Impact of a Trauma Response Nurse Deployment to Alpha Trauma Activations in a Level I Academic Trauma Center

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The purpose of this project was to evaluate outcomes of a Trauma Response Nurse (TRN) program at the highest tier of trauma activations in a Level I Trauma Center Emergency Department

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AGENCY FOR CLINICAL INNOVATIONS FRAMEWORK (ACI)

1
establish evaluation team
scope, analysis of previous evaluations and results

1. ESTABLISHING EVALUATION TEAM

- Advisor:
  - Dr. Beth Quatrara, DNP, RN, CMSRN, ACNS-BC
- Second Reader:
  - Dr. Kathryn Laughon, PhD, RN, FAAN

  Clinical Advisor
  - Valerie Quick, MSN, RN, EMT-I
- Data Specialist
  - Dr. David Martin, PhD

1
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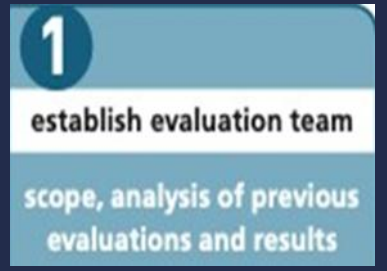
1. ESTABLISHING EVALUATION TEAM

Scope of Trauma:

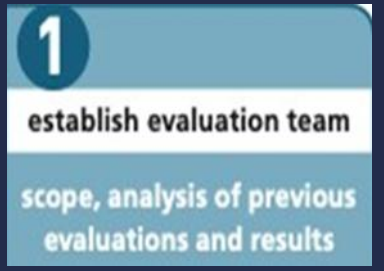
- **Unintentional injury #1 cause of death ages 16-44 (CDC, 2023b)**
- **295,000 American adults (>16) died from traumatic injuries (CDC, 2023a)**
- **4.9 million Years of Potential Life Lost (Y-PLL) [CDC, 2022a]**
- **22.8 million ED visits with 3.3 million admissions (CDC, 2023a)**



1. ESTABLISHING EVALUATION TEAM

Scope Continued:

- **Hemorrhage is the most common cause of death in traumatic injury. (Powell et al., 2016)**
- **Prompt recognition and administration of blood saves lives. (Cotton et al., 2010; Powell et al., 2016)**
- **In Mass Transfusion Protocol (MTP), 1:1 PRBC/FFP are preferred but 2:1 is acceptable. (Holcomb et al., 2015)**
- **Definitive care within two hours increases survival. (Hsieh et al., 2022)**



1. ESTABLISHING EVALUATION TEAM

Analysis of Previous State

Trauma Response Nurse (TRN) program origins

- Loss of trauma nurse experience
- Recognition of opportunity for improvement
- Original purpose of the TRN program
  - Rapid blood transfuser operations
  - Arterial line set-up with hemodynamic monitoring
- TRN program launched in July 2022
  - No previous evaluation of the program

1
establish evaluation team
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1. ESTABLISHING EVALUATION TEAM

What is a Trauma Response Nurse (TRN)?

- Surgical-Trauma ICU nurse with 2+ years of critical care experience
- TNCC required, ATCN and TCRN preferred
- Experience/comfort in critical care skills
- TRN counts against STICU full-time equivalent (FTE)

Alpha Trauma Alert (Adult ≥ 16) Criteria

Airway/Breathing

- ❒ Patients transported from the scene who require BVM assistance or who have had an advanced airway intervention (SGA, ETT, surgical cricothyrotomy, needle decompression)

  Patients intubated at OSH without any other alpha alert criteria or ongoing respiratory issues may be alerted at the beta level

Respiratory compromise:

- ❒ Sustained SPO2 ≤ 90% (with good waveform)
- ❒ Requires high flow oxygen (15L) to maintain saturations above 90%
- ❒ Significant work of breathing (ex. cyanosis, wheezing/stridor due to injury)
- ❒ Intra-oral/airway bleeding requiring ongoing suctioning or positioning
- ❒ Patients who are in need of an emergent airway intervention

Circulation

Confirmed hypotension at any time:

- ❒ Ages 16-64 years: SBP ≤ 90
- ❒ Ages 65+ years: SBP ≤ 100
- ❒ Patients who require ongoing blood transfusion or pressors
- ❒ Cardio/pulmonary arrest with ROSC

Disability

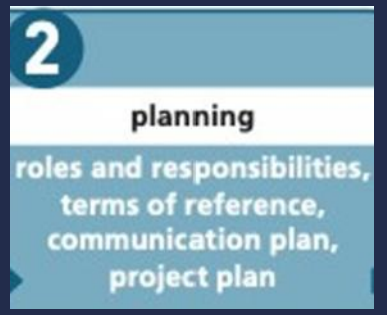
- ❒ GCS ≤ 9 (with mechanism attributed to trauma or signs of external injury) **

Physical Findings

- ❒ Gunshot wounds to the head, neck, chest or abdomen

Other

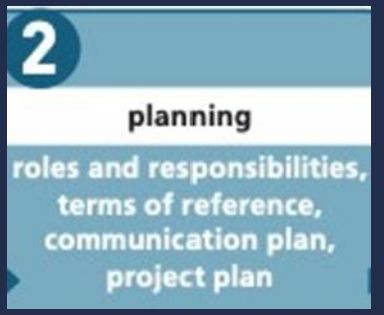
- ❒ Emergency or Trauma Service physician's discretion
- ❒ Alerts should be upgraded when alpha criteria are met (up until admission)



2. PLANNING

Common Themes in Literature:

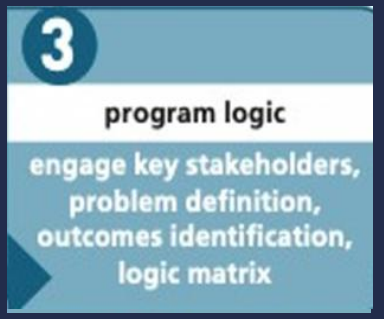
- Reduced ED LOS (Geyer et. al., 2016; Holder et. al., 2023; Moss et. al., 2021; Walter et al., 2015)
- Decreased time to definitive care (Clements et. al., 2012; Geyer et. al., 2016; Holder et. al., 2023; Martin et. al., 2011)
- Massive Transfusion Protocol (MTP) adherence led to better outcomes (May et. al., 2020; Polovitch et. al., 2019)



2. PLANNING, CONT.

Project Plan:

- **Consult with Lead Trauma Registrar**
- **Meeting with Clinical Advisor**
- **Chart Review from 1 Jul 2022-31 Jun 2024**



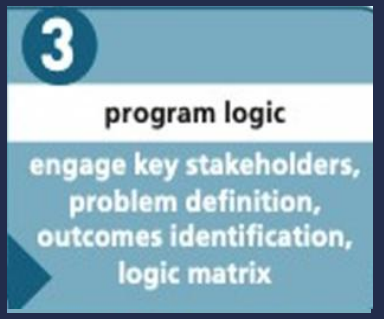
3. PROGRAM LOGIC

Engagement with Stakeholders:

- Stakeholder Meeting held May 2024
  - Defined the original intent of the TRN program
    - Hemodynamic monitoring setup
    - Rapid blood transfusion device operation

Problem Definition:

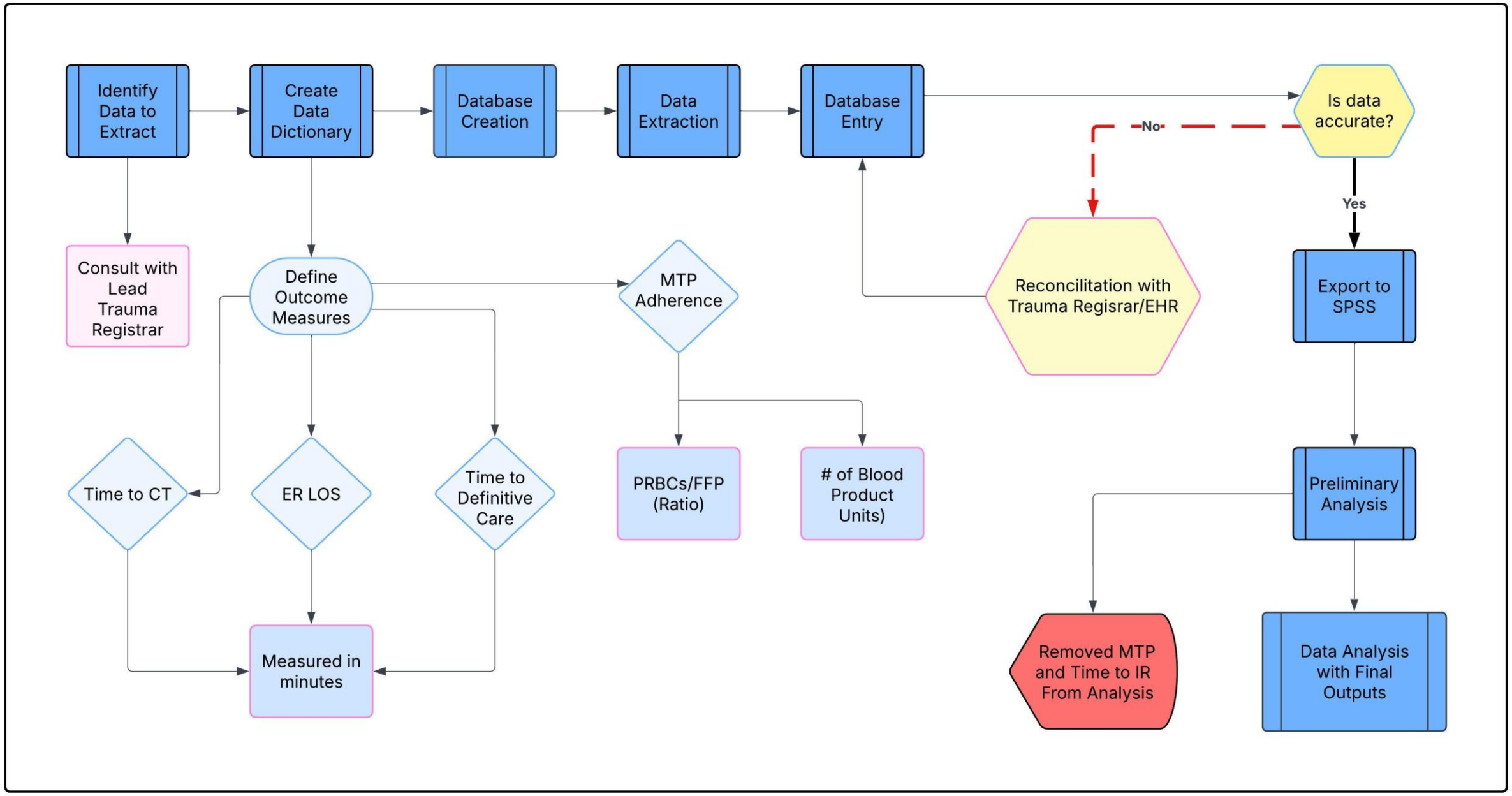
- Was TRN beneficial or not?



3. PROGRAM LOGIC, CONT.

Outcomes Identification:

- Primary Outcomes
  - Emergency Department LOS
  - Time to Definitive Care
    - Inpatient Unit, OR, IR
  - Time to CT
- Secondary Outcomes
    - MTP Response Times
    - MTP Protocol Adherence

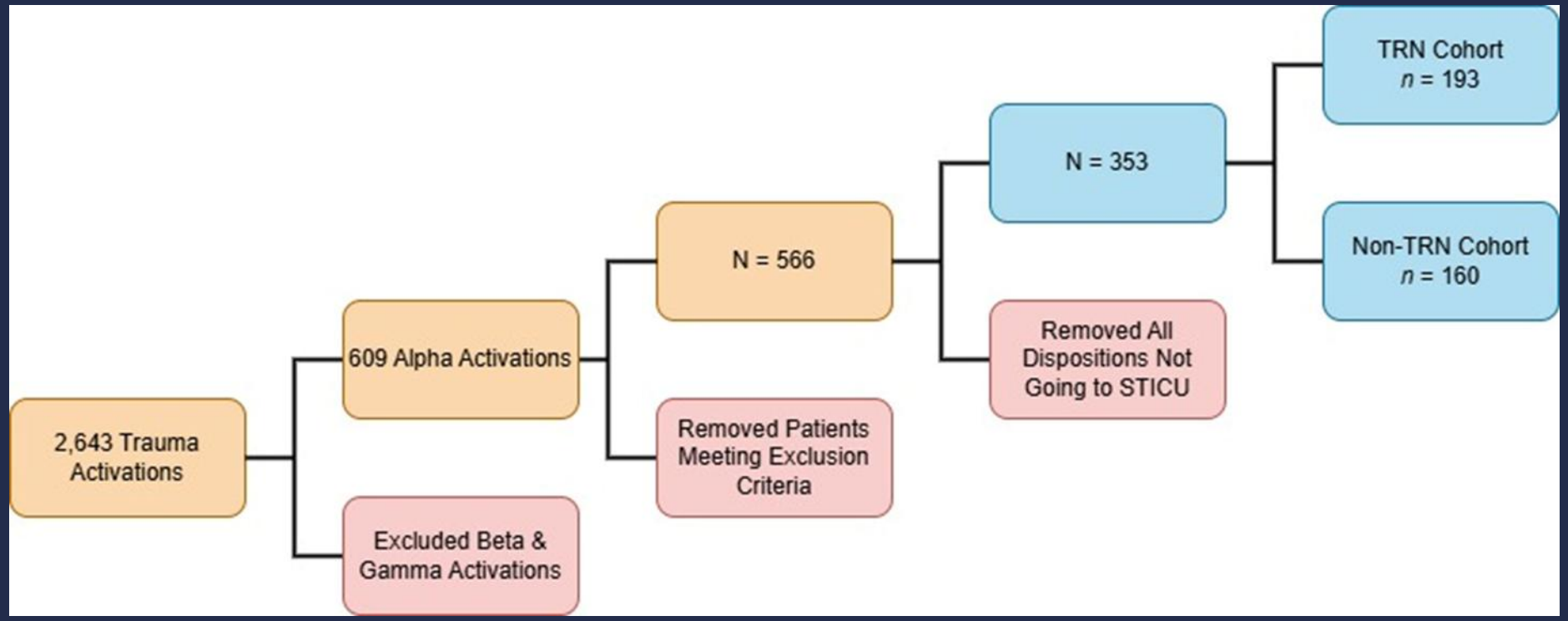

Identify Data to Extract
Create Data Dictionary
Database Creation
Data Extraction
Database Entry
Is data accurate?
No
Yes
Consult with Lead Trauma Registrar
Define Outcome Measures
MTP Adherence
Reconcilitation with Trauma Regisrar/EHR
Export to SPSS
Time to CT
ER LOS
Time to Definitive Care
PRBCs/FFP (Ratio)
# of Blood Product Units)
Preliminary Analysis
Measured in minutes
Removed MTP and Time to IR From Analysis
Data Analysis with Final Outputs

3

program logic

engage key stakeholders, problem definition, outcomes identification, logic matrix

3. PROGRAM LOGIC



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4. EVALUATION DESIGN

Specific questions to answer during this program evaluation include:

- **Were there any significant differences between TRN and Non-TRN groups?**
- **Were there differences in the primary outcomes measured between the TRN and Non-TRN groups?**

5. DATA PLAN

Data Sources:

- Data Extraction from Trauma Registry
- Developed a database to analyze patient data
- Exportation into SPSS Statistical Software

Measures:

- Primary outcomes measured in minutes

6

implementation

develop and test instruments, data collection, analysis

6. IMPLEMENTATION

- Chi Square Analysis
- Mann Whitney U Test
- Median over Mean

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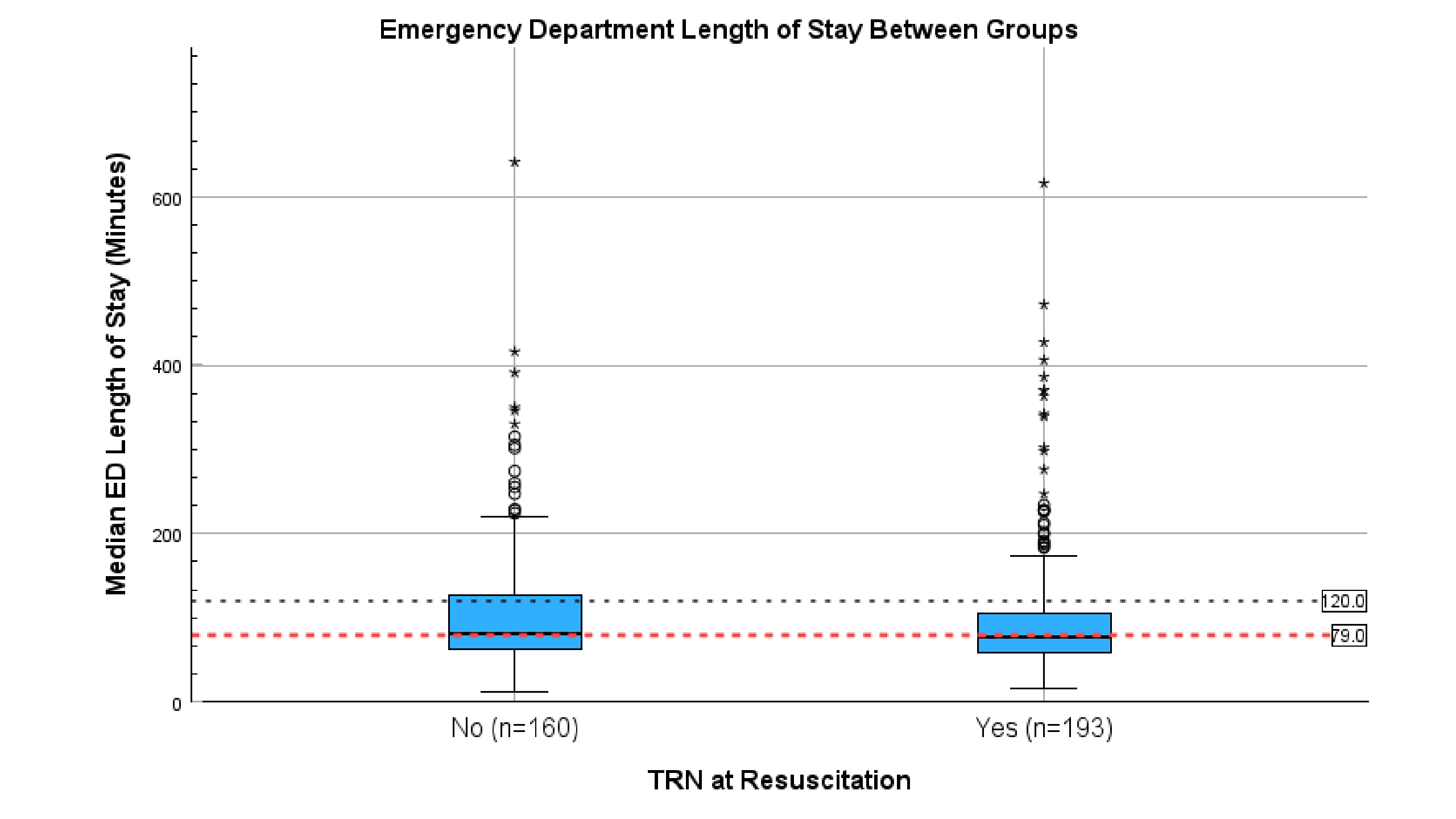
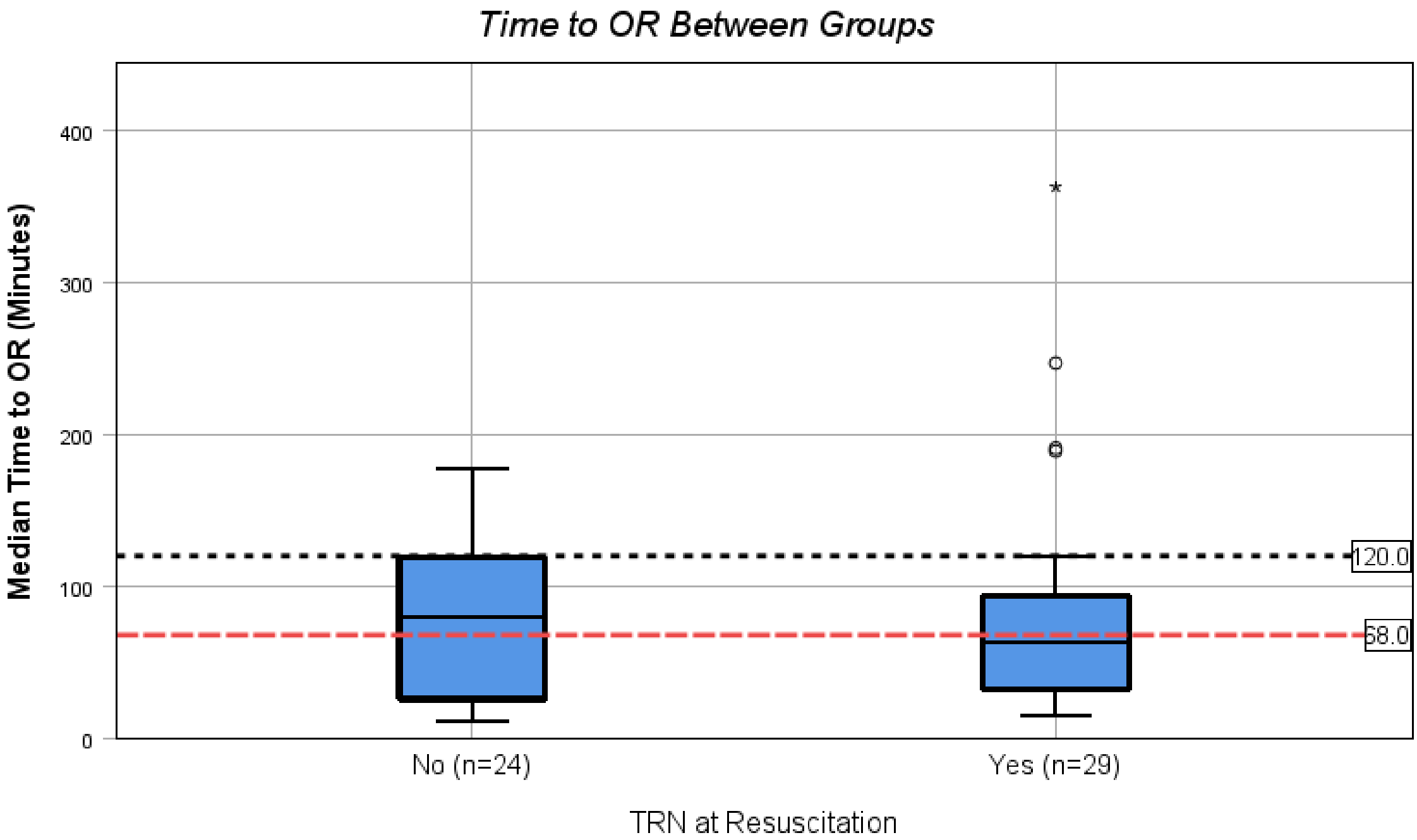
DEMOGRAPHICS

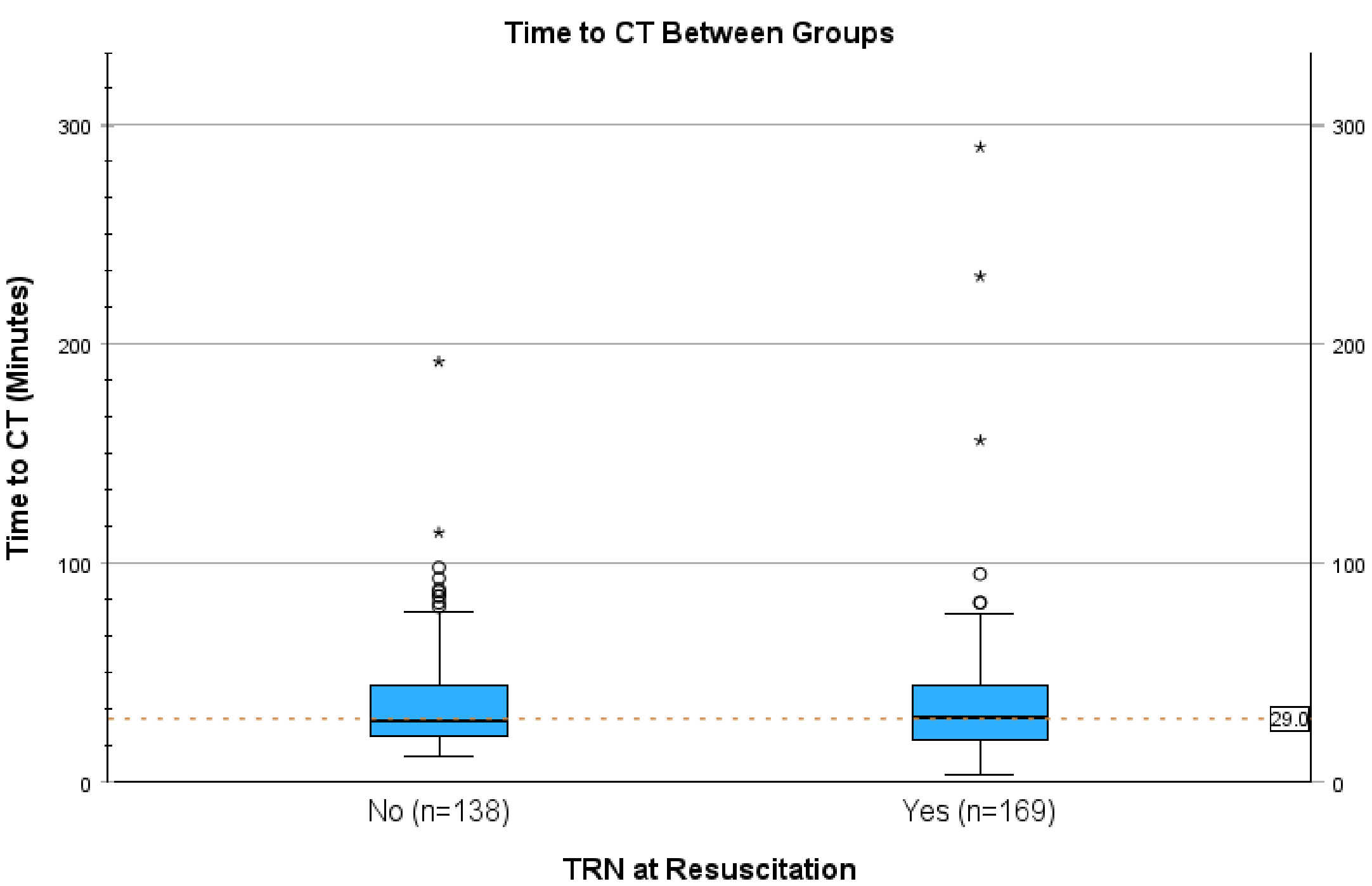
Demographics	TRN Group (*n*=193)	Non-TRN (*n*=160)	N=355	*p*
Sex, *n*(%)				.48
Male	144 (74.6%)	114 (71.3%)	258 (73.1%)	
Female	49 (25.4%)	46 (28.7%)	95 (26.9%)	
Age, *n*(%)				.74
16-30	51 (26.4%)	51 (31.9%)	102 (28.9%)	
31-45	43 (22.3%)	33 (20.6%)	76 (21.5%)	
46-65	42 (21.8%)	32 (20.0%)	74 (21.0%)	
>65	57 (29.5%)	44 (27.5%)	101 (28.6%)	
ISS, *Median* (IQR)	22 (14-29)	22 (14-29)		.40
POS, *Median*, (IQR)	0.87 (0.53-0.95)	0.89 (0.61-0.96)		.85
Pre-Hospital Cardiac Arrest, *n*(%)	10 (5.2%)	3 (1.9%)	13 (3.7%)	.10
Injury Type, *n*(%)				.23
Blunt	168 (87%)	132 (82.5%)	301 (85%)	
Penetrating	25 (13%)	28 (17.5%)	53 (15%)	

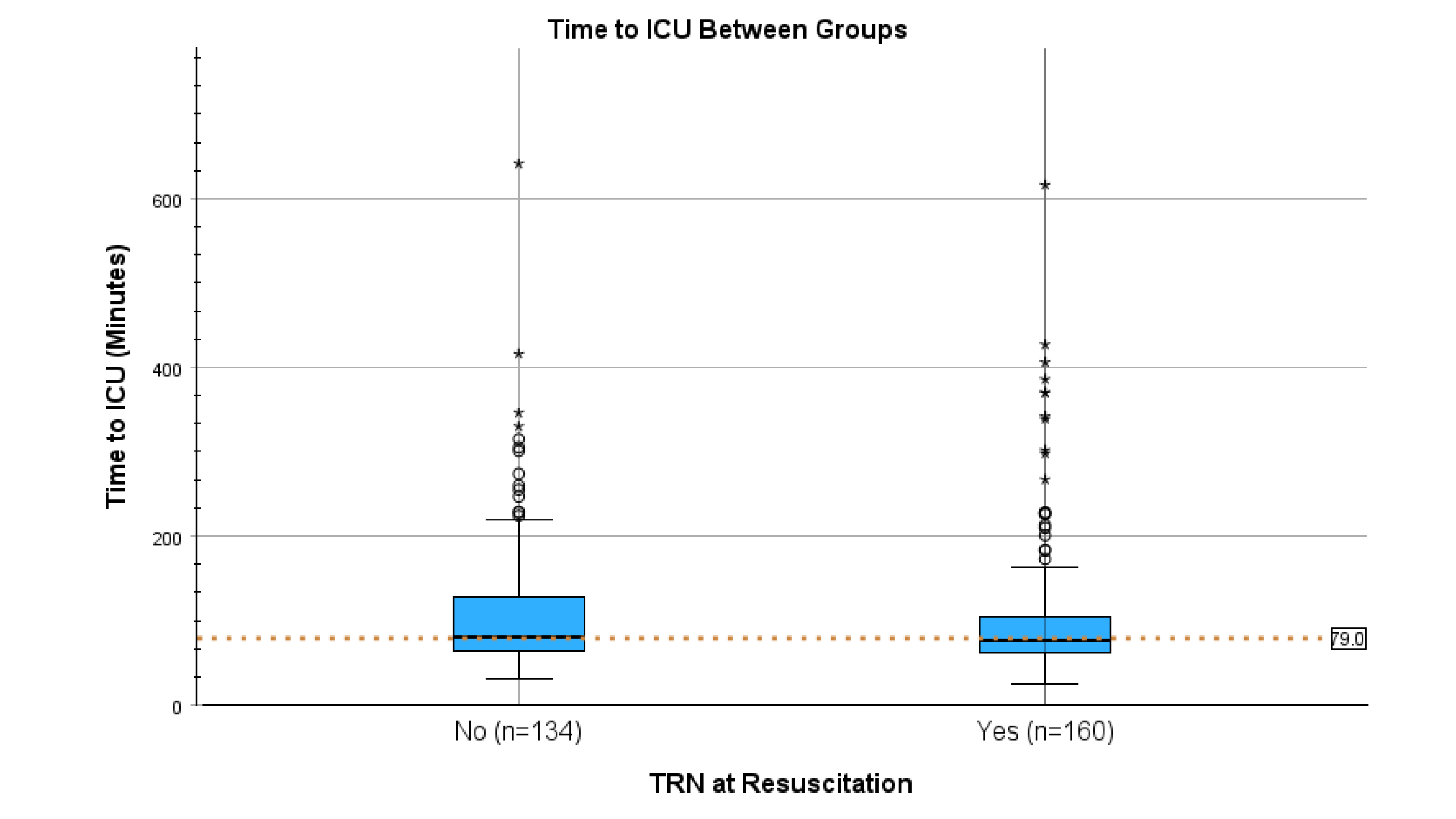
DEMOGRAPHICS, CONT.

Demographics	TRN Group (*n*=193)	Non-TRN (*n*=160)	N=355	*p*
Injury Mechanism *n*(%)				.43
Motor Vehicle Accident	75 (38.9%)	67 (41.9%)	142 (40.2%)	
Fall	48 (24.9%)	29 (18.1%)	77 (21.8%)	
GSW	21 (10.9%)	18 (11.3%)	39 (11%)	
Motorcycle Accident	17 (8.8%)	14 (8.8%)	31 (8.8%)	
Vehicle Vs. Pedestrian	11 (5.7%)	4 (2.5%)	15 (4.2%)	
Stabbing	2 (1.0%)	8 (5%)	10 (2.8%)	
Other Blunt Trauma	5 (2.6%)	4 (2.5%)	9 (2.5%)	
ATV Accident	3 (1.6%)	5 (3.1%)	8 (2.3%)	
Farm/Industry Accident	4 (2.1%)	3 (1.9%)	7 (2.0%)	
Crush Injury	3 (1.6%)	2 (1.3%)	5 (1.4%)	
Sports-Related Injury	1 (0.5%)	3 (1.9%)	4 (1.1%)	
Assault	2 (1.0%)	1 (0.6%)	3 (0.8%)	
Other Penetrating Trauma	1 (0.5%)	2 (1.3%)	3 (0.8%)	


Emergency Department Length of Stay Between Groups
Median ED Length of Stay (Minutes)
600
400
200
0
120.0
79.0
No (n=160)
Yes (n=193)
TRN at Resuscitation


Time to OR Between Groups
Median Time to OR (Minutes)
400
300
200
100
0
120.0
68.0
No (n=24)
Yes (n=29)
TRN at Resuscitation


Time to CT Between Groups
Time to CT (Minutes)
300
200
100
0
29.0
No (n=138)
Yes (n=169)
TRN at Resuscitation


Time to ICU Between Groups
Time to ICU (Minutes)
600
400
200
0
79.0
No (n=134)
Yes (n=160)
TRN at Resuscitation

7
communicating results
reporting, dissemination of results to all participants, publish

7. COMMUNICATING RESULTS

Discussion:

- Cohorts had similar demographics
- 55% overall TRN Response
- TRN had reduced time to OR (63 mins vs 80 mins)
- TRN reduced ER LOS (77 vs 81.5)
- TRN reduced time to ICU (77 vs. 81)
- Marginal differences in time to CT (30 vs 28 mins)

7. COMMUNICATING RESULTS,

Dissemination & Publication:

- **Executive summary to Stakeholders**
- **Submit an abstract to TraumaCon 2026 (Society of Trauma Nurses)**
- **Manuscript Submission**
  - **Journal of Trauma Nursing**

8. INCORPORATE FINDINGS

Recommendations based on results:

- **Dedicated TRN FTE to the Emergency Department.**
- **Expand to Beta trauma activations.**
- **In-situ observations to measure MTP effectiveness.**

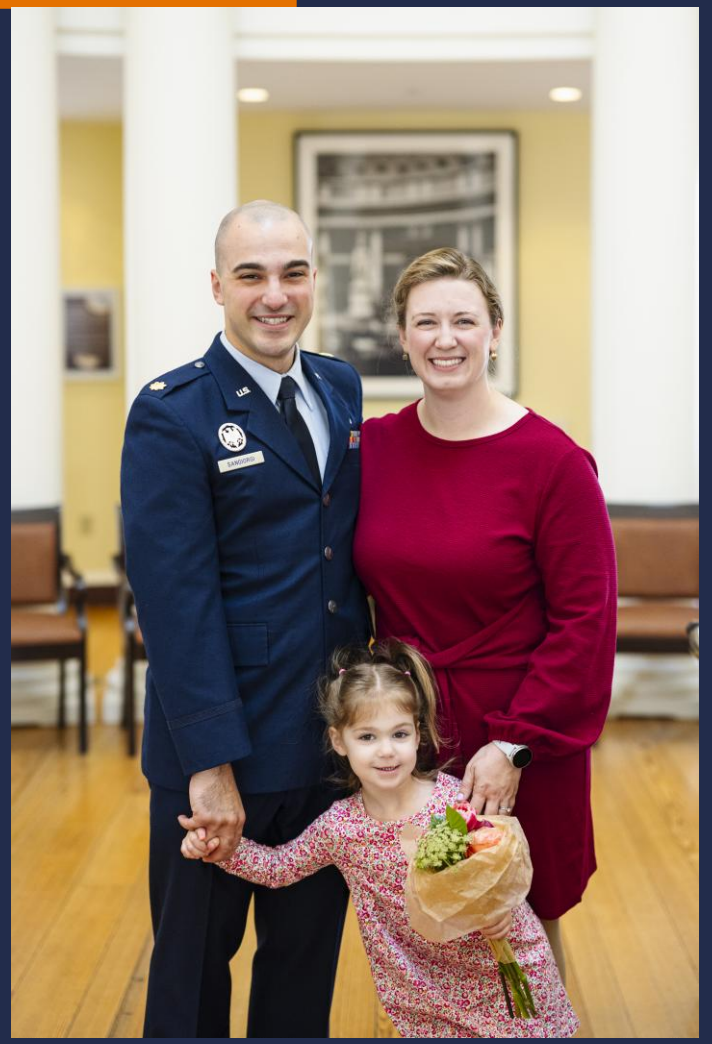
FINANCIAL CONSIDERATIONS

RN Full-time	Staffing will be 1 TRN per shift 24/7 (14 shifts/wk)	Unit Costs	Extended Cost
Salary	3 ppl x 3 d = 9 shifts (108 hrs/wk x 52 wks = 5616 hrs/yr)	$ 46.00	$ 258,336.00
Benefits	29%	$ 13.34	$ 74,917.44
Certification/Education	ACLS, TCRN, ATCN	$980	$ 2,940.00
RN Part-time			
Salary	2 x 2= 4 shifts (48 hrs/wk x 52 wks = 4992 hrs/yr)	$ 46.00	$ 114,816.00
Benefits	29%	$ 13.34	$ 33,296.64
Certification/Education	ACLS, TCRN, ATCN	$980	$ 1,960.00
RN Per Diem			
Salary	1 x 1= 1 shifts (12 hrs/wk x 52 wks = 624 hr/yr)	$ 46.00	$ 28,704.00
Benefits	0%	$ -	$ -
Certification/Education	ACLS, TCRN, ATCN	$980	$ 980.00
RN Replacement	4 wks off per full/ part-time staff (432 hr for full + 192 hr for part = 624 total hrs)	$ 36.00	$ 22,464.00
Sub-Totals			**$538,414.08**

ETHICAL CONSIDERATIONS

- Beneficence
  - Reduced mortality
  - Improve functional outcomes at discharge
- Justice
  - Timely care at 55% response rate
  - Recommend permanent TRN FTE in ER
    - Goal for 100% of alphas to have TRN

ACKNOWLEDGEMENTS



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