National Disparities in Insurance Coverage of Comprehensive Craniomaxillofacial Trauma Care

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**Background:** Comprehensive craniomaxillofacial trauma care includes correcting functional deficits, addressing acquired deformities and appearance, and providing psychosocial support. The aim of this study was to characterize insurance coverage of surgical, medical, and psychosocial services indicated for longitudinal facial trauma care and highlight national discrepancies in policy.

**Methods:** A cross-sectional analysis of insurance coverage was performed for treatment of common functional, appearance, and psychosocial facial trauma sequelae. Policies were scored for coverage (3), case-by-case coverage (2), no mention (1), and exclusion (0). The sum of points determined coverage scores for functional sequelae, acquired-appearance sequelae, and psychosocial sequelae, the sum of which generated a Comprehensive Coverage Score.

**Results:** Medicaid earned lower comprehensive coverage scores and lower coverage scores for psychosocial sequelae than did private insurance (P = 0.02, P = 0.02). Medicaid CCSs were lowest in Oklahoma, Arkansas, and Missouri. Private insurance CCSs and psychosocial sequelae were highest in Colorado and Delaware, and lowest in Wisconsin. Coverage scores for functional sequelae and for acquired-appearance sequelae were similar for Medicaid and private policies. Medicaid coverage scores were higher in states that opted into Medicaid expansion (P = 0.04), states with Democrat governors (P = 0.02), states with mandated paid leave (P = 0.01), and states with >40% total population living >100% above federal poverty (P = 0.03). Medicaid comprehensive coverage scores and coverage scores for psychosocial sequelae were lower in southeastern states. Private insurance coverage scores for functional sequelae and for ASCSs were lower in the Midwest.

**Conclusions:** Insurance disparities in comprehensive craniomaxillofacial care coverage exist, particularly for psychosocial services. The disparities correlate with current state-level geopolitics. There is a uniform need to address national and state-specific differences in coverage from both Medicaid and private insurance policies.

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**INTRODUCTION**

Insurance-related disparities in accessible coverage and healthcare quality have been described in many medical and surgical populations. For patients with traumatic injury, Medicaid enrollment has been associated with less surgery, poorer outcomes, and longer hospital stays compared with private insurance. These differences have contributed to inadequate mechanisms for delivering needed trauma care and unsustainable financial consequences to healthcare systems as a whole. With nearly a quarter of Level-I trauma presentations involving the face, and due to their steep resource needs, craniomaxillofacial (CMF) trauma patients are particularly subject to disparities in care.1-3

Traditional paradigms have considered CMF trauma reconstruction as an acute disease process that is often deprioritized because of perceptions of an undesirable patient population, undesirable financial incentives, lack of specialist interest, and the lifestyle unpredictability associated with its specialization.4-15 On the contrary, modern paradigms recognize CMF trauma as a chronic disease of acute onset in terms of facial deformity, functional disability, and psychosocial issues. Thus, as with other disease

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processes, wholistic interdisciplinary management poten-
tiates patient care.14 The concept of a comprehensive CMF
trauma program is to combine acute trauma care with
secondary management of established facial deformities,
address functional issues, and to unite patients with social
and psychiatric care services. The aim of this study was to
to characterize insurance coverage of surgical and medical
services indicated to treat common functional, appear-
ance-related, and psychosocial sequelae of major CMF
trauma, and highlight discrepancies in coverage.

METHODS

Medicaid and private insurance policies were cross-
sectionally reviewed in April 2020 to assess coverage of
comprehensive CMF trauma care for nondisabled adults
in all 50 US states and the District of Columbia (D.C.).
Only private policies available on the Affordable Care Act
(ACA) Marketplace as silver options—the most commonly
enrolled ACA marketplace option—were considered.15
Policies offered by each state’s largest insurer (FY2018
market-cap) were included. Certificates of coverage were
reviewed for all policies along with insurance company
medical policies. To define comprehensive care, 3 classes
of common injury sequelae were created: 1. Functional
deficits (acquired malocclusion, nasal airway obstruc-
tion, facial paralysis/paresthesia, excessive tearing/dry
eyes, difficulty closing eyes, pain with mastication, trouble
breathing); 2. Acquired appearance-related (orbital dys-
topia, nasal deformity, scar needling revision, asymmetry/
contour irregularity); 3. Psychosocial support (employ-
ment services/assistance, occupational/physical/speech
therapy; psychiatric care, social services).

Surgical treatments for functional and appearance-
related sequelae classes were individually scrutinized for
coverage. The same was done for the defined psychosocial
services. Policies were uniquely classified as clear cover-
age, case-by-case coverage, lack of mention, or explicit
exclusion. Policies indicating clear coverage were given 3
points, case-by-case coverage 2 points, no mention (silent)
1 point, and explicit exclusion of coverage 0 points. The
sum of all points was determined for each class of sequelae
yielding functional sequelae coverage scores (FSCS),
acquired-appearance sequelae coverage scores (ASCS),
and psychosocial service coverage scores (PSCS).

Financial (FY2018), socioeconomic, and political
data were collected from the Kaiser Family Foundation
Fund (KFF) State Health Facts to investigate underlying
factors and calculated coverage scores. The Kaiser
Family Foundation Fund State Health Facts pro-
vides free, up-to-date health data for all states and DC.16
Financial data included Gross State Product ($), state
spending per capita ($), total state tax collection ($),
total state Medicaid spending ($), state decision regard-
ing the ACA Medicaid Expansion (opt-in/out), and
federal: state contribution ratio to the state’s Medicaid
budget. Socioeconomic data included total Medicaid
utilizers (as % of state population), populations making
<100% and >400% of the federal poverty level (as % of
state population), non-citizen population (as % of state
population), and state mandated paid leave (sick or
family). Political data included voter population (as %
of state’s registered voters) and majority political affili-
tions of state governors, senators, and houses (Democrat/
Republican). Bivariate correlation and one-way ANOVA
were performed using Kaiser Family Foundation Fund
financial, socioeconomic, and political data as indepen-
dent variables and calculated coverage scores (CCS,
FSCS, ASCS, PSCS) as dependent variables. Continuous
independent variables were normally transformed using
cutoffs ± 2 standard deviations (sds.). All statisti-
cal analyses were performed using IBM SPSS Statistics
for Mac OS, version 25 (IBM Corp., Armonk, N.Y.).
Significance was defined as P < 0.05.

RESULTS

A total of 102 policies were analyzed, half from
Medicaid (n = 51) and half from private insurance
(n = 51). Coverage of individual CMF-trauma related
injuries are shown in Table 1. The majority of functional
injuries were explicitly covered. Acquired malocclusion
was covered by 82.3% (n = 42) of private policies and
84.3% (n = 43) of Medicaid policies. Pain with mastic-
tion, nasal airway obstruction, and excessive tearing were
covered by 94.1% (n = 48) of Medicaid policies. Pain with
mastication, difficulty breathing, excessive tearing/dry
eyes, and difficulty closing eyes were covered by 82.3%
(n = 42) of private policies. Nasal airway obstruction was
covered by 80.4% (n = 41) of private policies. Breathing
difficulty and difficulty closing eyes were explicitly cov-
ered by 96.1% (n = 49) of Medicaid policies. Facial
paralysis/paresthesia was covered by 84.5% (n = 38) of
private policies and 72.5% (n = 37) Medicaid policies;
25.5% (n = 13) of private policies, and 27.5% (n = 14) of
private policies provided case-by-case coverage of facial
paralysis/paresthesia. Coverage of acquired-appearance
injuries was heterogeneous across policies. Nasal deformity
was explicitly not covered by 25.5% (n = 13) of private
policies and 29.4% (n = 15) of Medicaid policies. The
majority of private policies (47.1%, n = 24) and Medicaid
policies (45.1%, n = 23) provided case-by-case coverage
of nasal deformity. Scar revision was similarly covered, with
47.1% (n = 24) of private policies and 43.1% (n = 22) of
Medicaid policies providing case-by-case coverage. An
estimated 31.4% (n = 16) and 27.4% (n = 14) of Medicaid
and private policies, respectively, explicitly did not cover
scar revision without functional consequence. Facial
asymmetry or contour irregularity were covered on a
case-by-case basis in 47.1% (n = 24) private and Medicaid
policies. The range (n) of Medicaid and private policies
providing explicit coverage for any acquired-appearance
injury was 13–14 (25.5%–27.4%). Employment services
were explicitly not covered by 98% (n = 50) of Medicaid
policies. Private insurance policies nearly half the time
excluded coverage (49%, n = 25) or did not mention
coverage (47%, n = 24). The majority of private (n = 46,
90.2%) and Medicaid policies (n = 46, 90.2%) provided
rehabilitative occupational, physical, and speech thera-
pies. Psychiatric/psychology services were covered by
92.1% (n = 47) of private policies and 88.2% (n = 45) of
Medicaid policies.
### Table 1. Coverage of Individual Injuries within Each Sequelae Class for Medicaid Policies (n = 51) and Private Insurance Policies (n = 51)

| Acquired-appearance Sequelae | Psychosocial Sequelae | Facial Sequelae | Functional Sequelae |
|------------------------------|-----------------------|-----------------|--------------------|
| Excessive Difficulty Airway | Depression | Facial Pain | Mastication Obstruction |
| Facial Asymmetry | Malocclusion | Asymmetry | Breathing |
| Contour | Revision | Closing | Dystopia |
| Employment Services | Surgery | Paralysis | Dry Eyes |
| OT/PT/ Speech Therapy | Voice | Psychological Services | Eyes |
| Pain with |  | Therapy | Paresthesia |
| nasal airway |  | Care | Dystopia |
|  |  |  | Deformity |

#### Coverage of Specific CMF Trauma Sequelae: Medicaid versus Private Insurance

Comprehensive care coverage scores (CCS) were higher for private insurance than for Medicaid across all states (Fig. 1). The national mean CCS was 38 (sd. 5.8) for Medicaid versus 40.9 (sd. 6.4) for private policies ($P = 0.02$). The top Medicaid comprehensive care score (CCS 45) was from 7 states (California, Idaho, Kansas, Maine, Rhode Island, South Dakota, and Vermont) plus D.C., while Oklahoma, Arkansas, and Missouri Medicaid CCSs were 2 sds. below the national mean. The top private comprehensive care score (CCS 50) was calculated from policies in Colorado and Delaware. Private policy CCSs from Indiana, Iowa, South Dakota, Tennessee, and Wisconsin fell 2 sds. below the national mean, with the lowest private score (CCS 23) from Wisconsin.

#### Analysis by Region and Associated State Factors

Medicaid coverage scores stratified by geographic region are shown in Table 2. There were no significant differences in the scores of Medicaid policies from Northeast, Midwest, and West Coast states; however, Southeast states’ Medicaid policies earned significantly lower CCSs and PSCSs than the rest of the nation. The Southeast states’ mean CCS was 33.2 (sd. 6.6) versus 39.3 (sd. 4.9) for non-Southeast states ($P = 0.01$) and their mean PSCS was...
8.5 (sd. 5) versus 11.7 (sd. 1.6) for non-Southeast states (P = 0.01).

Private coverage scores stratified by state region are shown in Table 3. Midwest states had significantly lower CCSs, FSCSs, and ASCSs than non-Midwest states. The Midwest states’ mean CCS was 37.8 (sd. 7.7) versus 42.4 (sd. 5.1) for non-Midwest states (P = 0.01), mean FSCS was 19.3 (sd. 3.5) versus 21.3 (sd. 2) for non-Midwest states (P = 0.01), mean ASCS was 6.4 (sd. 4.3) versus 8.9 (sd. 3.8) for non-Midwest states (P = 0.04). States from the Southeast, Northeast, and West Coast regions all earned similar coverage scores across sequelae classes.

States that opted into Medicaid expansion (n = 36) had higher Medicaid comprehensive coverage scores (CCS) and psychosocial coverage scores (PSCS) than those that did not (n = 15); the mean Medicaid CCS for states that had opted in was 39.2 versus 25.4 for those that did not (P = 0.04), and the mean Medicaid PSCS for states that had opted in was 11.7 versus 9.4 for those that did not (P = 0.01). These scores were also higher in states with Democrat governors; the mean Medicaid CCS for Democrat governor-led states was 39.9 versus 36.3 for Republican-led states (P = 0.02), and the mean PSCS for states with Democrat governors was 12 versus 10.2 for states
with Republican governors ($P = 0.03$). Medicaid CCSs were also higher in states that mandated paid sick/family leave ($n = 36$) than those that did not ($n = 15$); the mean CCS for states with mandated leave was 41.2 versus 36.7 for those that had no mandate ($P = 0.01$). Psychosocial coverage scores were higher in states with 40% or more of the total population earning >400% of the federal poverty line (FPL) ($n = 23$); in these states the mean PSCS was 12 versus 10.2 for states with less than 40% of the total population earning >400% of the FPL ($n = 28$) ($P = 0.03$).

**DISCUSSION**

Acute management of CMF trauma is the mainstay of care for patients with these injuries. Beyond the acuity of physical injury, appearance-related, functional, and psychosocial sequelae can persist. For many patients, CMF trauma becomes a chronic disease resulting in long-term quality of life decline.\(^{17,18}\) As such, optimal management of CMF trauma offers comprehensive care involving three paradigms: restoring function, correcting appearance-related deformities, and addressing psychosocial well-being.

Upon national comparison of coverage scores, our results indicated more comprehensive coverage of CMF trauma care offered by private insurance policies than Medicaid (CCS 40.9 versus CCS 38, $P = 0.02$). Scrutiny of this difference indicated coverage of psychosocial sequelae as the area of discrepancy. These findings mirror past reports of Medicaid enrollees receiving less care than private policy beneficiaries.\(^{19,20}\) For both Medicaid and private policies, however, preventative mental health and social/occupational support services were rarely covered and typically not mentioned. This is particularly consequential given the importance of social support and accessible resources for resilience and achieving post-traumatic emotional resolution.\(^{21}\)

Across states’ Medicaid policies, we found coverage of functional and appearance related sequelae to vary minimally. The minimal heterogeneity in functional sequelae coverage is unsurprising, as Centers...
...loss of function an unequivocal justification for coverage. This is similar for appearance-related coverages, as it was atypical for Medicaid to offer coverage in the absence of functional deficit; for states that did offer elective surgery for non-functionally deficit presentations, it was not common for there to be limits to the number of annual elective surgeries covered, thereby limiting the number of corrective operations one may undergo for trauma-related problems.

When coverage scores were stratified by geographic region, Medicaid coverage for comprehensive care and psychosocial sequelae were lower in the southeastern states than the rest of the country. By comparison, Medicaid coverage offered by Northeast, Midwest, and West Coast states was statistically similar. The median Medicaid score for comprehensive coverage was the greatest for West Coast states (CCS 41) and the lowest for Southeast states (CCS 9). Different geographic trends were noted upon analysis of private policy coverage, where policies from Midwest...
states scored a significantly lower mean for coverage of comprehensive care, functional sequelae, and appearance-related sequelae. Appearance-related coverage scores from Midwest state private policies were of the same range as policies from other regions (range, 12); however, Midwest state policies had the lowest median appearance-related coverage score (median ASCS 8).

Commonly a disease of poverty and product of socioeconomic environment, CMF trauma disproportionately affects disadvantaged populations who historically lack access to social and mental health services.\(^{10,22-24}\) Unfortunately, CMF trauma care has become increasingly costly for medical systems over the past 3 decades.\(^{25}\) Today, robust CMF trauma care is limited by significant opportunity costs that are incurred when higher-reimbursed CMF procedures are forgone to render trauma care, as well as tangential costs related to iatrogenic and pathologic complications.\(^{26,27}\) These system-level adversities have trickled down to affect the clinical environment, with the majority of surgeons who treat CMF trauma believing inpatient treatment required referencing both medical policies of insurance available on the ACA marketplace (versus bronze, silver, gold, and platinum). Additionally, coverage determination required referencing both medical policies of insurers (nonspecific to plan) and plan-specific certificates of coverage because the latter often lacked the nuanced medical descriptions needed to judge treatment context. Furthermore, judging policies that did not mention a condition required assuming that, compared with case-by-case statements of coverage, silent policies inherently translate to lesser coverage. In doing so, the considerable roles of prior authorization and peer-to-peer reviews on the determination of coverage are disregarded. Lastly, the limited number of insurance policies reviewed in this study precludes broader conclusions of all available insurance policies.

The epidemiologic manifestations of traumatic CMF injury have been clearly borne out in national- and institution-level data, with evidence that already marginalized patients are overly affected.\(^{30,34,35}\) Currently, however, sparse efforts have scrutinized disparities in the post-acute, longitudinal care provided to CMF trauma patients.\(^{29}\) Because the pervasive effects of a traumatic CMF experience are unpredictable in the acute setting, policies of predetermined coverage boundaries that limit standard access to wide-ranging multidisciplinary follow up care preclude patients an equitable likelihood of recovery. With the current heterogeneity in coverage offered across insurance policies, it is inevitable for aspects of medically necessary care to not be afforded to the underinsured aggregate and, by failing to do so, magnify known medical biases related to race, education, and socioeconomic status. To uniformly improve outcomes of CMF trauma, public policy efforts are needed to mitigate disparities in access-to-comprehensive care and better understanding factors contributing to inequity.

**CONCLUSIONS**

Comprehensive CMF trauma care includes restoring function, correcting posttraumatic deformities, and psychosocial support. Disparities exist nationally between Medicaid and private policies and between state Medicaid programs. State differences in Medicaid coverage are associated with overarching state demographic conditions and geopolitical factors. Collaborative efforts between physicians, medical systems, insurers, and lawmakers are required to improve access to the longitudinal care necessary following significant traumatic CMF injury.

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