes
    b. No

26. Did your receive implementation training as a team or individually during the implementation process?
    a. Yes
    b. No

27. Did you receive implementation training as a team or individually after the implementation process?
    a. Yes
    b. No

For the following questions rate your agreement on the following statement:

28. Organization leader were engaged in this implementation
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

29. The intervention was successfully implemented
    a. Strongly disagree, b. disagree, c. neutral, d. agree, e. strongly agree

30. What factors contributed to the success?

31. After the implementation, was there a post implementation plan?
    a. Yes
    b. No
    c. Don't know

32. Who made the post implementation plan? Comment:

33. Who is overseeing the post implementation plan? Comment:

APPENDIX 2

Survey questions table and breakdown

Questions	General	Communication	Organization understanding	Internal/external team collaboration	Site specific coordination	Leadership engagement	Post implementation evaluation	Training	Project Success
What type of health care organization do you work for?	G								
Are you familiar with any implementation framework used to disseminate EBI	G								
Are you familiar with the frameworks used for the dissemination?		C							
Have you had any formal training in implementation science?								T	
Does your organization provide education on spread of evidence based practices?								T	
What implementation skills would be helpful in a graduate program, such as the DHA?								T	

Questions	General	Communication	Organization understanding	Internal/external team collaboration	Site specific coordination	Leadership engagement	Post implementation evaluation	Training	Project Success
What are the challenges associated with dissemination of EBM in your organization?	G								
Have you ever participated in a project designed to spread evidence based practices within your organization?	G								
At what point in the project implementation did you become involved in the process?	G								
What product was implemented? Comment:	G								
What role did you play in the implementation process?	G								
Below is a list of common approaches to implementation	G								
Which of the common approaches was most important in your project?	G								

Questions	General	Communication	Organization understanding	Internal/external team collaboration	Site specific coordination	Leadership engagement	Post implementation evaluation	Training	Project Success
Why is the approach you selected most important to you for EBM implementation?	G								
The implementation team communicated effectively with stakeholders before the implementation?		C							
The implementation team communicated effectively with stakeholders during the implementation?		C							
The implementation team communicated effectively with stakeholders after the implementation		C							
The implementation team understood your organizational culture before the implementation			OU						
The implementation team understand your organization during the implementation			OU						
The implementation team understand your organization after the implementation			OU						

Questions	General	Communication	Organization understanding	Internal/external team collaboration	Site specific coordination	Leadership engagement	Post implementation evaluation	Training	Project Success
The implementation team worked with a front line staff in selecting the implementation approach				TC					
The purpose of the implementation approach was clear to all employees:		C		TC					
Did you have an organizational implementation lead during this implementation?					SSC				
How was the local implementation lead selected for this implementation?					SSC				
Did you receive implementation training as a team or individually before the implementation process?								T	
Did you receive implementation training as a team or individually during the implementation process?								T	
Did you receive implementation training as a team or individually after the implementation process?								T	

Questions	General	Communication	Organization understanding	Internal/external team collaboration	Site specific coordination	Leadership engagement	Post implementation evaluation	Training	Project Success
Organization leader were engaged in this implementation						LE			
The intervention was successfully implemented									S
What factors contributed to the success?									S
After the implementation, was there a post implementation plan?							PIE		
Who made the post implementation plan? Comment:				TC		LE	PIE		
Who is overseeing the post implementation plan? Comment:							PIE		

APPENDIX 3

Survey breakdown table count

General	G	10
Communication	C	5
Organization understanding	OU	3
Internal/External team collaboration	TC	3
Site specific coordination	SSC	2
Leadership engagement	LE	2
Post implementation evaluation	PIE	3
Training	T	6
Project success	S	2

APPENDIX 4

Implementation skills helpful for graduate program key concepts

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
Program Management and Lean Methodologies	Program Management	Lean methodology		

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
I was the lone researcher in my cohort; the remainders were administrators from non-academic hospitals. Our approaches to problem-solving were complimentary, but theirs were frequently more specific to their department, where my training was broader. Of course the most critical part of implementation (as your study is researching) is moving low p values from bench to bedside. There are huge challenges in deciding what the most important 'metrics' are, and how to evaluate successes. Based on my experience the one additional course I would advocate for in the DHA program is one on comparative effectiveness analysis (CEA). Familiarity with those concepts by administrators would go a long way in bridging the communications gaps between researchers and decision-makers at the local level.	Comparative effectiveness analysis			
Negotiation skills especially with physicians. Skills in developing models to measure progress in implementation.	Negotiation skills	Implementation progress model		

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
I have been out of the DHA program for a few years, so the curriculum may have changed - I do not recall covering any dissemination techniques in our quality course, so certainly if it does not exist in the curriculum today, I would add it to the course.	Dissemination techniques			
Communication skills for interprofessional audiences in large organizations	Communication skills			
Examples of how this has been implemented in various organizations	Implementation examples			
Project management and metrics/analytics	Project management	Metrics analysis		
Be an effective leader who is respected by the hospital and medical staff associated with their organization. The primary problem leaders have today is a lack of talent and effectiveness.	Effective leadership			
1. Leadership in promoting the value of EBI's 2. 'Marketing' the importance of EBI's. 3. Describing the factors in which evidence based practice is essential, e.g. reduced LOS, reduced readmissions, increased reimbursement	Leadership promotion	Marketing EBI	Articulating EBI	

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
An overview of critical implementation skills for specific health care settings and differing health administration roles.	Implementation skills			
How to move clinical investigation outcomes to the policy stage for actual change.	Knowledge transfer			
Provide instruction on types of methods and examples of best practices.	Best practice instructions			
Practical change implementation and sustainment tools.	Change implementation	Sustainable tools		
Project planning and management	Project planning	Project management		
A) Methods to engage physicians and advanced clinicians in literature review B) Theories in knowledge transfer C) Change Management	Physician engagement	Knowledge transfer	Change Management	
Change management skills communication skills information management/analysis research skills quality management	Change Management	Communication skills	Information Management	Quality Management
Identification of processes and person power that would enable research into EBP's, choice to implement, and eval. of EBP's in healthcare delivery	Process evaluation	Choice of implementation skills		

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
Transformational change skills set and the science of spread.	Transformation Change Management			
Change management skills leadership skills Team STEPPS training Lean training	Change Management	Leadership skills	Lean training	
Understanding of dissemination concepts and techniques Review of 'best practice' initiatives Review of evaluation for efficaciousness	Dissemination techniques	Evaluation techniques		
Basic training on dissemination techniques as well as how to partner with physicians and hospital leaders to implement.	Dissemination techniques	Leadership partnership		
General information on the programs and their clinical settings. Process and procedures.	Process evaluation	Procedure evaluation		
Understanding Systems processes	Systems processes			
It would be helpful to understand how the introduction of evidence based care will impact the patient experience and how it changes the metrics that hospitals use to measure performance	Performance measures			

What implementation skills would be helpful to include in a graduate program, such as the Doctor of Health Administration (DHA)?	Key Concept 1	Key Concept 2	Key Concept 3	Key Concept 4
How to effectively structure implementation in an organization.	Implementation procedure			
Value of using most recent innovation.	Innovation value			
Methods of dissemination, and stories that provide examples of what did and did not work.	Dissemination techniques	Practical examples		
Team-building and facilitation skills to organize and lead teams of professionals including physicians, nurses and other clinicians as well as non-professional staff. Training in efficiency techniques and philosophies including lean and six sigma	Leadership techniques	Lean and six sigma		
Through understanding on project management skills and developing expectations for potential outcomes	Project management	Expectation development		

APPENDIX 5

EBI Implmentation challenges categories

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Time	Time			
There are no formal processes or organizational commitment to attain such processes	Lack of formal processes	Lack of Organizational commitment		
I believe that the biggest challenge is that a small rural medical staff does not want to lead innovations. They prefer to do what is common, well researched, and trustworthy. They prefer to let someone else be the early adopters.	Resistance to leading change			
There is always a gap between the researcher and the clinician. We researchers say: 'the evidence shows that if we implement x, then y will happen'. But the clinicians say: 'we can't do this/this won't work in my population because/we don't have the resources because.' I think mandates within the ACA are improving some of these issues, but it boils down to interdisciplinary communication, and alignment of care expectations.	Lack of interdisciplinary communication			

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Resistance to change and lack of effective physician leadership	Resistance to change	Lack of effective Physician leadership		
Conflicting research as well as research that is very limited in scope.	Conflicting research	research with limited scope		
Identifying all stakeholders and ensuring information is received and read	Stakeholder identification	Active communication		
Collecting data and analyzing. I work in a non-primary care specialty.	Data collection	Data analysis		
Lack of evidence-based research related to health services management For our clients: Disagreement among clinicians on 'best practice' research outcomes Leadership buy-in and resource commitment	Leadership buy-in	Lack of evidence-based research	Disagreement on best practice	
Educating the target staffs.	Staff education			
1. Culture---old practices 2. Training and skill set 3. Competing org priorities 4. Uncertainty where to begin 5. Lack of key leadership buy in	Culture	Training	Competing organization priorities	Lack of leadership buy-in

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
As consultants, we are not responsible for implementing. We advise and educate leadership and organizations. The challenge, from our perspective, is educating leadership teams and emphasizing the importance of D&I in driving decision-making. Often times, leadership teams are hesitant because they are mistaken that this would require additional expenses or resources that they are not willing to invest.	Leadership education			
Dissemination of the study information to the right levels of the organization. Desire to stick with what has been practice over time.	Disseminating to right levels of the organization	sticking to old practice		
Large scale organization. Different specialties and needs, large geographic footprint.	Large scale organization	Differences in needs	Large geographic footprint	
Getting people to understand the value of evidence based research and to develop willingness to make new practices and standards of care part of their everyday routine.	Understanding evidence-based research	Accepting new practices		
Lack of email accounts for all staff. Staffing shortages.	Lack of stakeholder information	Staff shortages		

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
It is a challenge to maximize the effectiveness of such programs because of the real or perceived barriers between the different health care professions in the hospital.	Lack of agreement between physician groups			
It typically takes too long and rarely is formalized/ standardized.	Time commitment	Lack of standardization		
communication silos	Lack of communication			
Buy in from all other parties. Admin, clinicians, etc.	Buy-in from Clinician and administration			
A) Agreement of clinicians B) processes for obtaining agreement C) information systems to monitor practice patterns	Clinician agreement	Information systems to monitor practice		
Ensuring employed is committed to its success.	Staff commitment to success			
Difficulty with change, extreme deferring to wishes of MD's, lack of structure for introducing and tracking changes	Difficulty with change	Deferring to doctor's wishes	Lack of structure to introduce and	

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
			track change	
Generally, employees sometimes feel like ideas for change originate at the top and get pushed down to the masses which sometimes viewed as forced change. Better to hatch the ideas at the implementation level, allow the evidence to be researched and incubate there allowing for self-discovery, and provide support and encouragement for dissemination and implementation that came from the bottom.	leadership forced changes	Employee driven change		
Physician resistance to change and Evidence Based Medicine (driven by CMS) Some departments in hospital still work in silos	Physician resistance to change	Interdepartmental silos		
Understanding effective teaching/education/dissemination styles Needing to 'practice' those knowledge points				
No physician leaders to take up the cause. This needs to be a partnership between Administrators and Physicians.	Physician leadership	Physician/ leadership partnership		
Facility and staff size.	Organization size	Staff size		

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
Time for training away from regular work obligations, follow up, orientation to change, and consultation.	Training time	Follow up	Orientation to change	Consultation
Might not do it regularly.	Frequency			
Time	Time			
The organization is so large that some regional areas are better at dissemination and implementation than others.	Organization size			
Desire to change	Desire to change			
We are a group of 880 independent physicians. We have to provide financial incentives which are funded through grants, shared savings or risk contracts with upside. Sometime money runs thin and it is particularly difficult to maintain focus when you do not have the physician's attention.	Lack of funds	Lack of physician buy-in		
It is a military clinic and the medical health system is not set up well for dissemination of EBI. Dissemination of general information is fast and effective, and could easily be adapted to send out EBI.	Organization setup			

What are the challenges associated with dissemination and implementation of evidence-based interventions in your organization?	Challenges 1	Challenges 2	Challenges 3	Challenges 4
In small hospital environments (and likely all hospital environments), physicians typically regard themselves as individual players responsible for their patients and outcomes. Bringing physicians and staff together to understand participate in a team environment is a significant challenge to healthcare in general (but is beginning to evolve). Engaging medical staff leadership to lead change is another challenge but offers one of our best opportunities to change the healthcare model. Individuals need team training as well as exposure and education regarding best practices and strategies for implementing best practices EBI	Physician/ leadership partnership	Team agreement	Physician leadership buy-in	Training and education
Biggest challenge is the allocation of resources to implement a change that may or may not be directly correlated to an organizational strategy. and building the executive and downstream sponsorship to carry the implementation to fruition.	Organizational strategic alignment	leadership engagement		
Although our organizations understand that outcomes strategies need to be designed and implemented, more time is spend in reactionary mode.	Leadership procrastination	Reactional leadership mode		

APPENDIX 6

Complete survey question responses

Frequency Table

Are you familiar with any implementation framework used to disseminate EBIs?

	Frequency
	24

1. Which best describes the type of health care organization do you work for?

	Frequency	Percent
Government healthcare organization	5	20.8
Non-government Multihospital healthcare organization	5	20.8
Other	9	37.5
Standalone hospital	5	20.8
Total	24	100.0

2. Are you familiar with any implementation framework used to disseminate EBIs

	Frequency	Percent
No	6	25.0
Yes	18	75.0
Total	24	100.0

3. Are you familiar with any of these frameworks used for implementation or dissemination

	Frequency
Diffusion of Knowledge	5
PARiHS	0
PRECEED- PROCEED	0

Frequency Table	
PRISM	7
RE-AIM	4
CFIR	3
PCOR	14
OTHERS	1

4. Have you had any formal training in dissemination and implementation

	Frequency	Percent
No	13	54.2
Yes	11	45.8
Total	24	100.0

5. Does your organization provide education on dissemination and implementation

	Frequency	Percent
0	18	75.0
1	3	12.5
2	3	12.5
Total	24	100.0

9. At what point in the project implementation did you become involved in the process

	Frequency	Percent
6-12 months	1	4.2
Less than 3 months	21	87.5

Frequency Table		
one- two years	2	8.3
Total	24	100.0

11. What role did you play in the implementation process

	Frequency
Observer	1
Implementation leader	12
Implementation team member	9
Evidence based initiative user	3
Others	5

12. Common approaches to implementation you were involved with

	Frequency
EBI team communicates	19
EBI team understands the clinical setting	18
EBI team worked with clinical representatives	13
EBI team and stakeholder appoints clinical lead	13
EBI team engaged facility leaders.	19
EBI team implemented the intervention.	14
EBI team evaluation after implementation.	18

13. Which of the common approaches was most important in your project? (select one)

	Frequency
	2
EBI team communicates or reaches out to stakeholders.	6
EBI team engaged facility leaders.	5
EBI team evaluation after implementation.	3
EBI team implemented the intervention.	1
EBI team understands the clinical setting of your facility.	3
EBI team worked with clinical representatives to select implementation approach.	4
Total	24

15. The implementation team communicated effectively with stakeholders before the implementation

	Frequency	Percent
	2	8.3
Agree	13	54.2
Neutral	1	4.2
Strongly agree	8	33.3
Total	24	100.0

16. The implementation team communicated effectively with stakeholders during the implementation

	Frequency	Percent
	2	8.3
Agree	14	58.3
Neutral	1	4.2
Strongly agree	7	29.2
Total	24	100.0

17. The implementation team communicated effectively with stakeholders after the implementation

	Frequency	Percent
	2	8.3
Agree	12	50.0
Disagree	1	4.2
Neutral	5	20.8
Strongly agree	3	12.5
Strongly disagree	1	4.2
Total	24	100.0

18. The implementation team understood your organizational culture before the implementation

	Frequency	Percent
	2	8.3
Agree	10	41.7
Neutral	2	8.3

Strongly agree	9	37.5
Strongly disagree	1	4.2
Total	24	100.0

19. The implementation team understand your organization during the implementation

	Frequency	Percent
	2	8.3
Agree	11	45.8
Disagree	1	4.2
Neutral	1	4.2
Strongly agree	9	37.5
Total	24	100.0

20. The implementation team understand your organization after the implementation

	Frequency	Percent
	2	8.3
Agree	9	37.5
Disagree	1	4.2
Neutral	2	8.3
Strongly agree	10	41.7
Total	24	100.0

21. The implementation team worked with a front line staff in selecting the

implementation approach

	Frequency	Percent
	2	8.3
Agree	8	33.3
Disagree	3	12.5
Neutral	2	8.3
Strongly agree	8	33.3
Strongly disagree	1	4.2
Total	24	100.0

22. The purpose of the implementation approach was clear to all employees

	Frequency	Percent
	2	8.3
Agree	8	33.3
Disagree	5	20.8
Neutral	3	12.5
Strongly agree	6	25.0
Total	24	100.0

28. Organization leader were engaged in this implementation

	Frequency	Percent
	2	8.3
Agree	10	41.7
Disagree	1	4.2
Neutral	1	4.2

Strongly agree	10	41.7
Total	24	100.0

29. The intervention was successfully implemented

	Frequency	Percent
	2	8.3
Agree	8	33.3
Neutral	4	16.7
Strongly agree	10	41.7
Total	24	100.0

23. Did you have an organizational implementation lead during this implementation?

	Frequency	Percent
	3	12.5
Don't know	1	4.2
No	1	4.2
Yes	19	79.2
Total	24	100.0

24. How was the local implementation lead selected for this implementation?

	Frequency	Percent
	2	8.3
Clinical position within the organization	9	37.5
Education qualification	3	12.5

Leadership position	9	37.5
Unknown	1	4.2
Total	24	100.0

25. Did you receive implementation training as a team or individually before the implementation process

	Frequency	Percent
	2	8.3
No	14	58.3
Yes	8	33.3
Total	24	100.0

26. Did your receive implementation training as a team or individually during the implementation process

	Frequency	Percent
	2	8.3
No	13	54.2
Yes	9	37.5
Total	24	100.0

27. Did you receive implementation training as a team or individually after the implementation process

	Frequency	Percent
	2	8.3
No	15	62.5
Yes	7	29.2

Total	24	100.0

31. Is there a plan to keep the implemented intervention in place

	Frequency	Percent
	2	8.3
Don't know	2	8.3
Yes	20	83.3
Total	24	100.0

COMPLETE

	Frequency	Percent
Complete	23	95.8
Incomplete	1	4.2
Total	24	100.0