GUIDELINES FOR ASSESSING AND STABILIZING AXILLARY INTRA-AORTIC BALLOON PUMPS: PROMOTING MOBILIZATION

Doctor of Nursing Practice Project
Presented to the Faculty of MU
Graduate Studies
University of Missouri

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Nursing Practice
by
MEGHAN HUDOCK, MSN, RN

Shawn Zembles, DNP, APRN, CEN, CCRN, NPD-BC, ACNS-BC. Committee Chair
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MAY 2024
Cardiogenic shock (CS) is a life-threatening condition, with a mortality rate >30%, that results in impaired peripheral tissue and end-organ viability (Jentzer, 2020). Management of CS relies on prompt symptom recognition of an underlying or contributory cause, evaluation of the severity of exacerbation, and the implementation of appropriate interventions. Severe CS may require the use of an axillary intra-aortic balloon pump (AxIABP) device for assistance with improving circulation and ventricular function (Van Diepen et al., 2017). Historically, due to the acute shock phase and the use of a ventricular assist device, patients spent a vast amount of time in the intensive care unit (ICU) and on bedrest.

According to Chen et al. (2021), early mobilization for an AxIABP patient is vital to mitigate negative effects related to extended bedrest and physical deconditioning. Decker et al. (2021), revealed those who have participated in early mobilization have also shown higher-mobility scores post-device removal and a decrease in length of ICU stays. Furthermore, Decker et al. (2021) report that AxIABP early mobilization is both safe and feasible, when there is a standard process to assess patient readiness, ensure safe device securement, and the benefits outweigh the risks.

Although, there are multiple factors to consider when planning to mobilize an AxIABP patient such as, patient anatomy and device insertion site/location (e.g., device configuration), device securement, expected level of activity, severity of illness, and anticoagulation or vasoactive medications (Salna et al., 2020). There continues to be hurdles related to the proactive approaches of early mobilization, specifically, concerns with mobility-associated adverse events, limited resource availability, and a lack of buy-in and confidence to safely mobilize a AxIABP patients (Decker et al., 2021).

Statement of Purpose and PICOT

The purpose of this quality improvement (QI) project was to standardize insertion, securement, and dressing placements in the Cardiac Procedure Center (CPC) for AxIABP patients. Also, this project developed an AxIABP safety mobilization readiness guideline for the Cardiac Intensive Care Unit (CCU) team to utilize pre- and post-mobilization. The project objectives related to the following PICOT question: In a CCU, how does the implementation of a standardized guideline for assessing and stabilizing AxIABP devices (I) compared to a varied, non-standard approach for assessing and stabilizing the device (C), affect AxIABP adverse event occurrences (O) when mobilizing AxIABP patients (P) over three months (T)? The primary objectives of the project were:

- Within three months of implementation there will be a 10% decrease in adverse events requiring additional procedural interventions related to AxIABP devices.
- Within three months of implementation there will be a 10% increase of mobilization occurrences in AxIABP patients.
- Following the education, 85% of evaluated staff will show an increase in safety and comfort when mobilizing AxIABP.

Review of Literature

An extensive literature search revealed three themes: importance of mobilizing AxIABP patients, ambulation and safety protocol development, and barriers to overcome.

Mobilizing AxIABP Patients

Many of the studies discussed the negative precursor of bedrest for these patients and the multitude of hurdles that directly impact patient recovery. Furthermore, it is vital to discuss consistency among the bedside staff when assessing the device/surrounding skin integrity,
ensuring the catheter/tubing is properly anchored and secured, and that the patient is hemodynamically stable. Additionally, there is the common notion of ways to decrease morbidity and mortality rates, specifically emphasizing the need for hyper awareness on interventions that support early mobilization for AxIABP patients (Abrams et al., 2022).

**Ambulation and Safety Protocol Development**

Several studies described the importance of having a multidisciplinary care team approach when developing protocols or screening/ readiness guidelines for safe device and patient management. Team members should include perfusionists, bedside nurses, AxIABP specialists, surgeons, intensivists, physical therapy, and support staff. Each team member is an expert in their field, and this collaborative approach provides unique perspectives that will support buy-in and expand resource availability. Furthermore, clear objectives related to the therapy, device, and patient interventions need to be outlined prior to mobilization to promote a safe environment for the patient and bedside staff members.

**Barriers to Overcome**

According to Blok et al., (2022) fundamental high-quality patient care is directly dependent on nurse comfort, engagement, and support when initiating change. There was consistent discussion about barriers related to culture, knowledge, and overall attitudes of mobilizing AxIABP patients. Also, several studies highlighted challenges when working with multiple interventionalists and ICU providers who care for the patient post implantation. It is important to highlight that for protocol succession, there needs to be sufficient adoptions in the ICU culture and thorough education of team members related to the benefits of the interventions.

**Methodology**

**Research Design and Setting**

This was a retrospective and prospective QI cohort study design, with a dual focus on AxIABP device and patient outcomes and the CCU team members knowledge gain related to the protocol development and use. The project was completed in a 15 bed CCU at a non-profit academic medical center in St. Louis, Missouri. Device and patient data were pulled from January 2023-August 2023 (T1), pre-intervention, and then November 2023-March 2024 (T4) post-intervention. The target population was a purposive convenience sample of patient charts that met the following inclusion criteria: AxIABP patients >18 years old and admitted to the CCU. Exclusion criteria included: patients without an AxIABP and were <18 years old. Pre and post intervention knowledge survey data was gathered, from September 2023 (T2) to October 2023 (T3), with a purposive convenience sample of ICU nurses who met the following inclusion criteria: certified to care for AxIABP patients. Exclusion criteria included: agency, new graduate, and nurses on orientation.

**Interventions**

The principal investigator observed several AxIABP insertions that occurred in the CPC and met with a multidisciplinary group (e.g., interventionalists, intensivists, surgeons, etc.) to develop a protocol that met the needs of this institution and patient population. Patient and device pre-implementation data was gathered related to the number of adverse events with correlating intervention(s), number of x-rays, dressing changes, physical therapy consults, and occurrences of patient mobilizations from T1. As of April 2024, the principal investigator is still applying and interpreting the statistical analysis comparing T1 to T4 related to the patient and device data.

During T2, a pretest (Appendix A) was administered to the CCU team members to assess their overall comfort and safety views of mobilizing AxIABP patients. Immediately following
the pretest, six in-person education and training sessions (eight hours each) were organized for the CPC and CCU. The training sessions offered didactic and experiential approaches to standardizing insertion/securement techniques, ways to safely assess, stabilize, and mobilize AxIABP patients. Crucial elements of the guideline for the CPC (Appendix B) included a standardized targeted insertion area, device securement, and dressing application. Vital components of the protocol for the CCU (Appendix B) included assessment guidelines for mobility readiness, skin integrity, suture/securement, hemodynamic stability, resources, emergency, and escalation tactics, and dressing reinforcement. During T3, the post-test was administered; also, patient device and data from T2 were omitted.

**Tools/Measures**

For T1 and T4 patient and device data comparison, information was obtained from an internal report system that included all patients with an AxIABP and inclusion criteria. Then, the data was entered into the Statistical Package for Social Sciences (SPSS) database with 5% of the data utilized for data verification. Raosoft will be used for the final sample size calculation. Demographic information included primary diagnosis, patient age, gender, height, weight, BMI, device dwell days, insertion site, and inserting interventionalist.

For the T2 and T3 nursing data points, the effectiveness of the interventions related to the nurse’s comfort and safety levels was evaluated by administering an anonymous pre- and post-implementation survey. The survey was 11 questions with one free text option. The first three questions related to their certification, shift, and experience. The additional eight questions utilized a Likert scale to inquire about comfort/safety and perceived barriers to mobilizing AxIABP patients. The Likert scale questions were divided into a comfort/safety category with a 5 (very comfortable/safe) to 1 (not comfortable/safe) range and questions related to perceived barriers to mobilizing AxIABP had a scale of 5 (never an issue) to 1 (a great deal).

The calculation for sample size for T2 and T3 comparison is based on recommendations from G*Power 3.1 (Sample Size Calculator, 2007). To detect an effect size of Cohen’s $d = 0.5$ with 80% power ($\alpha = .05$, two-tailed), G*Power suggests that 32 participants would be needed in a Paired samples $t$-test, an effect size of .50, and a $p = .05$. All 73 of the participants completed the pre- and post-implementation survey at T2 and T3. Demographic information includes primary shift (e.g., days, nights, rotate), years of experience, overall knowledge gain, and perceived reason for AxIABP mobilization challenges (e.g., insertion site, patient body habitus, securement approach, staffing resources).

Descriptive statistics were utilized to provide an overview of the project sample. Ordinal data collected from the survey and Likert scales at T2 and T3 were analyzed using the Wilcoxon signed-rank test. Nominal data was analyzed using the chi-squared test and McNemar’s test, while ratio level data was analyzed using the Paired samples $t$-test. A Cohen’s $d$ was used to determine effect size with the Paired-samples $t$-test with values of small (.2), moderate (.5), and large (.8). Statistical significance was defined as $p \leq .05$.

**Evaluation**

**Demographics**

There were 73 AxIABP certified nurses who completed the pre- and post-survey during T2 and T3, and all were included in the nursing demographic analysis. Of these participants, the predominant shift worked was day shift, at 55% ($n=37$), then 34% ($n=25$) worked nights, and the remaining 11% ($n=11$) had rotating schedules. Fifty-eight percent ($n=42$) of the nurses had 5+ years of experience and 85% ($n=62$) of the nurses reported some or a lot of knowledge gain related to the interventions.
GUIDELINES FOR ASSESSING AND STABILIZING AXIABP

Insertion Site. Regarding the participants perceived impact the insertion site location has on barriers to mobilization 25% ($n=34$) reported a great deal, 22% ($n=30$) reported often, 33% ($n=45$) reported sometimes, 15% ($n=21$) reported rarely, 5% ($n=1$) reported never.

Body Habitus. Regarding the participants perceived barriers related to the patient’s body habitus and barriers to mobilization 18% ($n=25$) reported a great deal, 23% ($n=32$) reported often, 33% ($n=45$) reported sometimes, 26% ($n=36$) reported rarely, 0% ($n=0$) reported never.

Securement. Regarding the participants perceived impact on AxIABP securement and its relation to barriers to mobilization 14% ($n=19$) reported a great deal, 10% ($n=14$) reported often, 38% ($n=52$) reported sometimes, 33% ($n=45$) reported rarely, 5% ($n=1$) reported never.

Resources. Regarding the participants perceived impact on staffing resources and its relation to barriers to mobilization 12% ($n=16$) reported a great deal, 26% ($n=36$) reported often, 28% ($n=38$) reported sometimes, 26% ($n=36$) reported rarely, 8% ($n=11$) reported never.

Patient and Device. Pending

Nursing Knowledge Gain. A Paired-samples t-test was utilized to compare safety, securement, and mobilization scores from T3 and T4. When asked if there was confidence related to safety measures, there was a large statistically significant increase in the mean score from T2 ($M=3.55, SD=.99$) to T3 ($M=4.52, SD=.36$), Cohen’s $d=.98$ ($p<.001$). When asked if there was confidence related to securement measures, there was a moderately statistically significant increase in the mean score from T2 ($M=3.66, SD=1.02$) to T3 ($M=4.40, SD=.66$), Cohen’s $d=.78$ ($p<.001$). When asked if there was confidence related to mobilization changes/efforts, there was a large statistically significant increase in the mean score from T2 ($M=3.36, SD=1.18$) to T3 ($M=4.40, SD=.70$), Cohen’s $d=.97$ ($p<.001$).

Conclusions

The purpose of the QI project was to develop, implement, and evaluate to use of a standardized protocol for inserting, securing, and dressing application for AxIABP patients. Additionally, to increase the knowledge and confidence of the bedside teams caring for these patients. The primary project objective of a 10% decrease in adverse events requiring additional procedural interventions related to the AxIABP device is pending. The secondary objective of a 10% increase of mobilization occurrences in AxIABP patients is pending. The final project objective of 85% of evaluated staff showing an increase in safety and comfort when mobilizing AxIABP was met with 85% of increase in overall knowledge gain. Although the first two objective are pending, the data thus far supports a decrease in the amount of CPC interventions and procedures needed for mobilized AxIABP patients.

Recommendations

It is crucial there are measures in place to ensure device integrity and to decrease the risk of adverse events such as, cannula dislodgement, malposition, kinking, unintentional decannulation, neurovascular or hemodynamic changes, and bleeding during and post mobilization. The key stakeholders support the importance of having a standardized guideline and protocol in place to decrease unnecessary procedural interventions and to increase safety and awareness at the bedside. It will be vital to review the guidelines on an annual and ad hoc basis to ensure best evidenced based practices are being implemented.

Strengths and Limitations

Strengths of this project include the large statistical and clinical significance related to the knowledge and confidence gain for assessing, stabilizing, and mobilizing AxIABP patients. Limitations of this project include a short project time interval, lack of completed data, and the multiple disciplines, which can lead to variations in practice, that provide care to these patients.
References


Jentzer, J. C. (2020). Understanding cardiogenic shock severity and mortality risk assessment. *Circulation: Heart Failure, 13*(9). [https://doi.org/10.1161/circheartfailure.120.007568](https://doi.org/10.1161/circheartfailure.120.007568)

Salna, M., Abrams, D., & Brodie, D. (2020). Physical rehabilitation in the awake patient receiving extracorporeal circulatory or gas exchange support. *Annals of Translational Medicine, 8*(13), 834. [https://doi.org/10.21037/atm.2020.03.151](https://doi.org/10.21037/atm.2020.03.151)


https://doi.org/10.1161/cir.0000000000000525
Appendix A: Pre-Education Knowledge Check

**PRE-EDUCATION KNOWLEDGE CHECK**

**EARLY MOBILIZATION OF MCS DEVICE PATIENTS**

<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
<th>Option 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you care for MCS Device Patients?</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
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<tr>
<td>Primary Shift</td>
<td>Days</td>
<td>Nights</td>
<td>Rotate</td>
<td></td>
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<tr>
<td>Years of Experience</td>
<td>0-2</td>
<td>3-5</td>
<td>&gt;5</td>
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</tbody>
</table>

Rate the safety level when mobilizing MCS device patients with the current process.  
(1=Not Safe, 2=Sort of Safe, 3=Neutral, 4=Pretty Safe, 5=Very Safe)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
</table>

Rate your comfort level assessing MCS device securement prior to mobilization when utilizing the current standard.  
(1=Not Comfortable, 2=Sort of Comfortable, 3=Neutral, 4=Comfortable, 5=Very Comfortable)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
</table>

Rate your comfort level ambulating patients with a MCS device utilizing the current standard.  
(1=Not Comfortable, 2=Sort of Comfortable, 3=Neutral, 4=Comfortable, 5=Very Comfortable)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</table>

Rate the frequency of barriers to ambulating MCS patients with the current standard.  
(1=A Great Deal, 2=Often, 3=Sometimes, 4=Rarely, 5=Never)

<table>
<thead>
<tr>
<th>Insertion Site Placement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td>Body Habitus</td>
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<tr>
<td>Lack of Securement</td>
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<tr>
<td>Management of Device Pre-Post Mobilization</td>
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<tr>
<td>Staffing/Resource/Equipment Availability</td>
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<tr>
<td>Other:</td>
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</table>
Appendix B: Guidelines for Assessing and Stabilizing AxIABP Devices

Standardized Placement & Securement: CPC

**Place the IABP console on the patient’s right side prior to start of procedure**

Goal: Lateral chest placement with hub pointing in direction of the IABP

Step A:
- Place 4 sutures (#1-4)

Step B:
- Apply CHG dressing
- Temporarily secure lower portion of catheter

Step C:
- Slide patient to bed
- Place bed @ 90° and/or in chair position

Step D:
- Once optimal catheter path determined
  - Apply 1-2 Cathgrip tube securement devices
  - "Catheter sleeve needs to be taut"

Step E:
- Apply StatLock
- Apply Allevyn dressing under Y-Fitting Port

Step F:
- Apply both Frame Style Tegaderms
  - From insertion site to Y-Fitting port
  - Apply a 2" silk tape or medipore border around each tegaderm edge
  - Mark each securement site with permanent marker (6 total)
  - Date the dressing
  - Changed Q7d & PRN

Standardized Dressing & Safety Protocol: CCU
Appendix C: D1 Form

DNP Residential Project Committee
Appointment Request

Student’s Name: Meghan Hudock
Student’s Number: 18136336
Date Submitted: 6/20/23

I request that the faculty members listed below be appointed to serve as my Residential Project committee.

Dr. Shawn Zembles
Name of Chair*

Dr. Shelby Thomas
Member*

Dr. Melissa Schmidt
Member*

Member*

Meghan Hudock, MSN, RN
Signature of Student
*Please type or print

Shawn Zembles 6/22/2023
Signature, Chair of Committee

Shelby Thomas, APRN, MSN, FNP-BC, DNP 6/21/2023
Signature, Member

Miri D. Butler, DNP, NP-C, FNP-BC
Signature, Member

Signature of Director of DNP Program, School of Nursing

To be completed during the semester enrolled in:
N9080 Section 1 DNP Residency Project

SON Approved 7/2012
Appendix D: D4 Form

**Report of the DNP Residency Project Defense**

(This form should be completed and filed with the Graduate School within one month of exam completion)

<table>
<thead>
<tr>
<th>Candidate’s name:</th>
<th>Hudock, Meghan</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Last Name, First Name)</td>
<td>(Last Name, First Name)</td>
</tr>
<tr>
<td>Mizzou ID number:</td>
<td>18136334</td>
</tr>
<tr>
<td>Degree:</td>
<td>Doctor of Nursing Practice</td>
</tr>
<tr>
<td>Academic program:</td>
<td>Nursing</td>
</tr>
<tr>
<td>Major:</td>
<td>AG-CNS</td>
</tr>
<tr>
<td>Program Address:</td>
<td>S235 Sinclair School of Nursing</td>
</tr>
<tr>
<td>Emphasis area:</td>
<td>(If applicable)</td>
</tr>
<tr>
<td>Title of DNP Residency Project:</td>
<td>Guidelines for Assessing and Stabilizing Axiabp: Promoting Early Mobilization</td>
</tr>
<tr>
<td>Date of examination:</td>
<td>4/18/24</td>
</tr>
<tr>
<td>(mm/dd/yy)</td>
<td>(mm/dd/yy)</td>
</tr>
<tr>
<td>The above-named candidate has been examined by the committee with the following results:</td>
<td>[ ] PASSED [ ] FAILED</td>
</tr>
</tbody>
</table>

**Signatures of project review members**
(Please sign full names legibly)

<table>
<thead>
<tr>
<th>Chair:</th>
<th>Shawn Zembles</th>
<th>[ ] Pass [ ] Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Member:</td>
<td>Shelby Thomas</td>
<td>[ ] Pass [ ] Fail</td>
</tr>
<tr>
<td>Review Member:</td>
<td>Melissa Schmidt</td>
<td>[ ] Pass [ ] Fail</td>
</tr>
<tr>
<td>Review Member:</td>
<td></td>
<td>[ ] Pass [ ] Fail</td>
</tr>
</tbody>
</table>

**Director of graduate studies**

<table>
<thead>
<tr>
<th>Date</th>
<th>Dean of the graduate school</th>
<th>Date</th>
</tr>
</thead>
</table>

**Continuous enrollment list number:**

**Date copies sent to members and director of graduate studies:**

SON Approved 7/2010

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