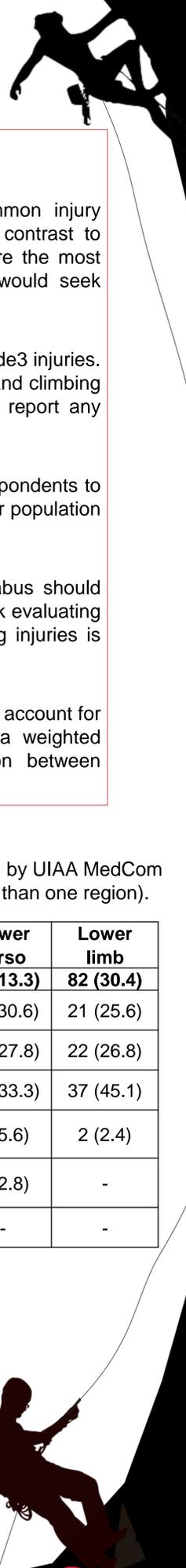


# Analysis of the type and severity of climbing injuries requiring Mountain Rescue in Snowdonia National Park and Isle of Anglesey

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## Introduction:

Snowdonia National Park and Isle of Anglesey are popular areas for climbing. Despite the use of protective equipment including harnesses, ropes and helmets, injuries can occur (1). Climbing injuries are managed by Mountain Rescue Teams (MRT). MRT include individuals with no medical knowledge prior to training. MRT complete a standardised training program, the Care for Mountain Rescue (2).

The International Mountaineering and Climbing Federation (UIAA), which publish recommendations to improve mountain safety. In 2010 the UIAA Medical Commission proposed a scoring system for recording injuries sustained whilst climbing, which includes injury location and severity (3). The UIAA developed a scoring system, the MedCom score. This retrospectively grades climbing injuries by their severity (Table1).

## Aims and Objectives:

**Aims:** Understand how climbing injuries present to MRT in Snowdonia National Park and Isle of Anglesey. This is to provide recommendations to improve management of climbing injuries by prehospital emergency services.

**Primary Objective:** Identify the type and severities of injuries sustained by climbers requiring MRT assistance.

**Secondary Objectives:** Identify whether MRT have been trained to manage climbing injuries. Identify trends for sustaining injury.

## Methods:

This is a retrospective observational study. Data was collected from the Mountain Medicine Database (MMD). This includes casualties from Snowdonia National Park and Isle of Anglesey who required treatment at a Emergency Department (ED) following assistance by MRT.

**Inclusion criteria-** climbing casualties

**Exclusion criteria-** insufficient notes to grade injuries.

The type and MedCom score of climbing injuries for each casualty were retrospectively graded by two ED doctors. The injuries were grouped into five body regions; upper limb, head, upper torso, lower torso and lower limb. The maximal MedCom score sustained across all body regions was noted.

## Data analysis:

- Frequencies- Injured body regions
- Frequencies- MedCom severity scores
- Whitney Mann U- Gender and severity
- Spearman's correlation- Age and severity
- Spearman's correlation- Height of fall and severity

Data analysis was completed using SPSSv26. No ethical approval was required for this project.

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Table1- The UIAA MedCom score descriptions (1)

Grade	Description:
1	<b>Mild injury or illness:</b> No medical intervention necessary. Self-therapy
2	<b>Moderate severe injury or illness:</b> Not life-threatening, prolonged conservative or minor surgery
3	<b>Major illness or injury:</b> Not life-threatening, immediate doctor attendance necessary
4	<b>Acute mortal danger:</b> Requires immediate prehospital doctor if possible Outcome: alive with permanent damage
5	<b>Acute mortal danger:</b> Requires immediate prehospital doctor if possible Outcome: death
6	<b>Immediate death</b>

## Results:

Between 2004 to 2019 1641 casualties were entered into the MMD. There were **144 climbing casualties** (10.8% of the MMD).

### Climbing Casualty Demographics:

- **Age-** Mean age of climbing casualties was **34 years**
- **Sex-** The majority of climbing casualties were **male** (79.2%) with 20.8% **female**.
- **Mortality-** The mortality of climbing casualties was 5.6% (n=8).
- **Fall from height-** 82.6% of climbing casualties (n=119) sustained a fall over one metre.

### Injury Types (Table2):

- **Injury by body region-** There were **270 injuries** graded across the five body regions
- **Common injuries-** Lower limb injuries were sustained in 56.9% (n=82) of climbers.
- **Uncommon injuries-** Upper torso injuries were the least common injury type sustained, with 22.9% (n=33) of climbing casualties sustaining a upper torso injury.
- **Injury Trends-** All upper torso injuries resulted from a fall (p=0.016).

### Injury Severities:

- **Maximal MedCom Score-** The most common maximal MedCom score was a grade2 injury at 40.2% (Table3).

### Trends for Injury Severities:

- **Gender-** There is no association between gender and severity (U=1210.0 p=0.116)
- **Age-** There is no association between age and severity (r<sub>s</sub>=0.138 p=0.099)
- **Height of fall-** There was a positive correlation between increasing height of fall and severity of injury (r<sub>s</sub>=0.301 p=0.003).

### MRT Training:

- **MRT Care for Mountain Rescue syllabus** included a learning outcome for all injuries sustained in the climbing population.

Table3: A table to show frequencies of casualties maximal MedCom grade sustained (%) n=144

Maximal MedCom severity	Grade1	Grade2	Grade3	Grade4	Grade5	Grade6
	14 (9.7)	58 (40.2)	53 (36.8)	11 (7.6)	4 (2.8)	4 (2.8)

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## Discussion:

### Injury Types

Multiple studies support lower limb injuries being the most common injury presentation to prehospital emergency services (4, 5). This is in contrast to findings in chronic injuries, of which upper limb overuse injuries are the most common injury sustained (6). It is unlikely that overuse injuries would seek emergency care, so would not be included in this study.

### Injury Severities

The majority of casualties sustained maximal MedCom grade2 or grade3 injuries. This is similar to a study on injuries sustained in indoor climbing (7) and climbing injuries presenting to an American ED (4). These studies did not report any fatalities.

### Trends for Injury

An online climbing association, UKClimbing.Com found 86.7% of respondents to an online survey were male, with 13.3% female (8). This suggests our population is representative of the UK climbing population.

### Mountain Rescue Teams

We identified MRT completing the Care for Mountain Rescue syllabus should have a good knowledge of managing climbing casualties. Future work evaluating the application of the MRT training on the management of climbing injuries is recommended.

### Scoring Methods:

The majority of casualties had polytrauma, the MedCom is not able to account for these. We recommend the MedCom score be adapted to form a weighted cumulative score. This would allow more scope for comparison between casualties.

Table2: A table to show number of injury types (n=270) per body region by UIAA MedCom score (%) sustained for climbers (some casualties had injuries in more than one region).

	Upper limb	Head	Upper torso	Lower torso	Lower limb
<b>TOTAL (%)</b>	<b>65 (24.1)</b>	<b>54 (20.0)</b>	<b>33 (11.8)</b>	<b>36 (13.3)</b>	<b>82 (30.4)</b>
<b>Grade1: Mild</b>	24 (36.9)	15 (27.8)	11 (33.3)	11 (30.6)	21 (25.6)
<b>Grade2: Moderate-Severe</b>	31 (47.7)	23 (42.6)	8 (24.2)	10 (27.8)	22 (26.8)
<b>Grade3: Major</b>	10 (15.4)	7 (13.0)	3 (9.1)	12 (33.3)	37 (45.1)
<b>Grade4: Acute Mortal Danger-Permanent Damage</b>	-	5 (9.3)	6 (18.2)	2 (5.6)	2 (2.4)
<b>Grade5: Acute Mortal Damage – Death</b>	-	2 (3.7)	2 (6.1)	1 (2.8)	-
<b>Grade6: Immediate Death</b>	-	2 (3.7)	2 (9.1)	-	-

## Conclusion:

Lower limb injuries are the most common injury type requiring MRT in Snowdonia National Park and Isle of Anglesey.

The majority of injuries requiring MRT are moderate to major injuries. Future research evaluating the application of Mountain Rescue Training in managing these injuries is recommended.

We suggest further development of the MedCom to generate a weighted cumulative score. This will improve comparisons between casualties.