

Oral and Maxillofacial Trauma and the Use of Telemedicine in the Grampian Region of Scotland: a Retrospective Study

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ABSTRACT

Objectives: To evaluate the amount and nature of adult facial trauma in Aberdeen, Scotland's third largest city, that requires referral to Aberdeen Royal Infirmary oral and maxillofacial surgery department by the Emergency Department and Grampian's telemedicine service over a six month period.

Material and Methods: A retrospective audit using oral and maxillofacial surgery trauma clinic and theatre records to identify Emergency Department (ED) notes for those patients presenting with facial trauma. ED notes were examined to extract demographic data on each patient as well as information on the nature and outcomes of the facial trauma. This data was compared with previously published national and international statistics.

Results: 137 patients were identified with a mean age of 33.7 years with a standard deviation of 16.7. 83.2% of facial trauma victims were male and 62% of facial injuries were caused by alleged assault. Only 1 patient was referred to Aberdeen Royal Infirmary by telemedicine.

Conclusions: Aberdeen has a high number of injuries caused by interpersonal violence. Telemedicine is an underused resource in the referral and review of facial trauma at Aberdeen Royal Infirmary.

Keywords: telemedicine; maxillofacial injuries; emergency care.

Accepted for publication: 26 September 2012.

To cite this article:

Hutchison C, Morrison R. Oral and Maxillofacial Trauma and the Use of Telemedicine in the Grampian Region of Scotland: a Retrospective Study.

J Oral Maxillofac Res 2012;3(3):e2

URL: <http://www.ejomr.org/JOMR/archives/2012/3/e2/v3n3e2ht.pdf>

doi: [10.5037/jomr.2012.3302](https://doi.org/10.5037/jomr.2012.3302)

INTRODUCTION

Facial trauma is very common in Scotland. Between 2001 and 2006 there were 82,461 patients with a facial injury diagnosis at the time of discharge from Scottish hospitals [1]. In 1997, a UK wide study found that facial injury accounted for at least 4% of all Accident and Emergency attendances. A figure believed to be a gross underestimation [2].

Facial injury can range from minor contusions and lacerations to complex hard and soft tissue injury requiring referral to one of the 156 oral and maxillofacial surgery (OMFS) units in the UK. Common hard tissue injuries requiring referral include fractures of the mandible, the zygoma, orbit and nasal bones, some of which will be treated conservatively with others requiring open reduction and internal fixation. Complex lacerations and fractures of the mandible requiring surgical treatment will tend to be admitted to the oral and maxillofacial department and operated on as soon as possible. Other bony facial injuries will be reviewed on an out-patient basis before a decision on definitive treatment is made [3].

Aberdeen Royal Infirmary (ARI) is the largest hospital within the National Health Service (NHS) of the Grampian region of Scotland. It is a teaching hospital and has around 900 beds [4]. It serves Aberdeen, the third largest city in Scotland, and the surrounding area. In 2008, it was estimated that there were over 450,000 people living in Aberdeen and Aberdeenshire [5]. Aberdeenshire extends to 6313 square kilometres, 8% of Scotland's overall territory [6].

ARI has a mid-sized oral and maxillofacial (OMFS) unit consisting of 4 consultants, 3 staff grades, 1 specialist trainee, 2 Foundation year 2 junior doctors (FY2) and 3 dental senior house officers (SHO). All referred facial injuries that do not require emergency hospital admission and surgical intervention are reviewed at the weekly trauma clinic by a consultant.

ARI has a large emergency department (ED), consisting of 10 consultants, 7 registrars, 6 General Practitioner Trainees (GPVT) and 6 Foundation Year junior doctors seeing over 90,000 new patients and 60,000 reviews per year. As well as the many attendees in person, the emergency department also runs Grampian Minor Injuries Telemedicine Service. The service has been operating since 2001 supporting 15 Minor Injury Units (MIUs) in community hospitals in the Grampian and Highland region. Over 120 new patients are seen by the telemedicine service each month [7]. Videoconferencing equipment allows the ARI ED clinician, aided by an on-site nurse, to take a history, examine and view radiographs from patients in these remote locations.

This allows for specialized consultation without the need for travel, thus improving patient quality of care and life. Only 3 - 9% of patients managed with telemedicine each year require transfer to the ED. Telemedicine at ARI is run primarily by the ED department but it does have the potential to play an important role in oral and maxillofacial surgery. Telemedicine in oral and maxillofacial surgery has been used in other centres to aid diagnosis and triage [8], assist out-patient referral [9] and even to augment surgical procedures with specialized input from another hospital [10].

The aims of this study were to evaluate the numbers and demographics of adult facial injuries referred to oral and maxillofacial surgery by the emergency department at Aberdeen Royal Infirmary and to investigate the use of telemedicine in the management of facial injury to determine if this valuable resource is utilised appropriately in oral and maxillofacial trauma at Aberdeen Royal Infirmary.

MATERIAL AND METHODS

Out-Patients referred to the OMFS department for investigation of facial injury are reviewed at the weekly trauma clinic. A 'trauma book' is kept containing a record of all patients seen as well as a brief note of the follow-up plans. The clinic reception diary contains details of those patients who were given trauma clinic appointments but failed to attend. Details of patients from both sources were collected spanning a seven month period between 1st June 2010 and 31st December 2010.

This method only identified patients who were deemed suitable for review on clinic. To determine patients that were admitted for operative management rather than first seen on clinic, theatre records were searched to gather data on patients operated on by the OMFS team, with facial trauma, between 1st June and 31st December 2010.

Emergency department record cards are kept for all patients seen in ARI ED. Using the names and patient unique Community Health Index (CHI) numbers gathered from operating theatre books and trauma clinic, ED notes were searched to find those patients who had been seen by the ED staff prior to oral and maxillofacial surgery referral between 1st June 2010 and 30th November 2010. Data from December 2010 was used to identify patients seen in the ED in late November but not operated on or reviewed in clinic until December. Patients attending the ED in December were not included in the study. Having identified the individual record cards, each was anonymised before data was collected on patient demographics as well as

method of injury and presentation to the department. Names and CHI numbers were used only to identify the records but were not used in the data collection or analysis. The study design was presented to Aberdeen Medical School Elective Submissions Panel and approved on ethical grounds prior to data collection.

RESULTS

Trauma clinic and theatre records identified 376 patients. Of these 139 had attended the ARI adult ED during the six month period and had ED notes available. Two patients were under the age of 16 and so excluded from the study leaving a data set of 137 adults aged 16 or older referred to the OMFS unit by the ED between the 1st of June and the 30th of November 2010. The mean age was 33.7 years (range 16 - 89) with a standard deviation (SD) of 16.7. A total of 114 (83.2%) patients were male and 23 (16.8%) were female. The majority of

patients were between the ages of 16 and 34 (Figure 1). Patients with facial injury attended most often on Saturday or Sunday (43.8%) and attendance were spread throughout the day (Figures 2 and 3).

By far the most common mechanism of injury was alleged assault (62%) with falls (17.4%) the second most frequent cause (Table 1).

Of the 85 alleged assaults, the method of assault was primarily by punches to the face (56.5%) with the remainder involving kicks (14.1%) and weapons (12.9%). Weapons used included crowbars, ashtrays, bottles and hammers. In 14.1% of cases, no method was recorded in the notes (Table 2).

Telemedicine

Postcode of attendees and distance of travel

There are 15 MIU's connected to ARI by telemedicine. The most distant is Forres (Table 3), it would require a round trip of over 150 miles to attend ARI ED

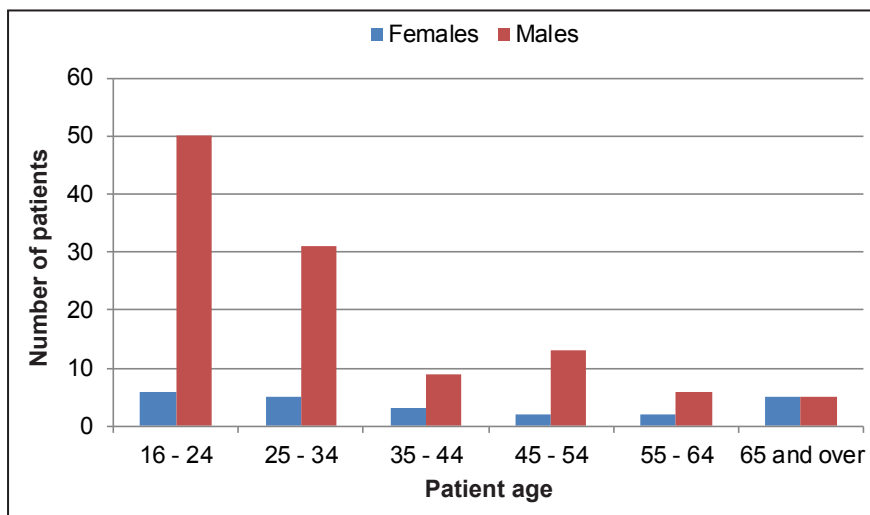


Figure 1. Distribution of patients by age and gender.

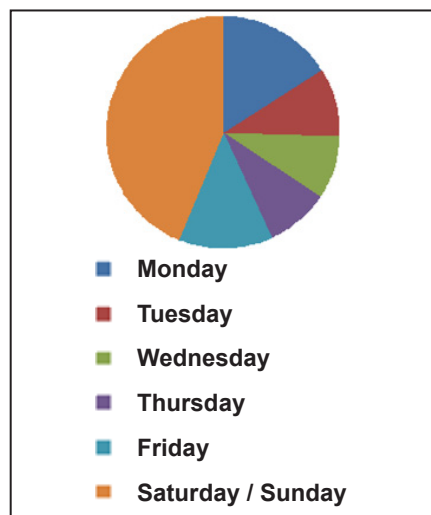


Figure 2. Day of presentation.

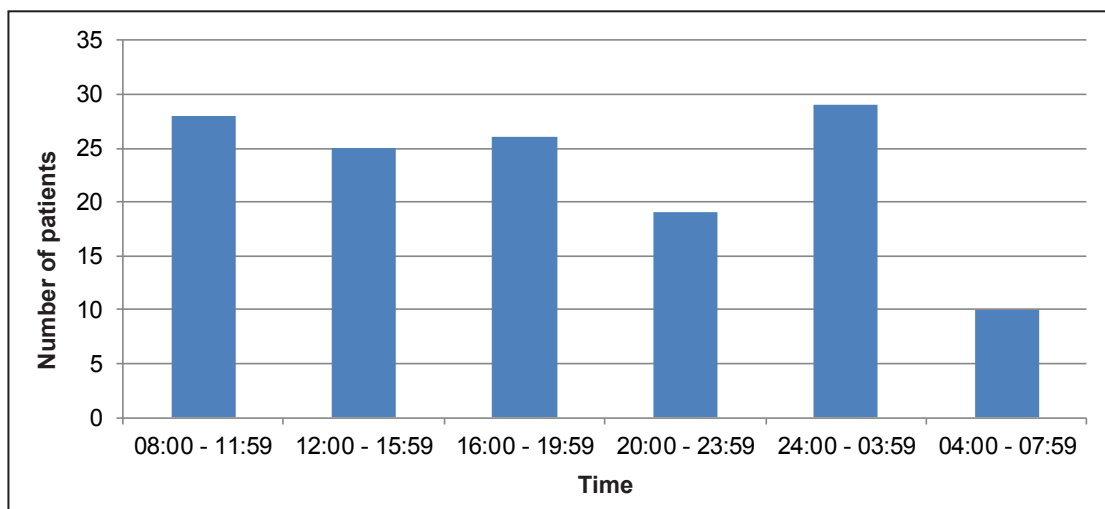


Figure 3. Time of presentation.

Table 1. Aetiology of patient’s injury

Aetiology of injury	Number of patients and percentage of sample
Alleged assault	85 (62.0%)
Fall	24 (17.6%)
Sport related	8 (5.8%)
Work related	2 (1.5%)
Other	9 (6.6%)
Unknown	9 (6.6%)

Table 2. Nature of alleged assault

Nature of assault	Number of patients and percentage of sample
Punch	48 (56.5%)
Kick	12 (14.1%)
Weapon	11 (12.9%)
Other	2 (2.4%)
Unknown	12 (14.1%)

Table 3. Distance of Minor Injury Units (MIU) to Aberdeen Royal Infirmary (ARI) and availability of telemedicine and X-ray facilities

MIU	Telemedicine available?	X-rays available?	Distance from ARI (miles)
Forres	Yes	No	76.6
Elgin	Yes	Yes	64.9
Buckie	Yes	Yes	60.6
Aberlour	Yes	No	57
Dufftown	Yes	No	51.6
Keith	Yes	Yes	48.1
Banff	Yes	Yes	45.1
Fraserburgh	Yes	Yes	41.2
Huntly	Yes	Yes	37.7
Peterhead	Yes	Yes	32.3
Aboyne	Yes	No	30.8
Turriff	Yes	Yes	29.4
Insch	Yes	No	28
Inverurie	Yes	No	16.3
Stonehaven	Yes	Yes	15.5

in person from Forres. Using postcode data, it was possible to work out the area that each patient lived in and therefore the distance between the patient’s home and ARI (Figure 4). By far the most common region of attendees with facial trauma was Aberdeen City (63.5%). Despite 19% living within an area served by a MIU (and many others living closer to an MIU than ARI) with access to telemedicine, only 1 patient (0.7%) was referred via the service.

Telemedicine Referral

The only case referred to ARI by telemedicine was a female patient brought to Peterhead MIU, 32.3 miles from ARI (Table 3) by police following facial trauma secondary to alleged domestic abuse. The nurse led team at MIU contacted ARI ED and the patient was reviewed by senior ED staff using telemedicine. The purpose of the consultation was to determine whether urgent transfer and admission to ARI were necessary. This was not thought to be necessary at the time. The patient attended the oral and maxillofacial trauma clinic some 3 days later. She was diagnosed with a nasal bone fracture and underwent manipulation under anaesthetic.

Trauma Clinic Outcome

Of the 137 ED cards, and therefore confirmed trauma patients, 117 had been referred to the trauma clinic (85.4%). The remaining 20 (14.6%) had been admitted directly to the maxillofacial ward and theatre.

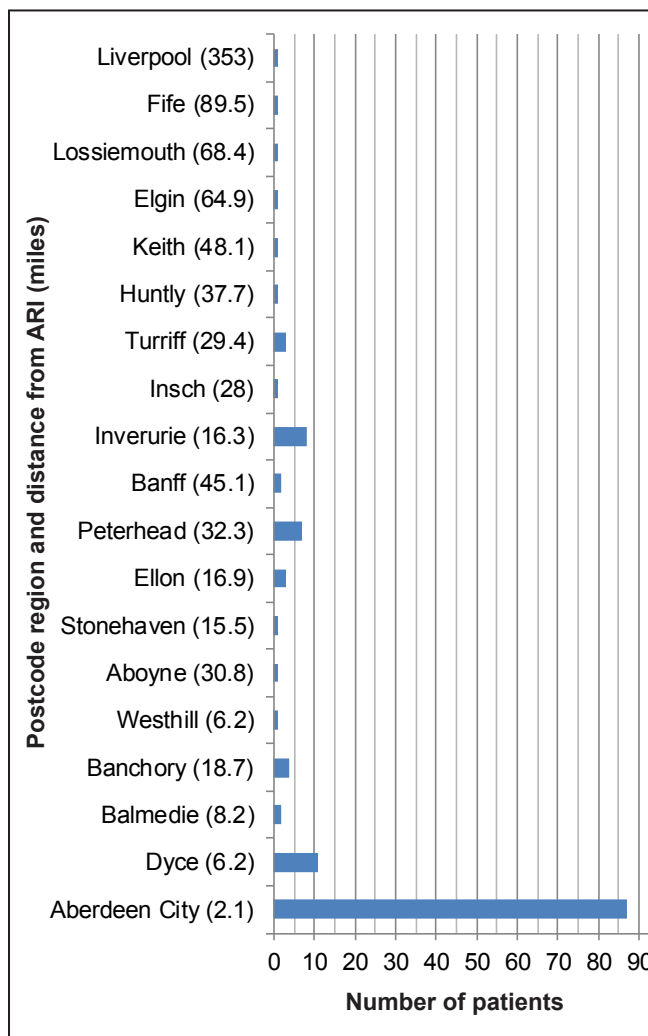


Figure 4. Postcode area and distance from ARI of attendees.

The outcomes of the referral to the outpatient clinic are shown in Table 4. Those that were admitted following clinic review were operated upon. Most (33.3%) trauma clinic reviews were discharged after one appointment. 22.2% failed to attend the arranged trauma clinic appointment.

DISCUSSION

The age of patients in this study (mean 33.7 years) is somewhat older than the 25.3 years found in the 1997 British Association of Oral and Maxillofacial Surgeons (BAOMS) UK wide survey of facial injuries [2]. This is unsurprising as BOAMS included all patients, regardless of age, rather than just adults. Patients under the age of 15 accounted for 39% of that data. However, similar characteristics were found in relation to young adults making up the majority of adult trauma [2]. A more recent UK facial injury survey from 2008 found a mean age of 29 years, closer to the Aberdeen value, despite including those under the age of 15 [11]. International data from Tokyo Medical and Dental University found over 50% of patients with maxillofacial fractures between 1977 and 1989 were between the ages of 10 and 29 [12]. Brazilian data from 1999 - 2004 showed the mean age of patients with maxillofacial fractures as 28 years [13].

In Aberdeen, as is seen in many other studies, males dominate facial injury referrals [2,12-14]. A male to female ratio of almost 5:1 was found. This is higher than the UK wide BOAMS study which found a ratio of only 2:1, increasing to 4:1 in assault cases [2].

One of the most striking and concerning features of the study was the high percentage of facial trauma secondary to alleged assault attending ARI. Inter-personal violence accounted for 67% of referrals to oral and maxillofacial surgery from the emergency department. This is much greater than in the previous UK studies which found assault the aetiological factor for only 24% in 1997 [2] and 31% in 2008 [11]. Although these studies both included young children, who are less likely to suffer assaults, this is not enough to explain the large increase in Aberdeen. Data for 15 - 25 year olds in BOAMS UK wide 1997 study found 46% of facial injury was caused by assault, still markedly lower than in this study. International studies found a wider variation in assault data. Inter-personal violence is the cause of only 15.5% of maxillofacial fractures in Tokyo [12], 22.6% of facial fractures in Brazil [13] but 75% of facial trauma presentations to a New Jersey ED [14]. Future studies could be aimed at finding an explanation for the large amount of trauma due to violence. Many studies have found an association between alcohol and drug use

Table 4. Trauma clinic review outcome

Trauma clinic review outcome	Number of patients and percentage of sample
To be admitted	24 (20.5%)
Further clinic review	23 (19.7%)
Discharged	39 (33.3%)
Failed to attend	26 (22.2%)
Other	2 (1.7%)
Unknown	3 (2.6%)

and inter-personal violence [1,2,15,16] and others have investigated the recurrent nature of facial injury due to assaults [14]. These areas were beyond the scope of this study but future studies could be designed to include this data. This may become increasingly important as violence reduction and alcohol awareness programmes are investigated and implemented as preventative measures [15,16].

The majority of victims of domestic violence present with maxillofacial injuries [17] and it is important that dental and maxillofacial teams are aware of this and are equipped with the appropriate training and knowledge to identify domestic violence and provide information about where the individual can go for advice [18-20].

In facial injury not due to inter-personal violence, the most common cause was falls, followed by sport related injuries (Table 1). The number caused by road traffic accidents (RTA) was negligible. This is in contrast to older studies where RTAs were a major factor in facial injuries [21]. The introduction of seat-belt and drink-driving legislation, as well as the widespread use of airbags is thought to have contributed to this decrease [2,21].

The majority of patients resided in or near Aberdeen City (63.5%). This was expected as the city is the main population base in the area with over 200,000 people residing there [5]. However the remainder lived outside the city in a more remote location. 19% resided in an area with a MIU which had access to the telemedicine service and many others lived closer to a MIU than ARI ED. Despite this, almost all of these patients attended ARI in person and only 1 patient was referred using the telemedicine service. Given the wide geographical nature of the Aberdeenshire, and the increasingly common utilisation of the service for other injuries, this is a disappointing figure. Telemedicine can improve quality of care and should be used more frequently. Traditionally, specialist advice between centres is offered based on a telephone consultation, the clinical decision is therefore heavily influenced by the experience, clinical knowledge and communication skills of both the referrer and the receiving specialist. This can lead to incorrect diagnosis and inappropriate

triaging of patients. Including images in the consultation, by using telemedicine, gives the minor injury unit access to specialized consultation of a higher standard than telephone alone improving diagnostic accuracy and improving patient triaging [8,22,23]. Use of telemedicine could also decrease expensive and unnecessary transfers of oral and maxillofacial surgery patients from rural areas, not only improving patient quality of life but also optimising use of medical resources [24]. This was true in the case referred by telemedicine in our study, where urgent transfer was avoided for a patient who was more suitable for review on an out-patient clinic. Out-patient referrals may also be managed this way; Rollert et al. [25] showed that telemedicine consultation could be used effectively for pre-operative assessment in dentoalveolar surgery and Blomstrand et al. [9] highlighted the use of telemedicine images in effective out-patient diagnosis, avoiding the need for travel to attend an oral medicine specialist. In our study a third of trauma clinic referrals were discharged after only one appointment and a further 22.2% failed to attend appointments. Many of these patients could have been managed by telemedicine rather than travelling from a rural location to Aberdeen for an out-patient appointment. Fractured mandibles and lacerations require prompt review and treatment and so may be unsuitable for initial review by telemedicine. However, other injuries, such as suspected fractured zygoma, may be more appropriate as it is often helpful to allow a period for the swelling to resolve so that a more accurate assessment can be made. Delays of 5 to

7 days are not at all unreasonable, allowing time for a telemedicine appointment to be arranged [3]. For those patients that do require treatment, telemedicine has been shown to improve surgery by increasing expert involvement in care at an early stage [10].

CONCLUSIONS

This study has shown that a large amount of the facial trauma referred to the oral and maxillofacial team in Aberdeen Royal Infirmary is due to interpersonal violence. Reasons behind this and possible preventative measures should be investigated and instituted with the aim of reducing this. Telemedicine has the potential to be an important part of trauma review in oral and maxillofacial units providing service to rural areas although it is currently underutilised by National Health Service Grampian. Appropriate use of telemedicine can improve patient care and use of medical resources.

ACKNOWLEDGEMENTS AND DISCLOSURE

The authors report no conflicts of interest related to the study. The authors would like to thank Dr. Fiona Mair (Aberdeen Royal Infirmary, Emergency Department) for her help in study design and data collection and Dr. Tatiana MacFarlane (University of Aberdeen) for her help in editing the manuscript.

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To cite this article:

Hutchison C, Morrison R. Oral and Maxillofacial Trauma and the Use of Telemedicine in the Grampian Region of Scotland: a Retrospective Study.

J Oral Maxillofac Res 2012;3(3):e2

URL: <http://www.ejomr.org/JOMR/archives/2012/3/e2/v3n3e2ht.pdf>

doi: [10.5037/jomr.2012.3302](https://doi.org/10.5037/jomr.2012.3302)

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