# Investigating the Impact of Leader Characteristics in the Trauma Bay

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## Abstract

Each year, over 2,000 critically injured patients receive care at the U's **Trauma Surgery Center.** Communication among the trauma team is essential to quality care. We examined whether communication clarity differed by Team Leader characteristics.

The Team Leader, a trauma surgeon, plays a decisive role in the trauma team's success. As the diversity of trauma surgeons increases, factors like gender bias may impact team functioning. Research from other industries shows that members' biases against women in leadership can negatively affect team performance. We investigated whether gender bias plays a role in the trauma bay, potentially compromising effectiveness.

Using both behavioral coding and acoustic level analyses, we analyzed recorded footage of over 800 trauma bay resuscitations to determine: average noise levels,, number of times "quiet" was spoken, and the effectiveness of "quiet" in reducing noise levels and increasing communication clarity. Analyses tested our research questions:

1. **Does the noise level in the trauma bay differ based on leaders' gender and/or rank?**
2. **Does a "quiet" command impact communication clarity, and does this differ by leaders' gender and/or rank?**
3. **Does a "quiet" command impact noise level, and does this differ by leaders' gender and/or rank?**

This project supports the U's missions to increase representation of women in trauma medicine and to provide exceptional patient care.

## Introduction

- When patient is brought into the trauma bay, a trauma surgeon leads a team of medical professionals through treating the patient.
- A high-functioning trauma team requires non-technical skills such as communication, teamwork, and leadership.[1]
- Outside of the trauma bay, there is evidence of gender bias among team members towards leaders, despite no difference in men and women's leadership quality.[2] Gender bias in the trauma bay would pose a threat to team efficiency and patient outcomes.[3]
- Whisper, an advanced neural network-based ASR by OpenAI, transcribes audio reliably across languages and challenging conditions, including noise and varied accents.[5]
- A-Weighting in audio processing adjusts sound measurements to reflect human ear sensitivity[6], commonly used to assess perceived loudness and analyze sound levels.[7,8]

## Materials

- We analyzed 818 videos recorded in the trauma bay for indications of negative team functioning including noise level, communication clarity and instances of "quiet" commands (in 202 videos).
- The team leader is either a resident (trauma surgeon in training) or attending physician.

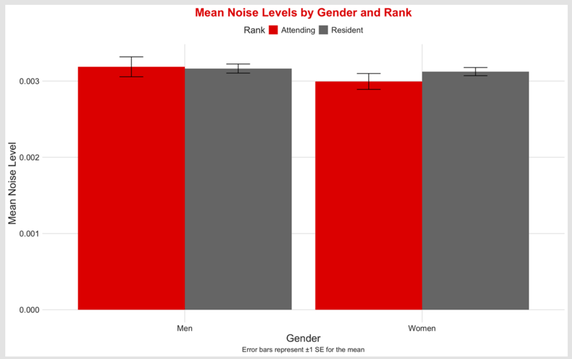
University of Utah Trauma Service Training Practice [9]

**Table 1**
*Trauma Leader Characteristics*

| | Men | Women |
|---|---|---|
| | Research Question 1 | |
| Residents | 210 | 297 |
| Attendings | 83 | 87 |
| | Research Question 2 | |
| Residents | 48 | 67 |
| Attendings | 28 | 12 |
| | Research Question 3 | |
| Residents | 23 | 30 |
| Attendings | 14 | 7 |

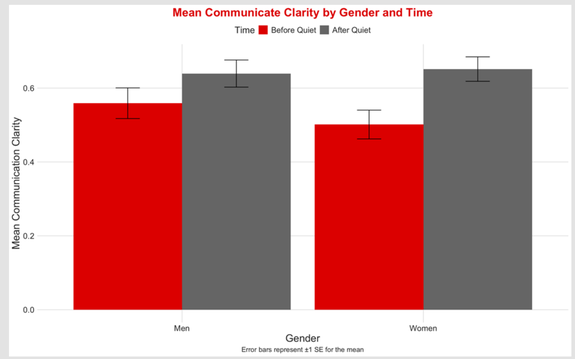
## RQ 1: Noisiness of the trauma bay didn't differ by leader gender or rank

**Significant Controls:** trauma bay room, patient systolic blood pressure
**Number of Videos:** 677



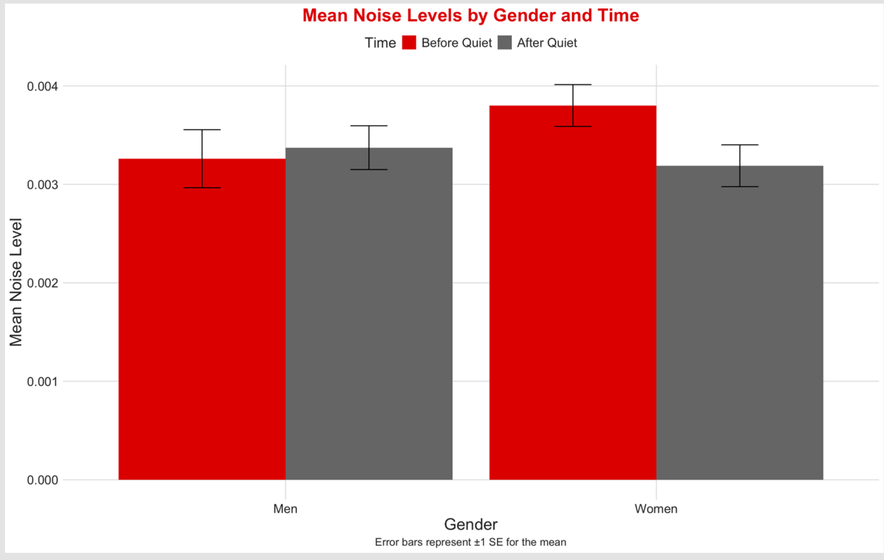

## RQ 2: "Quiet" increased communication clarity under all leaders

**Significant Controls:** none
**Number of Videos:** 155




## RQ 3: "Quiet" only decreased noise levels in trauma bays with women leaders

**Significant Controls:** trauma bay room, patient plasma count
**Number of Videos:** 74




## Analysis Strategy

| Full Data | Subset to Videos with Complete Data for Patient Controls | Model With All Control Variables | Increase Subset to Videos with Complete Data for Significant Controls | Final Model Interpretation |
|---|---|---|---|---|
| 818 total videos<br>• 202 videos where "quiet" was said | **RQ 1:** N = 196<br>**RQ 2:** N = 58<br>**RQ 3:** N = 66 | **RQ 1:** Higher systolic blood pressure - quieter rooms; Bay 2 louder than Bay 1<br>**RQ 2:** None<br>**RQ 3:** Higher plasma - louder rooms; Bay 2 louder than Bay 1 | **RQ 1:** N = 677<br>**RQ 2:** N = 155<br>**RQ 3:** N = 74 | **All plotted effects above are controlling for the significant control variables**<br>Model 1: OLS Regression; Models 2 and 3: Multilevel Modeling |

## Methodology

1. Human coders identified the leader's gender (man/woman) and rank (resident/attending physician) in videos.
1. Audio was transcribed using Whisper [5], an automatic speech recognition system, to quantify "quiet" utterances, ensuring transcript consistency via multiple runs.
1. Two transcripts per video were compared before and after "quiet" utterances using word overlap and embedding similarity to assess communication clarity.
1. Sound pressure levels were analyzed with an A-weighted transformation to approximate loudness [6]. Average noisiness was measured for the entire resuscitation and also in ten 30-second segments before and after "quiet."

## Conclusion and Recommendations

### Conclusions

- Across all leaders, "quiet" increased communication clarity.
- We didn't find bias in trauma team efficacy.
  - Men and women team leaders ran equally quiet trauma bays.
  - Residents do as well as attendings at keeping noise level low.
- The only evidence of gender bias was that "quiet" decreased noise levels under women, and not men.
  - More research is needed to verify who said "quiet," and that it was meant as a command.
  - Women may ask for quiet when the room is noisier than when men ask for quiet.
- Audio-recordings of trauma bays are inherently messy.
  - More techniques for cleaning background noise would increase the accuracy of Whisper transcriptions.

### Recommendations

- Technological tools can efficiently analyze trauma bay noise and communication clarity, providing valuable feedback to trauma teams.
- Quiet commands are effective for reducing noise and increasing communication clarity.
- Highly structured work environments may reduce the likelihood of gender bias emerging.

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Scan the QR code for our references

University of Utah Trauma Bay