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Deficiencies in the Assessment of Penicillin Allergy in Hospitalized Children in Hawai'i, 2021-2023

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Keywords: antibiotic, hypersensitivity, pediatrics, quality improvement

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Abstract

Although claims of penicillin allergy are common, after evaluation they are seldom confirmed and can lead to unnecessary interventions. National recommendations are to thoroughly evaluate potential allergies and, if appropriate, to delabel. This retrospective study reviewed records of children hospitalized at Kapi'olani Medical Center for Women and Children in Honolulu, Hawai'i, between January 1, 2021 and June 30, 2023 to assess the frequency of penicillin allergy claims, the appropriateness of their evaluation, and initiation of interventions. Of 3484 hospitalized children, 97 (2.8%) reported penicillin allergy. Documentation, by the admitting team, of the nature of allergy was incomplete for most (97%) of the hospitalizations, leading to deficient risk stratification, lack of implementation of recommended interventions, and frequent use of second-line antibiotics in 46.8% of those who required antibiotic treatment. While this problem is not unique to Hawai'i, it emphasizes the need for education among local providers to improve outcomes.

Abbreviations

AAAAI: American Academy of Allergy, Asthma, and Immunology
EMR = electronic medical record
KMCWC = Kapi'olani Medical Center for Women and Children
PAL = penicillin allergy label

Introduction

In pediatric care, antibiotics are commonly prescribed to treat proven or suspect infections. Given its long, favorable track-record of safety and efficacy, penicillin and its derivatives (eg, amoxicillin) represent some of the most utilized antibiotics. One potential side effect of the penicillins is allergy, which constitutes a relative contraindication for their use. In the United States, data from electronic health records of a large population (411 543 persons) cared for by the Kaiser Permanente Health Care Program in San Diego, CA, detected a cumulative prevalence of self-reported penicillin allergy of 9.0% (95% CI: 8.9-9.1%) for all age groups (0-80+ years); the corresponding pediatric age (0-19 years) prevalence was 5.1% (95% CI: 5.0-5.3%).[1] A smaller (66 419 person), single-center study in Milwaukee, WI, found a 0.9% (95% CI: 0.8-1.0%) prevalence of reported penicillin allergy among pediatric patients seen in the Emergency Department.[2]

Erroneous labeling of penicillin allergy is not innocuous and, by prompting use of alternative second-line antibiotics, can lead to significant adverse health outcomes including increased antibiotic-resistance, higher health care costs, longer hospital stays, adverse side effects, and even mortality.[3] It follows then that, by allowing use of these first-line, less toxic, more effective antibiotics, identifying and safely removing inaccurate labels of penicillin allergy can improve patient care. Yet, data show that fewer than 2% of children are properly evaluated to determine the accuracy of a penicillin allergy label (PAL), and that the management of these labels vary widely across health care settings.[4] In an effort to remediate these deficiencies, the American Academy of Allergy, Asthma, and Immunology (AAAAI) in its most recent 2022 practice parameter update recommends a proactive penicillin allergy delabeling approach, along with education of patients and clinicians on its benefits.[5] The proposed algorithm (shown in **Figure 1**) is based on sequential steps of proper evaluation, risk stratification, and implementation of corrective interventions.

There are no published epidemiological data evaluating the prevalence or management of penicillin allergy in the pediatric population of the state of Hawai'i. This gap is significant given the unique racial, ethnic, and geographic demographics of the state, which may influence allergy prevalence, health care access, and documentation practices. Moreover, the scarcity of access to medical specialists in Hawai'i, including those in allergy and immunology, makes it more challenging to ensure accurate diagnosis and proper management of PALs. The present study aimed to understand the magnitude of the problem at Kapi'olani Medical Center for Women and Children (KMCWC) in Honolulu, HI. The frequency of PALs reported by children hospitalized at KMCWC, the appropriateness of documentation and corresponding risk stratification, the initiation of interventions, and the consequences in the use of second-line antibiotics were assessed. To the study team's knowledge, this is the first epidemiological report addressing PALs in children from Hawai'i, and no Hawai'i-specific data have been previously published in the literature.

Methods

KMCWC is the main pediatric referral center for Hawai'i and Pacific islands. A retrospective review was conducted of the electronic medical records (EMRs) of patients under 18 years of age hospitalized to KMCWC during the 2-year period July 1, 2021 to June 30, 2023. Patients who reported penicillin allergy were identified and their EMRs thoroughly reviewed. Each hospitalization was treated as a dis-

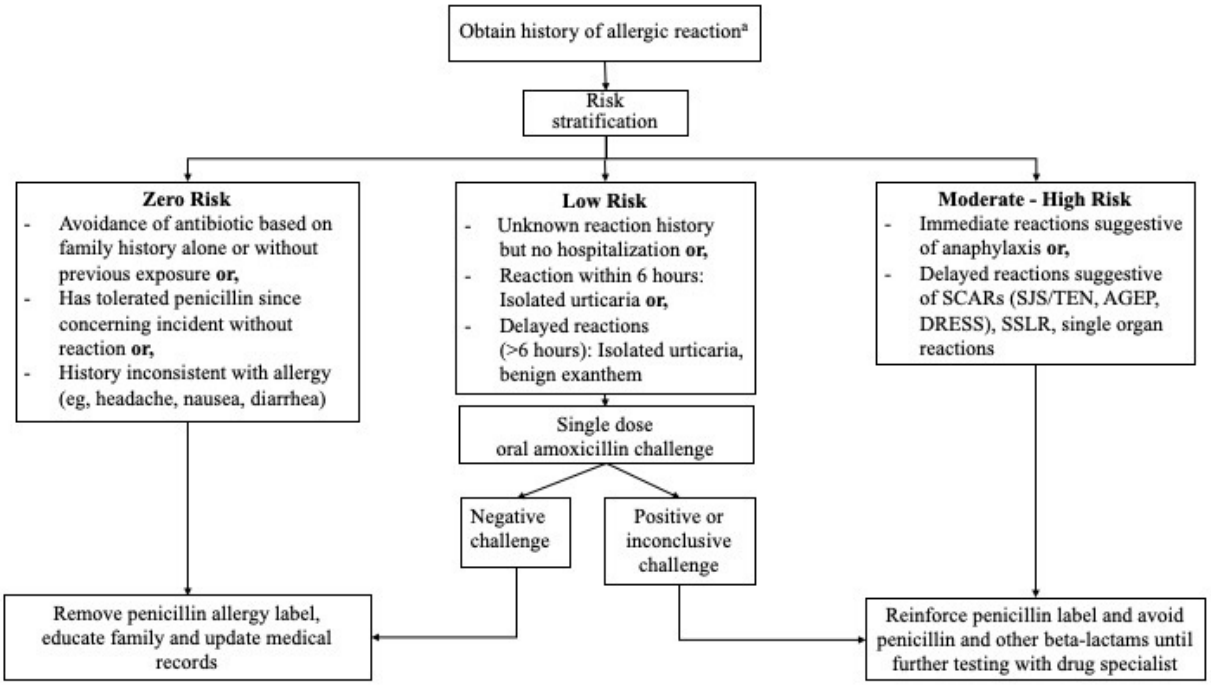

Figure 1. Algorithm for Diagnostic Approach and Decision Making in Pediatric Patients with Suspected Penicillin Allergy According to Risk.[5,6]

[a] Allergy history should include confirming antibiotic name, reaction-associated symptoms, and timing of the reaction. SCARs: severe cutaneous adverse reactions; SJS-TEN: Stevens–Johnson syndrome and toxic epidermal necrolysis; AGEP: acute generalized exanthematous pustulosis; DRESS: drug reaction with eosinophilia and systemic symptoms; SSLR: serum-sickness-like reaction.

tinct encounter, defined as a unique admission to the hospital. As individual patients may have had multiple admissions during the study period, the total number of encounters exceeded the number of unique patients.

Allergy documentation completeness was assessed by examining the 4 fields in the allergy section of the EMR: 1) severity classification, 2) pertinent symptoms, 3) free text comments, and 4) date of occurrence. EMRs with deficiencies were then reviewed by the investigators to further categorize them according to their allergy risk as either zero, low, or moderate-to-high, based on the AAAAI practice parameter (**Figure 1**) with special consideration to the type of reaction and timing in relation to antibiotic administration. Information was also retrieved to identify potential interventions initiated with the aim to clarify the allergy status (such as removal of the PAL, administration of an amoxicillin oral challenge, or referral to an allergist for testing). Finally, in the cases when antibiotics were required for hospitalization, and a penicillin would normally be the drug of choice, it was determined whether instead second-line agents were utilized because of the presence of a PAL.

Data was summarized as frequency (percent) for categorical data and analyzed using Pearson's χ^2 (chi-square) test, 2-sided, using GraphPad Prism version 5 (GraphPad Software, San Diego, California). This research study was deemed exempt from Institutional Review Board by the Hawaii Pacific Health Research Institute (HPRI Study Number: 2023-083).

Results

In the 24-month period from July 1, 2021 to June 30, 2023, 3484 unique children were hospitalized to KMCWC for a total of 4552 hospitalizations; their median age at hospitalization was 10 years (range: 5 months to 17 years). Of them, 97 children (2.8%; 95% CI: 2.2-3.3%), accounting for 149 (3.3%; 95% CI: 2.8-3.8%) hospitalizations, were identified with a PAL; amoxicillin (110 hospitalizations) was most implicated, followed by amoxicillin-clavulanate (12 hospitalizations), ampicillin (3 hospitalizations), and piperacillin-tazobactam (2 hospitalizations). In 22 hospitalizations, the type of penicillin was not specified. Of the total unique patients, 1944 (55.8%) were male and 1540 (44.2%) female, of whom 61 (3.1%) and 36 (2.3%), respectively, had a PAL. Patient self-identified race showed that 1503 (43.1%) were Native Hawaiian or Pacific Islander, 996 (28.6%) were Asian, 626 (18.0%) were White, 228 (6.5%) were mixed race, 65 (1.9%) were Black, 66 (1.9%) were unknown. Of the aforementioned racial categories, 35 (2.3%), 24 (2.4%), 23 (3.7%), 11 (4.8%), 3 (4.6%) and 1 (1.5%), respectively, had a PAL. Statistical comparisons of PAL frequencies by sex and race did not yield significant differences (P>.05, χ^2 test, **Table 1**).

Allergy documentation was mostly incomplete, with only 5 out of 149 hospitalizations (3.3%) having all 4 required fields completed. Severity classification was the most neglected field, missing in 117 (78.5%) hospitalizations. On further EMR review, 39 of these cases (26.2%) could be classified as zero risk, 108 (72.5%) as low risk, and

Table 1. Patient Demographics and Reported Penicillin Allergy Status, Kapi'olani Medical Center for Women and Children, July 1, 2021 to June 30, 2023.

	Unique patients No. (%)[b]	Reported penicillin allergy No. (%)[b]	*P*-value[a]
Total	3,484 (100)[b]	97 (2.8)[c]	
Sex			.2
Male	1944 (55.8)	61 (3.1)	
Female	1540 (44.2)	36 (2.3)	
Race			.2
Native Hawaiian/ Pacific islander	1503 (43.1)	35 (2.3)	
Asian	996 (28.6)	24 (2.4)	
White	626 (18)	23 (3.7)	
Black	65 (1.9)	3 (4.6)	
Unknown	66 (1.9)	1 (1.5)	
More than one	228 (6.5)	11 (4.8)	

[a] $\chi 2$ (chi-square) test, two-sided, compares distributions within subgroups
[b] percent of grand total

2 (1.3%) as moderate-to-high risk for penicillin allergy. Inpatient interventions in response to the PAL were rare and noted in only 8 patients (5.4%): 7 received an oral amoxicillin challenge and 1 was referred to an allergist; none was delabeled, despite 39 qualifying as low risk. Furthermore, in subsequent hospitalizations, 32 children were found to have received a beta-lactam antibiotic without an adverse reaction, but none had their PAL removed. More than half of the patients (79, 53.0%) required antibiotics during their hospital stay, with 37 (46.8%) of the 79 given second-line antibiotics (in decreasing order of use: clindamycin, ceftriaxone, azithromycin, ciprofloxacin, vancomycin, meropenem, or linezolid) due to their PAL.

Discussion

This study reveals significant deficiencies in the documentation and management of PALs among hospitalized children in Hawai'i, starting with incomplete documentation, especially regarding severity classification, which hindered appropriate interventions. Despite most PALs qualifying as low (72.5%) or zero (26.2%) risk, few patients received recommended interventions (either an oral amoxicillin challenge, or removal of the allergy label, respectively). These findings are consistent with national data that shows that only a minority of subjects with a PAL are properly evaluated despite strong recommendation from many national groups, and highlights the fact that there remains a substantial discrepancy between clinical evidence and actual practice when it comes to penicillin allergy delabeling.[7,8] Furthermore, the authors found that even when some patients received and tolerated beta-lactam antibiotics, their allergy labels remained unchanged. The frequent use of second-line antibiotics due to allergy labels highlights the clinical consequences of inadequate allergy evaluation.

Correcting the deficient evaluations and lack of interventions for PALs at KMCWC will require a multidisciplinary approach at many levels. Suggestions outlined in the literature include implementing standardized protocols for documenting drug allergies in EMRs; optimizing EMRs to be user-friendly, educating health care providers on proper classification and management of drug allergies, developing allergy delabeling programs, and quality improvement initiatives.[3,9] Locally, the authors, in cooperation with KMCWC, propose a multi-level approach, starting with provider-focused interventions such as incorporating penicillin allergy education into residency and hospitalist training, hosting grand rounds or other educational sessions for primary care providers, and promoting delabeling in younger children to address unconfirmed PALs before they become perpetuated into adolescence. Institutionally, the authors propose to incorporate penicillin allergy evaluation into medical checklists and implement an in-hospital standardized low-risk amoxicillin oral challenge protocol, following the successful experience described by Ray et al[9] Systemically, the EMR platform should be modified to incorporate electronic prompts and prevent entry of incomplete allergy histories – which is especially important given that 97% of current penicillin allergy labels in the KMCWC system lack complete documentation.

Of note, the prevalence of PALs in the present study (2.8%; 95% CI: 2.2-3.3%) is lower than the prevalence found by the Kaiser Permanente group (5.1%; 95% CI: 5.0-5.3%),[1] but higher than the study in Milwaukee (0.9%; 95% CI: 0.8-1.0%).[2] The authors believe several factors may contribute to the discrepant results between the studies. First, the present data is based on hospitalized children rather than the general pediatric population, which may lead to inherent differences in health care access and documentation practices. Second, the unique geographic and health care context of Hawai'i may impact health care utilization or continuity of care, hence affecting opportunities for antibiotic exposure or allergy labeling. Third, KMCWC patient demographics differ from national trends. A prior study by Taylor et al[10] suggests that non-Hispanic White children have the highest rates of PALs, whereas this group com-

prised a minority of the current study's population. Similarly, PALs seem to vary by sex and age-composition of the study population.[1] Fourth, differences in clinician practices could also contribute, as rates of PALs are known to vary across providers and clinics.[11,12] Lastly, this study was conducted during a time of increasing national awareness, following the 2022 AAAAI practice parameter update, which may have influenced provider behavior and documentation.

The main limitations of this study include its retrospective nature and its data source from a single-center only, which may limit generalizability. Still, many hospital-based practices may relate to this study's findings.

Conclusion

Penicillin allergy labeling remains a common but often inaccurate diagnosis among hospitalized children in the state of Hawai'i. In as much as the study population here included is a good reflection of the general population, close to 3% of children in Hawai'i may be labeled as penicillin allergic, many of them erroneously, and potentially not receive the recommended first-line treatments. This study highlights deficiencies in documentation completeness, risk stratification, and follow-up interventions, despite most allergy labels qualifying as low or zero risk. These gaps contribute to unnecessary use of second-line antibiotics and missed opportunities for safe delabeling. Given the unique patient demographics of Hawai'i and health care environment, tailored approaches are needed to address these issues effectively. To improve patient outcomes, focused efforts including provider education, standardized allergy documentation protocols, integration of penicillin allergy evaluation into clinical workflows, and implementation of active delabeling protocols are essential. The study findings underscore the need for institutional and systemic changes to reduce inaccurate penicillin allergy labels, optimize antibiotic stewardship, and enhance pediatric care in Hawai'i.

Conflicts of Interest

The authors have no conflicts of interest relevant to this article to disclose

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Holliday R, Lum S, Kindler C, et al. Traumatic Brain Injury among Native Hawaiian and Pacific Islander Veterans accessing Veterans Health Administration Homeless Services: A Preliminary Examination. *Hawaii J Health Soc Welf*. 2026;85(3):64-72.
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Traumatic Brain Injury among Native Hawaiian and Pacific Islander Veterans accessing Veterans Health Administration Homeless Services: A Preliminary Examination

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Abstract

Veterans experiencing homelessness have elevated rates of traumatic brain injury (TBI) diagnoses. There remains limited research on subsets of homeless Veterans, including Native Hawaiian and Pacific Islander (NHPI) Veterans. Department of Veterans Affairs (VA) electronic medical records of 724 752 Veterans who accessed Veterans Health Administration (VHA) homeless services from January 2005–December 2018 were examined. Of the total sample, 1177 identified as NHPI, with comparator samples of non-NHPI (n=723 575) and White (n=418 085) Veterans also generated. Rates of TBI were compared between NHPI Veterans relative to non-NHPI Veterans, as well as between NHPI and White Veterans (a subset of the non-NHPI Veteran sample). NHPI homeless Veterans were more likely to have a documented TBI diagnosis relative to non-NHPI homeless Veterans (AOR=1.82, 95% CI: 1.57-2.11), including the White homeless Veteran subgroup specifically (AOR=1.51, 95% CI: 1.30-1.75). This persisted in the presence of several covariates, including sex, ethnicity, rurality, VA service-connected disability, posttraumatic stress disorder, depression, and VHA mental health and general service use. NHPI homeless Veterans were also significantly less likely to utilize VHA services, suggesting an important gap in health service delivery. Results support potentially heightened risk for TBI among NHPI homeless Veterans, and a need to elucidate if such injuries occur during or outside of military service. Alternatively, given potential sociocultural differences, understanding the experience and expression of TBI sequelae among NHPI homeless Veterans is essential. Further research is requisite to understand how to optimally engage homeless NHPI Veterans in care to ensure TBI-related sequelae are adequately identified and addressed.

Abbreviations

AOR = adjusted odds ratio
CI = confidence interval
NHPI = Native Hawaiian and Pacific Islander
PTSD = posttraumatic stress disorder
TBI = traumatic brain injury
VA = Department of Veterans Affairs
VHA = Veterans Health Administration

Introduction

Traumatic brain injury (TBI) is a prevalent injury among individuals who have served in military conflicts.[1] TBI can result in lasting neurocognitive sequelae (eg, memory, executive dysfunction), leading to exacerbated psychosocial difficulty.[2] TBI is also highly comorbid with psychiatric conditions common among Veterans, including posttraumatic stress disorder (PTSD) and depression.[3,4] Moreover, the intersection of TBI with these psychiatric diagnoses is associated with financial difficulties, unemployment, and criminal legal system involvement.[5,6]

These factors are notable given their relation to homelessness. Of note, the prevalence of TBI among homeless Veterans is high,[7] with a cross-sectional study at 2 Veterans Affairs (VA) medical centers reporting that rates of TBI were nearly 91% among Veterans accessing homeless services.[8] However, it is largely unclear if TBI causally exacerbates trajectories to homelessness. Some, research suggests TBI is an independent and direct risk factor for homelessness.[9] In addition, TBI is also associated with indirect correlates of homelessness risk, such as financial challenges and unemployment.[9] A large prospective cohort study of transitioning service members identified TBI as being predictive of homelessness among some subgroups of Veterans, although this association was complicated by comorbid PTSD.[10] Nonetheless, the experience of homelessness, especially within unsheltered environments (eg, under an overpass, in a park), can increase risk for exposure to physical violence, including head injuries that can result in TBI.[9,11] This is further complicated by the fact that many individuals experiencing homelessness may have diminished access to care, which may result in delays obtaining TBI-related care. Such delays may impact the course of the brain injury, including both acute critical care needs (eg, brain bleed) and longer-term care (eg, neurocognitive and mental health symptoms).[9,11] As such, the relationship between TBI and homelessness is likely complex and bidirectional.[9]

Additionally, some segments of the homeless Veteran population remain understudied. For example, Native Hawaiian and Pacific Islander (NHPI) Veterans have his-

torically not been included within health research broadly due to various factors (eg, residing in US territories, inadequate sample size, lack of focused research on these populations).[12] Importantly, the VA has recently led epidemiologic efforts to elucidate rates of TBI, including comparison by race/ethnicity.[13] Although rates of TBI in the NHPI Veteran population do not appear elevated relative to other racial groups (eg, White Veterans), analyses were not specific to homeless Veterans.[13] Further, some research suggests NHPI Veterans experience trauma-related sequelae (eg, PTSD) and blast exposures with high propensity.[14, 15] Such exposures are notable as psychological trauma exposures, which can result in PTSD, have the potential to have concurrent physical traumatization (eg, physical assault, blast exposure), which can result in head injuries and, at times, a TBI.[16]

This limited research is further complicated by research tending to combine NHPI Veterans with those of other racial/ethnic identities (eg, Asian American Veterans). Indeed, recent research has suggested substantial heterogeneity between Asian American and NHPI Veteran populations, including differing risk for mental health sequelae.[14] Such an approach is further problematic given that NHPI Veterans often reside in high cost-of-living regions (eg, Pacific Islands) with more limited access to health and social services.[17,18] Further, many NHPI Veterans reside in rural regions (eg, Guam) which can serve as a barrier to accessing VA services, including specialty TBI-related care.[19] Finally, NHPI individuals have historically experienced generational traumas including loss of land with important cultural and familial ties. This has a notable impact on access to resources, including stable housing.[20]

To the authors' knowledge, no studies have examined if rates of TBI diagnosis among homeless Veterans differ between those who identify as NHPI versus those who do not. This study is an initial examination of TBI diagnosis among a national cohort of NHPI Veterans accessing Veterans Health Administration (VHA) homeless services. This analysis examined if there were differences in rates of TBI diagnosis between NHPI and non-NHPI homeless Veterans, including amongst the subsample of White homeless Veterans specifically.

Method

Participants and Procedures

The current study examined electronic medical record data of all Veterans accessing VHA homeless services between January 1, 2005 and December 31, 2018.[21] All data were obtained from VA Corporate Data Warehouse. Sociodemographic factors (ie, age, race, sex, ethnicity, rurality), service-connected disability (presence or absence), diagnoses (TBI, PTSD, depression), use of VHA mental health services, and use of VHA general services (ie, all VA services except mental health and homeless services)[21] were derived from Veterans' electronic medical records. Diagnoses were based on ICD-codes. Service use was based on relevant stop and bed section codes. As VHA service use was non-normally distributed, tertiles were formed for the entire sample based on number of total encounters each individual accessed from 2005-2018 for VHA use [low (⩽78); moderate (>78 and ⩽215); or high (>215) use] and VHA mental health care use [low (⩽17); moderate (>17 and ⩽93); or high (>93)].

The final cohort included 724 752 homeless Veterans. Of these, 1177 (0.2%) identified as NHPI. Comparator samples were generated for non-NHPI Veterans (n=723 575; 99.8%), and White Veterans (n=418 085; a subsample of the non-NHPI sample, which comprised 57.7% of the total sample and 57.8% of the non-NHPI Veteran sample). The current study was approved by the Colorado Multiple Institutional Review Board (#20-2756) and the local VA Research and Determinations committee.

Analytic Plan

Sample characteristics were generated for the NHPI and comparator cohorts (non-NHPI and White homeless Veterans). The 2 comparator samples (non-NHPI and White) were chosen to determine if the associations between NHPI race and TBI were specific to non-NHPI Veterans or only relative to White Veterans. As race and ethnicity were distinct variables in this sample (eg, White, non-Hispanic), Hispanic ethnicity was examined as a covariate to further delineate this association. Differences in sample characteristics were examined using chi-squared analyses. To examine if NHPI identity was associated with TBI diagnosis, crude logistic regression analyses were conducted. Adjusted logistic multivariate regressions were also conducted to determine if these associations remained significant when adjusting for covariates. Covariates included: rurality, age, sex, ethnicity, service-connected disability, PTSD, depression, VHA general use, and VHA mental health service use. Rurality, service-connected disability, and VHA service use (both general and mental health) were included as access and engagement in VHA services have been shown to be associated with greater likelihood of receipt of medical diagnosis, including TBI.[5] Sociodemographic factors (ie, age, sex, ethnicity) were included, as these factors are associated with propensity to encounter warzone experiences associated with TBI,[13] as well as social determinants associated with TBI diagnosis and receipt of care (eg, sex).[22] Finally, PTSD and depression were included in adjusted analyses given comorbidity as well as the intricate and neurologic relation of these diagnoses to TBI.[4] All analyses were conducted using IBM SPSS, Version 29.0 (IBM Corp, Armonk, NY).

Results

Table 1 includes sample characteristics for each cohort. Relative to both the non-NHPI and White cohorts, the NHPI cohort was significantly younger and included more females and those who resided in non-rural areas (P<.001). NHPI Veterans also were significantly less likely to have documentation of service-connected disability (P=.007 [vs. non-NHPI] and P=.005 [vs. White]) and were more likely to be low users (vs. moderate or high) of VHA general care or VHA mental health services when compared to non-NHPI and White Veterans (all P<.001). NHPI Veterans were also

significantly more likely to have a PTSD diagnosis when compared to both the non-NHPI and White Veteran cohorts (*P*<.001). There were no significant differences between NHPI Veterans and the comparator cohorts in depression diagnosis. Although associations were largely similar between the non-NHPI and White cohorts, the White cohort was significantly more likely to identify as Hispanic (*P*=.007), relative to the NHPI cohort; in contrast, this was not observed in comparisons between the non-NHPI and NHPI cohorts.

NHPI Veterans had higher rates of documented TBI diagnosis (18.3%) relative to both the non-NHPI (10.9%) and White (12.9%) Veteran cohorts. Specifically, in the crude model, NHPI homeless Veterans were 82% more likely to have a documented TBI diagnosis relative to non-NHPI homeless Veterans (AOR=1.82, 95% CI: 1.57-2.11, *P*<.001), and 51% more likely compared to White homeless Veterans (AOR=1.51, 95% CI: 1.30-1.75, *P*<.001; **Table 2**). This effect persisted in the presence of several covariates, such that, in adjusted analyses, NHPI homeless Veterans were 48% more likely to have a TBI diagnosis compared to the non-NHPI cohort (AOR = 1.48, 95% CI: 1.27-1.74, *P*<.001), and 28% more likely to have a TBI diagnosis compared to the White cohort (AOR=1.28, 95% CI: 1.09-1.50, *P*=.003).

Discussion

This study is the first to examine TBI diagnosis among NHPI homeless Veterans relative to non-NHPI homeless Veterans. It is important to consider why NHPI homeless Veterans had higher rates of documented TBI diagnosis relative to these other Veterans. For example, a study by Sakamoto and colleagues found that NHPI Veterans have among the highest rates of deployment-related blast exposure,[15] with many experiencing posttraumatic amnesia, factors that are significant correlates of TBI severity and subsequent neurocognitive impact. Consequently, research is needed to understand when homeless NHPI Veterans experience TBI (eg, during deployment, post-deployment), including potentially during episodes of homelessness, and how these injuries impact functioning.

Finding regarding elevated rates of TBI among NHPI homeless Veterans suggest these Veterans may warrant increased attention to inform delivery of TBI-related services, such as rehabilitative services. Findings also suggest that an important next step is understanding psychodiagnostic practices as they relate to TBI assessment among NHPI homeless Veterans. Culturally-sensitive approaches that consider the intersection of NHPI identity and housing instability may be important for conceptualizing cognitive symptoms. For example, some NHPI individuals are more likely to describe symptoms as physical complaints,[23] which may complicate the process of determining the etiology of somatic (headaches, concentration concerns) and psychiatric symptoms (sadness, anxiety).[24] Therefore, additional information, including how TBI diagnosis is determined and culture is integrated into case conceptualization, is necessary.

An incidental finding that warrants additional examination was the lower use of VHA services among NHPI homeless Veterans, which is concerning for multiple reasons. Individuals who do not present to care are less likely to be screened and evaluated for health conditions; thus, the finding of higher rates of TBI diagnosis despite lower VHA use is troubling. This may suggest rates of TBI are actually underestimated among NHPI homeless Veterans. Moreover, it is possible that some NHPI homeless Veterans were referred for VA care, yet did not access services. Additional research is needed to understand which services these Veterans are accessing, including TBI-related care, both within VA and the community.

Interestingly, prior research has been mixed regarding VA and community-based service use among NHPI Veterans. Some work has found no differences in service use among NHPI Veterans relative to other racial/ethnic groups of Veterans,[25] while other studies have found greater use of some VA services, including TBI-related care.[19] However, these studies examined the general NHPI Veteran population, rather than those experiencing homelessness, or aggregated data from Veterans who identified as NHPI and Asian American. In addition, some research has noted that Asian American and Pacific Islander Veterans are more likely to have private insurance than other cohorts (eg, Black Veterans).[25] Although it is less likely that homeless Veterans have private insurance, it is possible that some NHPI homeless Veterans have access to other forms of insurance (eg, Medicaid), and therefore, access community care in lieu of VA services.

Although this finding regarding VA use was incidental, there are several potential explanations. VHA specialty services for TBI-related care (eg, neurorehabilitation) may be more limited or difficult to access in regions with high concentrations of NHPI Veterans (eg, Guam).[14] As such, Veterans in these regions may have to travel to distant areas which may result in substantial financial burden (eg, transportation and lodging costs; childcare costs). Toward this end, Veterans in rural regions (eg, Guam) or experiencing psychosocial stressors (eg, homelessness) may lack financial resources to access or obtain specialty care, including TBI-related care, in distant, high-cost-of-living areas on O‘ahu or the continental US.[26,27] Further, NHPI Veterans in rural and underserved regions may access non-VA care if it is more readily available or if there is more local knowledge regarding services (eg, community-based case manager, spiritual leader).[28] Finally, prior experiences with the federal government may engender perceptions of structural racism and distrust, potentially contributing to lower use of VA services.[14,29]

Mental health stigma among NHPI individuals also may serve as a barrier to service use.[23,24] NHPI Veterans may engage in traditional cultural healing practices (eg, *ho‘oponopono*; *lomi lomi; la‘au lapa‘au*), rather than a “westernized” biomedical approach, although this warrants further research as it is unknown how homeless NHPI Veterans view available VA practices.[14,28] Similarly, some NHPI Veterans may prefer to access support through individuals

Table 1. Characteristics and Group Differences for NHPI, non-NHPI, and White Veterans accessing Department of Veterans Affairs Homeless Programs between January 1, 2005 and December 31, 2018.

	NHPI Cohort (*n*=1177)		Non-NHPI Cohort (*n*=723575)		χ^2 for NHPI vs. Non-NHPI Cohort[a]		White Cohort (*n*=418085)		χ^2 for NHPI vs. White Cohort[a]	
	n	%	*n*	%		*P*	*n*	%		*P*
Age					833.37	<.001			792.34	<.001
≤ 39	569	48.3	141,976	19.6			85,398	20.4		
40-49	245	20.8	96,108	13.3			55,593	13.3		
50-59	234	19.9	175,060	24.2			93,808	22.4		
60-69	104	8.8	220,216	30.4			121,659	29.1		
≥ 70	25	2.1	90,215	12.5			61,627	14.7		
Sex					76.52	<.001			136.25	<.001
Male	939	79.8	637,168	88.1			376,315	90.0		
Female	238	20.2	86,407	11.9			41,770	10.0		
Hispanic	93	7.9	58,561	8.1	.06	.809	43,031	10.3	7.27	.007
Rural	98	8.3	88,695	12.3	16.90	<.001	67,325	16.1	52.60	<.001
Service-connected disability	71	6.0	59,234	8.2	7.26	.007	34,707	8.3	7.94	.005
TBI	215	18.3	79,053	10.9	65.02	<.001	53,817	12.9	30.42	<.001
PTSD	609	51.7	293,156	40.5	61.45	<.001	175,338	41.9	46.32	<.001
Depression	694	59.0	427,063	59.0	<.01	.970	255,806	61.2	2.44	.118
VHA general use[b]					243.59	<.001			242.15	<.001
Low	624	53.0	240,007	33.2			138,133	33.0		
Moderate	359	30.5	241,479	33.4			142,423	34.1		
High	194	16.5	242,089	33.5			137,529	3.9		
VHA mental health use[c]					97.81	<.001			93.32	<.001
Low	472	40.1	240,526	33.2			136,817	32.7		
Moderate	472	40.1	241,367	33.4			143,258	34.3		
High	233	19.8	241,682	33.4			138,010	33.0		

[a]Chi-square analyses were conducted between NHPI and non-NHPI homeless Veteran cohorts as well as NHPI and White homeless Veteran cohorts.
[b]VHA general use computed based on total number of encounters as: low (≤78); moderate (>78 and ≤215); and high (>215) use.
[c]VHA mental health use computed based on total number of encounters as: low (≤17); moderate (>17 and ≤93); and high (>93).
Abbreviations: NHPI = Native Hawaiian and/or Pacific Islander; PTSD = posttraumatic stress disorder; TBI = traumatic brain injury; VHA = Veterans Health Administration.

Table 2. Crude and Adjusted Models Examining Associations Between NHPI Identity and TBI Diagnosis among Veterans accessing Department of Veterans Homeless Programs between January 1, 2005 and December 31, 2018.

Variable	NHPI vs. Non-NHPI			NHPI vs. White		
	AOR	95% CI	*P*	AOR	95% CI	*P*
Crude						
NHPI identity	1.82	1.57, 2.11	<0.001	1.51	1.30, 1.75	<0.001
Adjusted						
NHPI identity	1.48	1.27, 1.74	<0.001	1.28	1.09, 1.50	0.003
Age[a]						
40-49	0.51	0.50, 0.52	<0.001	0.51	0.49, 0.52	<0.001
50-59	0.30	0.30, 0.31	<0.001	0.31	0.30, 0.32	<0.001
60-69	0.23	0.23, 0.24	<0.001	0.24	0.23, 0.24	<0.001
≥ 70	0.19	0.18, .19	<0.001	0.18	0.17, 0.19	<0.001
Sex[b]	2.26	2.20, 2.32	<0.001	2.16	2.09, 2.24	<0.001
Ethnicity[c]	1.14	1.11, 1.17	<0.001	1.02	0.99, 1.05	0.314
Rural[d]	1.11	1.08, 1.13	<0.001	1.03	>0.99, 1.05	0.065
Service-connected disability[e]	1.21	1.18, 1.24	<0.001	1.23	1.19, 1.27	<0.001
PTSD	2.66	2.61, 2.71	<0.001	2.74	2.68, 2.80	<0.001
Depression	1.32	1.28, 1.35	<0.001	1.26	1.23, 1.29	<0.001
VHA general use[f]						
Moderate	1.80	1.76, 1.85	<0.001	1.80	1.74, 1.86	<0.001
High	3.06	2.96, 3.16	<0.001	3.09	2.97, 3.21	<0.001
VHA mental health use[g]						
Moderate	1.31	1.28, 1.35	<0.001	1.32	1.28, 1.37	<0.001
High	1.26	1.22, 1.30	<0.001	1.28	1.23, 1.33	<0.001

[a]Age ≤ 39 selected as reference.
[b]Male sex selected as reference.
[c]Hispanic ethnicity selected as reference.
[d]Residing in a rural region selected as reference.
[e]Presence of service-connected disability selected as reference.
[f]Low VHA general service use selected as reference.
[g]Low VHA mental health service use selected as reference.
Note. Binomial logistic regression models conducted for all crude and adjusted regressions. All models were significant.
Abbreviations: AOR = adjusted odds ratio; CI = confidence interval; NHPI = Native Hawaiian and/or Pacific Islander; PTSD = posttraumatic stress disorder; TBI = traumatic brain injury; VHA = Veterans Health Administration.

within their communities, such as family members, friends, peers, or spiritual leaders.[14]

The intersection of demographic and cultural factors also may have impacted use of VA services among NHPI Veterans, who were more likely to be female. Females traditionally are more likely to have caretaking duties (eg, children, older family members),[30] and this is especially true amongst NHPI individuals in which collectivistic ideals, including caretaking of older family members, is more normative.[31] Such factors can impact ability to access VA services, including specialty care which can be time-intensive (eg, psychotherapy). Additionally, multiple other barriers to VA healthcare use have been noted for female Veterans (eg, lack of gender-sensitive options, feeling uncomfortable) that are important to consider.[32] Therefore, examining the intersection of gender as it relates to NHPI race is important for future work in this domain.

Finally, an important note is the discrepancy between prior work documenting rates of TBI as high as 91% among Veterans experiencing homelessness[10] and this study's finding of 10.9%-18.3%. Several factors may explain this discrepancy, including that the prior study administered a diagnostic interview in a non-TBI-related service setting while this study examined VA electronic medical records, which necessitated the Veteran having received a documented diagnosis. Some Veterans experiencing homelessness may not have gone through the formal process to be diagnosed with a TBI (which can occur in TBI-related service settings), which could partially explain this discrepancy. Nonetheless, given the magnitude of difference in TBI diagnostic rates, additional work is requisite to understand why differences in rates may occur between VA electronic medical records and diagnostic interviews.

Limitations

Findings were based on VA electronic medical records and diagnoses were not confirmed via clinical interview. Some

factors were not readily available in this dataset (eg, private insurance, branch of service, specialty) which may be related to findings. TBI diagnosis was not differentiated based on severity (ie, mild, moderate, severe).[5,21] This is an important consideration as moderate/severe TBIs have differing repercussions and treatment approaches.[33] Homelessness was defined based on use of VHA homeless programs; as such, a portion of homeless Veterans (ie, those experiencing homelessness who had not accessed VHA homeless program services) may not be captured in this cohort.

NHPI race was extracted from VA electronic medical records and may not reflect how Veterans identified themselves. Indeed, Hernandez and colleagues[34] have noted that NHPI data extraction from VA electronic medical record may be poor relative to other racial/ethnic groups (eg, White Veterans). The broad NHPI category also did not allow for disaggregation; as such, differences between specific NHPI cultural groups could not be examined, despite heterogeneity between these groups. Multi-racial identity was also not categorized in analyses such that NHPI Veterans who were multi-racial were classified as NHPI. As many NHPI individuals are multi-racial,[35] with a substantial portion also identifying as Asian American, further disaggregation is necessary, particularly considering that Veterans who identify as both Asian American and NHPI appear to have higher rates of adverse health outcomes (eg, suicidal ideation).[36] In addition, given the transient nature of homelessness, it was not possible to examine the impact of region (eg, Pacific Islands relative to mainland), including if differences in rates of TBI diagnosis remained significant after accounting for region of residence. The smaller size of the NHPI cohort, compared to the non-NHPI and White cohorts, also may have impacted analyses; as such, analyses should be viewed as preliminary, with replication in a larger cohort warranted. This was also a secondary analysis of an existing dataset and data were not available beyond 2018 (including through the COVID-19 pandemic, during which housing instability was impacted).[37] Consequently, findings may differ in the more recent years, especially given factors impacting VA service use and housing instability (eg, COVID-19 pandemic). Examination with a more contemporary dataset is warranted.

It is also important to note that NHPI Veterans are disproportionately located within the US Pacific Islands and the West coast of the United States.[38] As such, these Veterans may be more likely to access VA care from VA facilities within these regions (eg, medical centers in Honolulu, San Diego, Las Vegas), which may may differ in their TBI-related assessment and care relative to other VA facilities. Nonetheless, this assertion is speculative in nature. As the teams was unable to account for specific VA facilities or facility types in our analyses, further examination of the region or facility where care was delivered may be important to include in future examinations of NHPI race and TBI among homeless Veterans.

Conclusions

This project serves as an initial examination suggesting higher documented rates of TBI diagnosis among NHPI homeless Veterans. Given lower rates of VHA service utilization among NHPI homeless Veterans, findings suggest a need to understand how to connect and engage NHPI homeless Veterans into care, especially TBI-related services. Future research focused on understanding culturally-sensitive methods of assessing TBI and facilitating engagement in services among NHPI homeless Veterans is paramount.

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Hosoda KK, Shiroma KY, Lee PM, Chun MB. Academic and Pre-Medical Advising Factors Associated with Admission to the John A. Burns School of Medicine Among Premedical Students at the University of Hawai'i at Mānoa. *Hawaii J Health Soc Welf*. 2026;85(3):73-77. doi:10.62547/NUGK1824

Academic and Pre-Medical Advising Factors Associated with Admission to the John A. Burns School of Medicine Among Premedical Students at the University of Hawai'i at Mānoa

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Abstract

The Medical School Hotline of the University of Hawai'i John A. Burns School of Medicine was founded in 1993, by Satoru Izutu PhD (former vice-dean of UH JABSOM). It is edited by Kathleen Kihmm Connolly PhD, HJH&W Contributing Editor.

*Understanding predictors of medical school acceptance is essential for informing effective premedical advising and applicant preparation. The objective of this study was to identify academic and advising-related factors associated with successful admission to medical school. A retrospective cohort study was conducted using institutional student records from the University of Hawai'i at Mānoa, including 238 premedical students who applied to medical school between 2018 and 2024. Academic variables included Medical College Admission Test scores, cumulative grade point average, and Association of American Medical Colleges Professional Readiness Examination scores. Advising-related variables included the number of pre-health workshops attended and advising appointments completed. Medical school acceptance was significantly correlated with Medical College Admission Test scores (r = 0.595), grade point average (r = 0.443), and Professional Readiness Examination scores (r = 0.355), with all associations reaching statistical significance (*P < .001*). In contrast, participation in advising appointments and workshops was not significantly associated with acceptance outcomes. These findings indicate that academic performance measures remain the strongest predictors of medical school acceptance among premedical students in this cohort. The lack of association between advising utilization and acceptance suggests a need to evaluate and potentially restructure advising services to better align with applicant needs and measurable outcomes. Improving the effectiveness of advising interventions may enhance their contribution to student success in the medical school application process.*

Abbreviations and Acronyms

AAMC = Association of American Medical Colleges
AMCAS = American Medical College Application Service
GPA = grade point average
MCAT = Medical College Admission Test
PAC = Pre-Health/Pre-Law Advising Center
PREview = Professional Readiness Exam
UHM = University of Hawai'i at Mānoa

Introduction

Research on premedical students is sparse despite the large number of students interested in pursuing a career in medicine,[1] with highly competitive acceptance rates at 41.9% of 165 326 applicants nationwide from 2021-2022 through 2023-2024.[2] A literature review identified some articles focused on a specific group or groups.[3,4] For example, Hadinger interviewed 33 underrepresented minority medical students about their application experiences and factors influencing application decisions.[3] Using a grounded theory approach, motivating factors were identified: commitment to medicine as a career, exposure to the health care field through personal experiences or by observing others (eg, role models), and desiring a fulfilling job where one can have both a stable income and help others.[3] Regarding "barriers and supports," some respondents found the application process to be "overwhelming, difficult, and expensive," especially the Medical College Admissions Test (MCAT). Mitigating factors included having a role model, familial support, and in some cases guidance from a pre-health advisor or someone similar. Hadinger noted that although further research was needed, pre-health advisors can play a critical role for students who lack other supports.[3]

Several articles evaluated perceptions of student needs in larger cohort studies. For example, a recent study by Malvitz et al utilized a Collective Case Series framework to identify themes in premedical student data. Data from 6 universities in the United States were collected between June and July 2022 in an attempt to identify student needs and the resources available to support them. Results found students reported a significant "mismatch" with the lack of adequate information on what a career in medicine actually entails.[1]

Attempting to include other factors into the medical admissions process, the Association of American Medical Colleges (AAMC) recently developed the Professional Readiness Exam (PREview). The exam is a standardized test that assesses 9 professional competencies relevant to entering medical students. When included in pre-interview screening, this test strives to improve holistic review in a high-volume context earlier in the application review process.[5] The PREview exam was piloted in 2020-2021.[6] A recent study found that there were small and positive correlations between PREview scores and MCAT scores and undergraduate GPAs.[7]

The purpose of the current study is to identify academic and advising-related factors associated with successful admission to medical school. In a previous study the authors attempted to learn more about premedical students' characteristics and experiences through an online, anonymous survey, and interviews; however, due to a low response rate, limited data were obtained.[8] Of the 8 students who voluntarily provided their contact information to be interviewed, all had quite diverse experiences. But, the 2 areas in common were viewing the MCAT as very difficult and a "major obstacle", and gratitude for the assistance they received from their pre-health advisors. This current study analyzed available data from University of Hawai'i at Mānoa (UHM) premedical students to identify significant differences between those who were accepted to medical school and those who were not, with the aim of determining whether utilization of Pre-Health/Pre-Law Advising Center (PAC) services was positively associated with medical school acceptance. The study was approved as exempt by the University of Hawai'i Human Studies Program on August 22, 2024 (Protocol Number: 2024-00581).

Methods

Data were obtained from a University of Hawai'i System database with student-submitted information on applications, registration, and PAC advising; PAC Google Drive; and American College Application Services (AMCAS). Information on 20 451 UHM students who graduated with bachelor's degrees from Spring 2014 through Summer 2023 was downloaded on September 19, 2024. Any student self-identifying as a premedical student, declaring a major relevant to seeking a career in medicine (eg, biology, chemistry), or indicating interest in a medical career was included. Additionally, students who signed up for services at PAC related to medicine or attended medicine-related workshops were also included. Data on students who saw PAC for 3977 appointments from January 2019 through February 2024 was pulled on March 7, 2024. The PAC Google Drive houses a database that collects data inputted directly by students who attend PAC workshops. PAC event attendee data from January 2018 through April 2024 was pulled on June 24, 2024, totaling 2149 registration entries. AMCAS is a nationwide database of medical school applicants. Information on 694 UHM applicants who applied from 2018 through 2024 was pulled on June 24, 2024. Of these applicants, 238 provided consent to access their application data. Exploratory analyses were conducted using data from 2014 through 2024. The final analyses presented in this study include only data from 2018-2024. The final analytic sample comprised 238 UHM medical applicants during this period.

The following information on the applicants were obtained from AMCAS: grade point average (GPA), MCAT and PREview scores, the number of medical schools they were accepted into, and, if accepted, the school they enrolled in. Information on students who attended PAC workshops and the number of events they registered for were collected. Information from all databases was merged into 2 files: accepted (n=112) and rejected (n=126) students. Data were deidentified and assigned participant ID numbers.

A Pearson correlation analysis and independent-samples *t* tests were conducted using IBM SPSS Statistics version 29(IBM Corp., Armonk, NY) to examine the relationships and group differences between acceptance status (0 = rejected, 1 = accepted) and continuous predictors, including the number of PAC workshops attended, the number of PAC appointments, MCAT total score, undergraduate GPA, and PREview total score.

Results

The study population included 238 UHM medical school applicants from 2018-2024 who consented to share application data. Bivariate correlations were conducted to examine relationships among acceptance status and key academic and noncognitive metrics, including MCAT total score, undergraduate GPA, and PREview total score. As summarized in **Table 1**, acceptance status demonstrated significant associations with multiple applicant metrics, and interrelationships among these measures were also observed.

Acceptance status was significantly and positively correlated with MCAT total score (r = 0.595, $P < .001$), indicating a strong relationship where higher MCAT total scores were associated with a greater likelihood of acceptance. Similarly, undergraduate GPA (r = 0.443, $P < .001$) and PREview total score (r = 0.355, $P < .001$) were moderately and positively correlated with acceptance, suggesting that higher GPA and PREview scores were also associated with higher chances of being accepted. In addition, total MCAT score was strongly and positively correlated with GPA (r = 0.622, $P < .001$) and moderately correlated with PREview total score (r = 0.374, $P < .001$), demonstrating consistency across academic performance metrics. A weak but significant positive relationship was also observed between GPA and PREview total score (r = 0.307, $P = .004$), suggesting some alignment between these measures of academic preparedness.

In comparing the number of PAC appointments between rejected and accepted applicants, descriptive statistics indicate that rejected applicants (n = 57) attended an average of 2.65 PAC appointments (SD = 2.27), while accepted applicants (n = 61) attended an average of 3.33 PAC appointments (SD = 2.09). The mean number of PAC appointments was higher among accepted applicants than rejected applicants, but the difference was not statistically significant ($P = .093$). An independent samples *t*-test was conducted using cases with complete data to compare the PREview total scores of applicants whose applications were rejected and those whose applications were accepted. The results indicated a statistically significant difference in scores between the 2 groups (**Table 2**). Descriptive statistics showed that rejected applicants (n = 50) had a mean PREview total score of 4.44 (SD = 2.05), while accepted applicants (n = 38) had a higher mean score of 5.79 (SD = 1.34). Therefore, results were interpreted as though equal variances were not assumed. The *t*-test revealed that the difference in PREview total scores between rejected and accepted applicants was statistically significant, $t(84.256) = -3.723$, $P < .001$. This

Table 1. Correlation Between Medical School Acceptance Status and Various Resources Utilized and Test Scores for University of Hawai'i at Mānoa Students from 2018-2024

Variable	1 *r*, *P*-value[a]	2 *r*, *P*-value[a]	3 *r*, *P*-value[a]	4 *r*, *P*-value[a]	5 *r*, *P*-value[a]	6 *r*, *P*-value[a]
1. Accepted	1					
2. PAC workshops	0.10, .48	1				
3. PAC appointments	0.16, .09	−0.19, .27	1			
4. MCAT total score	0.60, <.001	−0.17, .24	0.09, .35	1		
5. Undergraduate GPA	0.44, <.001	−0.02, .89	0.09, .36	0.62, <.001	1	
6. PREview total score	0.36, <.001	−0.13, .50	0.10, .45	0.37, <.001	0.31, <.004	1

PAC = Pre-Health/Pre-Law Advising Center, MCAT=Medical College Admission Test, GPA=grade point average, PREview = Professional Readiness Exam
[a]Values are Pearson correlation coefficients (*r*) and 2-tailed *P*-value. Acceptance status was coded as accepted versus not accepted. Sample sizes varied by variable due to data availability, ranging from *n* = 28 to *n* = 238.

Table 2. Comparison of Number of Premedical Advising Center Appointments by Acceptance Status

Acceptance Status	n	Mean	SD
Rejected	50	3.85	1.02
Accepted	38	5.79	1.12

Note. An independent-samples *t* test indicated that accepted applicants had significantly higher PREview total scores than rejected applicants, t(84.16) = 8.72, *P* < .001. Equal variances were not assumed based on Levene's test.

finding suggests that applicants with higher PREview total scores were significantly more likely to be accepted, highlighting the potential importance of this score in the selection process.

Discussion

Overall, the results highlight that MCAT total score, GPA, and PREview total score were key predictors of acceptance, while PAC-related activities (workshops and appointments) were not significantly associated with acceptance. These findings emphasize the need for more data to fully understand how premedical advising and workshops impact students persistence in premedical pathways and actual matriculation into medical school. Results reflect the complexity in identifying a "profile" of a student who successfully gains admission into medical school beyond traditional criteria (ie, high MCAT test scores and undergraduate GPA). With the intent of providing support to students who may have difficulty with certain aspects of the admissions process, the current study included the role of pre-health workshops and advising. Although "traditional" metrics like MCAT score, undergraduate GPA, and now PREview score were positively correlated with medical school admission, this was not the case with other measures. Past studies have championed the importance of pre-health advising early and over the long term, but how that should be measured is not clear.[1,3] Future research needs to take a more detailed look at the specific types of assistance being provided by pre-health advisors, when these services are being given to students, and how pre-health advising curriculum can be enhanced to further assist premedical students.

One critical issue of note is the understaffing of premedical advising offices. For example, in a study by Malvitz et al, a university in their sample reported that there were 2 advisors for 3200 students.[1] Similarly, during the current study's timeframe, UHM only had 1 advisor for both the entire pre-health student population of an estimated 4092 students and an additional 1708 pre-law students. To mitigate this, Malvitz et al suggested that universities consider developing a curriculum for premedical students to reach a larger number of students and help them to gain a better understanding of what a career in medicine actually entails. This would include not just the scientific aspects of medicine, but also the importance of compassion and patient-centered care.

Ultimately, a longitudinal study tracking students over time from when they first show an interest in medicine to admission would provide the most insight. Given the complexity of such an endeavor, initiatives to reach more students can be implemented: decreased premedical advisor-to-student ratios, mandatory advising and workshop attendance, assigned premedical advisors and mentors, and MCAT preparation courses offered through the university. On a more personal level, peer mentoring can also be encouraged. These strategies would help ensure more consistent preparation of premedical students.

Limitations of this study include that data were obtained at a single institution, making it difficult to generalize findings. Additionally, some applicants were excluded from the analytic sample because access to AMCAS application data requires applicant authorization. During the 2018–2024 application cycles, 694 University of Hawai'i at Mānoa (UHM) students applied to medical school; however, only 238 applicants (34.3%) granted permission at the time of application for UHM to access their AMCAS data. Authorization is provided during the application process and is not contingent upon medical school acceptance. As a result, the final analytic sample reflects only those applicants who consented to data access, accounting for the smaller sample size relative to the total number of applicants.

Conclusions

The results highlight that MCAT total score, undergraduate GPA, and PREview total score are key predictors of medical school acceptance, while pre-health workshops and advising did not have a significant association. At UHM, premedical advising opportunities remain limited, with only 2 advisors serving more than 2000 premedical students annually. Given these constraints, advising services warrant evaluation and possible restructuring to more effectively support applicants. Although the analytic sample represents only applicants who authorized access to their AMCAS data at the time of application, this authorization was independent of acceptance outcomes, and the findings provide insight into applicant experiences within a resource-constrained environment. These findings underscore the importance of examining how premedical advising and workshops could influence medical school acceptance. Future research should also investigate the specific factors influencing students from backgrounds underrepresented in medicine and identify strategies to improve their acceptance rates.

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Other disclosures

None.

Ethical approval

The study was approved as exempt by the University of Hawaii Human Studies Program on August 22, 2024 (Protocol Number: 2024-00581).

Disclaimers

None.

Previous presentations

None.

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Hawai'i Journal of Health & Social Welfare
General Recommendations on Data Presentation and Statistical Reporting (Biostatistical Guideline for HJH&SW)
[Adapted from Annals of Internal Medicine & American Journal of Public Health]

The following guidelines are developed based on many common errors we see in manuscripts submitted to HJH&SW. They are not meant to be all encompassing, or be restrictive to authors who feel that their data must be presented differently for legitimate reasons. We hope they are helpful to you; in turn, following these guidelines will reduce or eliminate the common errors we address with authors later in the publication process.

Percentages: Report percentages to one decimal place (eg, 26.7%) when sample size is >=200. For smaller samples (<200), do not use decimal places (eg, 27%, not 26.7%), to avoid the appearance of a level of precision that is not present.

Standard deviations (SD)/standard errors (SE): Please specify the measures used: using "mean (SD)" for data summary and description; to show sampling variability, consider reporting confidence intervals, rather than standard errors, when possible, to avoid confusion.

Population parameters versus sample statistics: Using Greek letters to represent population parameters and Roman letters to represent estimates of those parameters in tables and text. For ex ample, when reporting regression analysis results, Greek symbol (ß), or Beta (b) should only be used in the text when describing the equations or parameters being estimated, never in reference to the results based on sample data. Instead, one can use "b" or ß for unstandardized regression parameter estimates, and "B" or ß for standardized regression parameter estimates.

***P* values:** Using *P* values to present statistical significance, the actual observed *P* value should be presented. For *P* values between .001 and .20, please report the value to the nearest thousandth (eg, *P*=.123). For *P* values greater than .20, please report the value to the nearest hundredth (eg, *P* =.34). If the observed *P* value is great than *.999*, it should be expressed as "*P* > *.99*". For a *P* value less than .001, report as "*P*<.001". Under no circumstance should the symbol "NS" or "ns" (for not significant) be used in place of actual *P* values.

"Trend": Use the word trend when describing a test for trend or dose-response. Avoid using it to refer to *P* values near but not below .05. In such instances, simply report a difference and the confidence interval of the difference (if appropriate), with or without the *P* value.

One-sided tests: There are very rare circumstances where a "one sided" significance test is appropriate, eg, non-inferiority trials. Therefore, "two-sided" significance tests are the rule, not the ex ception. Do not report one-sided significance test unless it can be justified and presented in the experimental design section.

Statistical software: Specify in the statistical analysis section the statistical software used for analysis (version, manufacturer, and manufacturer's location), eg, SAS software, version 9.2 (SAS Institute Inc., Cary, NC).

Comparisons of interventions: Focus on between-group differ ences, with 95% confidence intervals of the differences, and not on within-group differences.

***Post-hoc* pairwise comparisons**: It is important to first test the overall hypothesis. One should conduct *post-hoc* analysis if and only if the overall hypothesis is rejected.

Clinically meaningful estimates: Report results using meaningful metrics rather than reporting raw results. For example, instead of the log odds ratio from a logistic regression, authors should transform coefficients into the appropriate measure of effect size, eg, odds ratio. Avoid using an estimate, such as an odds ratio or relative risk, for a one unit change in the factor of interest when a 1-unit change lacks clinical meaning (age, mm Hg of blood pressure, or any other continuous or interval measurement with small units). Instead, reporting effort for a clinically meaningful change (eg, for every 10 years of increase of age, for an increase of one standard deviation (or interquartile range) of blood pressure), along with 95% confidence intervals.

Risk ratios: Describe the risk ratio accurately. For instance, an odds ratio of 3.94 indicates that the outcome is almost 4 times as likely to occur, compared with the reference group, and indicates a nearly 3-fold increase in risk, not a nearly 4-fold increase in risk.

Longitudinal data: Consider appropriate longitudinal data analyses if the outcome variables were measured at multiple time points, such as mixed-effects models or generalized estimating equation approaches, which can address the within-subject variability.

Sample size, response rate, attrition rate: Please clearly indicate in the methods section: the total number of participants, the time period of the study, response rate (if any), and attrition rate (if any).

Tables (general): Avoid the presentation of raw parameter estimates, if such parameters have no clear interpretation. For instance, the results from Cox proportional hazard models should be presented as the exponentiated parameter estimates, (ie, the hazard ratios) and their corresponding 95% confidence intervals, rather than the raw estimates. The inclusion of *P*-values in tables is unnecessary in the presence of 95% confidence intervals.

Descriptive tables: In tables that simply describe characteristics of 2 or more groups (eg, Table 1 of a clinical trial), report averages with standard deviations, not standard errors, when data are nor mally distributed. Report median (minimum, maximum) or median (25th, 75th percentile [interquartile range, or IQR]) when data are not normally distributed.

Figures (general): Avoid using pie charts; avoid using simple bar plots or histograms without measures of variability; provide raw data (numerators and denominators) in the margins of meta-analysis forest plots; provide numbers of subjects at risk at different times in survival plots.

Missing values: Always report the frequency of missing variables and how missing data was handled in the analysis. Consider add ing a column to tables or a footnote that makes clear the amount of missing data.

Removal of data points: Unless fully justifiable, all subjects included in the study should be analyzed. Any exclusion of values or subjects should be reported and justified. When influential observations exist, it is suggested that the data is analyzed both with and without such influential observations, and the difference in results discussed.

Guidelines for Publication of Hawai'i Journal of Health & Social Welfare Supplements

The Hawai'i Journal of Health & Social Welfare (HJH&SW) partners with organizations, university divisions, and other research units to produce topic-specific issues of the journal known as supplements. Supplements must have educational value, be useful to HJH&SW readers, and contain data not previously published elsewhere. Each supplement must have a sponsor(s) who will work with the HJH&SW staff to coordinate all steps of the process. Please contact the editors at hjhsw@hawaii.edu for more information if you would like to pursue creating a supplement.

The following are general guidelines for publication of supplements:

1. Organizations, university divisions, and other research units considering publication of a sponsored supplement should consult with the HJH&SW editorial staff to make certain the educational objectives and value of the supplement are optimized during the planning process.

2. Supplements should treat broad topics in an impartial and unbiased manner. They must have educational value, be useful to HJH&SW readership, and contain data not previously published elsewhere.

3. Supplements must have a sponsor who will act as the guest editor of the supplement. The sponsor will be responsible for every step of the publication process including development of the theme/concept, peer review, editing, preliminary copy editing (ie, proof reading and first round of copy editing), and marketing of the publication. HJH&SW staff will only be involved in layout, final copy editing and reviewing final proofs. It is important that the sponsor is aware of all steps to publication. The sponsor will:

a. Be the point of contact with HJH&SW for all issues pertaining to the supplement.

b. Solicit and curate articles for the supplement.

c. Establish and oversee a peer review process that ensures the accuracy and validity of the articles.

d. Ensure that all articles adhere to the guidelines set forth in journal's Instructions to Authors page (https://hawaiijournalhealth.org/authors.htm), especially the instructions for manuscript preparation and the statistical guidelines.

e. Obtain a signed Copyright Transfer Agreement for each article from all authors.

f. Comply with all federal, state, and local laws, rules, and regulations that may be applicable in connection with the publication, including ensuring that no protected health information appears in any article.

g. Work with the editorial staff to create and adhere to a timeline for the publication of the supplement.

h. Communicate any issues or desired changes to the HJH&SW staff in a timely manner.

4. Upon commissioning a supplement, the sponsor will be asked to establish a timeline for the issue which the sponsor and the HJH&SW editor(s) will sign. The following activities will be agreed upon with journal publication to take place no later than 24 months after signing. Extensions past the 24 months will be subject to additional fees based on journal publication rates at that time:

- Final date to submit a list of all articles, with working titles and authors
- Final date for submitting Word documents for copy editing
- Final date for submitting Word documents for layout
- Final date to request changes to page proofs (Please note that changes to page proofs will be made only to fix any errors that were introduced during layout. Other editing changes will incur an additional fee of $50 per page.)

5. The cost of publication of a HJH&SW supplement is $6,000 for an 8-article edition with an introduction from the sponsor or guest editor. Additional articles can be purchased for $500 each with a maximum of 12 articles per supplement. This cost covers one round of copy editing (up to 8 hours), layout, online publication with an accompanying press release, provision of electronic files, and indexing in PubMed Central, SCOPUS, and Embase. The layout editor will email an invoice for 50% of the supplement to the designated editor for payment upon signature of the contract. The remaining will be due at the time of publication. Checks may be made out to University Health Partners.

6. The sponsor may decide to include advertisements in the supplement in order to defray costs. Please consult with the HJH&SW advertising representative Michael Roth at 808-595-4124 or email rothcomm@gmail.com for assistance.

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8. It is the responsibility of the sponsor to manage all editorial, marketing, sales, and distribution functions. If you need assistance, please contact the journal production editor. We may be able to help for an additional fee.

9. The editorial board reserves the right of final review and approval of all supplement contents. The HJH&SW will maintain the copyright of all journal contents.

Revised 3/21/23

Hawai‘i Journal of Health & Social Welfare
Style Guide for the Use of Native Hawaiian Words and Diacritical Markings

The HJH&SW encourages authors to use the appropriate diacritical markings (the ‘okina and the kahakō) for all Hawaiian words. We recommend verifying words with the Hawaiian Language Dictionary (http://www.wehewehe.org/) or with the University of Hawai‘i Hawaiian Language Online (http://www.hawaii.edu/site/info/diacritics.php).

Authors should also note that Hawaiian refers to people of Native Hawaiian descent. People who live in Hawai‘i are referred to as Hawai‘i residents.

Hawaiian words that are not proper nouns (such as keiki and kūpuna) should be written in italics throughout the manuscript, and a definition should be provided in parentheses the first time the word is used in the manuscript.

Examples of Hawaiian words that may appear in the HJH&SW:

‘āina	**Kaua‘i**	**O‘ahu**
Hawai‘i	**Lāna‘i**	**‘ohana**
kūpuna	**Mānoa**	**Wai‘anae**

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