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Staff Education on the Use of the LACE Index in Clinical Settings

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This is to certify that the doctoral study by

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Abstract

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MSN, University of Medicine and Dentistry, 2003

BSN, Bloomfield College, 1999

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

As of 2008, the Centers for Medicare and Medicaid Services has instituted monetary penalties for institutions with excess readmissions. As a result of these initiatives, hospitals are investing resources and efforts to educate their staff to use tools aimed at reducing readmission rates. The LACE index tool is one metric used to identify patients at high risk for readmission. The practice-focused question addressed in this project was whether the use of a teaching module is effective at improving clinical staff knowledge on the LACE index. The purpose of the project was to develop a teaching module to educate advanced practice nurses on the use of the LACE tool in clinical settings. The plan-do-study-act cycle methodologies guided this project. The educational content of the module was derived from an extensive literature review of peer-reviewed articles obtained from databases including CINAHL, EBSCO, PubMed, Walden University library, and Medline. The content of the teaching module consisted of a PowerPoint presentation with case scenarios. Pretests and posttests were used as measurement to assess the participants' knowledge. the scores were analyzed using descriptive statistics to evaluate whether an increase in knowledge occurred. Pretest scores ranged from 84% to 100% while the posttest score ranged from 92% to 100%. The findings indicated no significant difference between the pretest and posttest suggesting no change in staff knowledge. Recommendation for future project is to use the module with an audience with no prior knowledge of the LACE tool to better assess its effectiveness. This project has the potential to effect positive social change by reducing readmission rate and minimize healthcare cost.

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Dedication

I would like to dedicate this project to my beautiful god-daughter Christie, my cousin Jason and to my three babies: Kayla, Khloe, and Avery. Thank you for the support and encouragement. You are the light of my life.

Acknowledgments

I would like to thank Dr. Joanne Minnick for her guidance and encouragement. At times, when I wanted to give up, she amazingly continued to mentor me and support me on this journey. THANK YOU.

Table of Contents

List of Tables

Section 1: Nature of the Project

Introduction

Unplanned readmission is an issue for many hospitals. It is associated with poor quality care, and it affects institutions financially (Postel et al., 2014). Factors such as comorbidities, support system, surgical complications, and hospital length of stay may contribute to increased readmissions (Postel et al., 2014). With the new changes in the healthcare system, there is now an incentive for hospitals to do more to reduce unplanned readmission. As of 2008, the Centers for Medicare and Medicaid Services (CMS) imposed financial penalties for hospitals with 30-days readmission rates higher than the national database (CMS, 2015). Institutions that performed poorly and have excess readmission for conditions such as congestive heart failure, myocardial infarction, and pneumonia are penalized under the CMS readmission reduction program (Postel et al., 2014). Because of the high frequency of readmission and cost, patients who present to the emergency room within 30 days of discharge are a target for health care cost saving in the Medicare value-based purchasing (Robinson & Hudali, 2017).

The value-based purchasing program aims to encourage hospital and health systems to reduce readmissions through reductions in payments to hospitals with higher-than-expected readmission rates (Robinson & Hudali, 2017). As a result of this program, health institutions are implementing policies and investing resources and efforts to educate their staff to utilize tools aimed at reducing readmission rates. The LACE index (Length of stay, Acuity of admission, Comorbidities, Emergency room visits) is one of

these metrics used to identify patients at high risk for readmission. In this project, an educational tool was developed to educate the clinical staff on the use of the LACE index

Problem Statement

The problem addressed in this project was the increased readmission rate of patients after open-heart surgery to the hospital within 30 days of discharge. This was largely due to a lack of knowledge of the LACE tool to aid in reducing readmissions. This project was intended for this community hospital where there are no specific strategic tools to address readmissions in place. The selected site for this project was an acute care setting with a 451-bed capacity located in a Northeastern U.S. township. The institution serves 440,000 people in the county in which it is located and adjoining communities. The target population for this study comprised members of the clinical staff, the advanced practice nurse (APN) in the cardiac surgery service.

Unplanned readmission presents a problem for institutions. Under the Hospital Readmission Reduction Program, CMS is required to reduce payment to hospitals with excess readmissions (CMS, 2015). Identifying and offering preventive measures to those high-risk patients early on before they are discharged may prevent readmission (Damery & Combes, 2017). Predictive tools such as the LACE index can be an effective measure at reducing readmission (Smith, Pan, & Novelli, 2016). For this tool to be effective, educating APNs on its use is paramount. Staff education has been shown to improve staff knowledge (Schneider & Good, 2018). With changes in healthcare, it has become important for nurses to remain current about their practice and maintain competency and

continuing education in nursing (Schneider & Good, 2018). The practice-focused question was:

> PFQ: Will the use of an education module on the LACE tool improve staff knowledge on the use of the LACE tool?

This project is significant to nursing practice because unplanned readmission is indicative of poor quality of care. As health professionals, the APN must have the knowledge and skills necessary to assess patients who are at risk for readmission. This project involves developing a teaching module to educate the APN on the use of the LACE tool. The positive outcome for the use of this tool can significantly improve nursing care and lead to a change in practice.

Purpose

The practice problems identified were the increased readmission rate for cardiac surgery patients and staff knowledge. Reducing readmission rates among these patients is the long-term goal of this project. One of the institution's safety goals is to increase patients' satisfaction and reduce financial burden related to unplanned readmissions. The purpose of this project was to develop a PPT and use it to educate the staff on the application of the LACE index. The objectives for this process were (a) develop an educational plan by using a PPT to educate the clinical staff on the use of the LACE index, (b) educate the clinical staff on the indication and application of the LACE index in the clinical setting, (c) educate the clinical staff on the scoring of the LACE tool, and (d) review with the clinical staff the limitations of the LACE tool.

At the institution, despite measures such as follow-up telephone calls and home care visits, there still exist a gap in practice. Patients continue to return to the hospital within 30 days of discharge. According to Shaffer, Cui & Wanderer (2019), readmission in the United States is considered a quality indicator and accountability measure. Institutions have tried many approaches to reduce the readmission rate. These include implementing predictive modules that look at clinical factors to determine early on those at high risk for readmission. At the site where I implemented this project, there has been an increased rate of patients readmitted within 30 days of discharge. Those unplanned readmissions have been associated with a source of stress for patients and their families (Ritt & Taylor, 2016). In addition, they are also associated with an increase in mortality (Postel et al., 2014). While this may be common, unplanned readmission is also expensive and preventable. Institutions must find ways to reduce their readmission rate. The project addressed the question of whether educating APNs on the use of the LACE tool would increase the nurse's knowledge of timely identification of patients at high risk for readmission.

Nature of the Doctoral Project

CMS make readmissions a priority of care by penalizing facilities with high 30-days readmission rates. The LACE index was introduced to the project site practice, and it is one of the tools that may be used to shorten the length of hospitalization and predict unplanned readmissions. The LACE tool helps identify patients who are at risk for readmission and makes it possible to differentiate those patients at the time of hospital discharge (Smith et al., 2016). In this project, I developed a teaching module to educate

the APNs in the cardiac surgery department on the application of the LACE index tool. I used a staff education module to develop a PPT on the LACE tool to use with my intended audience. The sources of evidence used to complete this project include PubMed, GOOGLE, CINHAL plus Medline, CMS recommendations, and the LACE tool.

I administered a pretest and posttest to assess the effectiveness of the teaching module. I analyzed the results from the pretest and posttest using descriptive analysis and proportions to compare the scores and to assess for any improvement in knowledge. The overall purpose of this project was to improve staff knowledge on the use of the LACE tool to assist in preventing readmission of patients who undergo open-heart surgery.

Significance

Unplanned readmission has a negative impact on institutions. It is associated with an increase in health care costs and adverse patients' outcomes. In the United Stated, 30-days readmissions are indications of quality that require accountability (Low et al., 2015). CMS uses unplanned readmissions as an indicator of quality care and hospital performance to encourage hospitals to reduce their readmission rates (McCormack et al., 2013). CMS also publicly reports the rate of unplanned readmission and imposes financial penalties to institutions with high readmission rates (McCormack et al., 2013). These measures have led to the need for a tool that would help predict unplanned readmissions. Many hospitals, however, lack the tools needed to identify those high-risk patients. The ability to detect early changes in a patient’s condition can be lifesaving. The LACE index is one of those metrics used to shorten the length of hospitalization and

predict unplanned readmission (Amarasingham et al., 2015). The implication of early warning systems is seen in the management of critical patients. Nurses are using rapid response teams to justify transferring a patient to a critical care bed for close monitoring. Early interventions will most likely lead to better patient outcomes and reduce unplanned readmissions. It was important that the stakeholder be involved early in the project. Stakeholders for this project were APNs affected by the project and the evaluation process, the nurse manager who was in a position to advocate for the project, and the institution that was responsible for expanding the project to other units if needed. APNs were frontline in this project, and with the knowledge gained from the teaching module, they can make a positive impact on patients' outcomes. With training and knowledge, this project may be applicable to other clinical staff and help reduce unplanned readmission.

This project is significant to nursing practice because the positive outcome from the use of the LACE tool can significantly improve nursing practice. Educating the clinical staff on the use of this metric system will change the way nurses address the care of their patients.

Summary

Unplanned readmission poses a problem for institutions. It has a negative impact on patient outcomes and is associated with increased health care costs. The Federal government works to decrease the rate of unplanned readmissions by creating laws that impose financial penalties on institutions with high readmission rates. Because of these new laws, institutions have incorporated new metrics into the patient's plan of care to

identify those high-risk patients. The LACE index was selected for this educational module because of its ease of use and validity and reliability in its purpose. In section 2, I discuss the background and context for this project.

Section 2: Background and Context

Introduction

Unplanned readmission can be costly to institutions, and it can lead to adverse events for patients. Early identification of patients who are at high risk for readmission is important because it will help reduce preventable readmissions. To facilitate these measures, the CMS reduced payments to inpatient services for hospitals with excessive readmission rates effective October 1, 2012 (David, Britting & Dalton, 2015). Section 3025 of the Patient Protection and Affordable Care Act (ACA) financially penalizes institutions with high readmission rates and decreases money allocated to these institutions. This policy makes hospitals accountable for the care that they provide to patients, and it has shifted the focus from a fee for service to patient centered care (Puckett, 2017). Institutions have been working hard to develop and implement tools that would help identify those at high risk for readmission. The practice problems identified for this project were the increased readmission rate for cardiac surgery patients and staff knowledge.

The objective of this project was to develop a teaching module and educate the clinical staff. Unplanned readmission is an issue at the institution, and the use of this education module may increase the knowledge base of the APN and lead to a decrease in the readmission rate. The objectives of this project were: (a) educate the APN on the indication for the LACE index in the clinical setting, (b) educate the clinical staff on the use and scoring of the LACE tool, and (c) review with the clinical staff the limitation of the LACE tool. The practiced-focused question for this project was:

PFQ: Will the use of an education module on the LACE tool improve staff knowledge on the use of the LACE tool?

Theoretical Framework

The theoretical framework used to guide the project was the plan-do-study-act (PDSA)model. It was designed by the United States Institute for Healthcare Improvement to improve healthcare outcomes (Ungvarsky, 2020). This model is based on the work of Deming. Deming revised it several times and again before dying in 1993 so that it was adapted for use by health care providers (Ungvarsky, 2020). The PDSA model is widely used, and it is popular in healthcare settings because of its simplicity and flexibility, and it does not require extensive resources or time (Ungvarsky, 2020). Deming's model is often used to help teams improve the quality of care and making healthcare more efficient and patient-centered (Donnelly & Kirk, 2015). The PDSA cycles are short, and the result is readily noticeable.

The PDSA model was relevant to the implementation of this project. PDSA cycle methodologies are effective in this situation because they make it possible for the organization to see the improvement quickly. The PDSA cycle consists of four steps: planning, doing, studying, or checking, and acting (Kelly, 2011):

- Planning phase: During this phase, a multidisciplinary team is formed. The team creates steps necessary to accomplish their goals and states the changes that the team must make that would result in quality improvement and better patient outcomes (Gillam & Siriwardena, 2013). During the planning phase of this project, there was no multidisciplinary team. I identified the objectives for

the teaching module, developed the PowerPoint presentation, and created the pretest and posttest.

- Do phase: This phase involves piloting the tool on a unit and monitoring its progress and accuracy, making appropriate changes or additions. (Gillam & Siriwardena, 2013). During this phase, I carried out the teaching plan by presenting the education module to a subset of APNs in the hospital. I then administered the pretest and posttest, collected the responses to the pretest and posttest, and analyzed the data.
- Study phase: This phase involves analyzing the data and summarizing what has been learned. (Gillam & Siriwardena, 2013). During the study phase, I analyzed the data from the pretest and posttest, compared it for any noticeable differences, and summarized the findings.
- Act phase: This phase involves planning the next PDSA cycle with the necessary changes (Gillam & Siriwardena, 2013). During this phase, I planned the next cycle and determined whether the teaching module can be implemented with another clinical staff.

The PDSA framework helps nurses identify clinical situations that could lead to readmission to the hospital, and it affects the quality of care of patients and their outcomes (Jacelon, Macdonald, & Fitzgerald, 2015). The PDSA cycle is a useful framework for quality improvement; it can be used to improve the skills of nurses in critical areas and provide information about the quality of the program (Jacelon et al., 2015).

Definition of Terms

The following terms used in this paper are defined as follows:

The LACE index tool: The LACE index tool was originally developed in Canada. It uses collected clinical and administrative data to generate a risk score between 0 and 19 for individual patients where a high score indicates an increased risk of readmission (Damery & Combes, 2017). This Canadian LACE claims-based model is designed to predict 30 days mortality or unplanned readmission for patients discharged less than 30 days. It looks at four variables: (a) length of stay, (b) acuity on admission, (c) comorbidity of the patient, and (d) the number of emergency room visits to create a predictive score (Wang et al., 2014).

Stakeholders: Stakeholders are people or organizations involved and invested in the program (Hodges & Videto, 2011). There are three types of stakeholders to consider: those involved in the operation of the program, those who are affected by the program, and those involve in evaluating the results (Hodges & Videto, 2011).

Charlson comorbidity index score: It predicts mortality in hospitalized patients; higher Charlson comorbidity index score correlates with mortality and risk of readmission (Buhr, Jackson, Kominski, Dubinett, Ong & Mangione, 2019).

Pan-Do-Study-Act (PDSA): This model, which was first introduced by Shewhart and Deming, this is a quality improvement model that provides a framework that healthcare professionals can follow to implement an improvement (Newcombe & Fry-Bowers, 2018). This four-stage cycle (plan-do-study-act quality) model involves planning an intervention to an identified problem, implementing the intervention, studying the

outcomes, and acting to sustain or improve the intervention (Newcombe & Fry-Bowers, 2018). The PDSA model has proven to be beneficial because it allows stakeholders to become engaged and it the project to gain acceptance slowly with each cycle (Leis & Shojania, 2017).

Readmission: "It is defined as any inpatient admission or observation stay at the hospital within 30 days of hospital discharge" (Shaffer et al., 2019, p. 23).

Open heart surgery: Any surgery where the chest is cut open and surgery is done on the heart muscle, valves, arteries, or the aorta or other large arteries connected to the heart (Healthline.com 2018)

Unplanned readmission: Hospital readmission that occurs when a patient returns to the hospital for additional care within 30 days of being discharged (Ungvarsky, 2020).

Patient Protection and Affordable Care Act (ACA): This statute was signed into law on March 23, 2010, by President Obama. The ACA addresses both healthcare access and insurance reform (Goldsmith, 2015). The ACA enacted the Hospital Readmission Reduction Program that established financial penalties to motivate hospitals to reduce their 30-day readmissions conditions such as heart failure, acute myocardial infarction, and pneumonia (Gupta & Fonarow, 2018).

Relevance to Nursing Practice

Unplanned readmission has a negative impact on institutions. It is associated with an increase in health care costs and adverse patients' outcomes. In the United States, 30-days readmissions are indications of quality that require accountability (Low et al., 2015). With the ACA in place, new laws are enacted to motivate institutions to reduce 30-days

readmissions (Goldsmith, 2015). Among Medicare patients, the 30-days unplanned readmission rate for coronary bypass graft surgery (CABG) performed between July 1, 2011, and June 30, 2014, was 14.9% (Benuzillo et al., 2018). The estimated annual cost to Medicare for preventable readmission for CABG was $151 million, and CMS started to penalize hospitals whose readmissions were significantly higher than the national average (Benuzillo et al., 2018). As a result, CMS is now using unplanned readmissions as an indicator of quality care and hospital performance to encourage hospitals to reduce their readmission rates. Under the ACA, the value-based purchasing program was established to motivate health-care systems to reduce readmission rates by reducing payment to hospitals with higher-than-expected readmission rates (Robinson & Hudali, 2017). Institutions with excess readmission for conditions such as heart failure, pneumonia, and myocardial infarction must now pay a penalty under the CMS readmission reduction program (Postel et al., 2014). In 2016, CMS expanded their list to include CABG (Seifert, 2017). Institutions that perform cardiac surgeries must now develop strategies to reduce the readmission rate for that group as well. These measures have led to the need for a tool that would help predict unplanned readmissions.

Hospitals are now creating strategies that target unplanned readmission. Many of these hospitals, however, lack the tool needed to identify those high-risk patients. The ability to detect early changes in a patient's condition can be lifesaving. The LACE index is one of the tools used to shorten the length of hospitalization and predict unplanned readmissions (Amarasingham et al., 2015). Despite measures such as follow-up calls and home care visits, there still exist a gap in practice. Patients continue to return to the

hospital within 30 days of discharge. According to Shaffer et al. (2019), readmissions in the United States are considered a quality indicator and accountability measure. Institutions have tried many approaches to reducing the readmission rate including implementing predictive models that look at clinical factors to determine early on those at high risk for readmission. This project involved the application of an education module to educate the clinical staff on the use of the LACE index. This project is significant to nursing practice because the positive outcome from the use of the LACE tool can significantly improve nursing practice. Educating the clinical staff on the use of early warning system will change the way nurses address the care of their patients. Healthcare is always changing; nurses therefore have a responsibility to stay current in practice. A requirement of the nursing code of practice is that nurses are required to keep basic knowledge and clinical skills current (Schneider & Good, 2018).

Local Background and Context

The local evidence will be discussed to show relevance to the problem identified for this DNP project. The project site is an acute care center in the United States. The department is the heart and vascular institute that is consisted of nurse practitioners, intensivists, and cardiac surgeons. The nurse practitioners are integral in the management of the inpatient and outpatient settings. The target audience for this module are the APNs in the inpatient setting because they have minimal knowledge of the LACE tool and they will be responsible for implementing the module. At the institution, despite the use of follow-up phone calls and visiting nurses, there has been an influx of unplanned readmissions of patients to the hospital. Some of them are presenting to the emergency

room with complaints of cardiac arrhythmias, shortness of breath or surgical wound infections. Identifying those patients early on could potentially lead to a reduction in 30-days readmission and lead to better outcomes.

National Initiative

Unplanned readmission adds significant burden on the healthcare system. It is costly, and it can lead to adverse events for patients. In the United States, 20% of discharged patients return to the hospital and this account for $19.4 billion of hospital payment by Medicare (Low et al., 2015). Thirty-day readmissions are indications for quality of care that require accountability (Low et al., 2015). With rising healthcare cost, early identification of high-risk patients is important because it will help reduce preventable readmissions. To facilitate these measures, CMS reduce payments to inpatient services for hospital with excessive readmission effective October 1, 2012 (David et al., 2015). Section 3025 of the ACA financially penalizes institutions with high readmission rates and decreases money allocated to these institutions (Puckett, 2017). The ACA also added the hospital-readmission-reduction-program, which requires CMS to reduce payment to hospitals with excess readmission effective October 1, 2012 (Puckett, 2017). Value-based purchasing is another initiative geared towards encouraging hospitals and health systems to reduce readmissions through reduction in payments to hospital with high readmission rates (Robinson & Hudali, 2017). These policies make institutions accountable for the care that they provide to patients.

Institutions have then taken the initiative and developed measures to reduce unplanned readmission. Some of the metrics developed to reduce unplanned readmission

are the development of predictive models aimed at identifying patients at high-risk for readmission. The LACE index is one of those metrics and it can help identify those high-risk patients. The LACE tool is currently used at the institutions to identify high-risk heart failure patients. In this project, I developed a teaching module to educate the APN on the use of the LACE tool in cardiac surgery patients.

Staff Education

Quality improvement initiatives are the driving force for many changes in the healthcare system. With the new policies enacted in the ACA, institutions are motivated to develop and implement strategies to meet the new demands. Aside to decreasing health care cost, the key motivators for these initiatives is to improve patient's outcomes, provide care that is safe and efficient and promote patient's satisfaction. Several studies showed that staff education is critical for the accomplishment of these improvement initiatives. Stern, Grossman, Migliardi & Swallow (2014) used a convenient sample of 45 registered nurses that attended an educational program on heart failure to assess their knowledge's base. Stern et al (2014) administered a pretest and posttest to evaluate 30-days readmission rate for heart failure patients before and after administering the education module. The study showed that nurses gained an increased knowledge from the education program. Thirty days readmission rate was reduced after the staff attended the educational program, (Stern et al., 2014).

The success of quality improvement initiative depends upon the collaboration of the education, the staff, and the institution (Moayedi et al, 2017). Members of the projects are the APNs in the cardiac surgery service. The PDSA model is the framework used to

implement this project because it makes it possible for the institution to see the improvement quickly and make changes as needed.

Role of the Doctor of Nursing Practice Student

In this project, my role as a doctoral nursing student is to identify the problem then using evidenced-based studies, develop an educational module that targets the clinical staff and their knowledge of the LACE tool. Readmission is a source of stress for the patient and the family, and it account for billions of dollars in Medicare spending (Ritt & Taylor, 2016). This project is important to me because it affects the care that I provide to my patient. Unplanned readmission has a negative impact on patient's outcomes and institutions are implementing strategies to help reduce readmission rates. As a health professional, the APN must have the knowledge and skills necessary to assess patients with high risk for readmission. The positive outcome from the utilization of the LACE tool can significantly lead to a change in nursing practice.

Potential bias in this project is the stakeholders' background. The participants for this educational module are APNs and they are knowledgeable with the terminologies used in the module. The assumption is that they may have prior access to the LACE tool because of its usage with heart failure patients. Steps that I took to address this issue was to administer the pretest and posttest to assess whether the education module was effective.

Summary

As of October 2012, CMS makes hospital liable to payment generated from unplanned readmissions. As we noted in literature review, the new policies of the ACA

have brought this issue to the forefront. Unplanned readmission has become an indication for poor quality care and institutions are highly motivated to find predictive modules that would help them identify high-risk patients. In section 3, I develop the PPT for the staff education module of the LACE tool (Appendix A), the pretest and posttest (Appendix B) and review the evidence that supports the need for this project. I also reviewed the practice-focused question, sources of evidence, and procedures on how I plan to analyze and synthesize the data collected from this staff education project.

Section 3: Collection and Analysis of Evidence

Introduction

Unplanned readmission is an indication of a quality-of-care issue that requires accountability for institutions. It is costly to institutions, and it imposes a financial burden on the healthcare system. Clinical staff such as APNs are instrumental with helping to identify those high-risk patients. David et al (2015) looked at the outcome on readmission rate in patients in the acute care setting after adding a cardiac advanced practitioner to the care team. The study showed that the utilization of cardiac care nurse practitioner caring was associated with lower 30-days emergency department readmission and 30-days hospital readmission rates (David et al., 2015). In this project, APNs were educated on the use of the LACE index tool via a PowerPoint presentation. A pretest and posttest (Appendix B) were administered to assess their knowledge of the topic and to assess whether the education was effective. In this section, I introduce the teaching module (Appendix A) and discuss the use of pretest and posttest (Appendix B) to validate the effectiveness of the teaching module. I also discuss the sampling for the project and the data collection method.

Practice Focused Question

The use of predictive tools to assist with reducing readmission rates has a positive effect and helps clinicians identify high-risk patients. The role of the APN was important in this project and as a stakeholder; the education module was tailored for the APN. The APN sees the patient on admission and at discharge. Creating an education module that

targeted the APN was therefore important. The practiced-focused question for this project was:

PFQ: Will the use of an education module on the LACE tool improve staff knowledge on the use of the LACE tool?

Sources of Evidence

The ACA has made unplanned readmission the focus for many institutions. Section 3025 of the ACA financially penalizes hospitals with high readmission rates (Puckett, 2017). This policy makes institutions accountable for the care they provide on a national level, and it shifts the focus nationwide from a fee for service to patient centered outcome care (Puckett, 2017). Reducing readmissions is an important patient safety objective (Wasfy et al., 2017). The ACA established the Hospital Readmission Reduction Program. It requires that Medicare and Medicaid Services reduce payments to hospitals with higher-than-expected readmissions (Dharmarajan et al., 2017). With the passing of the Hospital Readmissions Reduction Program, 30-days readmission for conditions such as myocardial infarction, pneumonia and heart failure decreased rapidly (Wasfy et al., 2017). In 2016, CMS expanded their list to add coronary artery bypass graft surgery as one of the diagnoses that would be penalized for an unplanned readmission (Seifert, 2017).

CMS also instituted the Medicare Value Based Purchasing program to aid with reducing healthcare costs (Robinson & Hudali, 2017). Readmission is associated with increased mortality, and it is a marker for quality of care (Postel et al., 2014). At the institution, unplanned readmission remains an issue among cardiac surgery patients. One

of the focuses at the institution is the reduction of unplanned readmissions using predictive models. The LACE index tool has been in use in the clinical setting and the literature review indicates its effectiveness for identifying those high-risk patients. In a recent study, clinicians' ability to predict 30-days readmission is compared with the LACE tool (Miller, Nguyen, Vangala & Dowling, 2018). The study indicated that clinicians were able to independently predict readmission as well as the LACE tool (Miller et al., 2018). The researchers pointed out that although clinicians and the LACE tool were able to predict readmission, the LACE tool was more objective, and as such, its use can be beneficial in instances where clinicians have less experience (Miller et al., 2018).

For the LACE tool to be effective, the APN must become proficient with the use of the tool. The clinical staff needed to be trained and feel confident in the knowledge and skills that they acquired during this training module. Keeping basic knowledge and skills in clinical practice up to date is a requirement of the nursing code of practice (Aloysius, Platonos, Theakstone-Owen, Deierl, & Banerjee 2018).

Evidence Generated for the Doctoral Project

For the literature review I used databases from PubMed. GOOGLE, CINAHL, EBSCO host, Walden University library and Medline. The search was limited to articles dated from 2013-2020. Key terms and combination of search terms were: *LACE index, readmission, unplanned readmission,* and *staff education.* The literature review was limited to studies done in inpatient settings.

Unplanned readmission is costly and potentially a life-threatening event; identifying patients who are at high risk for readmission is important because it helps reduce preventable hospital readmission (Redzek et al, 2015). With the cardiac surgery patient, most common reasons for readmissions are postoperative infection, heart failure, cardiac dysrhythmia, and chest pain (Redzek et al, 2015). Most of the readmissions were due to postoperative complications rather than exacerbation of comorbidities (Redzek et al, 2015). There are several literature reviews supporting the need for a metric system to reduce readmission.

Unplanned readmission adds significant financial burden on the healthcare system. In the Unites States, 20% of discharged patients are readmitted, and this accounts for $19.4 billion of hospital payment by Medicare (Low et al., 2015). Thirty-day readmissions are an indication for quality of care that requires accountability (Low et al., 2015). There is even a greater need for institutions to develop and implement measures aimed at reducing unplanned readmissions. Some of the strategies developed to reduce unplanned readmission are the development and application of predictive models aimed at identifying patients at high risk for readmission.

Using a prospective cohort study, Walraven et al. (2010) developed and validated an easy-to-use tool for clinicians to quantify and identify patients who are at high risk for readmission or death after discharge from the hospital. Data for the study were collected from 4,812 medical and surgical patients discharged from 11 hospitals in Ontario, Canada, after an elective or emergent hospital admission (Walraven et al., 2010). The participants were mostly middle-aged, and 95% were independent with activities of daily

living and were free of serious comorbidity. The most common reasons for hospital admission were coronary syndromes, cancer diagnosis, heart failure, and coronary artery bypass and arthroplasty. Before discharge, research personnel interviewed the participants about their baseline functional status, living conditions, and chronic medical conditions. While the study looked at many variables that may influence unplanned readmission, the researchers narrowed it down to four variables that explained much of the variation in risk of early death or unplanned readmission: length of stay, acuity of the admission, comorbidity of the patient measured with the Charlson comorbidity index score, and emergency room visit in 6 months prior to admission . Patients were then contacted 1 month after discharge to determine if they had an unplanned readmission or death, and the scores using the LACE tool ranged from zero to 19. Of the 4,812 patients, 385 either died or were readmitted in less than 30 days. The study showed that the LACE tool might be of use for quality insurance when quantifying and identifying patients at high risk for readmission or death. The researchers recommended that future work on the use of additional variables might increase the accuracy of the tool (Walraven et al., 2010).

Zhou, Della, Roberts, Goh, and Dhaliwal (2016) systematically reviewed different predictive models looking at 28-days and 30-days unplanned hospital readmissions. They looked at 60 studies with 73 predictive models among which the LACE index was one. The study concluded that variables such as comorbidities, length of stay, and number of previous admissions remained the most cited predictive risk variables (Zhou et al., 2016).

A retrospective study of patients with a diagnosis of heart failure at a tertiary care center looked at the use of the LACE index tool for predicting patients who are at high risk for readmission. Using clinical data from patients' electronic records, Wang et al (2014) looked at how age, gender, ethnicity, length of hospitalization stays, comorbidities index, and the number of emergency room visit within 6 months would influence readmission in heart failure patients. The study concluded that the LACE index is slightly higher in patients with unplanned readmission while patients with a low LACE index score experienced no emergency room admission with the 30 days post index discharge (Wang et al., 2014).

Ritt and Taylor (2016) conducted a descriptive nonexperimental study that looked at the effectiveness of the LACE index in identifying patients at high risk for readmission within 30 days of discharge. They incorporated the LACE index into the admission process for participants from a post-acute care facility. There were 164 participants, and they were between the ages of 42 to 98 . The researchers created a training module available on the intranet and they conducted in-person training with each health care team member to ensure the correct use of the LACE index. Of the 169 participants, 19 (11.5%) had an unplanned readmission to the hospital within 30 days. Of the 19 who were readmitted, 16 were considered at high risk, and three were considered at moderate risk for readmission according to the score on the LACE index. The study concluded that the LACE index could be implemented at time of admission to alert nurses of those high-risk patients (Ritt & Taylor, 2016).

Participants

APNs are involved with the care of patients. They are an integral part of the healthcare system. They are involved with the admission and discharge processes making them the ideal stakeholder for this project. The education module was designed to educate the APN on the use of the LACE tool in the clinical setting. For the LACE tool to be effective, the clinical staff must become proficient with its use. They need to be trained and feel confident in the knowledge and skills that they acquired during the training module. Keeping basic knowledge and skills in clinical practice up to date is a requirement of the nursing code of practice (Aloysius et al., 2018). The five selected APNs for this project were from the cardiac surgery service. The practice-focused question for this DNP project was:

PFQ: Will the use of an education module on the LACE tool improve staff knowledge on the use of the LACE tool?

Prior to implementing the project, I obtained approval from Walden University Institutional Review Board (IRB). The education module (Appendix A) was presented at a date and time that was convenient for the APNs. I administered a pretest and posttest before and after the PPT to assess staff knowledge on the topic.

Procedures

In this EBP project, I used a PPT to educate the staff on the LACE index tool. I then evaluated the effectiveness of the education method using the pretest-posttest design to evaluate the level of staff knowledge before and after the implementation of the education module. This was achieved by administering the pretest before presenting the

PPT to assess the knowledge base of the staff. A posttest was administered after the presentation to assess if the education program was effective and extend the knowledge of the clinical staff. The data from the pretest and posttest was compared to assess for any differences in the knowledge base of the staff. The presentation lasted no more than 30 minutes with time allocated for the staff to ask questions.

Protections and Setting

To ensure that ethical protection of the participants is protected, I obtained approval from Walden University's IRB (approval # 09-10-20-0441654). Approval was also obtained from the site IRB and verbal consent from the participants before presenting the module. Following directions from the site IRB, I requested a waiver of documentation of consent from the site and I provided each participant with a research subject consent form that provided detailed information about the study and their participation in the study. Permission to use the site research subject consent template was obtained from the site research coordinator. I also obtained written consent to use the LACE index tool from Walraven, the lead researcher (Appendix D). Participants were not obligated to participate in the teaching module, and they may leave at any time during the presentation. Participants' privacy and confidentiality was protected during the project. The pretests and posttests did not include the participant's name and their responses were only shared in this project.

The setting for this evidence-based project was an acute care center in the Northeastern area of the United States. The hospital serves approximately 440,000 patients in the county and adjoining communities. The top primary diagnoses with

excessive readmission rates are hip-knee replacement (1.1337), heart failure (1.1064), COPD (1.0559), MI (0.9658) (CMS, 2015. Authorization from the site was obtained before conducting the educational module.

Data Analysis and Synthesis

The data for this project was analyzed using a descriptive analysis comparing the intervention before and after to assess for any increased in knowledge base. The pretest served as the baseline measure to assess the knowledge of the staff before initiating the education session. The results of the pretest and posttest were analyzed and compared using descriptive statistics. The results were anonymous and recommendation for future clinical studies were addressed. Steps taken to protect the security of the data included the use of no name on the pretest and posttest. As the conductor for this study, I was the only one who accessed the data. The results of the pretest and posttest were tabulated manually and stored in a computer with password protection that can only be accessed by me. At the completion of the study, all hard copies that may contain identifiable information were shredded.

Assumptions and Limitations

One assumption of this study is that fostering knowledge of the LACE index will ultimately reduce readmission rate. Developing the education module to educate the clinical staff will ultimately improve staff knowledge and help identify those at high risk for readmission. There were a few limitations noted in this project. The first limitation that I encountered was the sample size. The education module was limited to the small group of APNs on the cardiac surgery team and the data was retrieved from a

small sample size. The second limitation was the use of a convenient sample. Use of this sample will make it harder to replicate the pretest and posttest to those not familiar with cardiac surgery. The third limitation was the delivery method for the project. As a result of COVD 19, the teaching module was conducted in multiple sessions. It was informal and done at a time that was convenient for each participant.

Summary

The methodology is an important aspect of the project. It validates and gives it credibility. The use of pretest and posttest are effective in the project because they allow us to evaluate and revise the teaching module if indicated. Section 4 is an evaluation of the results of the staff education module and its implications in nursing. In section 4, I discuss the strength and limitation of the teaching module and make recommendation on how this project may be applicable in the clinical setting.

Section 4: Findings and Recommendations

Introduction

Unplanned readmission is an issue at the institution. The use of home care nurses and discharged phone calls are not sufficient for eliminating unplanned readmission. Review of the literature indicated that the use of the LACE tool has been effective with predicting patients who are at high risk for readmission. The LACE tool may be beneficial with cardiac surgery patients in providing an additional tool that the practitioner may use to identify patients who are at high risk for readmission. In Section 4, I addressed the project's findings and recommendations. The purpose of this doctoral project was to teach the APN how to use the LACE index tool to assess whether a patient is at risk for unplanned readmission. The practice-focused question was:

PFQ: Will the use of an educational module on the LACE tool improved staff knowledge on the use of the LACE tool?".

In the project, I conducted a PPT for the APNs to address the lack of knowledge regarding the LACE tool. The PPT was presented in a format that was easy to understand. It included cases scenarios that allowed attendees to test their knowledge as the presentation progressed. The outcome that was expected from the teaching module was that it would promote knowledge and lead to a reduction in unplanned readmissions. The source of evidence for this educational project came from the extensive literature review of health-related databases and peer reviewed articles conducted on unplanned readmission and use of LACE index tool. I used the PDSA model as a framework for developing the project and facilitating knowledge sharing among the participants and the

institution. Pre- and posttests were used as measurements to assess the participants' knowledge. The scores were tabulated, and they were statistically analyzed using mean score and standard deviation. I performed proportional analysis to evaluate whether an increase in knowledge occurred after the educational session. Results of the pre- and posttests were evaluated to determine if the education module was effective with increasing staff knowledge regarding the use of LACE tool.

Findings and Implications

Five APNs participated in the educational program. The PPT presentation was conducted individually with the participants because it was difficult to get everyone together due to schedule conflicts and the current health climate (COVID 19). The institution did not allow group meetings at the time. Prior to implementing the presentation, the pre- and posttest, Appendix C, and consent forms for the study were sent by e-mail to each participant asking them to complete the forms and to e-mail them back. After receiving the pretest and consent forms, I met with each participant individually and conducted the PPT presentation. The education session was conducted on the site and lasted 30 minutes with each attendee. Total participants for the presentation were five APNs, and they all completed the pretests and posttests. The results of the pretest and posttest are summarized in Table 1.

Table 1

Results of Pretest and Posttest

Participants	Pretest (X_1)	Posttest(X_2)	Differences(X_2-X_1)
1	100	100	0
2	92	100	8
3	84	92	8
4	92	100	8
5	100	100	0

Note. $T = 2.45$. Degree of freedom is $n-1 = 4$. $\alpha = 0.01$. t distribution score is 4.60.

The pretest scores ranged from 84% to 100% while the posttest scores range from 92% to 100%. The average test score for the pretest was 93.6% and the average test score for the posttest was 98.4%. The participants ($N = 5$) did well on the pretest as well as the posttest. There was not a significant difference noted between the pretest and posttest after the use of the educational module. The implication from the finding was that the teaching module did not show an increase in knowledge as predicted. The results of the pretest showed that there was no deficiency in knowledge. This is likely because the participants had prior knowledge of the LACE tool enabling them to do well on the pretest or it may be because questions on the pretest were not challenging.

In future projects, it would be best to use the teaching module with clinicians with no prior knowledge of the LACE tool. It would give a better assessment of the effectiveness of the module. Despite the unexpected findings, the educational module enhanced the clinicians' knowledge of the tool: posttest scores were higher (98.4%) than the pretest scores (93.6%). The teaching module can be replicated in other settings with clinicians who either want to learn or enhance their knowledge of the LACE index tool.

The advantage of this study is that the education module is now available at the institution and it can be of use to clinicians.

Some readmissions are unavoidable because the severity of a patient's health condition may make it difficult to avoid readmission. Nonetheless, risk assessment tools such as LACE index are becoming valuable when it comes to assessing a patient's risk of readmission (Vat, Common, Laizner, Borduas & Maheu, 2015). With the use of the LACE tool, clinicians can evaluate a patient's condition and communicate effectively with multidisciplinary team on the discharge planning that best suits the patient (Vat et al., 2015). The outcomes of the project indicated that the teaching module may be applicable to other settings and serve as a guide to either enhance knowledge or educate clinicians on how to use the LACE tool. The purpose of the LACE tool is to enhance discharge planning (Vat et al., 2015), and it serves as an additional tool that clinicians may use to evaluate a patient's risk of readmission. This project also has the potential to effect positive social changes by decreasing the incidence of poor patient outcomes, reduce readmission, and minimize healthcare cost.

Recommendations

It is important for clinicians to be proficient with the use of the LACE tool. While readmission may be unavoidable for some chronic conditions, the use of the LACE tool can be beneficial in this population as well. It can be used to identify those at high risk for readmission and assist with assigning appropriate discharge planning that is best suited for the needs of these patients. The results of the pretest and posttest were not significantly different because the participants had prior knowledge of the LACE tool.

However, the module may be use in other settings with clinicians with no prior knowledge. Other recommendations derived from this project are the importance of staff education. The study confirmed that the module may also be used to enhance clinicians' knowledge. Providing educational modules on a continuous basis will be useful to the clinical staff. Another recommendation is to update the teaching module to add current studies on the LACE tool. For future projects, the use of an audience with no prior knowledge of the LACE tool would give a better assessment of the effectiveness of the teaching module.

Contribution of the Doctoral Project Team

The DNP team consisted of the five APNs who agreed to participate in the study. The team was receptive and supportive throughout the delivery of the teaching module. They completed the pretest, posttest, and consent forms as directed. The institution was also cooperative with the project and granted the approval to conduct the study on site. While the result of the study did not show significant improvement in knowledge, I would recommend its use to clinicians who wants to enhance their knowledge of the LACE tool

Strength and Limitations of the Project

The result of the study was based on a small sample with clinicians who showed prior knowledge of the LACE tool. The advantage of this module is that it is now available, and it can be used to either enhance knowledge or educate clinicians on the use of the tool. Knowledge of the LACE index is beneficial in helping clinicians with early identification of patients at high risk for readmission to receive intervention to prevent

potentially avoidable readmission. Positive aspects of the study are that attendees verbally expressed that the one-on-one teaching was effective and allowed them to ask questions right away. The presentation was conducted at a time that was convenient for the attendee. The information was not overwhelming or difficult to understand because the attendees were open heart surgery practitioners and had prior knowledge of risk assessment tools. The positive feedback received from the APNs support the need for this teaching module in the clinical setting.

There were some unanticipated limitations that may have impacted the project. With the current healthcare climate, it was not possible to conduct the presentation with everyone at the same time. The institution did not allow in person meetings. Attempts to schedule virtual presentation with the APNs were not successful because none of them had Zoom installed on their computers. The educational sessions were conducted in person with each participant at times that were convenient for each person. The posttest was administered after the presentation and some were returned the same day while others were left in my mailbox after completion.

Another limitation of the project was the small sample size, making it difficult to generalize the result of the study. With the current health climate, COVID 19, it was difficult to conduct the session with a large group. Nonetheless the individual meetings yielded some positive outcomes.

Section 5: Dissemination Plan

The project was developed to educate APNs in the open-heart surgery unit on the use of the LACE tool and to increase their knowledge base. With the rising healthcare costs, institutions are now using risk assessment tools in the clinical settings to improve patient care and minimize hospital expenditures. The teaching module can be used to either train or enhance the knowledge of the clinician on how to use and incorporate the LACE tool in their practice. The module was conducted with the five participants individually. The teaching module can be disseminated to clinicians, nursing staff, and multidisciplinary teams that are involved in the patient's discharge planning. The module is easy to understand, and the information is easy to retain making it a great tool for clinicians and the nursing staff to use to expand their knowledge. The current healthcare climate of COVID 19 has affected the way information are now disseminated. It was not possible to conduct the presentation with large group of individuals. Modes of delivery such as virtual meetings may be more effective when reaching out to a larger audience.

Analysis of Self

The primary goal of my project was to develop a teaching module to educate fellow practitioners on the use of the LACE tool. As a practitioner, I enjoyed this learning experience because I learned how to develop and implement a project that was meaningful. I have been an open-heart nurse practitioner for many years, and I have seen the effect of unplanned readmission on patient care. Patients and family members usually expressed discouragement because they must return to the hospital so soon after discharge. The need to address this topic was important to me because the outcomes

would improve patient satisfaction and patient care. Developing this module and conducting the literature review were very productive. They taught me how to incorporate evidence-based practice into my profession. The project has improved my professional growth as a doctoral APN. I selected a PPT with case scenarios to disseminate the teaching module because of its visual effect and because it gives the learner an in-depth understanding of the material.

The participants for this project were my colleagues and their positive feedback was overwhelming and helped me through this journey. There were some unanticipated events that occurred along the way. The pandemic of COVID 19 made it impossible to conduct the study as originally planned. On-site meetings were not allowed at the institution; as a result, I had to find other modes to deliver my presentation. Attempts to deliver the teaching module virtually was not successful because the five participants did not use zoom or other virtual apps. Meeting with each member at times that were convenient for them was the best method. Addressing the topic as an APN was interesting for me because the use of the LACE tool was one that clinicians can use and incorporate in their practice as an additional tool for identification of high-risk patients and discharge planning.

As a scholar, the doctoral education that I received prepares me to play an essential role in healthcare. Conducting the project gave me the skills to recognize and assess a gap in practice. Readmission is still an issue for the open-heart surgery patient and identifying those patients early on will have a positive impact on patient care. This knowledge will allow the clinician to tailor the care that is best suited for the patient.

Keeping APNs proficient on the use of the LACE tool is an effective way to ensure staff knowledge. The result of the study further demonstrated that it is best to use the module with participants with no knowledge of the tool to better assess its effectiveness.

Summary

In summary, this doctoral project is significant for nurses because it increases professional growth, fosters teamwork, and improves communication with the interdisciplinary team. My initial goal when I decided to do this project was to address the increased readmission rate among cardiac surgery patients. The institution has been interested in finding a tool to identify high risk patients. Review of the literature indicated that the LACE tool is one that clinicians may implement in the clinical setting to identify high risk patients. The use of a teaching module that would teach the APNs how to use the LACE tool was an effective way to disseminate the information to clinicians. While the study did not yield an increased in knowledge, the outcome of the teaching module indicated that the module would be more effective with an audience with no prior knowledge of the LACE tool. Revising the questions on the pretest and posttest to make them more challenging may be another option.

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Appendix A: Staff Education on the Use of the LACE Tool in Clinical Settings

Staff education on the use of the lace tool in clinical settings

By
Carrole Dorcent RN, APN-C

Learning objectives

- At the end of the presentation, the learner will be able to:
- Know the indications for the LACE index
- Know what the LACE index tool is
- Know how to use and score the LACE index tool in the clinical setting
- Know the limitation of the LACE index tool

Goals

- Improve staff knowledge
- Ultimately decrease unplanned readmissions

Background

- Unplanned readmission is an issue for many institutions. It is associated with poor quality care and affects institutions financially (Postel, Frank, Barry, Shemin & Benharash, 2014)
- Unplanned readmission has a negative impact on institutions and it is associated with an increased in healthcare cost and adverse patients' outcomes (Low, Lee, Ong, Wang, Tan, Thumboo & Liu, 2015).
- Unplanned readmission adds significant financial burden to the healthcare system. According to Zhou, Della, Robert, Goh & Dhaliwal (2016), 20% discharged patients in the US are readmitted and this account for $17.4 billion of hospital payment by Medicare.

Background

- Section 3025 of the Affordable Care Act financially penalizes hospitals with high readmission rates to prevent future readmissions and decreases spending (Puckett, 2017). This policy makes hospitals accountable for the care it provides on a national level (Puckett, 2017).
- As of 2008, the Centers for Medicare and Medicaid Services (CMS) imposed financial penalties for hospitals with 30-days readmissions higher than the national database (CMS 2015).

Background

- CMS instituted the Medicare Value Based Purchasing Program to aid with reducing healthcare cost by reducing payment to hospitals with higher than expected readmission rates (Robinson & Hudali, 2017)
- Unplanned readmission is associated with increased mortality and it is used as a marker for quality of care (Postel et al., 2014).
- According to Shaffer, Cui and Wanderer (2019), readmission in the United States is considered a quality indicator and accountability measure.

What is the LACE index

- This Canadian Lace Claims-based model was originally developed in Canada and it was designed to predict 30-days mortality or unplanned readmission for patients discharged less than 30 days (Wang et al., 2014).
- The LACE tool was developed by Walvaren et al using data from 1,000,000 Canadian patients' records. Using a prospective cohort study, Walvaren and his colleagues validated an easy to use index that clinicians may use to quantify and identify the rate of readmission or death after discharge. Data were collected from 4812 medical and surgical patients discharged from 11 hospitals in Ontario, Canada after an elective or emergent hospital admission (Walraven et al., 2010)

What is the LACE index

Before discharge, patients were interviewed and asked about their baseline functional status, living conditions and chronic medical conditions. Patients or family were then contacted one month after discharge to determine if they had any unplanned readmission or death (Walraven et al., 2010).

Participants were mostly middle aged and 95% were independent with activities of daily living and were free of serious comorbidity. The most common cause of hospital readmission were coronary syndromes, cancer diagnoses, heart failure, coronary artery bypass graft surgery (Walraven et al., 2010).

What is the LACE index

- Walraven et al (2010) looked at 48 clinical and demographic variables that could influence readmission and found only four of them were independently associated with death or readmission after discharge.
- The four variables used in the model are: Length of stay, acuity of admission, comorbidity of the patient which was measured with the Charlson index score and number of emergency room visit in the past 6 months before admission (Walraven et al., 2010).

What is the lace Index tool

- The LACE index had a potential score ranging from 0 to 19
- The study showed that the expected probability of death or readmission within 30 days of discharge was 2% for a LACE score 0 to 43.7% for a LACE score of 19 (Walraven et al., 2010).
- Of the 4812 participants, 385 patients were either dead or readmitted within 30 days using the LACE tool (Walraven et al., 2010).
- The study concluded that the LACE index can be used to quantify risk of death or unplanned readmission within 30 days after discharge from the hospital (Walraven et al., 2010).

What is LACe Index Tool

- Several studies have evaluated the predictive value of the LACE index tool and they showed that the LACE index has a moderate to high predictive value in identifying those patients at risk for readmission and a high predictive value in identifying those patient at risk to return to the emergency room.

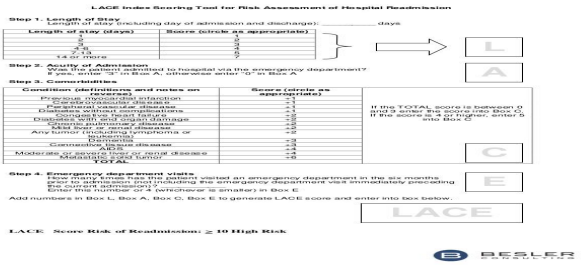
http://www.Besler.com/lace-risk-score/

Variables of the LACE Index tool

- The LACE Index Tool incorporates four variables to identify patients at high risk for unplanned readmission- LACE is an acronym and it stands for:
- L-stands for the length of stay
- A-stands for the acuity of the admission-specifically the patient
- C-stands for comorbidities
- E-stands for the number of emergency room visits within the last 6 months

https://www.besler.com/lace-risk-score/

Using the LACE Index in the clinical setting



LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

Step 1. Length of Stay
Length of stay (including day of admission and discharge): _____ days

Length of stay (days)	Score (circle as appropriate)
1	1
2	2
3	3
4	4
5	5
6	6
7-13	7
14 or more	8

L

Step 2. Acuity of Admission
Was the patient admitted to hospital via the emergency department?
If yes, enter "3" in Box A; otherwise enter "0" in Box A

A

Step 3. Comorbidities

Condition (definitions and notes on appropriate coding)	Score (circle as appropriate)	
Previous myocardial infarction	+1	If the TOTAL score is between 0 and 3 enter the score into Box C. If the score is 4 or higher, enter 5 into Box C
Cerebrovascular disease	+1	
Peripheral vascular disease	+1	
Diabetes without complications	+1	
Dementia	+2	
Chronic pulmonary disease	+2	
Connective tissue disease	+2	
Any tumor (including lymphoma or leukemia)	+2	
Ulcer disease	+3	
Connective tissue disease	+3	
Liver disease	+4	
Moderate or severe liver or renal disease	+4	
Metastatic solid tumor	+6	
TOTAL		

C

Step 4. Emergency department visits
Number of emergency department visits visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission) ____
Enter this number or 4 (whichever is smaller) in Box E

E

Add numbers in Box L, Box A, Box C, Box E to generate LACE score and enter into box below.

LACE

LACE Score Risk of Readmission: ≥ 10 High Risk

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Using the lace Index in the clinical setting

- Using the LACE scoring tool, add the sum of all the points and enter the total points in the box at the bottom of appendix B to get the LACE score.
- The score on the LACE scoring tool reflects the predicted rate of readmission within 30 days of discharge.

Scoring the LACE Index Tool

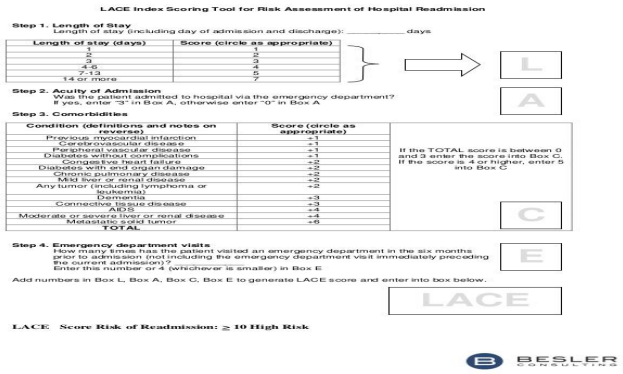
- The LACE Index ranges from 0-19 and it predicts the rate of readmission within 30-days of discharge
- A score of 0-4 indicates low risk for readmission
- A score of 5-9 indicates moderate risk for readmission
- Score of greater or equal to 10 is equal to high risk for readmission
- The score is calculated upon discharge

https://wwwbesler.com/lace-risk-score/

Case study 1

- 65 years old female with past medical MI, chronic pulmonary disease, PVD and controlled diabetes type 2 without complications. She presented to the emergency room with complaints of COPD exacerbation. Prior to this admission, she has been to the ED six times for complaints of COPD exacerbation. Hospital length of stay was 5 days. Calculate the LACE index score?
- a) score 0-4 (low) b) score 5-9 (moderate) c) score > 10 (high)

Case studies
(use the chart to calculate the lace score)



LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

Step 1. Length of Stay
Length of stay (including day of admission and discharge): _____ days

Length of stay (days)	Score (circle as appropriate)
1	1
2	2
3	3
4-6	4
7-13	5
14 or more	7

L

Step 2. Acuity of Admission
Was the patient admitted to hospital via the emergency department?
If yes, enter "3" in Box A, otherwise enter "0" in Box A

A

Step 3. Comorbidities

Condition (definitions and notes on reverse)	Score (circle as appropriate)
Previous myocardial infarction	+1
Cerebrovascular disease	+1
Peripheral vascular disease	+1
Dialysis or chronic renal insufficiency	+2
Congestive heart failure	+2
Diabetes with end organ damage	+2
Chronic pulmonary disease	+2
Mild liver or renal disease	+2
Any tumor (including lymphoma or leukemia)	+2
Moderate liver disease	+3
Connective tissue disease	+3
AIDS	+4
Moderate or severe liver or renal disease	+4
Metastatic solid tumor	+6
TOTAL	

If the TOTAL score is between 0 and 3 enter the score into Box C.
If the score is 4 or higher, enter 5 into Box C

C

Step 4. Emergency department visits
How many times has the patient visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission)?
Enter this number or 4 (whichever is smaller) in Box E

E

Add numbers in Box L, Box A, Box C, Box E to generate LACE score and enter into box below.

LACE

LACE Score Risk of Readmission: ≥ 10 High Risk

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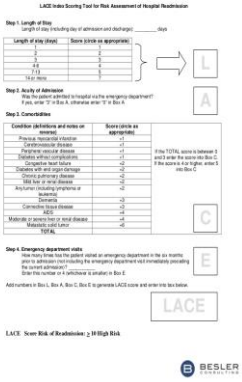
Case study 2

- 29 years old male with past medical history of diabetes type 2 without complications presented to the emergency room for complaints of dizziness and hypoglycemia. Length of hospitalization was 2 days and patient had no emergency room visit in prior six months. What is the LACE score?
- a) score 0-4 (low) b) score 5-9 (moderate) c) score > 9 (high)

Case studies
(Use the chart to calculate the lace score)


LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

Step 1. Length of Stay
Length of stay (including day of admission and discharge): _____ days

Length of stay (days)	Score (circle as appropriate)
1	1
2	2
3	3
4-6	4
7-13	5
14 or more	6

L

Step 2. Acuity of Admission
Was the patient admitted to hospital via the emergency department?
If yes, enter "3" in Box A, otherwise enter "0" in Box A

A

Step 3. Comorbidities

Condition (definitions and notes on reverse)	Score (circle as appropriate)
Previous myocardial infarction	+1
Cerebrovascular disease	+1
Peripheral vascular disease	+1
Diabetes without complications	+1
Congestive heart failure	+2
Diabetes with end organ damage	+2
Chronic pulmonary disease	+2
Mild liver or renal disease	+2
Any tumor, leukemia or lymphoma or metastatic	+2
Dementia	+3
Connective tissue disease	+3
AIDS	+4
Moderate or severe liver or renal disease	+4
Metastatic solid tumor	+6
TOTAL	

If the TOTAL score is between 0 and 3 enter the score into Box C. If the score is 4 or higher, enter 5 into Box C

C

Step 4. Emergency department visits
How many times has the patient visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission)?
Enter this number or 4 (whichever is smaller) in Box E

E

Add numbers in Box L, Box A, Box C, Box E to generate LACE score and enter into box below.

LACE

LACE Score Risk of Readmission: ≥ 10 High Risk

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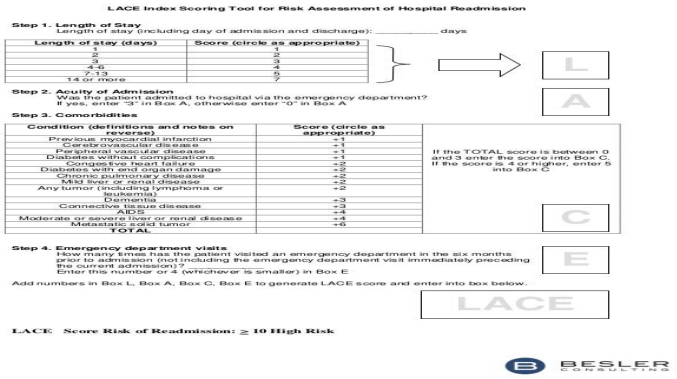
Case study 3

- 40 years old male with medical history of diabetes without complications. He underwent an open heart surgery for removal of myxoma. He was discharged home after four days and his recovery was uneventful. He was readmitted to the emergency room four days later with complaints of shortness of breath and pleuritic chest pain. Patient had no emergency room visits in last six months. What is the LACE score?
- a) 8 (moderate) b)11 (High) c) 5 (moderate)

Case studies
(Use the chart to calculate the LACE score)



LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

Step 1. Length of Stay
Length of stay (including day of admission and discharge): _____ days

Length of stay (days)	Score (circle as appropriate)
1	1
2	2
3	3
4-6	4
7-13	5
14 or more	7

L

Step 2. Acuity of Admission
Was the patient admitted to hospital via the emergency department?
If yes, enter "3" in Box A, otherwise enter "0" in Box A

A

Step 3. Comorbidities

Condition (definitions and notes on reverse)	Score (circle as appropriate)
Previous myocardial infarction	+1
Cerebrovascular disease	+1
Peripheral vascular disease	+1
Dementia (any type, including Alzheimer's)	+2
Congestive heart failure	+2
Diabetes with end organ damage	+2
Chronic pulmonary disease	+2
Mild liver or renal disease	+2
Any tumor (including lymphoma or leukemia)	+2
Connective tissue disease	+3
AIDS	+4
Moderate or severe liver or renal disease	+4
Metastatic solid tumor	+6
TOTAL	

If the TOTAL score is between 0 and 3 enter the score into Box C
If the score is 4 or higher, enter 5 into Box C

C

Step 4. Emergency department visits
How many times has the patient visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission)? _____
Enter this number or 4 (whichever is smaller) in Box E

E

Add numbers in Box L, Box A, Box C, Box E to generate LACE score and enter into box below.

LACE

LACE Score Risk of Readmission: ≥ 10 High Risk

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Limitation

- The score can only be calculated after the patient is discharged.
- The mean age of the participants in the original Canadian study population was 59 years old (Low et al., 2017).
- The LACE index may not be applicable to all demographic because it was initially used in participants free of serious comorbidities with more than 75% having a comorbidity index score of zero (Smith et al., 2016).

Conclusion

- With the new policies in the ACA, unplanned readmission has become a priority for institutions and it has a negative impact on the healthcare system. Institutions are now more motivated to incorporate the use of screening tool in the clinical setting. The LACE index looks at 4 parameters (Length of stay-acuity of admission-comorbidities-ER visit within last 6 months). The LACE score reflects the predicted rate of readmission with 30 days of discharge.
- In conclusion, despite its limitation, the LACE tool can be used as an additional tool to help clinicians identify patients who are at high risk for readmission.

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Questions?

Appendix B: Pretest and Posttest

1. What does the acronym LACE index stand for?
    a. **L**ength of stay **A**cuity of admission **C**o-morbidities-**E**mergency room visits
    b. **L**icensure **A**ccreditation **C**ertification **E**ducation
    c. **L**istening **A**nd **C**ommunication **E**nhancement
    d. **L**anguage **A**nd **C**ultural **E**xchange

2. What is the indication for the LACE index?
    a. It is used to predict the risk of unplanned readmission
    b. It identifies patients at high-risk for readmission
    c. It reduced readmission rates
    d. All of the above

3. A LACE score of 0-4 indicates
    a. Low risk
    b. Moderate risk
    c. High risk
    d. Average risk

4. A LACE score of 6-9 indicates:
    a. Low risk
    b. Moderate risk
    c. High risk
    d. Average risk

5. A LACE score of 10 or greater indicates:
    a. Low risk

b. Moderate risk

c. High risk

d. Average risk

6. Using the case study calculate the LACE index score: 70-year-old female with past medical history of HTN, DM2 and CHF presented to the ED for the fourth time in 6 months with recurrent CHF exacerbation. She was discharged from the hospital after undergoing coronary revascularization. During her post-operative course, she developed paroxysmal atrial fibrillation and was discharged home on day five. She has been back to the ED once already with complaints of SOB and she was sent home on additional doses of furosemide with recommendation to follow up with her cardiologist. What is the LACE score?

    a. 19

    b. 12

    c. 8

    d. 5

7. Calculate LACE index score for this case: 54 years old woman with past medical history of diabetes type 2 and COPD presented to the ED with complaints of palpitation. EKG shows rapid atrial fibrillation rate 140's. She recently had aortic valve replacement 2 weeks ago and her length of hospitalization was 5 days. She was started on Cardizem drip and admitted for observation overnight then sent home the next day. What is the LACE score?

    a. 19

    b. 12

    c. 8

    d. 9

8. Calculate the LACE index score: 65 years old female with past medical history of CHF, diabetes type II with end organ damage, MI underwent urgent coronary artery bypass graft surgery for recurrent chest pain. Her recovery was complicated by SOB and pleural effusion requiring thoracentesis. She was discharged home on day 5. She presented to the ED with complaints of SOB, edema bilateral lower

extremities on day after discharge. She had three ED visits in the last 6 months for CHF exacerbation. What is the LACE score?

a. 16
b. 8
c. 18
d. 9

9. Calculate the LACE index score: 40 years old male with past medical history of HTN, diabetes type II without complications. He presented to the ED for complaints of chest pain and SOB. He underwent open-heart surgery for the removal of a myxoma. His recovery was uneventful, and he was discharged home on day 4. He was readmitted to the hospital through the ED with SOB and pleuritic chest pain. He had no recent ED visit in last 6 months. What is the LACE score?

a. 16
b. 8
c. 18
d. 9

10. Calculate the LACE index score: 70 years old female with past medical history of CVA, previous MI, and COPD underwent emergent coronary artery bypass graft surgery. She was discharged home after 7 days. She was readmitted to the ED 2 days later with complaints of palpitation, atrial fibrillation, and SOB. She had four ED visits in last 6 months. What is the LACE score?

a. 16
b. 8
c. 18
d. 9

11. Calculate the LACE index score: 60 years old male with past medical history diabetes type 2 with no complications presented to the ED with recurrent SOB. He underwent aortic valve repair for aortic stenosis. His recovery was without complications and he was discharged home on day 5. He presented to the ED 10 days later with complaints of SOB. Echocardiogram indicates no pericardial

effusion, and he was treated with diuretics and admitted overnight for observation. He had no previous ED admission in last 6 months. What is the LACE score?

a. 16
b. 8
c. 18
d. 9

12. Calculate the LACE index score: 45 years female who has been otherwise healthy presented to the ED with complaints of SOB. She eventually had a mitral valve replacement for endocarditis. She has no past medical history. Her recovery was uneventful, and she was discharged home on day 4. She presented to the ED 5 days later with complaints of palpitation and SOB and EKG showed SVT. She was admitted overnight for and electrophysiologist was called on consult. What is the LACE score?

a. 16
b. 8
c. 18
d. 9

Appendix C: LACE Index Screening Tool

LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

Step 1. Length of Stay

Length of stay (including day of admission and discharge): _____ days

Length of stay (days)	Score (circle as appropriate)
1	1
2	2
3	3
4-6	4
7-13	5
14 or more	7

L

Step 2. Acuity of Admission

Was the patient admitted to hospital via the emergency department?
If yes, enter "3" in Box A, otherwise enter "0" in Box A

A

Step 3. Comorbidities

Condition (definitions and notes on reverse)	Score (circle as appropriate)	
Previous myocardial infarction	+1	If the TOTAL score is between 0 and 3 enter the score into Box C. If the score is 4 or higher, enter 5 into Box C
Cerebrovascular disease	+1	
Peripheral vascular disease	+1	
Diabetes without complications	+1	
Congestive heart failure	+2	
Diabetes with end organ damage	+2	
Chronic pulmonary disease	+2	
Mild liver or renal disease	+2	
Any tumor (including lymphoma or leukemia)	+2	
Dementia	+3	
Connective tissue disease	+3	
AIDS	+4	
Moderate or severe liver or renal disease	+4	
Metastatic solid tumor	+6	
TOTAL		

C

Step 4. Emergency department visits

How many times has the patient visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission)? _____
Enter this number or 4 (whichever is smaller) in Box E

E

Add numbers in Box L, Box A, Box C, Box E to generate LACE score and enter into box below.

LACE

LACE Score Risk of Readmission: ≥ 10 High Risk

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Consents email to use the LACE tool.

Appendix D

LACE index tool and DNP project

From: Carl Vanwalraven <cvanwalraven@toh.ca>
Sent: Friday, January 22, 2021 9:42 AM
To: Carrole Dorcent <carrole.dorcent@waldenu.edu>
Subject: RE: LACE index tool and DNP project

Sure thing.
Best of luck with your work.

Carl van Walraven MD MSc FRCPC
Professor, Department of Medicine / School of Epidemiology and Public Health, University of Ottawa
Senior Scientist, Ottawa Hospital Research Institute
Site Director, ICES uOttawa
Ph: 613-761-4903 Fx: 613-761-5492

From: Carrole Dorcent <carrole.dorcent@waldenu.edu>
Sent: Friday, January 22, 2021 12:42 PM
To: Carl Vanwalraven <cvanwalraven@toh.ca>
Subject: LACE index tool and DNP project

Good Morning Dr Van Walraven,

I am a doctoral student at Walden University working on my doctoral project. My topic is "educating clinicians on the use of the LACE index tool to reduce readmission rate". I am asking for permission to include the LACE tool in my powerpoint presentation.

Any questions, I can be reached at 973 204 3841
Thank you

Carrole Dorcent.