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Evaluating the Impact of a Specialized Inpatient Geriatric Unit Amongst an Asian and Pacific Islander Population: A Pilot Study

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Abstract

Rehabilitation programs targeting hospitalized geriatric patients reduce functional decline and 30-day readmission rates. Limited data exist regarding using rehabilitation programs with Native Hawaiian and Other Pacific Islander (NHPI) and Asian populations. In the current study, the Acute Care for Elders (ACE) program was implemented to help minimize delirium, prevent deconditioning, and secure appropriate discharge. Utilizing a multidisciplinary team protocol, patients older than age 60 with an Activity Measure for Post-Acute Care (AMPAC) score of at least 18 and admitted within the preceding 3 days were eligible for inclusion. Via retrospective chart review, outcomes and demographic data were compared among those who completed the program (Completed), disenrolled prematurely (Early Termination), or declined enrollment (Declined). The median age was 73 years (25%ile, 75%ile: 68, 80) with 49% Asian, 19% NHPI, and 32% White or other race. Median Length of Stay (LOS) for Completed, Early Termination, and Declined groups were 3.9, 9.9 and 4.0 days respectively (*P*=.003). Discharge disposition varied significantly, with 90% of Completed patients returning home versus 46% in the Early Termination group (*P*=.002). Completion of the ACE protocol was significantly associated with reduced LOS and higher rates of home discharge among Asian populations (*P*=.033).

Abbreviations and Acronyms

ACE=Acute Care for Elders
AMPAC=Activity Measure for Post-Acute Care
LOS=length of stay
NHPI=Native Hawaiian and Pacific Islanders

Introduction

Hawai'i has the highest life expectancy in the United States, and the state's geriatric population is expected to exceed 22% by 2030.[1] Despite stabilization during acute hospitalizations, previously independent geriatric patients frequently require assistance with activities of daily living once discharged.[2] Hospital-acquired deconditioning and insufficient social support contribute to discharge challenges, and many elderly patients are unable to return home. Barriers to home discharge include lack of community resources, limited availability of social coordinators to make in-person assessments post-discharge, and delays of home health services. Programs targeting hospitalized geriatric patients have demonstrated reductions in functional decline, mental health problems, 30-day readmissions, and cost.[3,4] Though previous reports have demonstrated that programs providing specialized acute care for elders provide improvements in functional outcomes, mental health, and 30-day readmissions with reductions in cost,[5] the population studied did not include Native Hawaiian and Pacific Islanders (NHPI). NHPI populations, due to various social determinants of health, have accelerated rates of dementia and biological aging, and lower rates of adequate physical activity at baseline.[3,4,6] To improve discharge outcomes and reduce the need for short-term care placement including skilled nursing facility and short term rehabilitation facility placement, the Acute Care for Elders (ACE) unit,[3,5,7,8] a standardized intervention designed to provide specialized inpatient care for geriatric patients, was implemented. This intervention, validated primarily in White cohorts,[9] aims to: (1) enhance the geriatric treatment environment, (2) promote a patient-centric management approach, (3) encourage discharge to a patient's home, and (4) enforce consistent review of medical care.

The ACE unit is designed to minimize delirium, prevent deconditioning in at-risk seniors, and secure appropriate and timely discharge. The ACE unit has a pre-specified protocol. The original ACE protocol was published in 1995,[8] and has been modified since then to conform to local resource availability and practice patterns. The key components of the original protocol are preparing the appropriate environment; patient-centered care including daily assessment by nurses of physical, cognitive, and psychosocial function and daily rounds by the multidisciplinary team; discharge planning with social workers and home healthcare nurses; and medical care review to minimize the adverse effects of selected procedures. These components were adjusted to accommodate the schedules of local hospital staff. In addition, nurses and physical and occupation therapists (PT/OT) were trained to perform daily assessments of mobility using the Activity Measure for Post-Acute Care (AMPAC) score, which was not included in the original version of ACE protocol.[10] The AMPAC score is a 41-item validated assessment of mobility, activities of daily activity and cognition. Unit benchmarks based on the components of the ACE protocol were established, encouraging team members to facilitate achievement. Dietary consultation is

done for personalized nutritional support. Patients have uninterrupted periods for sleep from 10 pm to 5 am, which includes holding vital signs checks and spacing out medication administration when possible.

Because the study was conducted in Honolulu, Hawai'i, the study population included a high proportion of Asian and NHPI patients, populations that remain underrepresented in the published literature. Cultural, linguistic, and structural barriers may affect health care communication, trust, and patient engagement among these groups, potentially influencing the effectiveness of multidisciplinary inpatient interventions.[11-14] Evaluating programs such as the ACE protocol in populations enriched with Asian and NHPI patients may therefore provide important insight into whether benefits demonstrated in prior studies are generalizable to more diverse communities. The aim of this study was to evaluate the impact of the ACE protocol in a community with high numbers of Asian and NHPI patients.

Methods

This pilot study was conducted in a tertiary hospital in Honolulu, Hawai'i. Patients admitted between July 1 and October 27, 2024 were enrolled. The protocol was reviewed by the institutional review board (protocol: IRB-FY2025-124) at The Queen's Medical Center, which is located in Honolulu, Hawai'i.

Patients older than 60 years, able to ambulate with an AMPAC score of at least 18, and admitted to a single, 32-bed medical-surgical geriatric unit floor within the preceding 3 days were eligible for inclusion. Patients who were bedbound, had undergone surgery during the hospitalization, had strict bedrest precautions, were diagnosed with acute blood loss anemia, were hypoxic at rest with oxygen saturation less than 94%, had any hypotension at rest, had a body mass index of greater than 40 kg/m^2, were residing in a long-term care facility before hospitalization, or were participants in a guardianship were excluded due to safety concerns.

Via retrospective chart review, length of stay (LOS), AMPAC scores on admission and at discharge, discharge disposition, and demographic data among 3 groups were compared: those who completed the program (Completed), those who were initially enrolled but disenrolled prematurely due to patient preference or transfer to another unit such as higher level of care including intensive care unit, or transition to hospice care (Early Termination), or those who declined initial enrollment (Declined). Demographic data included age, sex, and self-identified race based on the registration record in electronic medical records. Enrollment and disenrollment were tracked by following the orders for ACE unit placement within the electronic medical record, while patients who declined enrollment were tracked and recorded manually via reporting of the ordering provider to the study team.

The primary study outcome was the LOS of patients in each group. Secondary outcomes included group differences in AMPAC scores on admission and discharge, and discharge disposition. Differences in these outcomes between different ethnic groups were also evaluated.

All statistical analyses were conducted using R Statistical Software (version 4.2.0; R Foundation for Statistical Computing, Vienna, Austria). Data were presented as either median with 25%ile and 75%ile for continuous variables or as count and percent (%) for categorical variables. The normality of the distribution of continuous variables was assessed through the Shapiro-Wilks test, which showed non-normal distribution. Continuous variables were compared with the Kruskal Wallis test for 3 or more variables and Mann Whitney U test 2 variables. Categorical variables were compared using the Fisher's Exact test. Statistical significance was defined as a P value ⩽ .05.

Results

A total of 99 patients were enrolled at the time of analysis, with 69 in the Complete group, 13 in the Early Termination group, and 17 in the Declined group. The population consisted of 49% Asian individuals, 19% NHPI, and 32% who were either White, Black, or not reported, with a median age of 73.1 years. There were 2 Black patients and 1 patient with race not reported. There were no significant differences in age or race among groups (**Table 1**). The median time enrolled in the ACE program was 2.18 days in the Completed group, compared to 1.95 days in the Early Termination group, which was not statistically significant (**Table 1**).

Overall, 52% of patients were male, but the Declined group had a higher percentage, with 94% males. compared to 44% in the Completed group and 39% in the Early Termination group (P<.001). There were no other important difference in demographics among the groups.

NHPI were more likely to be younger with median age 68.6 years compared to 75.2 years for Asians and 75.6 years for White or other race (P=.002; **Table 2**). Asians had a shorter average LOS with a median LOS 3.82 days compared to 4.86 days for NPHI and 5.27 days for White or other race (P=.033).

The median LOS was significantly different among groups: 3.90 days in the Complete group, 9.89 days in the Early Termination group, and 4.00 days in the Declined group (P=.003). Significant differences in disposition were demonstrated, with 90% of Completed patients discharged home, compared to 46% in the Early Termination group, and 84% in the Declined group (P=.002). For discharge to care facilities, 31% of the Early Termination group were discharged to a nursing home or rehabilitation facility, compared to 9% in the Completed group, and 6% in the Declined group (P=.002). There was no significant difference in AMPAC score between groups on admission (median of 20, 19, 19 for Completed, Declined, Early Termination respectively; P=.86) or at discharge (median of 22, 22, 20, for Completed, Declined, Early Termination respectively; P =.34; **Table 1**).

ACE group distribution did not vary significantly among races (P=.104). Initial AMPAC scores on admission between racial groups showed no statistical difference (P=.79) and fi-

Table 1. Baseline Characteristics and Results of the Geriatric Inpatient Study Population by Participation Group

	Overall (N=99) No. (%)	Completed (n=69) No. (%)	Early Termination (n=13) No. (%)	Declined (n=17) No. (%)	*P* value
Age, years[a]	73.1 (67.7, 79.9)	72.2 (67.5, 79.8)	73.3 (71.6, 79.2)	76.7 (70.4, 81.1)	.75
Male	51 (52%)	30 (44%)	5 (39%)	16 (94%)	**<.001**
Race					.10
Asian	48 (49%)	38 (55%)	3 (23%)	7 (41%)	
NHPI	19 (19%)	14 (20%)	3 (23%)	2 (12%)	
White, Black, Not Reported	32 (32%)	17 (25%)	7 (54%)	8 (47%)	
Length of stay, days[a]	4.08 (2.92, 6.36)	3.90 (2.77, 5.77)	9.89 (4.95, 13.1)	4.00 (3.00, 6.00)	**.003**
ACE duration, days[a]	1.95 (0.95, 3.28)	2.18 (1.27, 4.22)	1.95 (1.24, 3.82)	0 (0, 0)	.47
AMPAC at admission[a]	20.0 (17.0, 22.0)	20.0 (17.0, 22.0)	19.0 (16.0, 22.0)	19.0 (18.0, 22.0)	.86
AMPAC at discharge[a]	22.0 (19.0, 23.0)	22.0 (20.0, 23.0)	20.0 (19.0, 23.0)	22.0 (19.0, 23.0)	.39
AMPAC difference[a]	1.00 (0, 3.00)	1.00 (0, 3.00)	0 (-2.00, 3.00)	1.00 (0, 3.00)	.34
Discharge disposition					**.002**
Home	83 (84%)	62 (90%)	6 (46%)	15 (88%)	
Nursing home or rehabilitation facility	11 (11%)	6 (9%)	4 (31%)	1 (6%)	
Expired or AMA	5 (5%)	1 (1%)	3 (23%)	1 (6%)	

ACE: Acute Care for Elders, AMA: Against Medical Advice, AMPAC: Activity Measure for Post-Acute Care, NHPI: Native Hawaiian or Pacific Islander
[a]Values are median (25%ile, 75%ile)

Table 2. Baseline Characteristics and Results of the Geriatric Inpatient Study Population by Race

	Asian (n=48) No. (%)	NHPI (n=19) No. (%)	White, Black or Not reported (n=32) No. (%)	Overall (N=99) No. (%)	*P* value
Age, years[a]	75.2 (70.4, 82.1)	68.6 (62.5, 71.3)	75.6 (67.0, 79.7)	73.1 (67.7, 79.9)	**.003**
Male	24 (50%)	10 (53%)	17 (53%)	51 (52%)	.96
ACE Group					.10
Completed	38 (79%)	14 (74%)	17 (53%)	69 (70%)	
Declined	7 (15%)	2 (11%)	8 (25%)	17 (17%)	
Early Termination	3 (6%)	3 (16%)	7 (22%)	13 (13%)	
Length of stay, days[a]	3.82 (2.51, 4.97)	4.86 (3.75, 6.75)	5.27 (3.49, 10.2)	4.08 (2.92, 6.52)	**.033**
ACE duration, days[a]	1.80 (0.985, 3.20)	2.30 (1.33, 4.18)	1.35 (0.000521, 3.69)	1.95 (0.950, 3.28)	.34
AMPAC at admission[a]	20.0 (18.0, 22.0)	20.0 (17.0, 23.5)	19.5 (17.0, 22.0)	20.0 (17.0, 22.0)	.79
AMPAC at discharge[a]	22.0 (19.0, 23.0)	23.0 (20.0, 24.0)	22.0 (19.8, 23.0)	22.0 (19.0, 23.0)	.42
AMPAC difference[a]	1.00 (0, 3.00)	1.00 (0, 6.00)	1.00 (0, 3.00)	1.00 (0, 3.00)	.73
Discharge disposition					.32
Home	40 (83%)	17 (90%)	26 (81%)	83 (84%)	
Nursing home or rehabilitation facility	6 (13%)	0 (0%)	5 (16%)	11 (11%)	
Expired or AMA	2 (4%)	2 (11%)	1 (3%)	5 (5%)	

ACE: Acute Care for Elders, AMA: Against Medical Advice, AMPAC: Activity Measure for Post-Acute Care, NHPI: Native Hawaiian or Pacific Islander
[a]Values are median (25%ile, 75%ile)

nal AMPAC prior to discharge also did not show any statistical difference (*P*=.42). Home discharges were not significantly different across race: 83% Asian, 90% NHPI and 81% White or other race (*P*=.32).

Post-hoc statistical analysis using Kruskal-Wallis Test was conducted to compare the LOS among enrollment groups within the Asian and NPHI subpopulations. Asians had shorter median LOS in the Completed group compared to the Early Termination group (*P*=.030), but there was no significant LOS difference among enrollment groups in the NPHI population. (**Table 3**, **Table 4**).

Discussion

The incorporation of Asian and NHPI individuals into geriatric research is an unmet need in the literature.[15,16] To the best of current evidence, no studies to date have focused on deconditioning and rehabilitation in an Asian and NHPI population, with only 1 registry study focusing on de-

Table 3. Subgroup Analysis Comparison of LOS Among Asian and NPHI Patients

race	test	statistic	*P*-value
Asian	Kruskal-Wallis	5.33	.069
NHPI	Kruskal-Wallis	.18	.91

LOS: length of stay, NHPI: Native Hawaiian or Pacific Islander

Table 4. Subgroup Analysis Comparison of LOS Among Asian and NPHI by ACE Group

race	comparison	z	*P* value[a]
Asian	Completed - Declined	.719	.23
Asian	Completed - Early Term	-2.10	**.035**
Asian	Declined - Early Term	-2.25	**.035**
NHPI	Completed - Declined	.369	.71
NHPI	Completed - Early Term	-.166	.43
NHPI	Declined - Early Term	-.421	>.99

LOS: length of stay, NHPI: Native Hawaiian or Pacific Islander
[a]Kruskal-Willis Test

mentia in this population.[17] Major trials and systematic reviews studying the impact of inpatient geriatric units have largely neglected these populations. In every study evaluating dedicated inpatient geriatric units, NHPI were not included among the race categories. For example, the landmark study conducted by Landefeld et al in 1995 evaluating one of the first dedicated inpatient geriatric units only enrolled White or Black individuals. More recent clinical trials by Flood et al and Conunsell et al published in 2013 and 2015 respectively enrolled cohorts composed of 99-100% Black or White patients.[5,8,18] Despite their proven benefits for White and Black patients, there are multiple cultural and socio-economic factors that make untested extrapolation of these results to Asians and NHPI inappropriate.

Previous randomized clinical trials and meta-analyses have demonstrated the benefit of Geriatric Evaluation and Management Units (GEMU) on functional status.[19,20] However, the current study did not find a significant difference in AMPAC scores on admission or discharge among ACE groups. This may be attributed to the inclusion criteria of an AMPAC score of 18 or greater, which limits this study population to patients with higher baseline functional status, in addition to the enrollment period being limited to only 16 weeks.

The overall findings suggest that completion of the ACE protocol may be associated with reduced LOS among Asian populations. This observation appears to be primarily driven by the significant difference in LOS between the Early Termination group and the Completed/Declined groups within the Asian subpopulation identified in the subgroup analysis. In this study, NHPI patients had a longer LOS compared with Asian patients and were admitted to the geriatric unit at a significantly younger mean age, which may indicate a generally less healthy population that is less responsive to the potential effects of the ACE protocol. Given the small sample size of this study, events such as death or discharge against medical advice in the Early Termination group may have disproportionately influenced group-level LOS differences. This may partly explain the absence of a clear difference in LOS across the NHPI enrollment groups. In contrast, Asian patients had the shortest LOS and a higher mean age at admission compared with NHPI patients. The ACE protocol may therefore have had a greater observable impact among Asian patients who completed the program compared with those who terminated participation early. Alternatively, unmeasured confounding factors or comorbidities may have resulted in the Early Termination group representing an inherently less healthy population, thereby contributing to the observed higher LOS.

NHPI participants in this study were enrolled into the ACE program at a younger age compared to other racial groups. Previous studies suggest that NHPI patients experience functional limitations at a younger age, and demonstrate earlier evidence of epigenetic aging compared to Whites and Asians.[4,21] Unstable financial resources, limited access to housing, and poor social support often challenge these populations and are associated with decreased rate of functional recovery and successful rehabilitation following hospitalization.[22] These social determinants lead to disproportionately higher rates of disability in managing activities of daily living, more severe declines in function and cognition after acute illnesses, and higher rates of hospitalization at younger ages, thus prompting more urgent enrollment into preventative rehabilitation programs.[23] The current data provide valuable targets for multidisciplinary team members to focus increased attention and sensitivity toward these populations.

This study has several limitations. First, the small sample size limits the generalizability of the findings and the precision of subgroup analyses. Second, comparing patients who completed the ACE program with those who withdrew early or were transferred to another unit, rather than using randomized groups, introduces potential confounding bias.

Patients who withdrew or were transferred may have had more severe illness at admission, which could have contributed to the longer LOS observed in the Early Termination group. Conversely, the similar LOS and rates of home discharge between the Completed and Declined groups may reflect baseline differences in patient characteristics. Patients in the Declined group may have had milder illness at admission and therefore perceived less benefit from participation in the ACE program. An imbalance in distribution by sex was also observed, with a higher proportion of male patients in the Declined group. The reason for this difference is unclear but may reflect demographic characteristics of the source population or potential differences in health-seeking behaviors. Additionally, the intervention period lasted only 16 weeks, which is shorter than in prior studies (around 6 months to 1 year) and may have limited the ability to detect significant effects.[5] Finally, chronic medical conditions and social determinants of health were not adjusted for at baseline, which may have introduced additional selection bias. Future studies may further evaluate potential confounding from socioeconomic factors, more detailed ethnic subgroup classifications, and immigration status.

This pilot study provides insight to the effects of specialized inpatient geriatrics units among Asian Americans and NHPI people. The findings of this study bring insight to the efficacy of this intervention in Asians and NHPI, a patient population that is frequently underrepresented in research.[24] The ACE protocol may be associated with shorter hospital LOS and increased rates of home-discharge for this diverse patient population. Further research utilizing larger patient samples, as well as randomization and control groups are warranted to better assess the protocol's long-term impact on discharge outcomes.

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Disclosure/Conflict of Interest Statement

The authors declare that there are no conflicts of interest or competing interests that could have influenced the research, authorship, or publication of this article.

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Managing Infection Prevention and Control for Multidrug-Resistant Organism Patients in Ebeye Hospital

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Abstract

Ebeye Hospital is a 60-bed acute care and district hospital in the Republic of the Marshall Islands (RMI). In October 2022, the hospital's Infection Prevention and Control (IPC) Program initiated health care-associated infection and antimicrobial resistance surveillance, along with efforts to promote appropriate antimicrobial use. New National IPC Guidelines call for the institution of appropriate infection control measures (based on the organism identified and site of infection) and adjustment, when needed, of patients' antibiotic regimen within 24 hours of release of multidrug-resistant organism culture results. A descriptive cohort study was conducted on hospital inpatients who tested positive for multidrug-resistant organisms, using program data from October 25, 2022, to December 31, 2023. Each case (n=58) was reviewed to assess: a) the timeliness of initiating infection control measures, and b) the timeliness and appropriateness of antibiotic selection, as guided by the RMI National Antimicrobial Guidelines. Multidrug-resistant organism cases involved a variety of organisms and occurred across all clinical wards. Of these, 35 cases (60%) met IPC standards. The primary reasons for not meeting IPC standards were lack of isolation rooms (n=10, 44%) and failure to meet the IPC initiation criterion per the working definition (n=13, 56%). Only 8 cases (14%) adhered to antibiotic usage guidelines. The most common reasons for non-adherence were prolonged antibiotic duration (n=19, 38%) and shorter-than-recommended duration (n=16, 32%). Management of a substantial proportion of multidrug-resistant cases at Ebeye Hospital failed to meet IPC standards. These findings highlight several areas for improvement.

Abbreviations and Acronyms

CDC = US Centers for Disease Control & Prevention
COVID-19 = Coronavirus disease 2019
CRAB = carbapenem-resistant Acinetobacter baumannii
ESBL = extended-spectrum beta-lactamase-producing *Enterobacteriaceae*
HAI = hospital-acquired infection
HAI/AR = health care-associated infections/antimicrobial resistance
IPC = infection prevention and control
KPN = Klebsiella pneumoniae
MDRO = multidrug-resistant organism
MRSA = Methicillin-resistant Staphylococcus aureus
PPE = personal protective equipment
VRE = Vancomycin-resistant enterococcus
WHO = World Health Organization

Introduction

Multidrug-resistant organisms (MDROs) are bacteria resistant to 1 or more classes of antimicrobial agents.[1] Although certain MDROs are named after resistance to only 1 agent (eg, Methicillin-resistant Staphylococcus aureus [MRSA] or Vancomycin-resistant enterococcus [VRE]), these pathogens are often resistant to most available antimicrobial agents. The prevalence of MDROs varies over time, by location, and by health care setting.[1] MDRO infections lead to prolonged hospital stays, increased morbidity and mortality, and result in significant economic burdens.[2] The United Nations General Assembly (UNGA) issued a call to action in September 2022 to combat antimicrobial resistance.[2] Infection prevention and control (IPC) interventions can significantly reduce health care-associated infection rates by 35-70%, regardless of a country's income level. However, only 15% of all countries worldwide meet the minimum IPC requirements.[3]

Ebeye Hospital is a district hospital and acute care facility in the Republic of the Marshall Islands (RMI) with a capacity of 60 beds. Located in the Kwajalein Atoll, Ebeye is the central point of the Ralik Chain of atolls and is home to approximately 9789 people. The Ministry of Health & Human Services (MOHHS) in the RMI implemented the IPC Program in response to the emergence of novel COVID-19. The ministry collaborated with The Pacific Community to provide technical support for the RMI National IPC team, resulting in the development and launch of the National Infection Prevention and Control Guidelines in October 2022.[4] The Pacific Community is the premier regional scientific and technical organization in the Pacific region, and an international development organization owned and governed by its 27 countries and 22 territory members.[5]

The RMI IPC Program work plan is aligned with the World Health Organization (WHO) Core Components for IPC.[6] The WHO has identified a set of core components for IPC programs,[6] which are essential to improving patient safety, reducing health care-associated infections (HAIs), and combating antimicrobial resistance.[7] These compo-

nents serve as a framework for countries and health care facilities to build or strengthen their IPC strategies. According to WHO, HAIs "also referred to as 'nosocomial' or 'hospital' infection, is an infection occurring in a patient during the process of care in a hospital or other health care facility which was not present or incubating at the time of admission".[8] One of the program's key focuses is the proper treatment and prevention of the spread of MDROs. The RMI Antimicrobial Guidelines 2018[9] provide guidance on adjusting antimicrobial therapy based on culture results for MDROs.

Ebeye Hospital's IPC Program, under WHO Core Component Six for IPC,[6] aims to enhance standards within the inpatient setting to combat healthcare-associated infections, antimicrobial resistance, and outbreak prevention and response. The IPC program guidelines require the implementation of standard measures within 24 hours of receiving culture results from the hospital microbiology lab. These measures include isolating the patient in an isolation room or cohorting with another patient with the same organism, displaying standard and transmission-based precaution signage outside room doors, providing personal protective equipment (PPE) carts, hand hygiene supplies, waste management supplies, educating the patient and their attendant, informing housekeeping staff, and enforcing visitation policies for the target population.

In October 2022, the Ebeye IPC Program initiated HAI/AR surveillance in conjunction with IPC and the National RMI Antimicrobial Guidelines 2018.[9] The antimicrobial guidelines were instituted in January 2018. This document serves as a guide for use with the intent of aligning practices on appropriate selection, dosage, frequency, and duration of antibiotics according to diagnosis, using a microbiology-guided methodology to avoid erroneous antibiotic prescription, and optimizing antibiotic prescribing. The guidelines cover the management of recommended antibiotic coverage for some MDROs (MRSA, ESBL – E.coli & Klebsiella, Carbapenemase-producing Enterobacterales – E.coli & Klebsiella) based on the drug listing of the national drug formulary. This surveillance fosters the collaboration between IPC, antibiotic stewardship, and clinicians to develop and implement comprehensive strategies to combat antimicrobial resistance.

This study aims to examine laboratory-confirmed MDRO cases among inpatients since the program's inception. It will evaluate whether IPC standard measures were promptly applied to each case, and whether antibiotic regimens were changed promptly based on culture sensitivity reports following the National RMI Antimicrobial Guidelines 2018.[9]

Methods

This is a descriptive cohort study of patients who were admitted to inpatient wards (Pediatric, Medical, Surgical, Maternity, and Intensive Care Unit) who had laboratory-confirmed cultures for any MDROs listed under the RMI Reportable Conditions, Class 2 (report within 48 hours) from October 25, 2022, to December 31, 2023.

Data was obtained from the Health care-Associated Infections/Antimicrobial Resistance (HAI/AR) database, maintained by the Ebeye Hospital IPC nurse, which includes all microbiology test results for inpatients during the study period. In addition, an MDRO Surveillance Form was completed for each identified case.

Each case was evaluated and classified as followed:

- Whether it met standards for initiating IPC measures (ie, initiated within 1 day of the culture result release date).
- Whether an adjustment to the antibiotic regimen was needed, based on the RMI Antimicrobial Guidelines 2018 (**Figure 1**).
- For cases requiring adjustment, whether the correct antibiotic type, dose, and duration were applied promptly (within 1 day of the culture result release date).

For cases that did not meet IPC initiation or antibiotic selection standards, the reasons for noncompliance were documented.

Ethics Approval

Ethics approval was obtained from the Ministry of Health and Human Services ethics board.

Results

Table 1 presents the culture isolates, sex, age, and inpatient ward distribution of the 58 MDRO cases identified during the study period. Cases were reported across all clinical wards, with the surgical ward accounting for most cases (n=32, 55%). The age group with the most confirmed MDROs was 45 – 65 years, representing 29 cases (50%). The majority of cases were male (n=33, 60%). MRSA was the most commonly identified organism (9 cases), while CRAB was the least common (4 cases) (**Table 1**). Based on the program's IPC definitions, 38 were classified as community-acquired infections, and 20 were health care-associated infections.

Of the 58 cases identified, 35 (60%) met IPC standards (**Table 2**). Among the 23 cases that did not meet these standards, the primary reasons were failure to isolate due to lack of isolation rooms (n=10, 44%) and failure to meet the IPC initiation criterion based on the working definition (n=13, 56%). A total of 50 cases did not meet antibiotic usage guidelines, while 8 cases (14%) complied with the standards for proper antibiotic selection, dose, and duration (**Table 2**). The major reasons for not meeting antibiotic usage standards include: prolonged antibiotic duration (n=19, 38%), shortened duration due to medication stockouts or early discharge (n=16, 32%), and frequent changes in antibiotics based on clinician preference rather than guideline recommendations (n=2, 4%). The 13 cases (56%) that did not meet IPC initiation criteria highlight an area for further investigation in future studies.

Sepsis Antibiotic Recommendations for Adults and Children TWO blood cultures should be taken before administering antibiotics. Give antibiotics as early as possible and always within one hour of presentation				
SOURCE of sepsis	ANTIBIOTIC		PENICILLIN ALLERGY	
SOURCE OF SEPSIS NOT KNOWN	Give 1st: Give 2nd:	ceftriaxone lg (child 40kg 25mg/kg) q12h PLUS flucloxacillin 2g (child < 40kg 25mg/kg) IV q6h If MRSA suspected, add clindamycin 600mg (child < 40kg 15mg/kg/dose) IV q8h	Give 1st: Give 2nd:	ciprofloxacin 400mg (child < 40 years 10mg/kg dose) IV q8h PLUS clindamycin 600mg (child <40kg 15mg/kg/dose) V q8h
INTRABDOMINAL	Give 1st: Give 2nd:	ceftriaxone lg (child < 40kg 25mg/kg/dose) q12h PLUS metronidazole 500 mg (child 12.5mg/kg/dose) qi2h	Give 1st: Give 2nd:	ciprofloxacin 500mg (child •z 40 years 12.5mg/kg/does) PO/IV q8h PLUS clindamycin 600mg (child <40kg 15mg/kg/dose) V q8h
	If patient is known or high risk to be colonized with an ESBL producer, instead of above regimen use meropenem Ig (child < 40kg 25mg/kg/dose) q8h pending culture results			
URINARY TRACT SOURCE	Give 1st: Give 2nd:	gentamicin 7mg/kg (ideal body weight) IV OD— maximum 3 days of therapy. PLUS ampicillin 2g (25mg mg/kg/dose) IV qid	gentamicin 7mg/kg (ideal body weight) IV OD— maximum 3 days of therapy.	
	In patients where gentamicin toxicity is a concern (known renal impairment, diabetic with known complications, history of gentamicin adverse event) use ceftriaxone Ig bd			
	If patient is known or high risk to be colonized with an ESBL producer, instead of above regimen use meropenem lg (child < 40kg 25mg/kg/dose) q8h pending culture results			
SKIN SOURCE	Excluding ischemic or diabetic foot ulcers, water related infections, necrotizing fasciitis — see relevant section in skin and soft tissue infection			
	Give 1st: Give 2nd:	flucloxacillin 2 g (child <40kg 50mg/kg/dose) IV q6h PLUS clindamycin 600mg (child < 40 kg 15mg/kg/dose) IV q8h	If penicillin non-immediate allergy — instead of flucloxacillin, give cefazolin 2g (child <40kg 50mg/kg/dose) IV q6h If immediate penicillin allergy — only give clindamycin 600mg (child < 40kg 15mg/kg/dose) IV q8h	
INTRAVASCULAR DEVICES	Give 1st: Give 2nd:	ceftriaxone lg (child < 40kg 25mg/kg/dose) qi2h PLUS vancomycin 30 mg/kg (actual body weight) up to a maximum of 3 g initial dose -> 15mg/kg bd. (children<40kg 15mg/kg/dose qid)	Give 1st: Give 2nd:	ciprofloxacin 500mg (child < 40kg 12.5mg/kg/dose) PO/IV q8h PLUS vancomycin 30 mg/kg (actual body weight) up to a maximum of 3 g initial dose -> 15mg/kg bd. (children <40kg 15mg/kg/dose qid)
Review therapy and modify based on pathogen and susceptibility results ESBL = extended-spectrum beta-lactamase-producing Enterobacteriaceae, MRSA = Methicillin-resistant Staphylococcus aureus				

Figure 1. Sepsis Antibiotic Recommendations for Adults and Children.[9]

Discussion

This is the first study in the Pacific region to assess compliance with IPC standard measures and antibiotic usage guidelines for MDRO cases. The study also evaluated Ebeye Hospital's capacity to institute and sustain IPC practices in alignment with the WHO Core components. The findings suggest potential areas for improvement, including strengthening monitoring and feedback systems, promoting adherence to IPC guidelines, enhancing health care worker training, and ensuring the availability of essential supplies such as hand hygiene at points of care. Addressing these gaps through in-service training for nurses and doctors, improving procurement and inventory systems, and resolving staffing shortages across key departments could improve IPC compliance and impact future outcomes.

Several factors may explain the gaps observed in both the initiation of IPC standard measures and adherence to antibiotic usage guidelines during the study period. Isolation rooms in the clinical wards were designated predominantly for infectious diseases when the building was built, and the practice of isolating MDRO cases is relatively new to the facility. One potential solution is to designate non-isolation rooms for cohorting patients with MDRO. Barri-

Table 1. Characteristics of Multidrug-Resistant Organism (MDRO) Cases in Ebeye Hospital, October 25, 2022, to December 31, 2023 (N=58)

	MRSA	CRAB	ESBL	PAE	KPN	Total (%)
MDRO Isolates	19	4	6	13	16	58 (100%)
Age Group in No.						
≤ 14	4	0	0	0	0	4 (7%)
14 - 44	9	0	0	4	3	16 (27%)
45 - 64	2	3	5	7	12	29 (50%)
≥ 65	4	1	1	2	1	9 (16%)
Sex						
Female	7	1	4	8	5	25 (40%)
Male	12	3	2	5	11	33 (60%)
Wards						
• Maternity	1	0	0	0	0	1 (2%)
• Medical	3	1	1	2	3	10 (17%)
• Surgical	10	2	4	6	10	32 (55%)
• Pediatric	4	0	0	0	0	4 (7%)
• Intensive Care Unit (ICU)	1	1	1	5	3	11 (19%)

MRSA = Methicillin Resistant Staphylococcus Aureus; CRAB = Carbapenem-Resistant Acinetobacter Baumannii; ESBL = Extended-Spectrum Beta-Lactamase; PAE = Pseudomonas aeruginosa; KPN = Klebsiella Pneumonia

Table 2. Compliance with IPC Standard Measures and Antibiotic Usage Guidelines and Reasons for Non-Compliance Among MDRO Cases in Ebeye Hospital, October 25, 2022, to September 20, 2023 (N=58)

IPC Standard Measures	Meets Standards	35 (60%)
	Does not meet standards	23 (40%)
	Reasons for Failure:[a] • No isolation rooms were available. • Does not meet IPC initiation criterion	10 (44%) 13 (56%)
Antibiotic Usage Guidelines	Meet Standards	8 (14%)
	Does not meet standards	50 (86%)

	Reasons for Failure:[b]
	• Unavailability of antimicrobials/shortage
	• Patients discharged before the results
	• Antibiotic duration:
	  ◦ Too long
	  ◦ Too short
	• Frequent changes in antibiotics
		7 (14%)
		6 (12%)
		19 (38%)
		16 (32%)
		2 (4%)

IPC = Infection prevention and control, MDRO = multidrug-resistant organism
[a]Percentages are calculated based on 23 cases that did not meet IPC Standard Measures
[b]Percentages are calculated based on 50 cases that did not meet Antibiotic Usage Guidelines.

ers to antibiotic usage guidelines include the unavailability and shortage of key antimicrobials, largely due to gaps in stock auditing and inventory management. This highlights the importance of balancing improved access to proper antibiotics and avoiding excess use of restricted antibiotics. In 2 cases, non-compliance resulted from the absence of recommended medications in the hospital drug formulary, an issue that should be addressed by the national therapeutics committee. It is also recommended that the national drug formulary and the National Antimicrobial Guidelines 2018 be reviewed to add new medications and reassess the current restricted drug list. As a country, RMI must prioritize the development of a robust inventory management system and a comprehensive antibiotic approval and stewardship protocol to mitigate ongoing shortages and ensure appropriate usage.

Birgand G, et al in "Overcoming the obstacles of implementing infection prevention and control guidelines",[10] concluded that multidisciplinary approaches are essential for success and that the mere existence of guidelines is insufficient for effective IPC. Ebeye Hospital's IPC committee is a multidisciplinary team. However, the IPC committee has not consistently enforced standards or ensured that staff fully understand and apply those standards. These is-

sues could be addressed through regular department meetings and IPC refresher training. Additionally, the hospital could benefit from appointing a qualified quality assurance and quality improvement (QA/QI) officer to oversee adherence to standards and reinforce IPC practices as part of a broader patient safety strategy.

One of the study's strengths was the existence of a robust system – the HAI/AR database - which systematically logs all microbiology specimen results for inpatients across all clinical wards. This database is regularly updated, allowing for consistent, ongoing data collection and dissemination. Furthermore, PPE was readily available throughout the study period, supported by a dedicated, pre-staged cart for efficient access.

This study has several limitations. One major limitation is the relatively small cohort size (N = 58), which limits generalizability. The database was limited to culture result release times, IPC control measure initiation, and antibiotic adjustment times and details. The facility still relies on paper-based medical records, so documentation was often unclear on antibiotic change dates, especially for longer-staying patients, and discharge dates were occasionally missing. The facility is planning to implement an electronic health records system to resolve many of these issues. In the interim, periodic audits are necessary to assess staff competency and give constructive feedback. Additionally, due to limitations in laboratory reagents and technology, some MDROs, such as *Clostridioides difficile*, *Candida auris*, and VRE, cannot be detected. Thus, laboratory capacity should be improved to sustain testing needs and insights into our local MDRO strains. This requires qualified microbiologists.

In December of 2023, Ebeye Hospital lost its only microbiologist, who was an expatriate on contract. Since that time, there have been no cultures performed at the hospital, and it is no longer able to identify MDROs. This highlights the vulnerability of hospitals in the region to the loss of key staff members and the importance of building the skills of Indigenous staff.

The design and consistent updating of the MDRO surveillance forms ensured accurate classification of cases, allowing for prompt initiation of IPC measures. However, in the absence of direct observation, there is no guarantee that all of the recommended IPC measures were applied in each case. This is an area for further study and monitoring if any strategies in antibiotic usage and IPC standard measures are to be sustained. Innovative and combination strategies could be effective, but the key is strong ongoing support from senior clinicians and senior leadership. Adherence to IPC evidence-based standards and robust antimicrobial stewardship are essential in the fight against MDROs. In summary, the study identified shortcomings in both the initiation of IPC measures and adherence to antibiotic usage guidelines based on culture results. These findings point to actionable interventions that could improve infection control and antibiotic management, ultimately improving patient outcomes.

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Conflict of Interest

None of the authors identify a conflict of interest.

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From Simulation to Service: A Multi-Modal Approach to Interprofessional Health Education on Houselessness in Hawai'i

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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&SW Contributing Editor.

Background

Hawai'i has the highest rates of houselessness per capita in the US, at 81 per 10 000 people classified as houseless, including both sheltered and unsheltered individuals.[1] A high percentage of the houseless population in Hawai'i is unsheltered at 76.2%.[1,2] This includes single adults; families with children; and unaccompanied youth, a population that is the fastest growing among houseless people. The other 23.8% of houseless individuals reside in emergency shelters and transitional housing units. While a large percentage of those who are houseless are employed, the high cost of living in Hawai'i makes it difficult to maintain housing. Many have health conditions including diabetes and hypertension; mental health disorders (33.6%), which include anxiety and schizophrenia; and substance use disorders (28.3%), which include misuse of alcohol, tobacco, and cannabis.[1,2] The average life expectancy for someone who is houseless in Hawai'i is 53 years, decades shorter than the average of over 80 years for the general population living in Hawai'i.[3]

Interprofessional education (IPE) is a foundational strategy for preparing future health professionals to address complex social and health challenges such as houselessness. Individuals experiencing houselessness often face a combination of medical, behavioral, social, and structural barriers that cannot be effectively addressed by a single discipline. IPE brings learners from multiple professions together to learn with, from, and about one another, fostering collaborative practice, role clarity, and shared responsibility in patient care. In 2014, the Hawai'i Interprofessional Education Workgroup (HIPE) at the University of Hawai'i (UH) was created and is comprised of representatives from the UH School of Nursing and Dental Hygiene (SONDH), John A. Burns School of Medicine (JABSOM), Daniel K. Inouye College of Pharmacy (DKICP), and Thompson School of Social Work (DSW) & Public Health (DPH).

Houseless Simulation Experience

To help prepare health professional students to work with houseless individuals, HIPE developed an IPE simulation experience for health professional students to collaborate as a team and develop innovative solutions to support individuals experiencing houselessness. HIPE team members who had experience working with houseless people and who had participated in other similar simulation experiences contributed to the creation of this simulation experience.

The simulation-based activity is an interprofessional immersive learning experience designed for health care professional students to uncover assumptions about houselessness and discuss the impact of social determinants of health (SDOH) through personal, professional, and policy lenses. Using a gamified "choose your answer" text-based online activity, first year JABSOM students, fourth year SONDH students, and graduate students from DKICP, DSW, and DPH step into the shoes of a single, houseless parent to experience some of the challenges and decisions likely to be encountered when experiencing houselessness. Following the interactive portion of the simulation, learners are placed in small groups in online breakout rooms, where they discuss emotional responses, preconceived notions, and implicit biases they may have uncovered during the exercise.

Groups then work together in a second activity to understand each profession's unique role in addressing social determinants of health and to apply their learning to macro-level policy issues that impact members of the community experiencing houselessness. Students are asked to collaborate on the creation of a plan of care and associated policy changes that could help the single parent experiencing houselessness. Each group chooses their top priority and corresponding policy solution, and one representative from the group shares with the larger group to close the interprofessional immersive learning experience. Since its inception in 2021, 366 learners have participated in the 38 sessions hosted by the HIPE team. This included medical students (n=158), nursing students (n=90), social work students (n=28), public health students (n=40) and pharmacy students (n=50). More details about this interprofessional learning event are explored in Teruya et al., 2024.

HOME Clinic

The Hawai‘i Houseless Outreach and Medical Education (HOME) Project was established in 2005 at JABSOM with the intention of providing clinical experience for medical students in providing care to underserved populations, while addressing the health care needs of the growing houseless population in Hawai‘i. The mission of the program is to improve quality and access to health care for individuals in Hawai‘i experiencing houselessness, while increasing student and physician awareness and understanding of houseless individuals and their health care needs. Operating as a student-run clinic, the HOME Project offers free medical services to the houseless community across Oahu 7 days a week through mobile medical vans and a standalone clinic in Iwilei, providing care that is high-quality, accessible, inclusive, and compassionate.

As a student-run initiative, the HOME Project provides an excellent platform for interprofessional education. Participation in student-run free clinics is an effective method to increase students' role awareness of other health profession students.[4,5] Students from various health-related fields can collaborate in a real-world health care setting, learning to work effectively as a health care team. Although students outside of JABSOM (eg, students of social work, psychology, and pharmacy) have worked at the HOME clinics with the medical students, these have been individual student experiences rather than part of a structured interprofessional educational program. The primary barriers to establishing a fully coordinated interprofessional experience have been space limitations and the availability of faculty supervision from different professions. Although medical students receive supervision from faculty and volunteer community physicians, other disciplines have struggled to secure adequate supervisors for their students.

HOME clinic recently relocated to a larger facility in the Iwilei area, through a partnership with the City and County of Honolulu's Crisis Outreach Response and Engagement (CORE) team. The previous clinic location lacked private discussion areas, and its patient exam spaces only fit up to 3 individuals beyond the patient, which limited the ability to facilitate comprehensive team-based learning. The new facility features private patient rooms large enough to fit more students and faculty members. It also includes more learning spaces and a large conference room that can accommodate full teams of interprofessional students and faculty. While faculty supervision remains a challenge, potential grant funding could support additional faculty presence, and there are also opportunities to recruit volunteer clinical supervisors from various disciplines beyond medicine.

Future Plans

An overarching goal is to create new designated IPE sites with immersive learning environments that go beyond the traditional concept of health care services. HIPE would also like to expand houseless IPE experiences to include perspectives from disciplines outside the traditional health care workforce, including students of urban & regional planning, architecture, law, education, nutrition, and agriculture to creatively develop innovative communities designed to support vulnerable populations of individuals and families impacted by houselessness. For example, communities designed to support housing, health care, and wraparound services for people with behavioral health or physical disabilities would be a helpful resource. The goal is to create immersive experiential learning opportunities that allow students to use their professional knowledge to collaborate on innovative models of health care and service delivery.

The state of Hawai‘i needs a comprehensive plan to tackle houselessness, with collaboration from the city, state, university, and private organizations. The best way to address these difficult policy issues is by working as an interprofessional team, where all team members can leverage each other's strengths. By engaging health care students early in their training, the HIPE experiences aim to inspire sustained commitment to working with houseless populations and to empower learners to recognize their capacity to effect meaningful change. By modeling interprofessional policy engagement and discourse, HIPE hopes to inspire the creation of interprofessional workgroups among students who will shape collaborative structures in the future. Exposure to barriers, such as with houselessness, allows creative minds to explore solutions that could become future plans. These experiences will help students learn how to address health care challenges in the future as they graduate and take their skills into the community as professionals.

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Hawai‘i Journal of Health & Social Welfare (HJH&SW)

Guidelines for Publication of HJH&SW 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, 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
   i. 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 via Scholastica
   - 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, provision of electronic files, and indexing in PubMed Central, SCOPUS, and Embase. The journal Publications Specialist 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 theJH&SW via email (hjhsw@hawaii.edu) for assistance.

7. Supplement issues are posted on the HJH&SW website (http:// https://hawaiijournalhealth.org) as a full-text PDF (both of the whole supplement as well as each article). Full-text versions of the articles will also be available on PubMed Central.

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 Publications Specialist. 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.

Hawai‘i Journal of Health & Social Welfare (HJH&SW) 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	**Māori**	**O‘ahu**
Hawai‘i	**Lāna‘i**	**‘ohana**
kūpuna	**Mānoa**	**Wai‘anae**

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