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The Orthodontist's Role in Post-Battlefield Craniomaxillofacial Trauma Reconstruction

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ABSTRACT

Introduction:

In modern conflicts, deployed members are more vulnerable to craniomaxillofacial (CMF) injury than in previous conflicts. Patients presenting with CMF trauma are susceptible to post-trauma dental malocclusion and may require lengthy rehabilitation to achieve pre-injury function. This study surveyed military health care professionals who are potential contributors to CMF trauma rehabilitation teams to evaluate the orthodontist's inclusion in treating to the final outcome.

Methods:

Following approval from the Defense Health Agency Information Management Collections Office (Control Number: 9-DHA-1031-E) and the Air Force 59th Medical Wing Institutional Review Board (Reference Number: FWH20210061E), a survey study was conducted from April 2021 to July 2021. Volunteer participants were recruited from orthodontists, oral maxillofacial surgeons, medical specialists, and other dental specialists who have worked in military healthcare. Respondents reported their current practice treating CMF trauma, self-evaluated their knowledge of different aspects of the process, and submitted their perceptions on system and patient-limiting factors which affect outcomes. Descriptive statistics were conducted for ordinal data and chi-square tests for categorical data. Kruskal–Wallis analyses of variance compared cohorts with further Mann–Whitney U tests to distinguish the difference in cohorts.

Results:

Valid responses were collected from 171 participants. The responses were mostly from active duty military (93%) and well distributed among orthodontists, oral maxillofacial surgeons, other dental specialists, and medical specialists. When reporting current CMF trauma treatment practices, the majority of dental specialists stated they most commonly participate in a multidisciplinary team that addresses any CMF trauma case (68.4%) whereas medical specialists most commonly act as solo independent provider practice (53.6%). Dental specialists reported follow-up with post-trauma patients greater than 1 year and medical specialists reported the shortest post-trauma follow-up time with a median of 0 to 3 months. The majority of participants selected at least one system factor limiting CMF trauma care (78.7%) and at least one patient factor limiting CMF trauma care (86.3%). When asked about orthodontic participation in multidisciplinary teams, the responses showed a great range with orthodontists never included in CMF trauma care 23.1% of the time and always consulted regarding trauma cases 10.7% of the time. Other survey data collected allows the investigators to draw conclusions regarding specific limitations to treatment and recommendations for improvement, along with qualitative responses from survey participants.

Conclusions:

Orthodontics, while available in the military, is underutilized in treating post-warfare or other CMF trauma. There are both system- and patient-limiting factors in the treatment of battlefield and non-battlefield CMF trauma. In addition, there are limitations to the inclusion of orthodontists in CMF trauma care which include the physical distance from primary treating specialists and the absence of standard referral protocols. Oral maxillofacial surgeons reported the highest understanding of the military orthodontist's contribution to a CMF trauma treatment team and medical specialists reported the lowest understanding. Advanced technology tools could help improve outcomes and multidisciplinary interactions. Further research is needed to study the complete CMF trauma rehabilitation process in military treatment facilities, evaluate the efficiency of cross-specialty referrals, and highlight best practices and protocols of functioning multidisciplinary teams.

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BACKGROUND

The Global War on Terrorism has encompassed many theaters and joint forces in a persistent cycle of deployment over the past 2 decades. Improvements in combat casualty care, advanced body armor, and faster evacuation have increased the casualty survival rate to greater than 90%.¹⁻³ However, the modern soldier remains vulnerable to craniomaxillofacial (CMF) injury. The consequences of facial trauma and resulting disfigurement create “the most tragic of all war’s victims”.⁴ Improvised explosive devices (IEDs) are the most common mechanism of injury with particular impact in the CMF region⁵ and the primary cause of warfare-related CMF trauma in 58% to 88% of patients.^{3,6-8} In addition, IEDs tend to cause polytrauma requiring lengthy rehabilitation to make the wounded whole again.⁹

Historically, the CMF region has been affected by 16 to 21% of combat trauma⁶ but this has increased in recent conflicts to reported levels from 30% to 42%.¹⁰ In addition, the daily hazards of deployed environments, other than battlefield mechanisms, contribute to 24% of all deployed U.S. military CMF injuries, with the most common being motor vehicle accidents.¹¹ Following primary treatment and evacuation from the deployed location, Level V Military Treatment Facilities (MTFs) manage the patient’s continuing care and follow-up surgical procedures.^{1,2,12} Anderson et al. recommended that military CMF trauma cases be followed to analyze outcomes in treating the long-term functional rehabilitation and aesthetic outcomes.^{1,6,8,12} This recommendation is because patients suffering either maxilla and/or mandible fractures are vulnerable to post-trauma malocclusion with negative functional consequences.¹³ No studies have analyzed occlusion post-CMF trauma, but malocclusion is recognized as a common sequela with a reported incidence between 5% and 20%.¹⁴⁻¹⁶

Definitive facial reconstruction within functional and aesthetic norms is critical to restoring the patient to as close to their pre-injury condition as possible.^{6,17} Success or failure of this restorative treatment has social and psychological implications.^{18,19} Following the initial treatment of CMF trauma, many adjunctive procedures may be required to achieve the final outcome. These disciplines and procedures can include: orthodontics, maxillofacial prosthodontics, endodontics, dental implants, additional osteotomies, scar revisions, cosmetic surgery, speech therapy, and psychosocial therapy.²⁰

No research or reports to date have documented post-CMF trauma reconstruction multidisciplinary team protocols in MTFs. This study aims to survey the military health care community of professionals who are potential contributors to CMF trauma rehabilitation teams to evaluate the orthodontist’s inclusion in treating to the final outcome. In addition, respondents are asked to identify potential limiting factors facing long-term rehabilitation of CMF trauma patients.

The null hypotheses investigated in this study include: (1) There are no limiting factors in post-CMF trauma care in

the military system as perceived by treating specialists. (2) There are no factors limiting the inclusion of orthodontists in the interdisciplinary treatment of CMF trauma as perceived by treating specialists. (3) There are no differences in perceptions of the orthodontist’s contribution to CMF trauma rehabilitation among treating specialists.

METHODS

A cross-sectional questionnaire was developed to survey the opinions and experiences of military medical and dental specialists who most commonly treat CMF trauma and the associated dental sequelae (See Supplemental Material). The Defense Health Agency Information Management Collections Office (Control Number: 9-DHA-1031-E) and the Air Force 59th Medical Wing Institutional Review Board reviewed and approved the survey and study (Reference Number: FWH20210061E).

Study Design

Responses were collected from April 27 to July 31, 2021, with an electronic survey instrument (SurveyMonkey.com). Survey participation was anonymous and voluntary, and it was possible to select one, none, or multiple answers.

First, the participants provided demographic details related to their military practice. They selected their specialty, military service branch (or Veteran’s Administration (VA)), current duty status, and history of deploying in a medical or dental role. The second section gathered information about the participant’s current experience and practice with CMF trauma. The third part asked the respondents to identify perceived limitations in treating multidisciplinary CMF trauma and suggest potential improvements. Next, the participants judged the reasons for the inclusion or exclusion of orthodontists in trauma cases and evaluated their own knowledge of dental occlusion as well as their understanding of orthodontic contributions to treating CMF trauma. The end of the survey asked participants for their preferred technology adjuncts that could improve their confidence in managing dental complications.

Knowledge rating questions were quantified using the 7-point Likert scale. Categorical questions allowed respondents to select responses from a list, including the response option “not applicable.” Free response was an option in each question to allow respondents to provide narrative comments. Comments were categorized based on principle ideas for data purposes with several responses incorporated in the discussion section. The most common additional comment was a respondent claiming either no experience or relevant knowledge to answer the question.

Sample Population

This study targeted the U.S. military population of orthodontists, three additional dental specialties (oral maxillofacial surgery (OMFS), maxillofacial prosthodontics, and

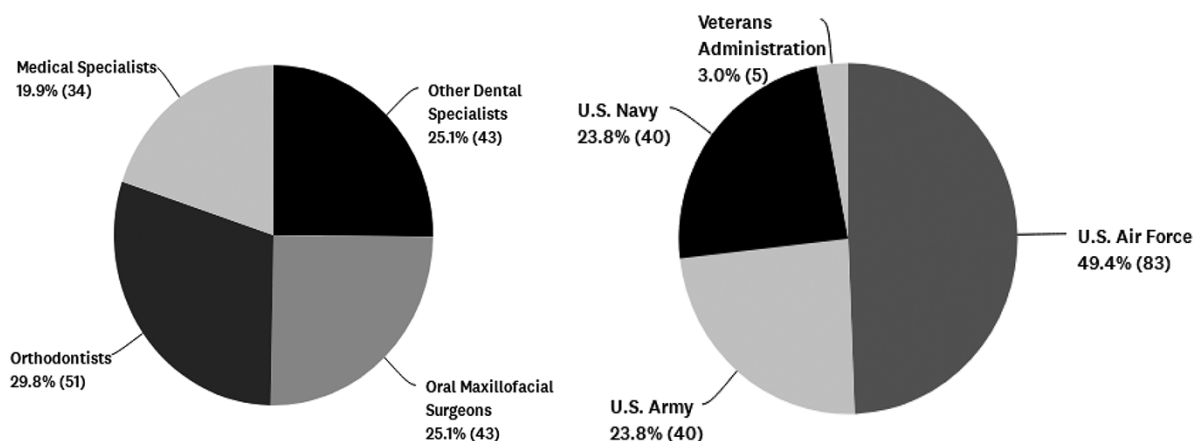


FIGURE 1. Participant demographics—medical or dental specialty & most recent service branch

prosthodontics) and two medical specialties (otolaryngology and plastic surgery). Recruitment of survey participants was through the specialty consultants for each U.S. military branch (Air Force, Navy, and Army).

Statistical Analysis

Upon closure of the data collection window, statistical analysis was performed after eliminating respondents who either did not accept the informed consent or complete the initial demographic questions. The SPSS software package (IBM, version 27.0) was used for statistical analyses. Descriptive statistics of the Likert scale data are presented as median, mode, and interquartile range (IQR). Comparison of nonparametric data from multiple groups was accomplished with a Kruskal–Wallis analysis of variance test and further investigated with two group comparisons using the Mann–Whitney U test. Categorical variables were analyzed with chi-square tests to determine association. A *P*-value of <0.05 was considered statistically significant. The data underlying this article will be shared on reasonable request to the corresponding author.

RESULTS

There were 171 valid responses from the 576 survey invitations, giving a response rate of 29.6%. The responses were well distributed among the target populations (Fig. 1). Prosthodontists or maxillofacial prosthodontists were 93% of the other dental specialists. The medical specialists included mostly otolaryngologists (79%) and plastic surgeons (18%). The majority of participants identified as currently active duty, Reserve, or serving as an Individual Mobilization Augmentee (92.3%). Most of the respondents reported the U.S. Air Force as their most recent service branch, with equal representation from the U.S. Navy and the U.S. Army, and a minor representation from those working in the VA (Fig. 1).

Current CMF Trauma Practices

After demographic questions, respondents described their protocol when addressing CMF trauma, stated if they treated battlefield and non-battlefield CMF trauma differently, and specified their follow-up timeline for these cases. Only in this section were responses for specialists who indicated that CMF trauma was not part of their current practice environment ($N = 76$) excluded from the sample.

Responses from dental specialists (orthodontists, oral maxillofacial surgeons, and other dental specialists) were similarly distributed and stated their most common modality for treating CMF trauma is through participation in a multidisciplinary team which addresses any CMF trauma (68.4%). The second most common practice is as solo independent provider practice (31.5%) with a few selecting that they participated in a warfare-specific CMF trauma team (4.1%) or consult with CMF trauma solely within their specialty (10.9%). In contrast, medical specialists chose their most common modality as solo independent provider practice (53.6%) with equal responses for working with a warfare-specific CMF trauma team (21.4%), consulting with a CMF trauma team solely within their specialty (21.4%) or participating in a multidisciplinary team for any CMF trauma (21.4%).

Seeking further discrimination of current practices, respondents were asked to state if there is a difference in treatment protocol between battlefield and non-battlefield CMF trauma treatment. The majority of respondents reported there is no difference in how they treat battlefield versus non-battlefield CMF trauma (59.7%).

Dental malocclusion following CMF trauma may not be identified clinically until a year post-trauma.²¹ To investigate this outcome, respondents were asked how long CMF trauma patients are followed in their practice. If applicable to their practice and experience, the participant could select between six options correlating to ordinal data: (1) until discharge after primary fixation, (2) 0 to 3 months, (3) 4 to 6 months, (4) 7 to 9 months, (5) 10 to 12 months, and

(6) greater than 1 year. Orthodontists and the other dental specialist cohort reported the longest follow-up timelines with the mode for each group being greater than 1 year (Orthodontists: median = 5, IQR = 3, mode = 6; Other Dental Specialists: median = 5.5, IQR = 3.5, mode = 6). Oral maxillofacial surgeons reported a lower median of 4 to 6 months, however their IQR was broader (IQR = 4) and their total responses had two modes, 4 to 6 months (option 3) and greater than 1 year (option 6). Medical specialists reported the shortest post-CMF trauma follow-up median at 0 to 3 months (median = 2, IQR = 1, mode = 2). A Kruskal–Wallis analysis of the four groups together showed a significant finding ($P = 0.004$) which led to a Mann–Whitney U comparison of the groups. The four group comparisons demonstrated a significance in the follow-up time range between medical specialists and each of the other three groups (Medical Specialists/Orthodontists: $P = 0.001$, Medical Specialists/Oral Maxillofacial Surgeons: $P = 0.005$, Medical Specialists/Other Dental Specialists: $P = 0.032$).

Limitations to Multidisciplinary CMF Trauma Care

To investigate perceived limitations with multidisciplinary CMF trauma care, participants were asked to respond to three categorical questions. First, participants either selected the system factors that limit multidisciplinary care or selected that there are no system factors limiting care. The majority selected as least one system factor limiting CMF trauma care (78.7%). Next, participants selected the patient factors that limit multidisciplinary care or selected that there are no patient factors limiting care. Again, the majority selected at least one patient factor limiting CMF trauma care (86.3%). Finally, participants selected improvements they believe would improve warfare-related CMF trauma care or indicated that no improvements are needed. Once again, the majority selected at least one area of improvement for CMF trauma care (93.9%). A chi-square test of these three questions shows significance (statistic = 14.37, $P = 0.0007$) and lead us to reject the null hypothesis that there are no limiting factors in post-CMF trauma care in the military system as perceived by treating specialists.

Orthodontists Included or Excluded from CMF Trauma Care

A key area of interest for this survey is the inclusion or exclusion of orthodontists from CMF trauma care. Participants reviewed two questions that evaluated their perception of reasons for orthodontists to be included with or excluded from CMF trauma care. A minority of respondents answered the question about inclusion by indicating that orthodontists are never included in CMF trauma care (23.1%). In addition, a minority of respondents when asked about the exclusion of orthodontists from CMF trauma consideration replied saying orthodontists are always consulted regarding these cases (10.7%). A chi-square test of these two questions shows significance (statistic = 117.65, $P < 0.00001$) and lead us to

reject the null hypothesis that there are no factors limiting inclusion of orthodontists in interdisciplinary treatment of CMF trauma as perceived by treating specialists.

Since knowledge of dental occlusion is important in the restoration of function in CMF trauma,^{14–16,20,22–25} respondents self-assessed their own understanding of dental occlusion with a Likert 7-point scale. The range extended from “detailed training and/or experience with dental occlusion” (1), to “grasp the fundamentals of dental occlusion” (4), and “no training or knowledge of dental occlusion” (7). Orthodontists, oral maxillofacial surgeons, and other dental specialists all reported the same median and mode of detailed training and/or experience (1 on the scale). Medical specialists assessed themselves with a median of 3 and a mode of 4, grasping the fundamentals of dental occlusion. A Kruskal–Wallis analysis showed significance in the disparity ($P < 0.00001$) and paired analysis with Mann–Whitney U tests confirmed the significance, as expected, of the medical specialists’ assessment of dental occlusion compared to those with dental degrees.

Further exploration of the orthodontist’s inclusion or exclusion led us to ask respondents to assess their knowledge of what a military orthodontist could contribute to the care of CMF trauma patients. A 7-point Likert scale was used with values from “no knowledge of orthodontist’s contribution” (1), to “have observed orthodontic outcomes with CMF trauma cases” (4) and extending to “thoroughly understand what orthodontists can contribute or regularly consult orthodontists” (7). Oral maxillofacial surgeons assessed themselves with the highest level of understanding of orthodontic contribution to CMF trauma (median = 7, IQR = 4, mode = 7). Orthodontists and other dental specialists also reported high understanding of the orthodontic contributions (median = 6, IQR = 3, mode = 7). Medical specialists self-reported the lowest understanding of an orthodontist’s potential contribution to treating CMF trauma (median = 2, IQR = 2, mode = 2). A Kruskal–Wallis analysis showed significance in the disparity ($P = 0.00026$) and cohort analysis with Mann–Whitney U tests confirmed the significance of the medical specialists’ different understanding of orthodontic contributions in CMF trauma rehabilitation compared to the other three cohorts. This allows us to reject the third null hypothesis that there are no differences in perceptions of the orthodontist’s contribution to CMF trauma rehabilitation among treating specialists.

Advanced Technology in Support of CMF Trauma Management

The last question in the survey asked what advanced technology could improve the specialist’s confidence in managing dental occlusion complications at initial intervention. The prioritized responses are included in the discussion below. Responses were sorted by the specialty cohorts and also by comparing the responses of those with or without

TABLE I. (A) System and (B) Patient Factors Limiting Multidisciplinary Craniomaxillofacial Trauma Care

(A) System factors limiting care		(B) Patient factors limiting care	
Lack of multi-disciplinary team	43.1%	Moves to another location w/o medical/dental support	71.3%
Separate medical & dental records	41.1%	Separates from military	55.3%
No referral protocol between medical/dental	36.4%	Ineligible for further military care (for any reason)	34.0%
No orthodontist available at duty location	32.5%	Declines further care	19.3%
Occlusion not part of evaluation at follow-up	21.2%	Returns to duty w/ no further treatment needs	17.3%

medical/dental deployment experience. Although not one of the null hypotheses, a chi-square test was run showing no significance between any of the groups.

DISCUSSION

This survey data is divided here into three domains for discussion. The first domain is the perceived system factors and patient factors which limit multidisciplinary care of CMF trauma (Table I). The most common reported system factor deficiency is the lack of a multidisciplinary team to address the comprehensive restorative process (43.1%). The second and third most commonly reported system factors limiting treatment are related to interactions between medical and dental teams: the maintenance of separate electronic health/treatment records (41.1%) and the lack of referral protocol (36.4%). Military Health System Genesis is a unified military health record which proposes to integrate notes, referral solutions and ease the process. While not fully launched at this time, it will be interesting to follow the implementation and study if it relieves these perceived limitations once providers interact with the system and treat CMF trauma cases to completion. The fourth most common system factor noted the absence of an orthodontist and will be discussed further with the third domain. Interestingly, the fifth most common perceived system limitation identified is the lack of dental occlusion evaluation at follow-up. As noted previously, dental malocclusion can take up to a year to present.¹⁴ Given the disparity of the follow-up timelines along with the varying degrees of training, this suggests that CMF trauma patients could be referred to dental for long-term follow-up after medical stabilization.

In addition to system factors limiting care, there are patient factors as well. The primary perceived patient limitation is the permanent change of station without specialist medical and/or dental support. Specialists which treat CMF trauma rehabilitation are generally stationed at larger MTFs. Military medicine

is highly focused on readiness. However, wartime readiness does not equate with complete return to pre-injury function. While an ideal treatment plan cannot override the service member's needs for their job or career, a well-developed plan of continuity can inform decisions for duty assignments. Follow-up care through all stages of rehabilitation is required to achieve a return to maximum function. The next two most common patient limiting factors reported are the patient separating from the military (55.3%) or the patient ineligible for further military care (34.0%). One respondent commented that in the case of a severely wounded patient that "he/she is often not on Active Duty by the time an Active Duty orthodontist would be involved." These patient centric factors overlap with the systems of military medical care. When a patient separates from active duty, there are perceived challenges in communicating care plans from the active duty MTF to the VA. Moreover, at separation from the military the patient's condition might be seen as not severe enough to warrant further care. The next patient limiting factor identified was the patient declining further care. This emphasizes the ethics principle of patient autonomy. Patients have the right to decline further care and/or recognize an acceptable return to function requesting no further treatment. The fifth patient factor is recognized as a limit in a positive sense. In this case, providers identify that all treatment goals are accomplished and the patient is returned to duty, but this only represents 17.3% of survey participants.

For the second domain, participants contributed their suggestions for improvement based on their experience with CMF trauma. The top five recommendations are presented in Table II. The participants' suggestions included: establishing a network of CMF trauma teams (58.8%), standardizing hand-off of patient care from the MTF to civilian or VA providers (56.2%), developing a military standard complete CMF rehabilitation protocol (52.9%), increasing transparency between medical and dental records (46.4%), and circulating CMF trauma treatment case reports among treating specialists (35.3%). In addition to these improvements, technological advances can be leveraged for patient care. The United States Army Institute of Surgical Research (USAISR) develops and adapts technology to enhance medical outcomes. Participants selected their preferred advanced technologies which they believe could improve CMF trauma care. Tele-consult with an orthodontist was the primary request of participants (52.4%). The ability to interact remotely has broadly expanded during the COVID-19 pandemic and more providers are more comfortable exploiting this option. The Tri-Service Orthodontic Residency Program (JBSA Lackland, San Antonio, Texas) is well positioned to be a potential consult center since Air Force, Army, and Navy orthodontists are all represented and integrated with the San Antonio military healthcare system. Virtual reality (48.3%) and battlefield simulation (44.1%) training adjuncts were suggested and match pre-deployment skill training recommendations in other studies.^{10,26,27} The suggestion of developing an automated digital application to

TABLE II. (A) Improvements & (B) Advanced Technology for Multidisciplinary Craniomaxillofacial Trauma Care

(A) Suggested improvements		(B) Advanced technology	
Establish network of Craniomaxillofacial trauma teams	58.8%	Tele-consult (live video) option w/ orthodontist	52.4%
Standardize hand-off military to Veteran's Administration /civilian	56.2%	Virtual reality surgical assistance for facial trauma	48.3%
Develop warfare craniomaxillofacial trauma protocol	52.9%	Battlefield simulation on managing dental occlusion	44.1%
Merge medical/dental records for transparency	46.4%	Automated aids (apps) to assess dental occlusion	37.2%
Circulate case reports focusing on craniomaxillofacial trauma	35.3%	Decision support tool (such as burn navigator)	29.0%

assess dental occlusion was a frequent request (37.2%) but further investigation is required to narrow down requirements. A concern in any facial reconstruction is inferring the pre-existing dental stability with no knowledge of the patient's initial dental occlusion.²² There is an isolated anecdote where a battlefield CMF trauma patient had a pre-trauma full cranium cone beam computed tomography that was useful in the patient's post-trauma surgical planning.

The third domain explored why orthodontists are either included or excluded in CMF trauma rehabilitation. The top five responses in each category are presented in Table III. The principal factor identified was co-location of the primary CMF trauma treating specialist with an orthodontist. This facilitates inclusion when a military orthodontist is stationed at the same facility or region but also results in exclusion when a military orthodontist is not available. Several participant comments mentioned the manning reduction of specialists as a contributing factor in limiting both availability for consults and maintaining multidisciplinary environments. Another key factor is the existing relationship of the primary specialist treating the trauma with an orthodontist. Similar to the effect of co-location, this can both bolster the inclusion or consult of an orthodontist regarding the plan or present a barrier resulting in exclusion. In the same way, local treatment protocols are supportive of orthodontic inclusion and consults when in place but the lack of an established protocol is the primary barrier in achieving orthodontic consults. Treating specialists who have previous case experience working with orthodontists cite this experience as motivating them to include orthodontists in future cases. In addition, multiple respondents commented on the referral routes such as scenarios where a prosthodontist receives a patient for care and contacts the orthodontist for support or if a medical specialist perceives a dental or malocclusion issue, they reach out to OMFS for support.

TABLE III. Reasons for (A) Inclusion or (B) Exclusion of Orthodontists in Craniomaxillofacial Trauma Care

(A) Inclusion of orthodontists		(B) Exclusion of orthodontists	
Co-stationed w/ military orthodontist (facility)	43.1%	No established protocol	51.1%
Existing relationship	39.6%	No orthodontist present at facility	45.4%
Co-stationed w/ military orthodontist (region)	36.8%	No previous relationship	39.7%
Previous personal case experience	27.1%	No orthodontist in region	34.8%
Local protocol for trauma cases	11.1%	Other higher priority treatment objectives	30.5%

This complex connection of assignment locations, relationship, and local protocols require intentional efforts from all treating specialists, but perhaps more so the military orthodontists, so a framework for successfully managing multidisciplinary follow-up exists before patients present with battlefield or non-battlefield related CMF trauma.

One poignant reminder is that in the midst of treating life-threatening CMF trauma there are higher priority treatment objectives where seeking other consults could delay care. One participant stated they are "wary of complicating a high adrenaline situation." Long-term rehabilitation is essential but some specialty care may be neglected due to prioritization of the most emergent aspects of the casualty's injuries. A prosthodontist expressed concern over the management of "abnormal occlusion" by any other specialty in such situations. An oral surgeon summarized their perspective on facial trauma treated by other specialists as "typically focusing on anatomical reduction where as we [oral surgeons] focus on a functional reduction with occlusion as the goal." Similarly, a maxillofacial prosthodontist stated that a significant "frustration and challenge" has been the management of "the absence of restorative space" when OMFS has not been consulted during surgical reconstruction and the treating surgeon has no knowledge of dentistry. This respondent said they have been involved in numerous "salvage surgeries to correct poor surgical outcomes." General CMF trauma is a critical wartime readiness skill^{2,10,11} and several comments suggested surgeons "spend time at civilian trauma centers to maintain adequate reps due to inadequate trauma volume." In addition, there are additional complexities with battlefield trauma because IED and blast-induced facial fractures present differently than non-battlefield trauma.²⁸ Overall treatment although still needs comprehensive evaluation at the end-point using standard metrics such as the 10-point oral function and facial aesthetics scale.^{1,29}

CONCLUSIONS

Orthodontics, while available in the military, is underutilized in treating post-warfare or other CMF trauma.

This multidiscipline survey of U.S. military medical and dental specialists led to the rejection of all three null hypotheses leading to the following conclusions.

First, there are both system and patient limiting factors in the treatment of battlefield and non-battlefield CMF trauma. Duty location of either the patient, specialist, or both is seen as limiting complete CMF trauma rehabilitation. There is a lack of uniformity in dental and medical record availability for treating teams which complicates multidisciplinary communication and contributes to a lack of standardization in referrals. Failure to recognize malocclusion and final outcome tracking which does not include occlusal evaluation or sufficient follow-up time post-trauma also affect outcomes.

Second, there are limitations to the inclusion of orthodontists in CMF trauma care which lead to underutilization of available care. The limitation of physical distance (either regionally or practicing in separate facilities) is one not easily solved. However, the use of local consulting protocols and bolstering of the relationship between orthodontists and primary CMF trauma treating specialists can be part of the solution. The successful treatment of CMF trauma cases as a multidisciplinary team encourages future collaboration.

Third, oral maxillofacial surgeons reported the highest understanding of the military orthodontist's contribution to a CMF trauma treatment team and medical specialists reported the lowest understanding. There may be opportunity to include military orthodontists in the treatment of CMF trauma, especially in applying expertise where other specialists perceive a skill deficiency. In addition, the participants identified areas for improvement in CMF trauma care and highlighted the advanced technology tools that could help improve outcomes and multidisciplinary interactions.

Future research can support the understanding of complete CMF trauma rehabilitation by comparing outcomes of CMF trauma in MTFs and evaluate the efficiency of cross-specialty referrals both before and after implementation of Military Health System Genesis. Protocols for handling CMF trauma should be gathered and collated to highlight best practices and make recommendations for harmonizing the military health-care. In addition, the costs of treatment should be studied to determine if there is an increase or savings and how this relates to the efficacy and efficiency of treatment. These future studies will act on the recommendations of military specialists treating CMF trauma who contributed to this survey and further improve our systems of care.

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SUPPLEMENTARY MATERIAL

Supplementary material is available at *Military Medicine* online.

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CONFLICT OF INTEREST STATEMENT

None declared.

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