The Relationship of Early Acute Pain In Theater and Heart Rate in Injured Soldiers

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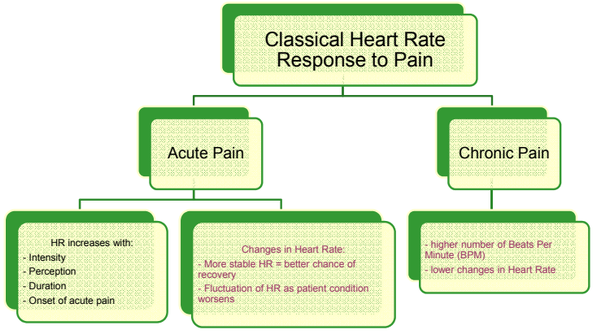
The Importance of Pain

- Pain, both acute and chronic, is being recognized as a leading problem among US soldiers injured on active duty or during deployments. Pain is experienced throughout the continuum of trauma care and within all ranks of the military.
- Pain is important to clinicians who treat both acute and chronic pain, and also to researchers who show that the development of pain as a chronic symptom may be a contributing factor to Post Traumatic Stress Disorder (PTSD) development.
- Tax dollars are spent every day for pain management of wounded soldiers, nursing home patients, and the chronically ill.
- Understanding pain, how it presents and the response our body has to it, is the key to bettering it's treatment.

Introduction

- Pain has multiple effects to the Autonomic Nervous System (ANS)[9]
- The ANS consists of the sympathetic and parasympathetic systems.[1,7]
  - The sympathetic system accelerates heart rate, widens bronchial passages, constricts blood vessels, and raises blood pressure.[1,7]
  - The parasympathetic system slows heart rate and decreases blood pressure.[1,7]
- The ANS response to pain is for the increase in sympathetic activity and a drop in parasympathetic activity.[5,9]
- HR increases as the sympathetic system takes over.[5,9]
- Pain is distinguished between discriminative (intensity) and motivational-affective (unpleasant) stimuli.[8]
- Pain causes increased heart rate and blood pressure.[5]
- However, no one has examined the relationship of early pain and physiological parameters in wounded soldiers, nor the relationship of injury severity and pain.



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Results

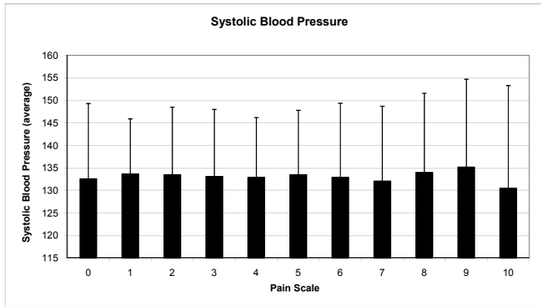

Figure 1: Heart Rate vs. Pain Scale. The heart rate showed no positive correlation with the pain scale. When graphically applied, no statistical significance was seen.

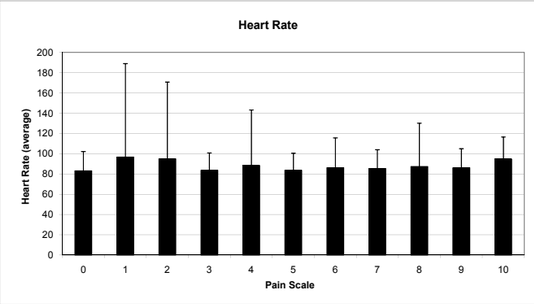

Figure 2: SBP vs. Pain Scale. The systolic blood pressure showed no positive correlation with the pain scale. When graphically applied, no statistical significance was seen.

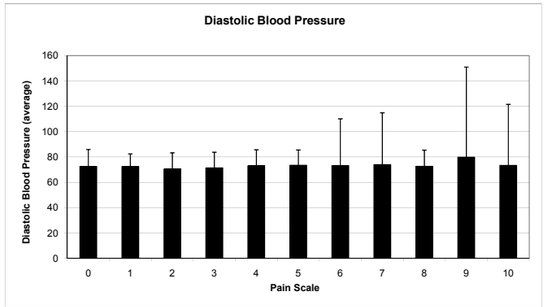

Figure 3: DBP vs. Pain Scale. The diastolic blood pressure showed no positive correlation with the pain scale. When graphically applied, no statistical significance was seen.

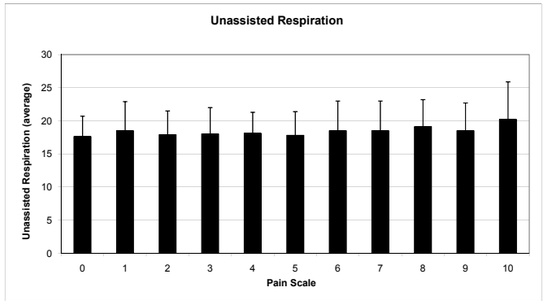

Figure 4: Unassisted Respiration vs. Pain Scale. The unassisted respiration showed no positive correlation with the pain scale. When graphically applied, no statistical significance was seen.

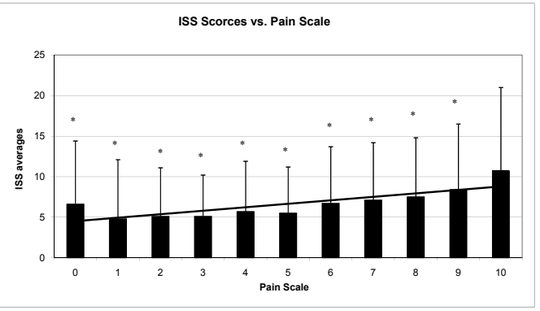

Figure 5: Injury Severity Score vs. Pain Scale. The injury severity scores taken from the JTTR showed a positive proportionality to the pain scale. Statistically significant p values were seen.

*Significant differences with a p value of <0.0001 were seen when compared to 10

Joint Theatre Trauma Registry Data						
Pain score	Number of patients	Heart rate (average)	Sbp (average)	Dbp (average)	Unassisted respiration (average)	ISS (average)
0	245	83.1 ± 19.1	132.6 ± 16.7	72.4 ± 13.5	17.6 ± 3.1	6.6 ± 7.8
1	49	96.7 ± 92.2	133.7 ± 12.2	72.4 ± 10.1	18.5 ± 4.4	4.8 ± 7.3
2	148	94.9 ± 75.8	133.5 ± 15.0	70.3 ± 13.0	17.9 ± 3.6	5.1 ± 6.0
3	159	83.6 ± 17.2	133.1 ± 14.9	71.4 ± 12.4	18.0 ± 4.0	5.1 ± 5.1
4	172	88.3 ± 54.9	132.9 ± 13.3	72.9 ± 12.8	18.1 ± 3.2	5.7 ± 6.2
5	316	83.6 ± 16.9	133.5 ± 14.3	73.4 ± 12.1	17.8 ± 3.6	5.5 ± 5.7
6	288	86.1 ± 29.5	132.9 ± 16.5	73.2 ± 37.0	18.5 ± 4.5	6.7 ± 7.0
7	331	85.4 ± 18.6	132.1 ± 16.6	73.9 ± 41.0	18.5 ± 4.5	7.1 ± 7.1
8	371	87.3 ±42.8	134.0 ± 17.6	72.6 ± 12.8	19.1 ± 4.1	7.5 ± 7.3
9	192	86 ± 19	135.2 ± 19.5	79.8 ± 71.2	18.5 ± 4.2	8.4 ± 8.1
10	393	94.6 ± 21.9	130.5 ± 228	73.3 ± 48.3	20.2 ± 5.7	10.7 ± 10.3

Discussion

- We saw that the early pain scores were not related to heart rate, blood pressure, and respiration. There were no differences based on severity of pain based on these parameters.
  - Possible explanations for lack of changes in response to pain include:
    - Over the counter weight-lifting and bodybuilding supplements used by many soldiers to maintain athletic performance may account for increased metabolism and increased baseline heart rate
    - Competing stimuli such as hemorrhage, analgesic agents and trauma may mask effects of pain on the Autonomic Nervous System (ANS)
- Contrary to our expectations, injury severity scores were shown to be directly proportional to the pain scale.
  - In civilian literature there is little relationship between the injury severity and the pain score.
  - There were significant injury severity differences between mild (0-3), moderate (4-6) and severe (7-10) pain scores.

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