Developing an ECMO Cannula Insertion Site Bundle to Improve ECMO Patient Outcomes

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PROBLEM STATEMENT

- Extracorporeal Membrane Oxygenation (ECMO) is a modality with increasing use at the project site, and there is an absence of formalized practice surrounding care of the cannulas at the insertion site.
- Patients are left prone to catheter related infection (CRI), repeated dressing changes (bleeding, compromised skin integrity)[1], ineffective use of time/resources.

PROJECT PURPOSE

- **Purpose:** create evidence-based bundle for ECMO sites based off CLABSI bundles, which is recommended by the Extracorporeal Life Support Organization (ELSO)[2].
- **Aim:** to reduce bleeding at insertion site, dressing changes required, infection rates.
- In the adult cardiothoracic intensive care unit (CTICU) patient receiving ECMO via peripheral cannulation, will the implementation of a cannula bundle decrease the amount of dressing changes due to lost dressing integrity or insertion site bleeding, over 90 days, compared to current practice?

METHODS

- **Subject/Setting:** Peripherally cannulated adult ECMO patients at a hospital in Tampa.
- **Framework/Theory:** Model of Improvement (Figure 3), Lewin's Change Theory
- **Outcomes:** Frequency of dressing changes, indication of dressing changes, occurrence of bloodstream infections.
- **Intervention/Data Collection:** Protocol creation, stakeholder education, in-person rounding, pre and post data collection
- **Statistics:** 2x3 Chi Squared test (discrete data)
- **Instruments/Tools:** Dressing change indication and frequency were measured pre/post implementation on excel checklist.
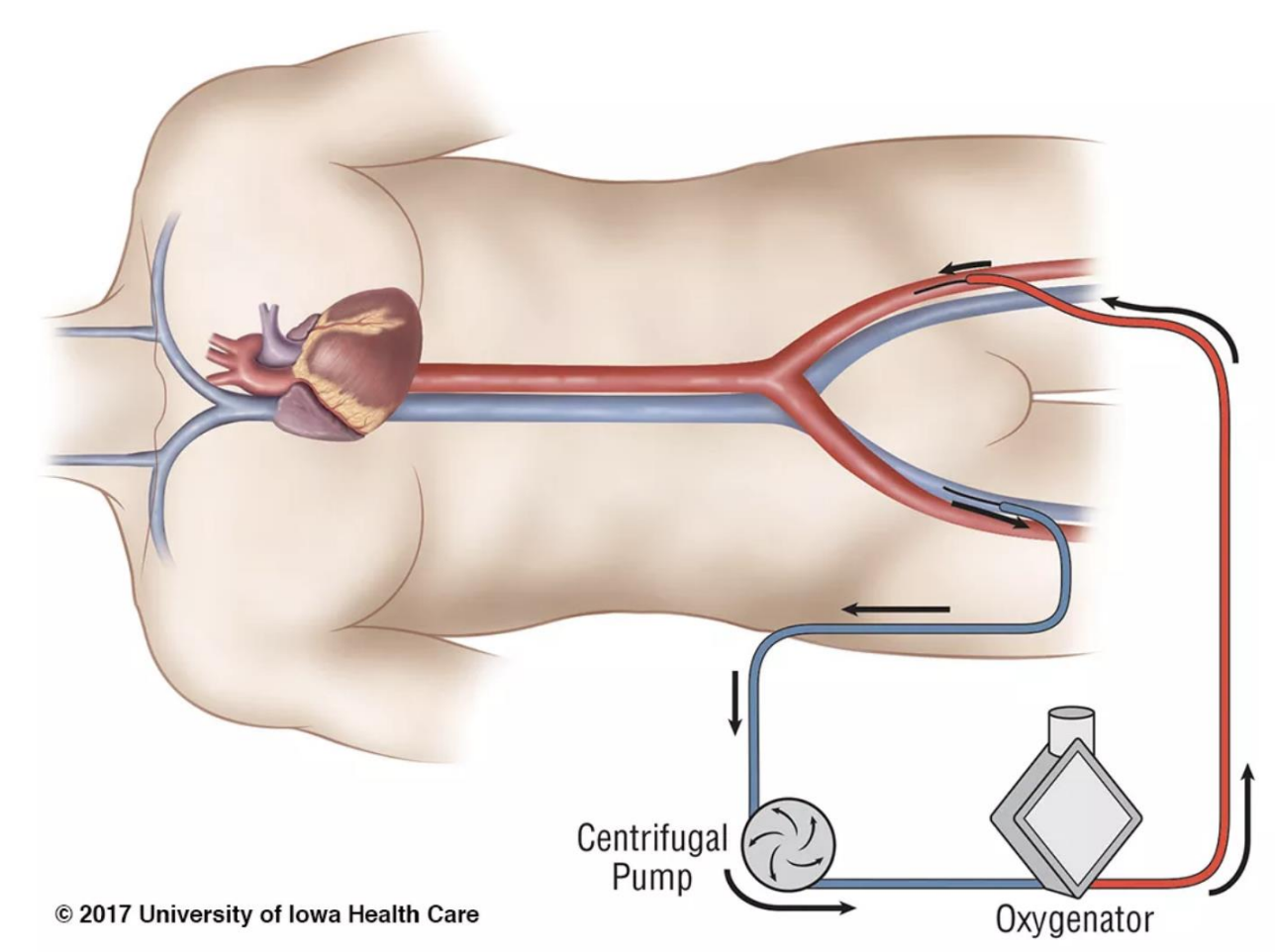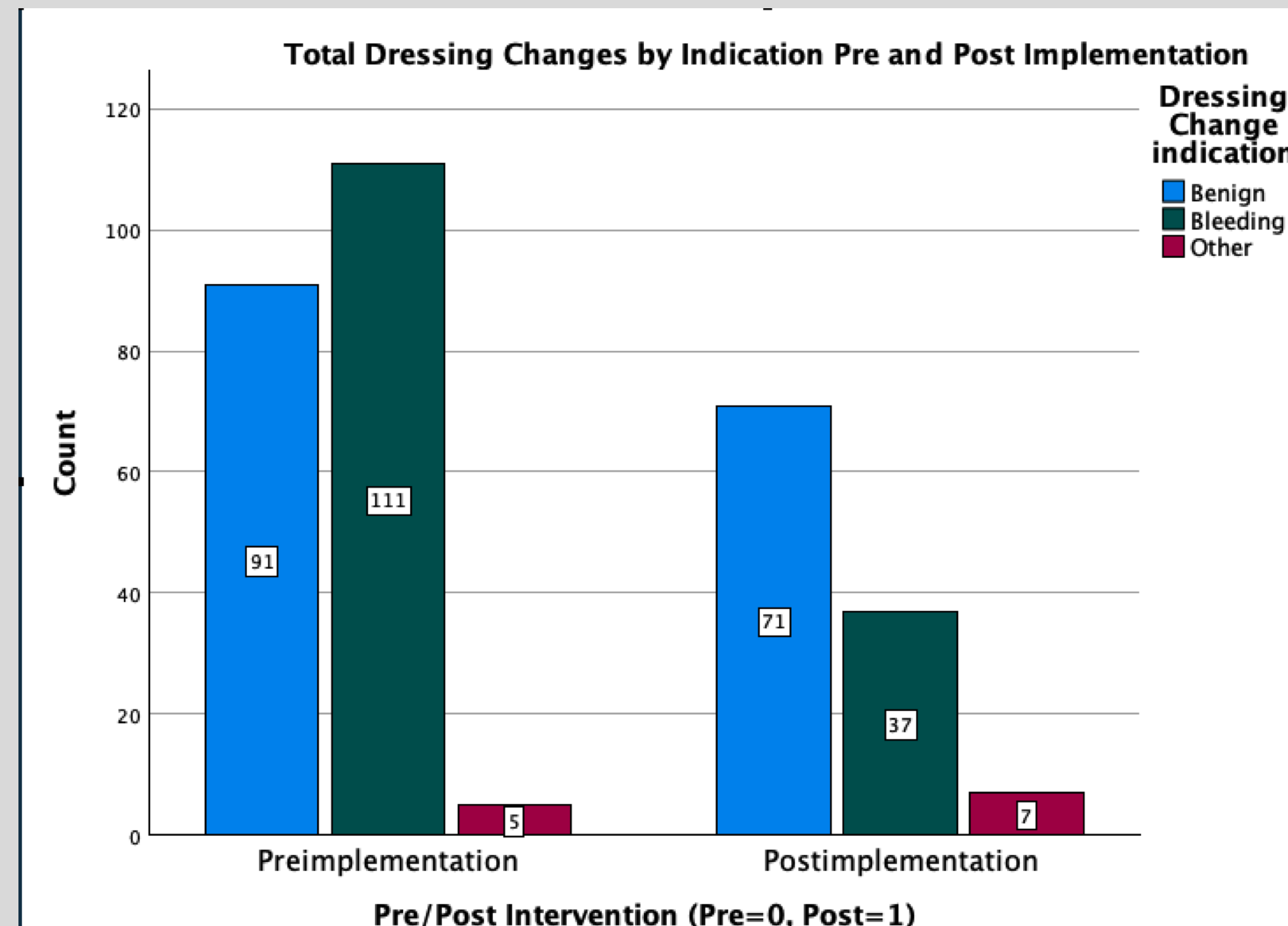

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Picture 1

Table 1. Data Demographics

Dressing Change Indication (% of total)	Pre Intervention n = 207 28 Patients	Post Intervention n = 115 21 Patients	Pre-Post Delta
Benign	91 (43.96%)	71 (61.74%)	-17.8%
Bleeding	111 (53.62%)	37 (32.17%)	21.5%
Other	5 (2.42%)	7 (6.09%)	-3.67%
X2 = 14.7, p < 0.001			-17.8%

Figure 1. Dressing Change Indication Pre/Post Implementation (Total)

Figure 3. Project Phases

Phase 1 (Plan)
- Began May 2022
- Project idea discussed with unit manager
- Needs assessment, lit review

Phase II (Plan)
- Began Sept 2022
- Site support established
- Proposal drafted, methodology

Phase III (Do)
Began Jan 2023
- IRB Approval (non research)
- Implementation began 3/1/2023
- Rounding on unit

Phase IV (Do/Study/Act)
- Data ended 5/28/2023
- Working with staff to finalize policy on intranet
- Data Analysis
- Delivery of results

RESULTS

- 28 unique patients prior to implementation, 21 post, with 322 dressing changes total (Table 1, Figure 1)
- Nonbenign dressing changes as a proportion of total decreased by 17.8% (Table 1)
- Pre implementation, patients averaged 0.5 (SD 0.8) non-benign changes per person per day, post implementation was 0.3 (SD 0.6) but due to strong positive skew and high variance, dressing change rate was was not significant (Figure 2).
- No infections were noted in either pre or post.
- No adverse events related to cannulas were noted pre or post.

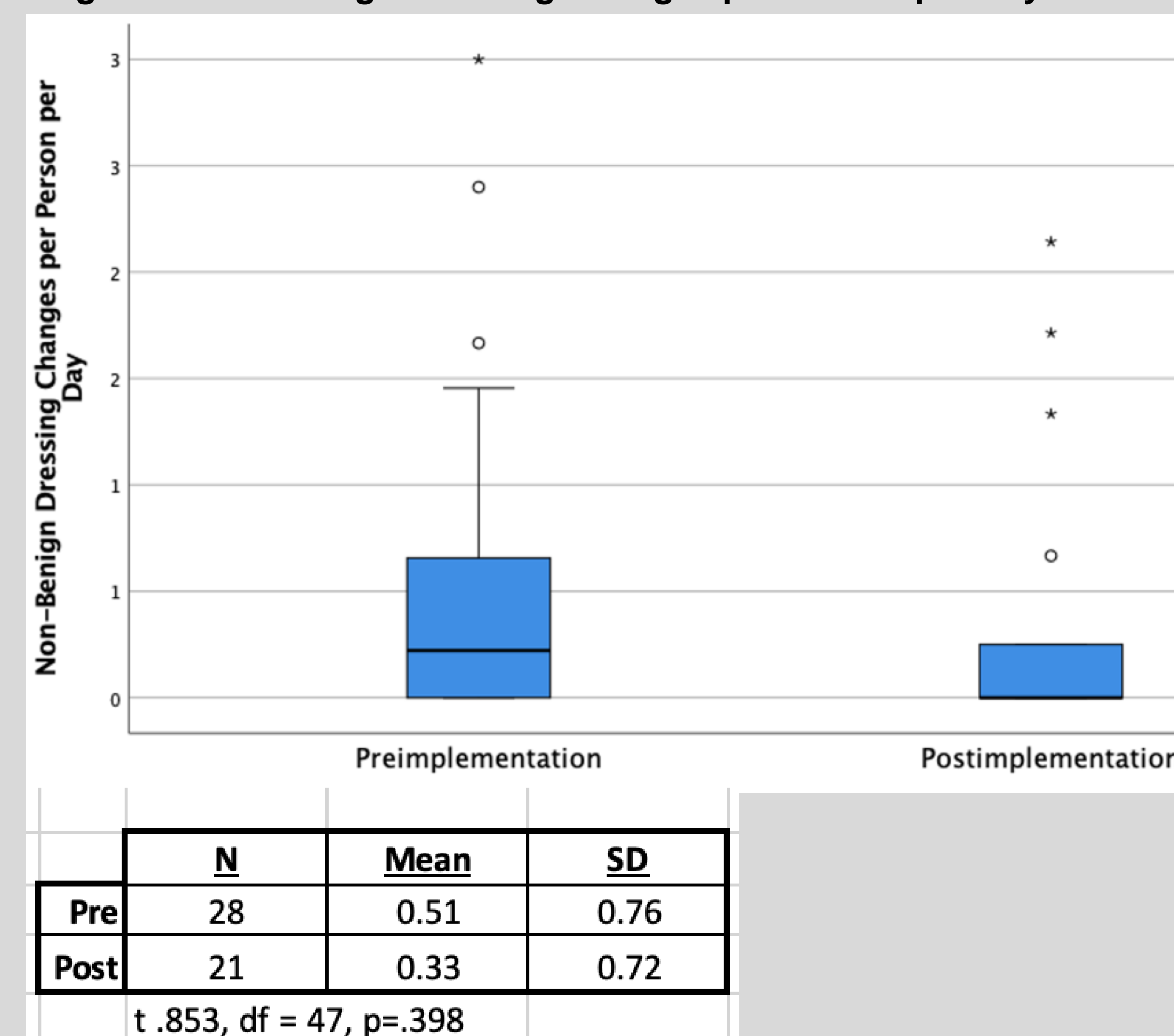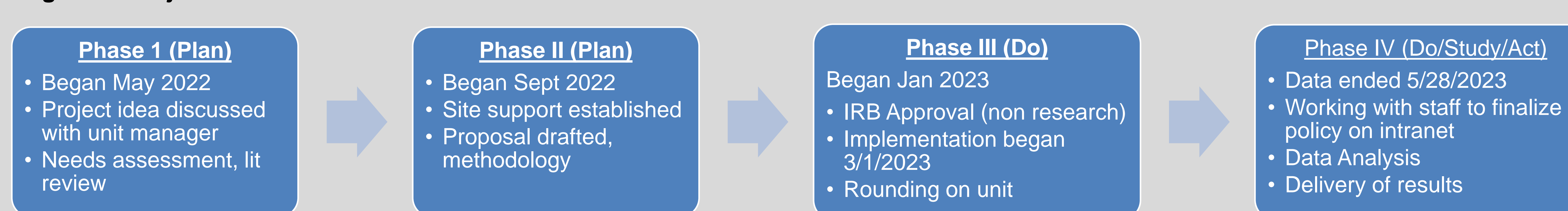**Figure 2. Non-Benign Dressing Changes per Person per Day**

	N	Mean	SD
Pre	28	0.51	0.76
Post	21	0.33	0.72
t .853, df = 47, p=.398			

SUSTAINABILITY

- Favorable as infection prevention efforts are a large priority for the site.
- ECMO program is growing, which equals a need for protocols.
- Infection prevention rounding tool and buy-in lay groundwork for integration to electronic charting system.
- Ease of use, bundle is made from already existing practices/materials.

LIMITATIONS

- Inconsistent charting practices were a large barrier and could have compromised accuracy.
- Many competing priorities, difficult to get together Project could be more easily repeated after all bundle elements are implemented into EMR.

IMPLICATIONS FOR PRACTICE

- APP's have an interest in patient outcomes of ECMO patients as APP's are often the primary providers while the patients are cannulated.
- A well executed and maintained bundle will be a valuable tool when examining reasons for adverse events.

DISCUSSION

- Nonbenign dressing changes decreased as proportion of total, but rate NS.
- After stakeholder presentation, feedback was given regarding requesting more specificity in the protocol (which dressing components are best).
- Infection prevention rounds have revealed decreased compliance in certain bundle components, presenting opportunity for additional staff education or reminders.

REFERENCES
1. Botsch, A., Protain, E., Smith, A., & Szilagyi, R. (2019). Nursing implications in the ECMO patient. In M. Firstenberg (Ed.), Advances in Extracorporeal Membrane Oxygenation (Vol. 3). https://doi.org/10.5772/intechopen.85982

2. Extracorporeal Life Support Organization. (2022). Extracorporeal Life Support Organization. https://www.elso.org/

3. Ogrinc, G. S., Headrick, L., Barton, A. J., Dolansky, M. A., Madigosky, W. S., & Miltner, R. S. (2018). Fundamentals of health care improvement: A guide to improving your patients' care (3rd ed.). Joint Commission Resources.

Picture 1. University of Iowa. (2017). VA ECMO [Photograph]. https://uihc.org/sites/default/files/styles/webp/public/uihc_org/ecmo_3.jpg.webp?itok=cvvoAS6W

Nonbenign dressing changes decreased by 17.8% after bundle implementation. Dressing change rate decreased but was not significant.

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