

Research Article

A Quality Improvement Project to Improve Sepsis Survivorship through Nurse Education in a Medical Surgical Unit

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***Corresponding author:** Thomas P, Johns Hopkins School of Nursing, Johns Hopkins University, 525 N Wolfe Street, Baltimore, Maryland, 21205, USA**Received:** March 19, 2022; **Accepted:** April 25, 2022;**Published:** May 02, 2022**Abstract**

Aim: Sepsis readmission has become one of the significant threats to our healthcare system. The purpose of this project was to decrease the 30-day sepsis readmission rate of a single medical surgical unit by increasing nurses' knowledge on the challenges of sepsis survivorship.

Design: A quality improvement project with a pre/post-test design was used.

Methods: Nurses' knowledge on sepsis survivorship and 30-day sepsis readmission rate of the unit at baseline and immediately after an educational intervention were compared. The intervention was an online educational module on sepsis survivorship. The SQUIRE guideline was used.

Results: Results of the final sample showed a statistically significant improvement in nurses' knowledge on sepsis survivorship. The effect of the intervention on 30-day sepsis readmission rate was inconclusive given the effect of the pandemic on readmission rate.

Keywords: Sepsis; Readmission; Patient education; Survivorship

Introduction

Readmission after an initial hospital discharge has become one of the significant threats to the healthcare system. Hospital readmission is estimated to cost 41.3 billion U.S. dollars annually [1,2]. Increased morbidity, mortality and financial burden are associated with readmission [1]. As a result, Centers for Medicare, and Medicaid Services (CMS) has included 30-day readmission as one of the outcome measures of the quality of care and incentivizes hospitals to reduce readmissions by linking payment with readmission measures [3]. According to the 2013 nationwide readmission database, of all 30-day hospital readmissions, the most common index hospitalization diagnosis was sepsis [4]. Given the dangerous consequences associated with readmissions, acquiring evidence to guide strategies to prevent readmissions and to improve survivorship among adult sepsis survivors is of paramount importance.

Background

Out of 49 million people hospitalized with sepsis worldwide, 38 million survive sepsis hospitalization [5]. Each year more than 1.7 million adults develop sepsis in the United States, more than 1.4 million survive sepsis, and more than a third of sepsis survivors require readmission [6-8]. National 30-day sepsis readmission rate ranges between 17.5% and 29% [9-11]. In the project site, for calendar year 2019 the hospital wide 30-day sepsis readmission rate was 20%. Increase in the number of sepsis survivors with increased morbidity requiring readmission causes a huge financial burden to the patient, family, and the health care system.

There are modifiable and non-modifiable risk factors resulting in sepsis readmission. Patient socio-demographics, comorbidities,

and index hospitalization characteristics were proven to influence the 30-day sepsis readmission [1]. Among the index hospitalization characteristics resulting in readmission, inadequate discharge planning is one of the modifiable risk factors that provide room for improvement. Literature recommends including patient education on sepsis survivorship in discharge planning as an ideal approach in preventing sepsis readmission [11].

A review on sepsis readmission pointed out the importance of survivorship education in improving patient health behaviour and motivation and also in reducing 30-day readmission rate in sepsis and heart failure patients [12,13]. Another review highlighted the importance of including modifiable causes of readmission and preventive strategies in the education [11]. Education is crucial to understand one's health and is essential to empower survivors to participate in their recovery and equip caregivers to act as their advocates [14]. Decrease in readmission rate by 7.3% to 39% was found in heart failure patients who received discharge education on survivorship from nurses who were trained on heart failure management and survivorship [15-18]. Enhancing the discharge process by educating nurses via online and video educational interventions to equip them to educate patients has resulted in a clinically significant reduction in 30-day Emergency Department visits by 7.5% among bariatric surgery patients [19]. Thus, educating nurses and increasing their knowledge on sepsis survivorship using an online educational intervention to equip them to educate sepsis survivors before discharge would be an initial ideal approach in enhancing survivorship and reducing sepsis readmission.

Despite sepsis readmissions being potentially preventable, and survivorship education having an impact on reducing readmissions,

no standardized educational intervention on sepsis survivorship currently exists in the institution. Here nurses are required to complete an e-learning module on sepsis protocol or TREWS (Targeted Real Time Early Warning System) which focuses on the identification and management of sepsis in the inpatient setting. However, it does not cover the long-term outcomes of sepsis. Sepsis coordinator educates the nurses during new hire orientation and skills day on sepsis protocol, but it does not include the long-term challenges faced by sepsis survivors.

Therefore, the purpose of this quality improvement project was to decrease the 30-day sepsis readmission rate of a single adult inpatient acute care medical surgical unit by increasing nurses' knowledge on the challenges of sepsis survivorship. To fulfil the purpose of the project, four aims were formulated:

- Determine the baseline 30-day sepsis readmission rate of the unit.
- Determine the baseline knowledge of the nurses of the unit on the challenges of sepsis survivorship and provide online educational course on sepsis survivorship over an 8-week period.
- Measure the effects of educational intervention on nurses' knowledge on the challenges of sepsis survivorship.
- Measure the effects of educational intervention on 30-day sepsis readmission rate of the unit.

PICO question

Does educating the nurses of an adult inpatient acute care medical surgical unit on the challenges of sepsis survivorship decrease the 30-day sepsis readmission rate in that unit?

Translational framework

Re-Aim model was found to be the appropriate model in the context of this project as it addresses the different stages of the project. The project site being a healthcare facility, the framework is suitable to the context as its primary aim is health-promotion. The five steps of this model include reaching the target population, ensuring adoption of the intervention by the organization, ensuring implementation consistency of the delivery of intervention, ensuring the effectiveness of the intervention, and maintenance of the intervention for long term use [20,21]. The actual impact of planning, implementation and evaluation of the project will depend on the combined effects of the five steps of the model.

In this project, nurses were the target population. Unit manager, unit educator, and the sepsis champion of the unit were the key stakeholders in the adoption of the intervention. The evidence-based intervention implemented was an online educational module for the nurses on the challenges of sepsis survivorship. After building relationship with the stakeholders and the nurses, an elevator speech was delivered during staff meeting to propose the project to the stakeholders and to overcome the barriers for adoption of the intervention in the unit. Voluntary consent was obtained from the nurses via email and through staff meeting and appropriate training and technical support were provided to ensure the implementation consistency of the intervention. Once, the educational intervention was complete, the effectiveness of the education was evaluated by comparing the pretest and posttest scores. The readmission rate

of the unit following the implementation was compared with the readmission rate for three months prior to the intervention. The plan was to sustain the intervention by adding it to the E-learning for new employee orientation and annual competency. A schematic representation of the Re-Aim model is located in Figure 1.

The Study

Design

This quality improvement (QI) project used a pre/post-test study design.

Method

The total number of nurses who voluntarily participated in this project was 36 including the permanent and new hire nurses. New graduate, float, and travel nurses were excluded. The study took place within a single adult inpatient acute care medical surgical unit in an urban academic medical center in the northeast part of the United States. The Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0; File F) guidelines were used to guide reporting [22].

Baseline demographic characteristics of nurses including gender, level of education, years of experience, employment status, and national certification were collected from the unit nurse manager. Pretest and posttest assessment of nurses' knowledge on sepsis survivorship was measured using a knowledge questionnaire. The maximum summary score possible was 100. Thirty-day sepsis readmission rate in this study was defined as the number of patients who were readmitted to any hospital for any reason within thirty days following discharge from the project site with a primary diagnosis of sepsis, severe sepsis, or septic shock for the index hospitalization. This data was collected from the hospital population health dashboard.

Timeline

Following XX review and approval as a quality improvement project, 30-day sepsis readmission data of the unit for May, June and July 2020 was collected. Project implementation began in August 2020 to continue over 8 weeks. Pretest and first attempted posttest scores of each participant were collected from the Sepsis Alliance Institute. The 30-day sepsis readmission data for three months following the project implementation was compared with that for three months prior to the project.

The evidence-based intervention used in this study to increase nurses' knowledge on sepsis survivorship was a standardized online educational module titled "caring for sepsis survivors" lasting for 50 minutes by the Sepsis Alliance Institute. Pretest and posttest were conducted using a questionnaire with 12 knowledge questions on sepsis survivorship. The module covers post-sepsis syndrome, causes of readmission, strategies to prevent readmission, and patient resources relevant to sepsis survivorship.

Analysis

Data Collection: The goal of the first aim was to determine the baseline 30-day sepsis readmission rate. The data was obtained from the hospital outcomes coordinator.

The objective for the second aim was to establish the baseline knowledge of nurses on sepsis survivorship and to disseminate

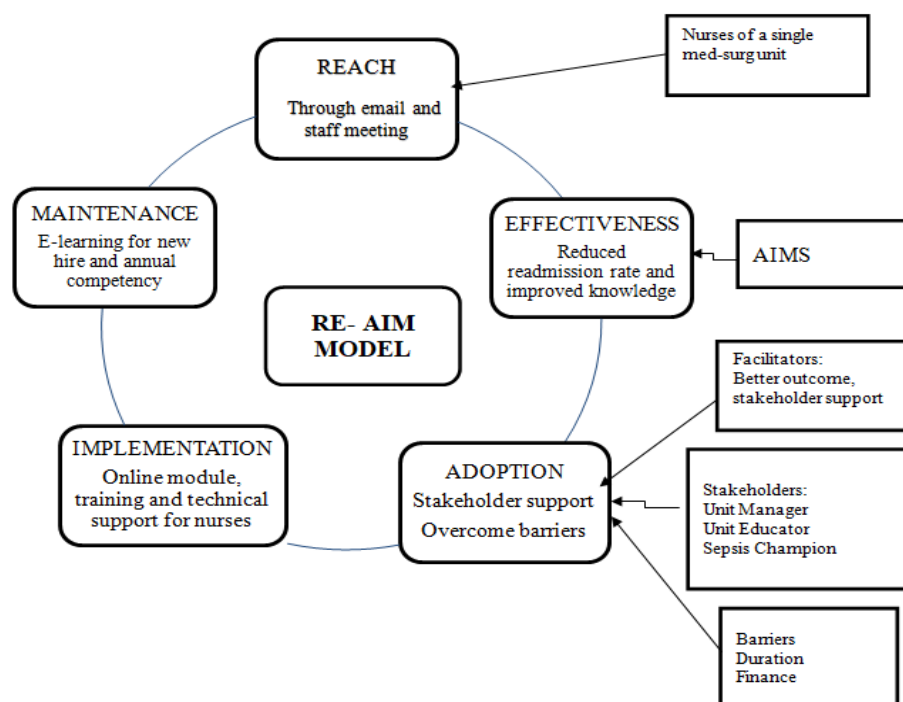


Figure 1: RE-AIM model to improve sepsis survivorship.

knowledge. Participants were required to complete a pretest questionnaire before they could view the presentation, download the slides, and take the posttest.

The third aim was achieved by obtaining the aggregate scores of the first attempted posttest for all the participants from the Sepsis Alliance Institute and comparing it with the pretest scores. The goal of the fourth aim was to gauge change in the 30-day sepsis readmission rate following the intervention compared to the baseline rate. Thirty-day sepsis readmission rate of the unit for three months prior to and three months following the intervention were obtained from the hospital outcomes coordinator.

Data analysis: Baseline demographic characteristics of nurses were analyzed using descriptive statistics. Baseline knowledge of the nurses on sepsis survivorship was analyzed using descriptive statistics as the median pretest summary score. Posttest summary score was also analyzed using descriptive statistics as the median posttest summary score. Box plots were used to graphically depict the median summary scores of pretests and posttests. Due to the small sample size, a Wilcoxon Signed Rank test was conducted to assess the difference between pre and posttest summary scores of the nurses who completed the module. Thirty-day sepsis readmission rate of the unit for three months prior to the intervention and three months following the intervention were collected from the population health dashboard and the difference was analyzed using descriptive statistics.

Ethics

The project was deemed quality improvement project and was exempted from institutional review board (IRB) review by the XX committee.

Results

A total of 36 registered nurses were enrolled in this quality improvement project out of which 21 nurses completed the project. All of them were employed fulltime. Out of all the participants who completed the educational intervention, 90.5% were female, 95.2% had Bachelor of Science degree or more and 9.5% of them were nationally certified. Participants had a broad range of experience working as a registered nurse ranging from less than five years to

Table 1: Baseline Characteristics of Registered Nurse Participants.

Demographic Characteristics	Frequency	%
Sex		
Male	2	9.5
Female	19	90.5
Education		
Associate degree	1	4.8
Bachelor's degree and more	20	95.2
Experience in Nursing		
Less than 5 years	8	38.1
5 to 10 years	7	33.3
10 to 20 years	5	23.8
More than 20 years	1	4.8
Position		
Full time	21	100
Other	0	0
Nationally Certified	2	9.5

Note: N=21.

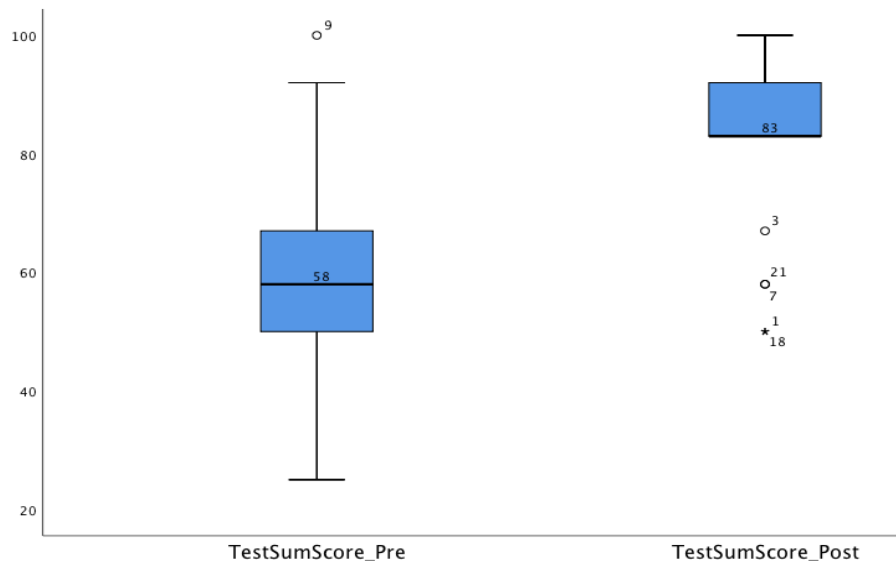


Figure 2: Pretest and posttest median scores.

Note: Median test summary scores for pretest and posttest are shown in this figure. Values outside of the box are outliers.

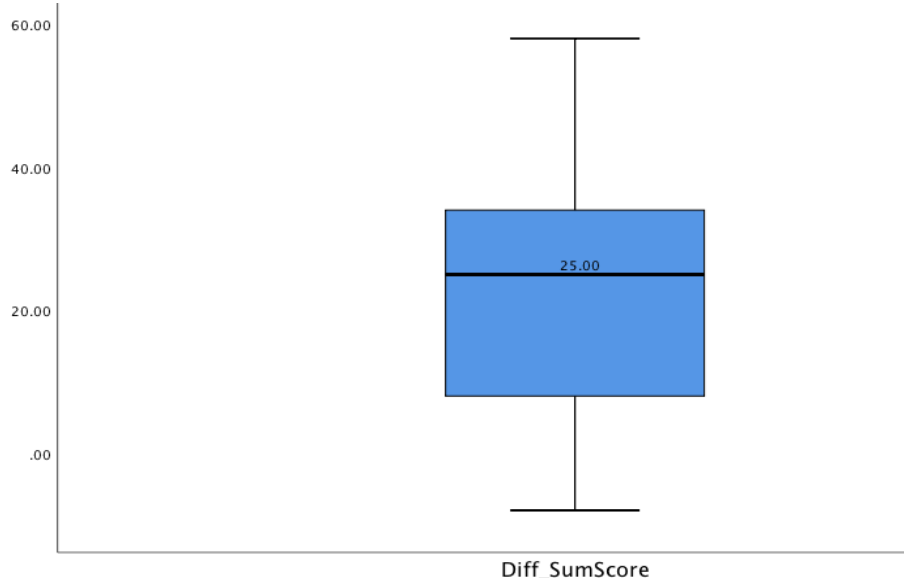


Figure 3: Difference in Summary scores.

Note: Difference in summary scores from pretest to posttest is shown in this figure with 25 as the median of the difference in summary scores.

more than twenty years. Table 1 details the baseline characteristics of the participants.

Findings for Aim 1

The baseline 30-day sepsis readmission rate of the unit for three months prior to the intervention was 7.1%. Out of 28 patients discharged from the unit from May 2020 to July 2020 with a primary diagnosis of sepsis, severe sepsis, or septic shock, only two patients were readmitted to any hospital within 30 days.

Findings for Aim 2

The median summary score of the pretest, assessing knowledge of nurses on the challenges of sepsis survivorship, was 58.0 (IQR=17).

Findings for Aim 3

Following the online educational program, the median posttest summary score assessing knowledge of nurses on the challenges of sepsis survivorship was 83.0 (IQR=9). As we see in Table 2 and Figure 2 and 3 overall, from pretest to posttest there was a median 25-point improvement (IQR=26) in scores assessing knowledge on the challenges of sepsis survivorship which was statistically significant as evidenced by a p value of <0.001 in the Wilcoxon Signed Rank Test.

Findings for Aim 4

The 30-day sepsis readmission rate of the unit for three months following the project implementation was 19.2%. Out of 26 patients

Table 2: Nurse Knowledge- Outcomes Table (Wilcoxon Signed Rank Test).

Variable	Pre-test sample (N=21)	Post-test sample (N=21)	p-value	z-score
Knowledge Assessment Score, Median (IQR)	58.0 (17)	83.0 (9)	<0.001	3.592

discharged from the unit from October 2020 through December 2020 with a primary diagnosis of sepsis, severe sepsis, or septic shock, five patients got readmitted within 30 days of discharge.

Discussion

The project was implemented during COVID-19 global pandemic. Patient admissions to the project unit and all other hospital units were restricted due to the state lock down and “stay at home” orders. Hence the 30-day sepsis readmission rate of 7.1% for the pre intervention period amid the pandemic does not represent the actual 30- day sepsis readmission rate of the unit.

However, the evidence based educational intervention for the registered nurses on sepsis survivorship significantly increased the knowledge of the registered nurses of the unit on the challenges of sepsis survivorship. This finding validates and expands upon previous studies examining the impact of educating nurses to equip them to educate patients prior to discharge with the goal of reducing readmission [16,17,19]. In this hospital, nurses are required to complete an e-learning module on sepsis protocol which focuses on the identification and acute management of sepsis. It does not entail the long-term outcomes of sepsis. This intervention therefore provided the nurses of this unit with a tool to increase their knowledge on the challenges of sepsis survivorship to increase their confidence level in educating sepsis survivors before discharge.

Educating patients on sepsis survivorship was proven to be effective in reducing sepsis readmission [12]. Reduced readmission rate was also found in heart failure patients who received survivorship education from nurses who were trained on heart failure management and survivorship [16,17]. Enhancing the discharge process by educating nurses and preparing them to educate patients resulted in reduced readmission among bariatric surgery patients [19]. In the setting of this quality improvement project, the 30-day sepsis readmission rate in the post intervention period increased from the baseline 30-day sepsis readmission rate. Though the restrictions on admissions and “stay at home” orders were partially lifted during the post intervention period, the impact they had on the baseline readmission rate makes it difficult to compare the readmission rates between those two periods. As a result, the effect of the educational intervention on 30- day sepsis readmission rate of the unit is inconclusive. However, nurses being the primary health care members who educate sepsis survivors prior to discharge, improvement in their knowledge on sepsis survivorship could be suggested to have clinical significance in reducing readmission rate. The nurse education module in this study focused mainly on post- sepsis syndrome, causes of readmission, and strategies to prevent readmission such as medication reconciliation, discharge counseling, anticipatory guidance, peer support, promotion of functional recovery, timely vaccination, and timely follow ups and laboratory monitoring.

Strengths

The main strength of this study was that it addressed a significant

gap in the literature. There are currently no disease specific guidelines available to inform the long-term management of sepsis survivors and this study provides a framework for approaching care. It also lays the foundation for development of formal guidelines if sustainability and dissemination efforts are successful.

Stakeholder buy in was essential to the success of this project. From the organizational leadership to the unit nurses, those involved in the intervention remained engaged from commencement to completion. Even with the negative impacts from the pandemic, 58.3% of nurses participated and, 100% of them completed the pretest and posttest questionnaire. There remains sustained interest in continuing the online sepsis educational module, though the intervention is now complete.

Limitations

There were some limitations associated with this study. The sample size was small. Increased workload and stress due to the pandemic prevented nurses from participating in this project. With the online learning, it was hard to establish academic integrity. The project having implemented during a global pandemic and resulting in decreased number of patient admissions in the pre-intervention period questions the reliability of the baseline readmission rate. The primary diagnosis of sepsis, septic shock or severe sepsis for the index hospitalization was coded by the coders. The possibility of disparity in coding could be considered a weakness in the evaluation of the project. Time constraints and competing priorities of the nurses, other stakeholders, and the interventionists, were other limitations.

Conclusion

Sepsis readmissions are preventable. It will however take combined efforts on the part of many people. Incorporating patient education on sepsis survivorship as a part of discharge process would help reduce sepsis readmission rate. Nurses being the primary health care members who educate sepsis survivors prior to discharge, educating them and increasing their knowledge on the challenges of sepsis survivorship to equip them to educate sepsis survivors before discharge would be an initial ideal approach in reducing readmissions.

Declaration

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Authors Contributions: PT: Designed the study, collected, and analyzed the data and prepared the manuscript. Author has agreed on the final version of the manuscript.

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