

# Education of Staff Nurses on the Implementation of a Standardized Clinical Care Pathway for Patients Who Undergo Correction of Pectus Excavatum

Amber N. Jones



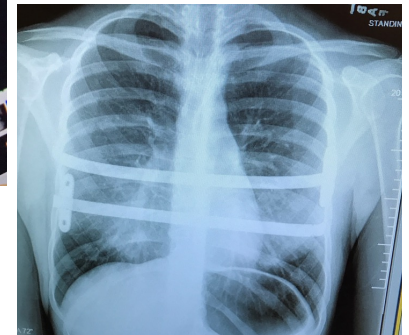
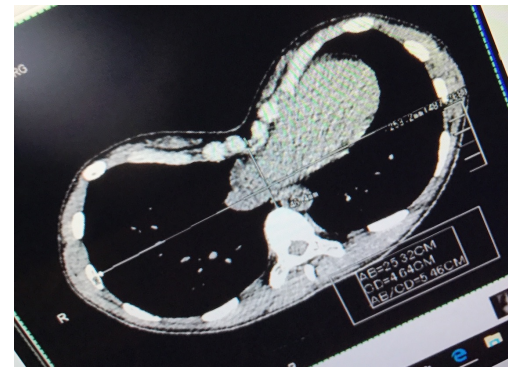
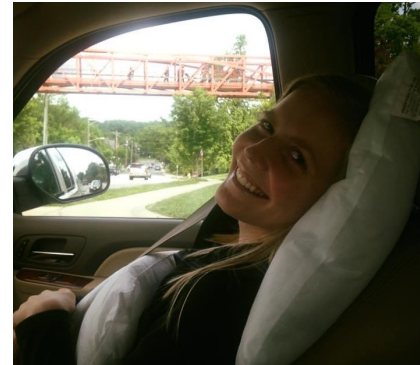
THE UNIVERSITY OF  
TENNESSEE  
KNOXVILLE

# Background



# My Experience

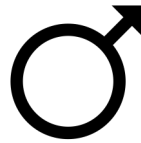
- In May 2016, I had the Nuss Procedure at Cincinnati Children's Hospital Medical Center.
- Two titanium bars were placed into my chest to reform my sternum.
- In January 2022, I had both of my metal bars removed!





### Pediatric Anomaly

Pectus Excavatum is the most common chest wall anomaly, occurring in **1/8** children per **1,000** births



### Male Predominance

Pectus Excavatum has a male predominance of **4:1**



### Surgical Correction

The Nuss Procedure, a **minimally invasive corrective surgery** for pectus excavatum, was created in 1998 by Dr. Nuss in Norfolk, Virginia

# BACKGROUND

- Lengthy, painful post-operative recovery time.
- Lack of focus on the post-operative inpatient recovery period.
- Creation of **standardized clinical care pathways (SCCP)** to guide post-operative care.

(Gurria et al., 2020; Mangat et al., 2020; Nuss et al., 2016; Rotter et al., 2010)

# SIGNIFICANCE

- Increased demand for surgical correction of PE.
- Length of stay (LOS) for PE patients at East Tennessee Children's Hospital (ETCH) from 2018-2020 was **5-7 days**.
- CCHMC implemented an SCCP for PE patients in 2016 and had a decrease in LOS from **4.5 to 3.4 days**.
  - In addition, patient satisfaction improved and total patient charges decreased by **30%**.
- Other studies also show a decrease in LOS following implementation of an SCCP for PE patients.

(Gurria et al., 2020; Mangat et al., 2020; Nuss et al., 2016; Rotter et al., 2010)

# SIGNIFICANCE CONTINUED



- There was **no** education plan for staff nurses at ETCH regarding the new SCCP.
- Surgical patients have been shown to have better outcomes when treated in hospitals in which staff nurses have **higher levels of EBP nursing education**.
- Successful implementation of an SCCP requires thorough, continual education of the entire multidisciplinary team.

(Block et al., 2018; Francis et al., 2018; Kakkar et al., 2021)

# Problem Statement

- Lack of evidence-based education for staff nurses could compromise the successful implementation of the standardized clinical care pathway (SCCP) for patients who undergo the Nuss Procedure for correction of pectus excavatum (PE).
- This evidence-based practice (EBP) project aims to explore the importance of **educating staff nurses** on the implementation of a SCCP for patients who undergo the Nuss Procedure for correction of PE to **decrease length of stay**, decrease hospital costs, decrease post-operative complications, and improve pain control.







# Purpose and Frameworks

# Project Purpose and Aims

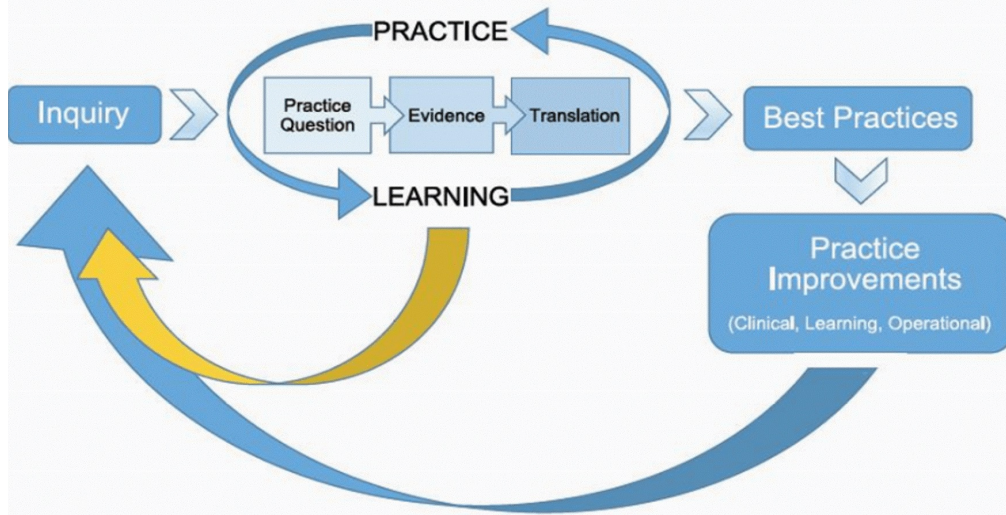
## Purpose

This evidence-based practice project aims to educate staff nurses on the use of the new standardized pathway, with the goal of increased quality of care and decreased length of hospital stay.

## Aims

- Develop and implement a pre-intervention knowledge assessment, eLearning module, and post-intervention knowledge assessment with associated application-based case study questions.
- Assess adherence to the SCCP through chart audits over a three-month period.
- Enhance policies and protocols and decrease Nuss patients' length of stay, in turn improving patient outcomes and healthcare costs.

The Johns Hopkins Nursing Evidence-based Practice Model



© The Johns Hopkins Hospital / Johns Hopkins University School of Nursing

## John's Hopkins Nursing Evidence-Based Practice Model

- Three overall steps: inquiry, practice, and learning.
- Detailed problem-solving approach to clinical decision-making.
- 19 step process divided into 3 phases known as the **PET** process.
  - Practice Question (**P**): steps 1-6
  - Evidence (**E**): steps 7-11
  - Translation (**T**): steps 12-19

(Dang & Dearholt, 2018)

---

**In pectus excavatum patients, how does a standardized clinical care pathway following the Nuss Procedure compared to current standard of care affect length of hospital stay?**

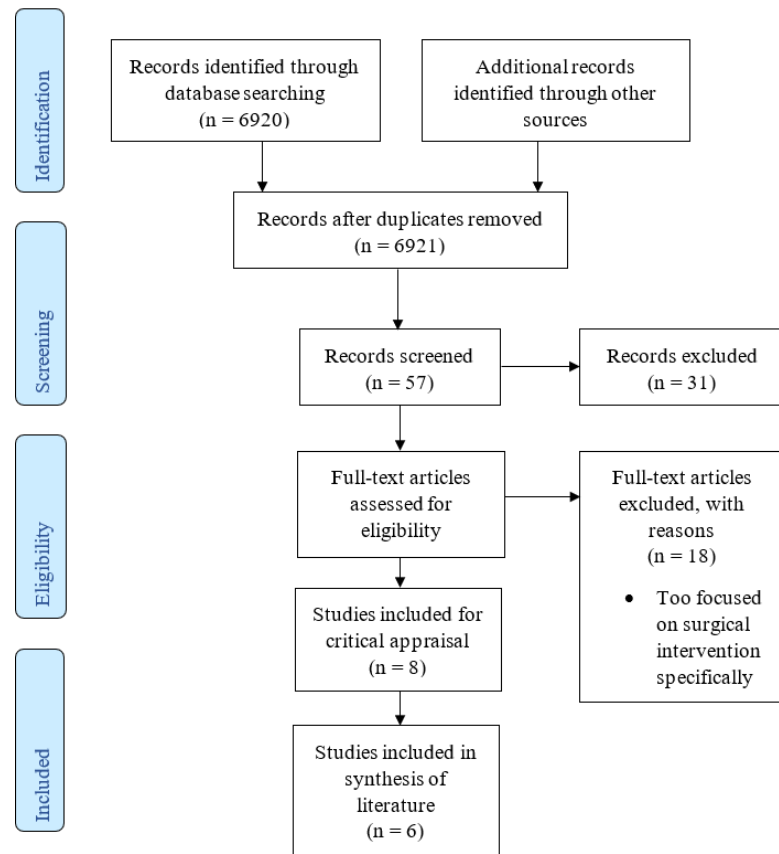
---

PICO QUESTION

# Evidence

**Figure 1**

*Adapted PRISMA Flow Diagram*



*Note. Adapted PRISMA Flow Diagram.*

# LITERATURE SEARCH



# Research Evidence

- Eight articles met the PICO question components and inclusion criteria and were appraised using the JHNEBP Model critical appraisal tools.
- Decrease in length of stay following SCCP implementation in a variety of settings and modalities (Holmes et al., 2019; Rotter et al., 2010; Wharton et al., 2020; Yu et al., 2020).
- Hospital setting (Holmes et al., 2019; Mangat et al., 2020; Wharton et al., 2020; Wildemeersch et al., 2018; Yu et al., 2020).
- Retrospective chart reviews most frequently used to gather data (Holmes et al., 2019; Mangat et al., 2020; Wharton et al., 2020; Yu et al., 2020).
- **Evidence Ratings**
  - Level II-III/A (high quality)
  - Level III/B (good quality)

# Evidence Synthesis

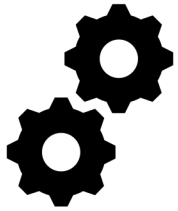
Outcome	Rotter et al., 2010	Mangat et al., 2020	Yu et al., 2020	Wharton et al., 2020	Holmes et al., 2019	Wildemeersch et al., 2018
Length of Stay <sup>1</sup>	↓ <sup>s</sup>	≠	↓ <sup>s</sup>	↓ <sup>s</sup>	↓ <sup>s</sup>	↑ <sup>s</sup>
Pain Scores <sup>2</sup>	∅	↓ <sup>s</sup>	∅	↓ <sup>s</sup>	↓ <sup>s</sup>	↓ <sup>s</sup>
Hospital Readmissions <sup>2</sup>	∅	≠	∅	↓ <sup>c</sup>	↓ <sup>c</sup>	∅
Postoperative Complications <sup>2</sup>	↓ <sup>s</sup>	≠	≠	∅	≠	∅
Sample Size	11,398 patients	55 patients	148 patients	109 patients	436 patients	122 patients
Level of Evidence	II	III	III	III	III	III
Quality of Evidence	A	A	A	A	A	B

*Note.* ↓=decrease; ↑=increase; ≠=no change, ∅=not discussed in study; s=statistical significance; c=clinical significance; <sup>1</sup>=primary outcome, <sup>2</sup>=secondary outcome



# Non-Research Evidence

---



- **Literature reviews** have shown that evidence supports decreased length of stay following implementation of an SCCP (Gurria et al., 2020; Medbery et al., 2019)
  - **Educating** staff nurses with eLearning tactics increases knowledge level for associated topics, thus **improving quality of care** (Block et al., 2018; Francis et al., 2018; Kakkar et al., 2021)
  - **Evidence Ratings**
    - Level III/A (high quality)
    - Level III-V/B (good quality)
-

# Recommendations

1

It is recommended to implement a standardized clinical care pathway for pectus excavatum patients who undergo the Nuss Procedure to decrease length of stay.

(Holmes et al., 2019; Rotter et al., 2010; Wharton et al., 2020; Yu et al., 2020)

2

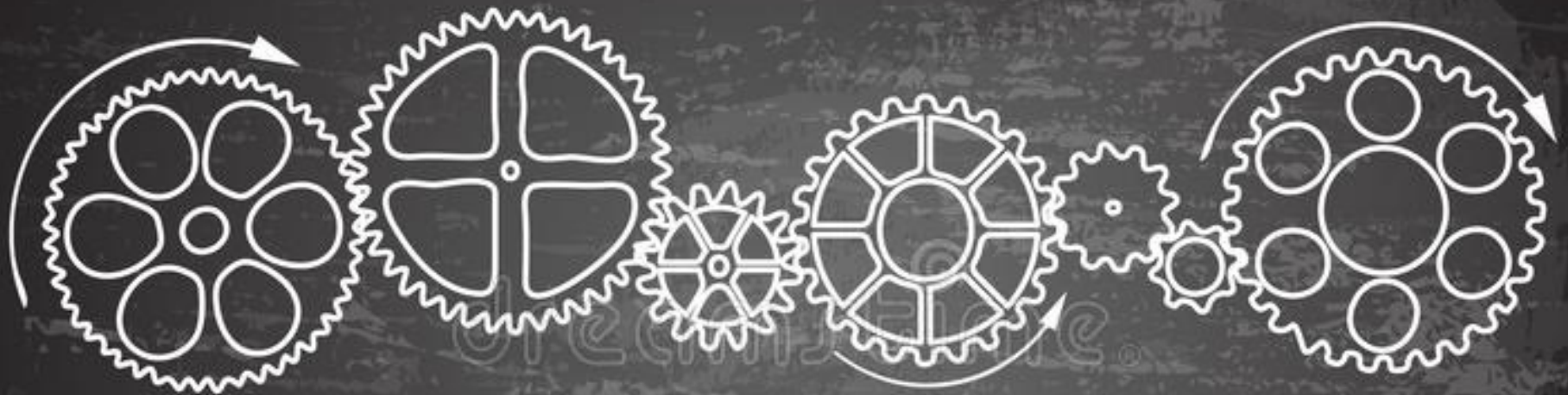
It is recommended to implement a standardized pain protocol for pectus excavatum patients who undergo the Nuss Procedure to improve post-operative outcomes.

(Mangat et al., 2020; Holmes et al., 2019; Wharton et al., 2020; Wildemeersch et al., 2018)

3

It is recommended to provide education to staff nurses regarding implementation of a standardized clinical care pathway for pectus excavatum patients.

(Block et al., 2018; Francis et al., 2018; Kakkar et al., 2021)



**IMPLEMENTATION**

# Setting and Population

- East Tennessee Children's Hospital
  - Serves local counties, Southeast Kentucky, and Southeast Virginia
  - 152 inpatient beds
- Inpatient Surgery Unit (IPS)
  - 24 bed unit
  - 32 registered nurses
- All patients who undergo the Nuss Procedure for Correction of Pectus Excavatum
- Pilot implementation reaching all 32 IPS nurses

# Project Team and Stakeholders

- **Project Team Members**
  - DNP Student
  - Faculty project chair
  - Community committee member
- **Additional Stakeholders**
  - IPS staff nurses
  - IPS management staff
  - UTK statistician

# Intervention Implementation

- eLearning Module
  - Pre-knowledge assessment
    - 11 questions highlighting key knowledge topics regarding pectus excavatum, the Nuss Procedure, and the SCCP created by the ETCH multidisciplinary team.
    - 6 demographic questions requesting the nurses' age, race, and years as a nurse.
  - eLearning module with information regarding the SCCP and care for PE patients.
  - Post-knowledge assessment
    - Staff nurses answered all the same questions from the pre-knowledge assessment, then were required to apply the knowledge gained in two application-based case studies, with four questions each.

# Intervention Implementation

- Chart audits were completed from June 1, 2022 to August 31, 2022 to assess staff nurses' utilization of the standardized clinical care pathway on patients who underwent the Nuss Procedure.
- Data collected during chart audits included:
  - Patients' length of hospital stay.
  - Nursing utilization of the patient intervention checklist to prepare for discharge:
    - Incentive spirometry use, ambulation, diet, hygiene.
- Chart audits were completed to address gaps between care interventions and nursing/patient capability, along with charting limitations.

# Steps to Going Home Discharge Checklist



POST-OP

## Pectus repair (Post-Op Care)

### Pain Control:

There are 2 types of pain control that may be used after surgery:





#### Cryo Nerve Block Therapy

- The nerve under each rib is frozen by your doctor before surgery. This makes the chest have no feeling. This can take up to 18 hours to take effect.
- While the nerve block therapy is starting to work, your doctor will order a PCA (patient controlled analgesia) pump. The PCA is a small computer that gives you a safe amount of medicine.

#### Epidural

- A small catheter (flexible tube) is put into your back to deliver medicine by a special pump controlled by a computer.
- It is very safe

You will be given the Recovery Chart below. This chart explains what you are expected to do after the surgery.

				
<b>Day 0 (Day of Surgery)</b>	Walk to bathroom in your room Move to the chair and sit for 30 minutes <input type="checkbox"/>	Start with clear liquids. If you are not sick at your stomach or vomiting, ask for food.	Use the incentive Spirometer 10 times every hour while you are awake <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<b>WASH YOUR HANDS</b>
<b>Day 1</b>	Walk to bathroom in your room Sit in the chair 3 times <input type="checkbox"/> <input type="checkbox"/> Walk in the hall <input type="checkbox"/>	If you are not sick at your stomach or vomiting, eat a regular diet.	Use the incentive Spirometer 10 times every hour while you are awake <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<b>WASH YOUR HANDS</b> Wash your body (you can shower) Put on a clean gown/shirt
<b>Day 2</b>	Walk to bathroom in your room Sit in the chair 3 times <input type="checkbox"/> <input type="checkbox"/> Walk in the hall <input type="checkbox"/> <input type="checkbox"/>	If you are not sick at your stomach or vomiting, eat a regular diet.	Use the incentive Spirometer 10 times every hour while you are awake <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<b>WASH YOUR HANDS</b> Wash your body (you can shower) every day Put on a clean gown/shirt
<b>Day 3</b>	Walk to bathroom in your room Sit in the chair 3 times <input type="checkbox"/> <input type="checkbox"/> Walk in the hall <input type="checkbox"/> <input type="checkbox"/>	If you are not sick at your stomach vomiting, eat a regular diet.	Use the incentive Spirometer 10 times every hour while you are awake <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<b>WASH YOUR HANDS</b> Wash your body (you can shower) Put on a clean gown/shirt

Steps to going home

[www.etch.com](http://www.etch.com)



# Ethical Considerations

- Determination from the University of Tennessee Institutional Review Board (IRB) and the IRB at ETCH was sought prior to the implementation of this project.
- Data collection occurred at two points: pre-module completion and post-module completion.
- Privacy and confidentiality protection through collection, storage, analysis, and transfer.
  - Data were securely exported to Microsoft Excel and SPSS.
  - All data were reported in aggregate.



# Findings



## Demographics

- The mean age of participants was 31.31 years ( $SD = 6.85$ ).
- Of the nurses participating, 93% identified as female, White, and not Hispanic or Latino.
- The mean years of nursing experience was 7.15 ( $SD = 5.56$ ).
- Three nurses had an associate degree, 10 had a bachelor's degree, and one had a master's degree.

# Knowledge Assessment



- Fourteen nursing staff completed the initial pre-and-post knowledge assessments indicating a 44% participation rate.
- There was a statistically significant difference between the pre-and post-intervention learning assessments after completing the eLearning module.
  - Scores on the pre-knowledge assessment were ( $M = 9.07$ ,  $SD = 1.27$ ) and ranged from a score of 7 to 11 out of a possible score of 11. Scores on the post-knowledge assessment were ( $M = 10.71$ ,  $SD = 0.47$ ) and ranged from 10 to 11.
- A paired sample t-test indicated a statistically significant difference between pre-and post-knowledge assessment scores ( $p = .001$ ).

# Assessment of Charting on Outcome Measures



- Chart audits assessed nursing staff adherence to charting from the SCCP checklist over the three-day period.
- Nurses charted the patient diet 100% of the time, patient shower/bath hygiene 20-100% of the time, and patient linen/clothing hygiene 0-100% of the time. Ambulation and incentive spirometry use were charted 0% of the time.
  - Diet and hygiene charting interventions are pre-populated in the patient's electronic health record (EHR).
  - Ambulation and incentive spirometry use must be manually added to EHR.
- Nurses were more compliant with charting items from the checklist that were pre-populated into the patient chart. However, there was a considerable amount of missing data in the patient's chart as well as the paper copies of the bedside checklist were not scanned into the EHR.

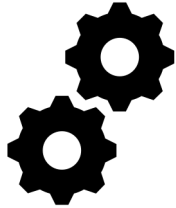
# Length of Stay

- There was a statistically significant difference between the use of cryotherapy for pain management and the length of hospital stay following the Nuss Procedure.
- Length of stay decreased from a mean of 4.28 days ( $SD = 0.49$ ) in 2020 to 2 days ( $SD = 0.0$ ) in both 2021 and 2022 following the implementation of cryotherapy in 2021.
- This 2.28-day decrease in length of stay was a statistically significant difference in length of stay after beginning cryotherapy ( $p = .001$ ).

# Implications

# Practice Implications

---



- **Length of hospital stay** was significantly decreased following the implementation of the cryotherapy pain management treatment from the SCCP.
  - Suggests a likely **decrease** in post-operative pain scores during hospital admission.
- **Pectus excavatum** is the **most common** chest wall anomaly – there will continue to be patients that require the Nuss Procedure for surgical correction.



# Strengths and Limitations

## Strengths

- Collaboration of the multidisciplinary team to create the SCCP.
- Low cost of creating the SCCP and implementing nursing education.
- Decrease in length of stay following the implementation of the cryotherapy feature of the SCCP.

## Limitations

- Small sample size of nursing participants and patients receiving the Nuss Procedure at this pediatric facility.
- All aspects of the eLearning module had to be completed at the same time.
  - Restriction of the learning management system.
  - Resulted in the inability to determine retention of knowledge.



## Barriers

- IPS unit switched floors to a unit with a higher number of beds.
- Large amount of staff turnover.
- Nurses expressed increased burnout.
- The patient population on the IPS unit changed to include a wider variety of patient diagnoses.
- Staff nurses were noted to adhere to charting interventions that were pre-populated into the chart, and there was poor adherence to charting interventions that did not pre-populate into the chart.
- Discharge checklists were on paper and were misplaced at patient discharge.

# Areas for Further Examination and Sustainability

- Creation of a specified intervention bundle for Nuss Procedure patients in the EHR or update current intervention bundle that is used at this time.
- Charting interventions related to the SCCP, such as ambulation, incentive spirometry use, diet, hygiene, and education, should be pre-populated in the EHR.
- The patient discharge checklist should be converted from paper to an electronic version within the EHR.
- Addition of hands-on education and simulation of skills.
- Continued chart audits for nursing adherence until sustained.



# Dissemination

## Dissemination

1

**Poster Presentation** at University of Tennessee, Knoxville Research Day on November 8, 2022.

2

**Executive Summary** to be submitted to key stakeholders at the project facility by December 15, 2022.

3

**Submission of manuscript and final defense PowerPoint presentation** to Tennessee Research and Creative Exchange (TRACE).

# QUESTIONS?

Thank you!



THE UNIVERSITY OF  
TENNESSEE  
KNOXVILLE