

## Introduction

Scrambling, as defined by the British Mountaineering Council, is mixture of hillwalking and rock-climbing, whereby as the route becomes steeper, the difficulty of the scramble increases, and the more skills and equipment become necessary. (1)

Snowdonia National Park, in North West Wales, is home to popular scrambles including Tryfan North Ridge and Snowdon's Crib Goch ridge. In 2018 both routes attracted over 25,000 visitors. (2)

There is little existing research on scrambling, but British studies on hillwalking and rock-climbing have found lower limb injuries to be most prevalent. (3, 4)

## Aims

The aim of this project was to help the Emergency Department (ED) prepare for incoming patients by describing the demographics and patterns in patients who present after an incident while scrambling. This project focused most on those with injuries rather than illnesses while scrambling.

## Methods

A single-centre retrospective cross-sectional study was conducted in an ED in North Wales. The Mountain Medicine Database (MMD) was used to select scrambling patients. The database includes all patients attending Ysbyty Gwynedd ED after contact with Mountain Rescue Team or Search and Rescue following an incident in Snowdonia National Park.

**Inclusion criteria:** Patients in MMD who were scrambling at time of incident.

**Exclusion criteria:** Patients with insufficient documentation.

Injuries and illnesses were scored by body area and severity using the International Climbing and Mountaineering Federation Medical Commission protocol for reporting injuries and illnesses. (5) Each patient was given a maximum injury and illness classification (IIC) score based on their most severe illness or injury. The IIC score ranges from 0 (no injury) to 6 (instant death). (5) The case fatality rate was calculated using data from Snowdonia National Park Authority. (2)

**Primary Outcome:** Anatomical body location of injuries.

**Secondary outcomes:** IIC and maximum IIC score. Case fatality rate.

**Acknowledgments:** Thank you to my project supervisor Dr Richard Griffiths for your continuous support throughout. Thank you to Dr Sophie Mohun Kemp for all your time and assistance. Thank you to Dr Emily Bebbington for your help and advice.

## Results

The MMD had entries for 1684 patients from 2004-2020. From these, 140 scrambling patients were included in the study. Of the scramblers, 132 were injured and eight had illnesses. A total of 146 injuries were identified.

**Location:** A lower limb injury of any severity was found in 72.7% of patients, making it the most commonly injured area, with a mean IIC score of 1.70 (table 1).

**Severity:** The median (IQR) maximal IIC score across all the injured patients was 2 (1), with two also being the mode maximum IIC score (table 2).

**Sex:** The maximum IIC in males was significantly higher than in females ( $U=1382.500$ ,  $p=0.0019$ ).

**Falls:** A fall, from a height greater than standing, was the cause of injury in 65.4% of patients with injuries. The maximum IIC was significantly higher in the patients who had a fall compared to those who had not ( $U=1342.000$ ,  $p=0.001$ ).

**Fatalities:** Of the 140 scrambling patients there were 12 (8.6%) who were dead at scene, one due to illness. All 11 of the traumatic deaths were related to falls, with 11 suffering fatal head and neck injuries, and six having concurrent fatal trunk injuries. Crib Goch was found to have a case fatality rate of one death per 29,864 passes.

## Discussion

Lower limb injuries were the most common injuries in scrambling patients, as found for hillwalking and rock-climbing in the literature. This study found these lower limb injuries were predominantly low severity.

As falls from height and male sex were found to increase risk of higher severity injuries, trauma calls should be considered for these patients

Future research should look into use of protective equipment, including helmets and level of experience of the scramblers. More research is needed in EDs near scrambling terrains due to small sample sizes.

Table 1: Patient Injuries according to anatomical location and injury severity score<sup>a</sup> with a mean IIC for each body area

Body Area	UIAA MedCom IIC score						Mean IIC score
	1	2	3	4	5	6	
Head and Neck n=65	18	33	2	1	-	11	2.46
Upper Limbs n=72	33	22	17	-	-	-	1.78
Trunk n=58	30	9	10	3	-	6	2.17
Lower Limbs n=96	50	25	21	-	-	-	1.70
Total	131	89	50	4	-	17	

<sup>a</sup> Colour to represent frequency with red the most and green the least common.

Table 1 shows the spread of different severity injuries by body regions. Low severity lower limb injuries were the most common.

Table 6: Demographics by maximum IIC

Maximum IIC score	Number of patients	Mean age (years)	Fall from height (%)	Male (%)	Female (%)
1	24	35	11 (46)	13 (54)	11 (46)
2	57	42	34 (60)	39 (68)	18 (32)
3	36	39	26 (72)	29 (81)	7 (19)
4	4	35	4 (100)	3 (75)	1 (25)
5	-	-	-	-	-
6	11	45	11 (100)	9 (82)	2 (18)

Table 2 displays the spread of patients with each maximum IIC score. As the score increases, there is a greater proportion of male patients. All patients with maximum IIC score above three have had a fall from height.

## Conclusion

In conclusion, this study found lower limb injuries to be the most common amongst scrambling patients, but head and trunk injuries were the most likely cause of death. Pre-alerts mentioning fall from a height should warrant a trauma call in the ED. A lower threshold should be adopted for initiating a trauma call in male scrambling patients.

## References

- (1) British Mountaineering Council. Different Types of Mountaineering Activities Explained. 2014.
- (2) Snowdonia National Park Authority. Visitor Monitoring Figures. 2018.
- (3) Mort AJ, Godden DJ. UK mountain rescue casualties: 2002-2006. 2010.
- (4) Jones G, Asghar A, Llewellyn DJ. The epidemiology of rock-climbing injuries. 2008.
- (5) Schöffel V, Morrison A, Hefti U, Ullrich S, Küpper T. The UIAA Medical Commission Injury Classification for Mountaineering and Climbing Sports. 2011.

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