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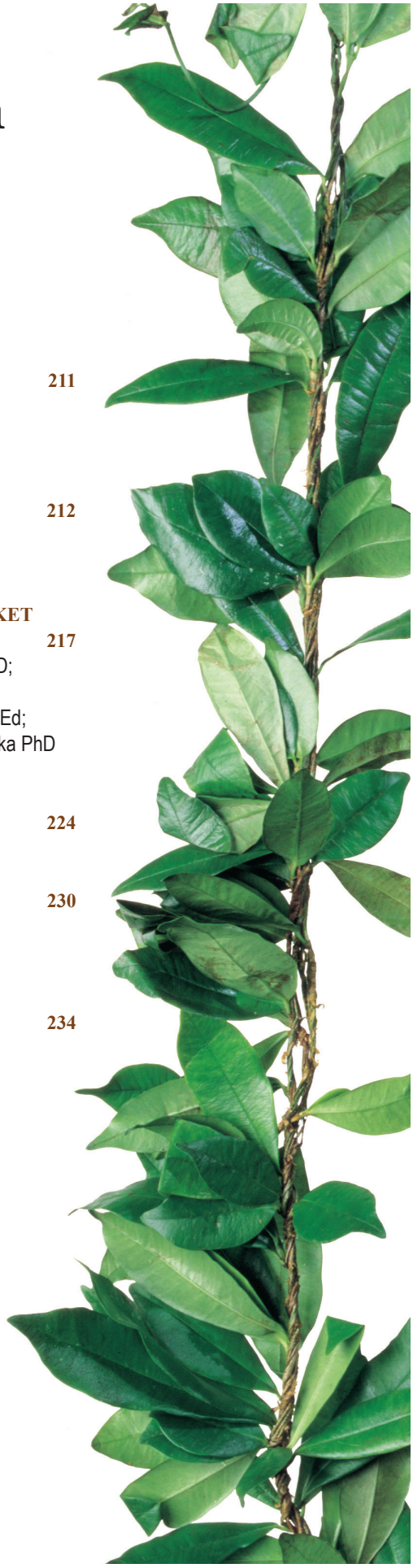

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Aim:
The aim of the Hawai‘i Journal of Health & Social Welfare is to advance knowledge about health and social welfare, with a focus on the diverse peoples and unique environments of Hawai‘i and the Pacific region.

History:
In 1941, a journal then called The Hawai‘i Medical Journal was founded by the Hawai‘i Medical Association (HMA). The HMA had been incorporated in 1856 under the Hawaiian monarchy. In 2008, a separate journal called the Hawai‘i Journal of Public Health was established by a collaborative effort between the Hawai‘i State Department of Health and the University of Hawai‘i at Mānoa Office of Public Health Studies. In 2012, these two journals merged to form the Hawai‘i Journal of Medicine & Public Health, and this journal continued to be supported by the Hawai‘i State Department of Health and the John A. Burns School of Medicine.

In 2018, the number of partners providing financial backing for the journal expanded, and to reflect this expansion the name of the journal was changed in 2019 to the Hawai‘i Journal of Health & Social Welfare. The lead academic partners are now the six units of the UH College of Health Sciences and Social Welfare, including the John A. Burns School of Medicine, UH Public Health, the Myron B. Thompson School of Social Work, the School of Nursing and Dental Hygiene, the UH Cancer Center, and the Daniel K. Inouye College of Pharmacy. Other partners are the Hawai‘i State Department of Health and the UH Office of the Vice Chancellor for Research. The journal is fiscally managed by University Health Partners of Hawai‘i.

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HAWAI'I JOURNAL WATCH

KAREN ROWAN MS

Highlights of recent research from the University of Hawai'i and the Hawai'i State Department of Health

Project to Strengthen Research Capacity in American Samoa Trains Its First Cohort

The INdigenous Samoan Partnership to Initiate Research Excellence (INSPIRE) project is aimed at strengthening research capacity in American Samoa and includes partners from American Samoa and the US. During the first year of the project, the partners, including Lana Sue 'Ilima Ka'opua PhD, of the Myron B. Thompson School of Social Work, worked together to establish a foundation and train the first cohort of researchers. The partners developed a weaving approach, incorporating both Samoan and Western knowledge into the training project, which involved developing ways to increase screening rates for colorectal cancer in American Samoa. The project succeeded in research capacity strengthening, training seven individuals. The project partners found that the trainees preferred working together in group learning activities, increased their commitment to health disparities research over the course of the project, and would recommend the training to others. The goals of sustainable global health and health equity will require sustained human relationships, the researchers concluded.

- Tofaeono V, Ka'opua LSI, Sy A, et al. Research capacity strengthening in American Samoa: Fa'avaeina le fa'atelega o le tomai aa'ili'ili i Amerika Samoa. *Br J Soc Work*. 2020;50(2):525-547. doi:10.1093/bjsw/bcz160

Prognostic Factors of Microcephaly in Infants of Women Infected with Zika Virus

Among women with Zika virus infections during pregnancy, microcephaly in the infant may be more common among women infected during the first trimester, women with symptomatic infections, and male infants. Researchers including Vivek R. Nerurkar PhD, of the John A. Burns School of Medicine, conducted a systematic review and meta-analysis to identify prognostic factors of microcephaly in newborns and fetuses whose mothers had Zika infections during pregnancy. The researchers identified 12 studies published between 2015 and 2018, including 6 whose authors provided primary data for the meta-analysis. The studies involved a total of 6154 newborns/fetuses, including 1120 (18.20%) who were diagnosed with Zika virus infections. Of those, 509 (45.45%) were diagnosed with microcephaly. Females had a lower microcephaly risk compared with males (RR 0.79). Infants of women without infection symptoms had a lower microcephaly risk (RR 0.68) compared to those born to women with symptomatic infections, and infections during the first trimester were linked with higher microcephaly risk (RR 1.42) compared with later infections. Maternal age and ethnicity were not prognostic of microcephaly risk. Because the studies included in the meta-analysis varied in their definitions of Zika virus infection and in their data collection, the researchers concluded there is a need for greater consistency in methods across studies.

- Gallo LG, Martinez-Cajas J, Peixoto HM, et al. Another piece of the Zika puzzle: assessing the associated factors to microcephaly in a systematic review and meta-analysis. *BMC Public Health*. 2020;20(1):827. doi:10.1186/s12889-020-08946-5

Potential New Biomarkers of Pancreatic Cancer Identified

A new study has identified 38 proteins as candidate biomarkers of pancreatic ductal adenocarcinoma (PDAC), a highly lethal cancer that is often asymptomatic in its early stages. Researchers including senior author Lang Wu PhD, of the UH Cancer Center, conducted a large study including 8280 cases and 6728 controls from the Pancreatic Cancer Cohort Consortium and the Pancreatic Cancer Case-Control Consortium. They used genetic variants known to be associated with protein levels to estimate the genetically predicted blood concentrations of a wide range of proteins, and then analyzed the associations between the predicted protein concentrations and PDAC risk. Eight of the 38 candidate biomarkers were associated with PDAC risk independent of previously identified PDAC risk variants. More work is needed to confirm the findings, but the results suggest avenues that could further the understanding of the etiology of PDAC.

- Zhu J, Shu X, Guo X, et al. Associations between genetically predicted blood protein biomarkers and pancreatic cancer risk. [published online ahead of print, 2020 May 21]. *Cancer Epidemiol Biomarkers Prev*. 2020;10.1158/1055-9965.EPI-20-0091.

New Scale to Measure Resilience Incorporates Indigenous Perspective

Native Hawaiians who have higher levels of resilience may also have better health. Researchers led by Mapuana C.K. Antonio, DrPH, of the Office of Public Health Studies, developed a new scale to measure resilience in Native Hawaiians taking into account not only traditional measures of resilience, such as self-reliance, but also the Indigenous perspective of resilience, which places high value on relationships. The scale was psychometrically tested using survey data from 124 Native Hawaiian adults living on Hawaiian Homestead Lands. Results showed participants who scored higher on the resilience scale also reported higher levels of general health, mental health, and physical functioning. The psychometric properties of the new scale demonstrated good model fit (RMSEA=.069, CFI=.989) and good validity. The new scale can be used in future research on Native Hawaiian health that uses a strength-based approach.

- Antonio MCK, Hishinuma ES, Townsend Ing C, et al. A resilience model of adult Native Hawaiian health utilizing a newly multi-dimensional scale [published online ahead of print, 2020 May 1]. *Behav Med*. 2020;1-20. doi:10.1080/08964289.2020.1758610

The Needs and Priorities of Environmental Health Professionals

Environmental health (EH) professionals in state and local health departments fufill vital roles, addressing environment-related threats to human health including natural disasters and water contamination, yet there is no common definition for the EH profession. Environmental health specialists nationwide including Darren Tamekazu BS, of the Hawai'i State Department of Health, met and assisted in assessing the EH workforce. The results of these focus groups aimed at analyzing the priorities and needs of EH workers. Results showed a need for increased leadership development among EH professionals, a need for a comprehensive framework to help EH professionals to identify partner organzations and foster collaborative relationships, and a need for studies to determine the impact of EH interventions on improving health outcomes. The group concluded that a robust EH workforce will be needed to meet the challenges of the 21st century.

- Gerding JA, Brooks BW, Landeen E, et al. Identifying needs for advancing the profession and workforce in environmental health. *Am J Public Health*. 2020;110(3):288-294. doi:10.2105/AJPH.2019.305441

Effects of a Single Concussion During the School Year on the Academic Performance and Neuropsychological Functioning of High School Athletes

William T. Tsushima PhD; Ahriika Jordan; Vincent G. Tsushima PhD; and Nathan M. Murata PhD

Abstract

There are very few studies examining the effects of sports-related concussion (SRC) on objective measures of school performance, such as grades or test scores. In this research, the grade point averages (GPAs) and scores of the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) of athletes who sustained an SRC during the school year were compared with those of athletes who did not have an SRC. Multivariate analysis of variance (MANOVA) revealed a significant linear decline in GPA of both groups across the school year, but indicated no difference in the GPA decline between the concussion and no concussion groups. The GPAs of the concussion and no concussion groups were not significantly different across the school year. Finally, no differences were found between the pre- and post-concussion ImPACT scores of the concussed athletes. This study found that an SRC during the school year did not affect the academic performance or neurocognitive test scores of high school athletes.

Keywords

sports-related concussion, academic, neuropsychological, high school

Abbreviations

ADHD = attention-deficit/hyperactivity disorder
GPA = grade point average
HCAMP = Hawai'i Concussion Awareness and Management Program
ImPACT = Immediate Postconcussion Assessment and Cognitive Testing
M = *mean*
MANOVA = multivariate analysis of variance
n = *number*
P = *probability*
SD = *standard deviation*
SRC = sports-related concussion

Introduction

The past 2 decades have witnessed the increased incidences of concussion in high school sports, with growing concern over the proper management of athletes who sustain a sports-related concussion (SRC).[1,2] The treatment of SRC in young athletes is of concern because post-concussive symptoms, including somatic, cognitive and behavioral difficulties, not only impact return-to-play decisions for the student-athlete, but can also affect their school performance at this period of their educational development.[3] Some reports suggest that post-concussion symptoms, such as headache and sleep disturbance, may lead to deficits in concentration and school performance. However, these reports offer insufficient evidence to support these claims.[4,5] Other studies observe that those with post-concussion symptoms may suffer difficulties in verbal communication, multitasking, and completing assignments, accompanied with a reported decline in test grades, and class attendance.[6,7] But these assertions suffer from methodological problems, eg, lack of a comparison group or reliance on parent and self reports.

Despite the widespread concerns about the influence of SRCs on the academic functioning of high school athletes, a literature review suggests that studies examining the effects of SRC on objective measures of school performance, such as grades or test scores, are limited.[8] An investigation of high school athletes found that recently concussed athletes as well as those with a history of 2 or more SRCs had significantly lower grade point averages (GPAs) than youth athletes with no concussion history.[9] Researchers collected school grades over 2 years from secondary rugby players in South Africa and found statistically significant decrease in academic performance in the subject of Afrikaans language in students with very mild traumatic brain injury (vmTBI) and mild traumatic brain injury (mTBI), but not among no-contact controls.[10] However, no academic grade differences were found in mathematics, science, ore English. The authors of this study acknowledged the limitations of the small sample size of participants (26 vmTBI, 9 mTBI, 10 controls).

In contrast to the paucity of studies of SRC effects on academic performance of high school athletes, there is a substantial body of research that has examined the effects of non-sports-related mTBI on school performance, with multiple reviews concluding that there are minimal or insignificant adverse long-term academic outcomes following mTBI. Review papers include (1) an early comprehensive review of 40 studies (1970-1995) of the relationship between mild head injuries in children and adolescents and academic performance;[11] (2) an addendum review of studies from 1995-1998 of the effects of mild head injury on cognitive, academic, or psychosocial functioning;[12] (3) a review of 428 studies related to prognosis in school performance after mTBI;[13] (4) a meta-analytic review of the

literature (1988 to 2007) on the neurocognitive outcomes after pediatric traumatic brain injury;[14] (5) a review of pediatric studies aimed at the clinical management of mTBI;[15] and (6) a review of studies that examined school grades and national examination scores.[8]

The relationship between neuropsychological functioning and school readiness and performance have been reported with both sports and non-sports head injuries.[8,12,16] However, distinctions between non-sports mTBI and SRC should not be ignored.[17] SRC research typically employ brief neurocognitive instruments, such as the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT), that provide prompt test results to quickly determine whether an athlete can return to competition. In contrast, with non-sports mTBI, comprehensive neuropsychological test batteries are administered to direct long-term neuro-rehabilitation. Because of these differences, research regarding the effects of non-sports mTBI injury high school students may vary from studies of the consequences of SRC on school performance.

In view of the small number of existing empirical studies of the relation between SRC and academic performance, the present study was designed to provide further objective measures to assess the extent to which an athlete's school functioning, as well as neurocognitive abilities, may be impacted by an SRC during the academic year. The findings generated by this research contribute to the understanding of how an SRC affects an athlete's academic performance.

Methods

This study used data collected by the Hawai'i Concussion Awareness and Management Program (HCAMP)[18] and the Hawai'i State Department of Education as part of a multi-faceted research effort to examine the effects of SRC on the academic functioning of high school athletes. Approval for the use of the research data was granted by the Hawai'i State Department of Education. This retrospective study was evaluated by the Hawai'i Pacific Health Research Institute's institutional review board and was determined to be exempt.

Measures

To assess the effects of an SRC on the academic functioning of high school athletes, GPAs, obtained from official school transcripts and provided by the Hawai'i State Department of Education, were employed as a measure of the athlete's school functioning. GPA has long been known as a useful indicator of classroom performances,[19,20] however is rarely found in sports neuropsychological studies. GPAs in this study were obtained from official school transcripts and provided by the Hawai'i State Department of Education. In addition to GPA, the study employed ImPACT,[21] which is a web-based computerized neuropsychological test battery widely used for the assessment of SRC in high school, collegiate, and professional athletes.[22] ImPACT, collected as part of the HCAMP program, takes approximately 30 minutes to complete and yields five Composite scores, including Verbal Memory, Visual Memory, Visual Motor Speed, Reaction Time, and Impulse Control. ImPACT provides a Total Symptom score based on the Post-Concussion Symptom Scale that consists of 22 commonly reported symptoms (eg, headache, dizziness) rated on a 7-point Likert scale. The ImPACT examination also includes self-reported demographic and health information, such as age, sex, years of education, native language, sport played, prior concussion, history of learning disability, attention deficit disorder, psychiatric illness, and seizures. A more complete description of ImPACT can be found elsewhere.[23]

Participants

The participants for this study came from a pool of 946 boy and 684 girl athletes from seven high schools randomly selected by the Hawai'i State Department of Education in the 2012-2013 school year. There were 80 participants included in this study (55 boys, 25 girls). Those in the concussion group were 39 athletes (31boys, 8 girls) who had a single SRC during the school year and who had pre- and post-concussion ImPACT testing. The no concussion group of 41 athletes (24 boys, 17 girls) was selected using a Stat Trek random numbers generator to pull from a large group of athletes who did not sustain a concussion during the school year. SRCs were typically observed in practice or competition by the team staff and directly evaluated by a certified athletic trainer, adhering to the concussion criteria provided by the consensus statement on concussion.[24] A small minority of athletes experienced concussion symptoms sometime after a practice or game. They reported their conditions and were subsequently assessed and diagnosed by the athletic trainer. The athletes participated in various sports, including football, basketball, softball, wrestling, cheerleading, soccer, volleyball, and track and field. The demographic characteristics of the concussion and no concussion groups are shown in Table 1.

Table 1. Demographic Characteristics of the Concussion and No Concussion Groups

	Concussion	No Concussion
Age	14.92 (*SD* = 1.27)	15.00 (*SD* = 1.18)
Boys	31	24
Girls	8	17
Prior SRC history	4	0
ADHD history	5	1
Special education history	1	0

Procedure

The GPAs of the concussion and no concussion groups were obtained for each of the 4 quarters of the entire school year. Online ImPACT baseline testing was administered prior to the athlete's season in small group settings by certified athletic trainers who conducted the standard administration of the examination. In addition to the baseline testing, ImPACT was again administered soon after the SRC. The average days between the injury and post-injury testing was 3.56 ($SD = 1.93$), though it should be noted that the post-injury days data were available for only 16 of the 39 athletes who sustained an SRC. The average days between baseline testing and post-concussion testing was 45.70 ($SD = 29.39$), based on 30 of the 39 athletes.

Statistical Analyses

The ages and sex ratios of the concussion and no concussion groups were compared. The dependent variables were the GPA, the 5 ImPACT Composite scores (Verbal Memory, Visual Memory, Visual Motor Speed, Reaction Time, and ImPulse Control), and the Total Symptom score of the participants. MANOVAs were used to compare the GPAs and of the ImPACT measures for within-group to examine any change across time, and between-group differences to compare the GPAs and ImPACT scores of the 2 groups. A MANOVA was calculated to assess pre- and post-SRC ImPACT scores. For the comparisons of GPAs across 4 quarters, an *a priori* statistical significance level was set with Bonferroni correction at $.05/4 = P < .01$. For the multiple comparisons of the 6 ImPACT scores, a statistical significance level was set at $.05/6 = P < .008$. The statistical analyses were done with the SPSS Data Analysis Software, IBM Corporation, Armonk, New York.

Results

Among the 39 athletes in the concussion group, 5 reported a history of attention-deficit/hyperactivity disorder (ADHD), 1 reported a history of special education, and 4 reported a history of a prior SRC. In the no concussion group, 1 reported a history of ADHD, and none reported a history of special education or prior SRC The difference between the concussion and no concussion group in terms of ADHD history was not significant, ($\chi^2[1] = 3.80$, $P > .05$).

The mean ages of the 2 groups were as follows: concussion group 14.92 years ($SD = 1.27$), and no concussion group 15.00 years ($SD = 1.18$). The age difference between the 2 groups was not significant, $t = .28$, $df = 78$, $P = .78$. The difference in the sex ratios of the 2 groups was statistically significant ($\chi^2[1] = 4.08$, $P = .04$). Among the concussion group, 4 had a prior history of concussion, while those in the no concussion group had no previous SRC.

MANOVA, using Pillai's trace, indicated no significant between-group GPA difference, $F(6,73) = 4.26$, $P = .04$, across the 4 quarters. MANOVA results, on the other hand revealed significant within-group GPA difference, $V = .18$, $F(6,73) = 5.63$, $P = .002$, with no interaction effect between groups across the 4 quarters of the school year. (See Figure 1 for GPA data.) Post-hoc tests of

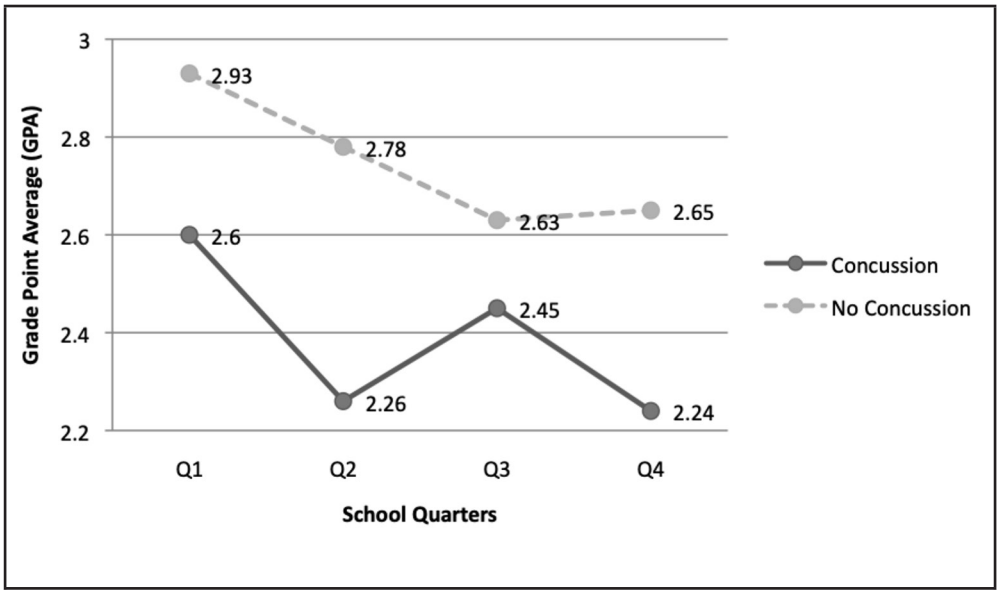

Figure 1. Grade Point Averages (GPA) of the Concussion and No Concussion Groups Across the Four Quarters of the School Year.*

* The linear decline across time was statistically significant $F(6,73) = 7.48$, $P < .001$. The difference in the GPA decline of the two groups was not significant $V = .09$, $F(6,73) = 2.47$, $P = .007$.

within-subjects effects indicated a significant linear decline in GPA across time, $F(6,73) = 7.48$, $P < .001$, with lower grades as the school year progressed. The effect size, *partial* $\eta^2 = .09$, was medium.[23] MANOVA, using Pillai's trace, showed no difference between the concussion and no concussion athletes in the decline of GPA across the school year, $V = .09$, $F(6,73) = 2.47$, $P = .007$. The linear GPA declines of the Concussion and No Concussion groups are shown in Figure 1. MANOVA, using Pillai's trace, indicated no significant between-group difference in baseline ImPACT scores, $V = .18$, $F(6,73) = 2.72$, $P = .02$. Finally, no differences were found between the pre- and post-SRC ImPACT scores, $V = .01$, $F(1,37) = .39$, $P = .54$, of the Concussion athletes. The means and standard deviations of the pre- and post-SRC ImPACT scores appear in Table 2.

Table 2. Pre- and Post-SRC ImPACT Scores of the Concussion Group*

	Pre-SRC n = 39	Post-SRC n = 39
Score Category	**Mean (*SD*)**	**Mean (*SD*)**
Verbal Memory	80.41 (9.13)	76.85 (14.79)
Visual Memory	73.13 (12.08)	68.67 (13.73)
Visual Motor Speed	33.54 (6.26)	33.87 (7.95)
Reaction Time	0.62 (0.10)	0.68 (0.18)
Impulse Control	9.13 (6.26)	8.87 (5.62)
Total Symptom	12.46 (17.29)	18.23 (14.71)

Abbreviations: SRC = Sports-related Concussion, ImPACT = Immediate Post-Concussion Assessment and Cognitive Testing

* MANOVA indicated no statistical significance between the pre- and post-SRC ImPACT scores, $V = .01$, $F(1,38) = .23$, $P = .63$.

Discussion

This study provided objective measures of academic performance in high school athletes following an SRC, by utilizing the student athlete's GPA. The results revealed (1) no difference between the two groups in GPAs across the school year; (2) a significant linear decline in within-group GPA across time for both the concussion and no concussion groups, with lower grades as the school year progressed; (3) no difference between the 2 groups in the decline of GPA across the school year; and (4) no difference between pre- and post-concussion ImPACT scores of the concussion athletes.

Across the school year, the GPAs among the concussion group and the no concussion group were not significantly different. A previous study similarly found that the GPAs of a concussion and a control group of high school athletes did not differ significantly. [25] These results concur with the vast research literature on non-sports-related mTBI that indicated insignificant effects on school learning.[8,14,15] Nonetheless, the absence of differences in the academic and neuropsychological performances in this group of athletes should not imply that SRCs are benign and do not result in lasting neuropsychological sequelae. A small subset of athletes may exhibit persistent learning and neurocognitive effects due to their head injury, as the recovery pattern from a concussion can vary from individual to individual.[2]

This study revealed a significant within-group linear decline in GPA across the school year, while showing no differences in the decline over time between the concussion and no concussion groups. These data were consistent with a large-scale non-sports mTBI study in Canada that found that both concussion and non-concussion matched students had lower adjusted GPA over time, i.e., from one year to the next; and that there was no significant difference in GPA change between the concussed and non-concussed students.[16]

The GPA is a global index of school performance but does not provide grades in specific subjects, such as mathematics or language arts. Thus, the overall GPA index may conceal specific academic dysfunctions. A recent large-scale non-sports-related research of 8240 high school students (1709 concussed, 6531 non-concussed) found that concussion did not have deleterious effects on GPA, although small but statistically significant reductions were seen in social studies grades among students following a concussion.[16] Grades in specific school subjects were not obtained in this study.

Limitations

Limitations with this study include the following: (1) The relatively small sample size of high school athletes was a serious shortcoming that probably resulted in lower statistical power with an inability to discern subtle academic consequences following a concussion. (2) Individual quarterly GPAs that were most proximate to an athlete's SRC were not analyzed, which could have provided a more sensitive measure of a student athlete's concurrent performance in the classroom. (3) While GPAs present a valuable index of academic functioning, other measures of school functioning, such as school achievement test scores, aptitude test results, and teacher ratings of classroom performance, can offer additional insight into the possible consequences of concussion on the student athletes. (4) It is not known if all of the reported concussions occurred during a sports activity. A few may have been sustained outside the sports setting and were not SRCs. (5) ImPACT was administered, on the average, 3.56 days after the SRC, but the post-injury duration data were available for only 16 of the 39 athletes. It is conceivable that several of the cohort of concussion athletes were tested a week or longer after the head injury and, thus, would not be expected to display the acute evidence of SRC sequelae.[26] This may have affected the pre- and post-concussion ImPACT comparisons in this study. (6) Although the identification of an SRC was made by athletic trainers adhering to standard concussion protocol, there was no formal checklist or recording of pertinent symptoms. Thus, some variability in the application of diagnostic criteria could not be avoided or ascertained.

Conclusion

The effect of SRCs on the school learning of high school athletes is a major concern for the athletes, parents, school teachers and administrators, and sports staff. The present findings suggested that an SRC did not affect the GPAs or neurocognitive test scores of athletes during the school year. This is one of the few SRC studies to date that employed an objective measure of academic performance, the GPA of athletes, to assess the effect of an SRC, encouraging future research to examine other measures of academic performance, such as grades in specific subjects, school achievement test scores, and aptitude test results.

Conflict of Interest

None of the authors identify a conflict of interest.

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The Affordability of a Thrifty Food Plan-based Market Basket in the United States-affiliated Pacific Region

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Abstract

In an effort to characterize food costs in the United States (US)-affiliated Pacific Region, a first-time food cost survey was conducted in March 2014. A market basket survey was developed using an adaptation of the US Department of Agriculture Thrifty Food Plan. Surveys were conducted in the states of Alaska and Hawai'i; Portland, Oregon; the US-affiliated Pacific Islands of American Samoa (American Samoa); Commonwealth of the Northern Mariana Islands; the island of Pohnpei within the Federated States of Micronesia; Guam; Republic of the Marshall Islands; and Republic of Palau. Urban and rural communities were included. Multiple stores in multiple communities were surveyed in each jurisdiction. Food retailers (N = 74) ranged from convenience markets to supermarkets. Not all foods in the market basket survey were available in each of the communities. Inspection of available income data also showed that food costs represented a higher percentage of household income for American Samoa than those of Alaska, Hawai'i, and Portland. Thrifty Food Plan weighted weekly totals for the region ranged from $181.90 to $264.30. Weighting was based on the amount of the item converted to grams required for the Thrifty Food Plan menu. These food costs are significantly higher than those of Portland ($142.00) for the survey period. Protein foods, grains, vegetables, fruit, and dairy were the 5 most costly components, in descending order. Food affordability was assessed by comparing food costs across jurisdictions and examining estimated food costs to reported average jurisdiction incomes. The survey is intended to help inform public health policy and educational programs in the region. A locally adapted food survey would benefit future analyses, regional policy, and educational efforts.

Keywords

obesity, food security, food costs, Thrifty Food Plan, food environment, US-affiliated Pacific Region

Abbreivations

CFSAT = USDA Community Food Security Assessment Toolkit
CHL = Children's Healthy Living Program
TFP = Thrifty Food Plan
USAPR = US-affiliated Pacific Region
USDA = United States Department of Agriculture
WWEIA = What We Eat in America

Introduction

An increased prevalence of overweight and obesity among all age groups is associated with food insecurity.[1-3] The link between food security, diet, and young children's health has been well established.[4-7] Multiple environmental factors can affect family food security and food insufficiency including food costs.[8] Food prices may be a barrier to consumption of fruits and vegetables, which are nutrient-dense foods important to a healthy diet.[9,10]

The United States-affiliated Pacific Region (USAPR) is an expansive and diverse region that includes the states of Alaska and Hawai'i, and the US-affiliated Pacific Islands of American Samoa (American Samoa), the Commonwealth of the Northern Mariana Islands (CNMI), the Republic of Palau, Pohnpei State in the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI), and Guam (collectively referred to here as jurisdictions). The Children's Healthy Living Program (CHL) is a partnership among land-grant colleges in the USAPR jurisdictions, sponsored by the US Department of Agriculture (USDA). CHL's mission is to build the region's capacity for establishing healthy food and physical environments.[11] Little documentation exists for food costs throughout most of this region, making it difficult to identify recommendations for budget meal planning, which involves making choices that meet nutritional needs while constraining costs.

One of the most widely used tools for assessing healthy food environments is the USDA Thrifty Food Plan (TFP), which is the basis for USDA food assistance programs such as the Supplemental Nutrition Assistance Program (SNAP) and other similar programs.[12,13] The TFP is 1 of 4 official USDA food plans maintained by the USDA Center for Nutrition Policy and Promotion that were designed to meet national nutritional guidelines for various segments of the US population.[13] The TFP is classified as the low-cost option, satisfying nutritional requirements for a healthy diet at minimal cost. The TFP is menu-based, and all meals are presumed to be prepared at home under the assumption that households have time available to prepare meals from the menu ingredients. The USDA Community Food Security Assessment Toolkit (CFSAT) was "…developed through a collaborative process that was initiated at the Economic Research Service/USDA Food Security Assessment Conference in June 1999."[14] It provides a variety of tools that have been used to evaluate food security in several populations and includes a survey protocol that approximates the TFP weekly cost of food for a family of 4.[14-16] The surveyed food items represent the ingredients of the TFP meals, with individual ingredient costs adjusted by the amount required by

the weekly menu. We sought to determine the affordability of retail foods based on relative food costs among USAPR communities and that of the mainland US city of Portland, Oregon. The computed TFP costs for a family of 4 for Portland ($142.00) was similar to that of the US national average ($148.40)[17] as estimated by USDA in March 2014**,** supporting the relevance of this Pacific Northwest city as a mainland US reference community for comparison with the USAPR jurisdictions. Portland also has been part of past food costs surveys conducted by the University of Alaska Fairbanks Cooperative Extension Service using the same survey protocol used in this study.

Affordability was assessed by examining the estimated food cost to reported average community income in selected communities based on data availability. The survey is part of a community food affordability assessment and used in the CHL project as a first step to help revise federal food assistance programs and develop public policy and educational programs to promote public health in USAPR communities.

Methods

Study Design and Sample

The USAPR survey protocol was taken from the CFSAT. The CFSAT includes a food list (Table 1) and also has detailed instructions for surveyors, including preferred package sizes for pricing.[14] The CFSAT foods were further organized into 12 What We Eat in America (WWEIA) categories.[18] The advantage of this organization is that it provides a summary of foods and beverages by food category.

Surveyors entered stores with approval from store managers and recorded food prices for each available CFSAT survey item, or its alternate. No price was taken if an item, or its predetermined alternate, was unavailable. Food prices were collected in Portland by a contracted surveyor, for comparative purposes. Surveyors were CHL project employees from each jurisdiction and an audio training was provided, which included conducting pilot surveys with a follow-up debriefing. The survey manual included instructions for jurisdiction food cost coordinators and step-by-step instructions for surveyors. Food cost surveys were completed in at least 3 stores when possible in each of the 27 selected USAPR communities during a 2-week period in March 2014.[19] Food stores were selected to best reflect the cost of food for a low-income family of 4 with children ages 6-11 years. The selection criteria included that the store best met the selection of food items included in the CFSAT menu, that at least 1 store per jurisdiction was located in a low-income neighborhood, if available, and that stores be full service. Convenience stores were included only if conventional food stores were unavailable. Convenience stores that did not offer fruits and vegetables were excluded. The store classifications were based on the state of California Communities of Excellence (CX^3) food market survey protocol that defines a small market as selling vegetables and meats and having 3 or fewer cash registers and fewer than 20 employees; a supermarket is defined as being part of a chain and having 4 or more cash registers and more than 20 employees.[20]

All completed surveys were returned to the jurisdictional food cost coordinator, entered into a provided Excel spreadsheet, and reviewed for survey and data entry errors. The original surveys and the Excel spreadsheets were sent to the CHL project food cost coordinator at the University of Alaska Fairbanks for additional review and verification. The CFSAT-based weekly cost of food was derived from a total of 87 weighted food prices (weighting was based on the amount of the item converted to grams required for the TFP menu). An imputed price was calculated for missing items. The imputed item price was calculated as the corresponding Anchorage, Alaska price adjusted by the ratio of the median price of all TFP menu items for the jurisdiction to that of Anchorage. National census data was used for population estimates and income data.[21]

Table 1. Number and Percentage of Stores and Food Retail Environments Surveyed in USAPR Jurisdictions by Community and Store Types–March 2014.

		Store Type N (%)				
Jurisdiction	Communities (N)	Super-market	Large grocery	Small market	Convenience	Total
Alaska	4	12 (100%)				12
American Samoa	3			9 (100%)		9
CNMI	6		1 (6%)	17 (94%)		18
FSM	1			3 (100%)		
Guam	5	2 (14%)	3 (21%)	9 (64%)		14
Hawai'i	4	7 (58%)	2 (17%)	1 (8%)	2	12
Palau	1	1 (33%)	2 (67%)			3
Pohnpei	1			3 (100%)		3
Marshall Islands	3		2 (67%)		1	3
Total	27	22 (30%)	10 (10%)	39 (53%)	3 (4%)	74

USAPR = US-affiliated Pacific Region, CNMI = Commonwealth of the Northern Mariana Islands, FSM = Federated States of Micronesia

Statistical Analysis

Prices are expressed as dollars per pound ($/lb), while cost, in dollars per week ($/wk), is the sum of menu ingredients' prices times their associated weights (lbs) as specified in the CFSAT protocol for a family of 4 with school-aged children. The use of pounds rather than grams in the statistical analysis, as previously referenced in the calculation of survey weighted food prices, was to ease interpretation of results. All foods were priced by the unit as sold (eg, dozen for eggs, volume for milk, weight for flour), but converted to unit weight ($/lb) for ease of comparison.[22] The average weighted community-level prices (N = 87) were summed to provide weekly community food costs. Jurisdiction-level weekly food costs were then calculated as the average of the food costs of the communities within that jurisdiction.

Summary statistics were calculated using JMP 12 for Windows (SAS Corporation, Cary, NC). Food prices and weekly food costs were tested for normality with the Kolmogorov-Smirnov Goodness-of-Fit test for normality, with normality rejected for $P < .05$. Prices and costs were log-transformed for analyses. Equality of multiple medians was determined using the Kruskal-Wallis test, with a chi-square test for homogeneity of distributions. Medians are presented with interquartile range. Logarithmically-transformed food prices within WWEIA groupings and jurisdiction-level weekly weighted totals were compared by ANOVA, with Tukey-Kramer adjustments for multiple comparisons.

Results

Three stores or markets were surveyed in participating communities per jurisdiction, with the exception of Santa Rita, Guam, which had only 2 available stores, and the RMI, which had 1 store surveyed in each of 3 communities, for a total of 74 stores surveyed among 27 communities (Table 1). Supermarkets (N = 27) were available at each location in Alaska, and in varying numbers in the remaining jurisdictions. All 3 stores surveyed in Portland were supermarkets. The preponderance of stores available for survey were small markets (N = 39) and supermarkets.

Food Availability

For some locations, the choice of food outlets was limited and many of the 87 CFSAT food items were unavailable. The range of missing items was 0%-8% at the retailer level. In jurisdictions where supermarkets were available, no missing food items were reported. Small market stores had many unavailable items. When aggregated at the community level, missing items occurred in 6% of cases. Missing food items were reported 28 times in CNMI, 22 times in American Samoa, 20 times in Guam, 3 times in Palau, 2 times in RMI, and 1 time in FSM and Hawai'i. All items were available in Alaska and Portland (data not shown).

Food Prices and Costs

Food prices for each of the 87 items of the CFSAT protocol were averaged at the community level. In this way, food prices reflected the mix of stores surveyed within a community and accessed by shoppers. The median unit price and the estimated weighted weekly cost of food based on the CFSAT protocol are shown in Table 2 for each USAPR jurisdictions and Portland. The jurisdiction-level price medians ranged from $2.50 (Alaska) to $2.86 (RMI). By comparison, the median price in Portland was $1.70. The minimum reported price was $0.16/lb (refrigerated fruit drink, Hawai'i), while the maximum was $130.11/lb (oregano, Alaska). Food prices did not differ by store type after adjusting for jurisdiction.

Weighted jurisdiction-level food costs (calculated from the price multiplied by the CFSAT weekly purchase quantity) were computed as the average weighted cost of each food within a community. The weighted food costs across all USAPR communities ranged from $0.00/wk (pepper, American Samoa) to $28.44/wk (ground beef, Guam), with a median cost across all USAPR jurisdictions of the 87 food items of $1.15/wk (N = 2174). The weekly totals of weighted food costs ranged from $180.72/wk (Alaska) to $261.91/wk (FSM), in comparison to $142.37/wk in Portland. These weekly food costs (log transformed) differed significantly between each USAPR jurisdiction (ANOVA $P < .05$) except FSM and Palau, which were the jurisdictions with the highest estimated weekly food costs (Table 2). The costs of the 87 foods at the USAPR level are included in the supplemental materials.

Also shown in Table 2, is the jurisdictional weekly median household income (where available) and the cost of food relative to household income. The shopping basket is more expensive as a percentage of income in American Samoa than in Alaska and Hawai'i. For example, in CNMI, the shopping basket costs 51.6% of weekly per capita income, while 13.5% of weekly per capita income would be required to purchase the TFP equivalent in Alaska. Weekly CFSAT-based food costs are also shown in relationship to Portland, which range from 127% (Alaska) to 184% (FSM).

What We Eat In America

Mean food costs across USAPR jurisdictions were grouped according to the WWEIA categories (Supplemental Table 1). Ranked by median cost in the USAPR, protein foods were the leading contributors to the weekly cost total (28.4%) followed by grains (16%). Fruits and vegetables (11% each) were third and fourth, but combined would be ranked second. Together, protein foods (led by lean ground beef) were significantly greater contributors to weekly cost ($P < .01$) than grains, the next highest cost contributor. Fruit drinks and orange juice were found to commonly be among the most expensive items in the weekly food cost menu for most of American Samoa.

The costs of protein foods in each jurisdiction are shown in Table 3. The variability in costs between jurisdictions is reflected in the differing column heights within a group. For protein foods, American Samoa had the lowest weekly protein food sum ($35.53), while FSM had the highest ($51.56).

Table 2. Food and Average Household Income Values for USAPR Jurisdictions and Portland, Oregon–March 2014*.

Jurisdiction	Towns surveyed (N)	Median food price ($)**	Average weekly (wk) cost of food ($/wk)***	Average weekly costs as percent of Portland (%)	Averageweekly income ($)	Average food cost as a percent of income (%)
Alaska	4	2.50 (2.91)	181.9 (13.2)	127	1344	13.5
American Samoa	3	2.22 (2.75)	198.42 (15.2)	139	496	40
CNMI	6	2.24 (2.63)	213.58 (10.8)	150	414	51.6
FSM	2	2.80 (3.54)	264.37 (26.4)	185	.	.
Guam	6	2.66 (3.17)	236.73 (11.8)	166	1002	23.6
Hawai'i	4	2.66 (3.43)	217.27 (13.2)	152	1183	18.4
Palau	1	2.68 (3.74)	260.13 (26.4)	182	.	.
Marshall Islands	1	2.86 (2.48)	245.32 (26.4)	172	.	.
Portland	1	1.70 (2.46)	142.37 (26.4)	100	1013	14.1

USAPR = US-affiliated Pacific Region, CNMI = Commonwealth of the Northern Mariana Islands, FSM = Federated States of Micronesia
* Income data unavailable for some jurisdictions.
** Median (interquartile range) using Kruskai-Walis ($P < .01$).
*** Means (standard deviation) using ANOVA ($P < .05$). Mean does not include Portland.
Sources. Alaska, Hawai'i, and Portland median household income, 2009-2013 American Community Survey 5-Year estimates, US Census Bureau, US Department of Commerce. America Samoa, CNMI, and Guam median household income, 2010 Census, US Census Bureau, US Department of Commerce [inflation adjusted by the Consumer Price Index For All Urban Consumers (CPI-U) to 2013 dollars)].

Table 3. Foods by What We Eat In America Weighted Protein Categories in Summed Weighted Median Prices based on the Food Cost Survey across USAPR Jurisdictions and Portland, Oregon–March 2014.

	USAPR Jurisdiction								
WWEIA Food	Alaska ($)	American Samoa ($)	CNMI ($)	FSM ($)	Guam ($)	Hawai'i ($)	Portland ($)	Palau ($)	Marshall Islands ($)
Beans, peas, legumes	1.73	1.83	2.07	2.21	1.91	2.78	1.75	1.92	2.44
Chicken, whole pieces	4.31	2.78	4.57	4.85	5.77	4.01	3.19	3.56	4.08
Cold cuts and cured meats	3.43	2.68	2.20	2.14	4.49	3.54	2.40	3.06	2.71
Eggs and omelets	3.45	3.43	4.17	5.90	4.08	4.97	2.98	4.53	4.92
Fish	8.32	4.21	4.16	4.63	5.27	9.80	6.40	5.29	5.02
Ground beef	16.10	11.49	17.04	20.86	19.63	14.82	14.37	22.30	16.86
Pork	5.58	5.74	4.86	6.10	4.70	6.76	4.40	6.30	6.20
Turkey, duck, other poultry	3.82	3.36	3.08	4.88	3.19	3.78	3.33	3.10	4.49

WWEIA = What We Eat In America, USAPR = US-affiliated Pacific Region, CNMI = Commonwealth of the Northern Mariana Islands, FSM = Federated States of Micronesia

Supplemental Table 1. Survey Foods, Weekly Weightings, and Prices Organized by What We Eat In America Categories–March 2014.[a,b]

WWEIA Category	Weekly Weighting Value (lb)	Mean Price ($/lb)[c]	Mean Weighted Price ($/lb/wk)
Beverages			
Fruit drink, refrigerated	7.89	0.73 (0.43)	0.43 (5.63)
Orange juice concentrate	5.18	3.15 (0.97)	0.97 (15.71)
Condiments & Sauces			
Catsup	0.07	1.62 (0.34)	0.34 (0.11)
Lemon juice	0.03	2.25 (0.82)	0.82 (0.07)
Soy sauce	0.14	4.02 (1.28)	1.28 (0.56)
Spaghetti sauce	1.6	1.73 (0.7)	0.7 (2.77)
Tomato sauce	0.49	1.5 (0.41)	0.41 (0.74)
Dairy			
Cheese, cheddar	0.12	6.14 (1.55)	1.55 (0.76)
Cheese, cottage	0.43	4.03 (1.46)	1.46 (1.39)

Cheese, mozzarella	0.06	6.41 (1.6)	1.6 (0.39)
Milk, 1%	17.76	0.86 (0.38)	0.38 (15.01)
33Milk, evaporated	0.25	2.17 (0.28)	0.28 (0.54)
Milk, whole	7.89	0.85 (0.36)	0.36 (6.76)
Fats & Oils			
Margarine	0.93	2.59 (1.2)	1.2 (2.4)
Mayonnaise	0.31	3.05 (0.91)	0.91 (0.94)
Shortening	0.25	2.65 (0.62)	0.62 (0.65)
Vegetable oil	0.49	1.77 (0.44)	0.44 (0.87)
Fruit			
Apples	1.23	1.88 (0.48)	0.48 (2.32)
Bananas	2.71	1.27 (0.35)	0.35 (3.26)
Grapes	1.48	3.32 (0.7)	0.7 (4.91)
Melon	0.99	1.59 (0.32)	0.32 (1.63)
Oranges	4.69	1.63 (0.41)	0.41 (7.63)
Oranges, mandarin	0.8	2.38 (1.4)	1.4 (1.91)
Peaches, canned	1.6	2 (0.54)	0.54 (3.2)
Grains			
Bagels	1.97	4.47 (1.76)	1.76 (8.56)
Bread, French or Italian	0.25	2.78 (1.1)	1.1 (0.7)
Bread, white	1.97	2.09 (0.8)	0.8 (4.12)
Bread, whole wheat	0.99	2.47 (0.69)	0.69 (2.44)
Cereal, Corn Flakes	0.06	4.96 (2.24)	2.24 (0.3)
Cereal, Toasted Oats	0.62	5.56 (2.76)	2.76 (3.43)
Hamburger buns	0.8	5.76 (7.96)	7.96 (4.5)
Macaroni	1.3	1.96 (0.48)	0.48 (2.54)
Noodles	1.11	2.96 (1.14)	1.14 (3.25)
Rice, white	3.08	0.97 (0.17)	0.17 (3)
Rolls, dinner	0.25	7.49 (6.95)	6.95 (1.85)
Spaghetti noodles	0.68	1.83 (0.47)	0.47 (1.24)
Mixed Dishes			
Bread crumbs	0.19	3.06 (1.72)	1.72 (0.57)
Other			
Baking powder	0	4.47 (0.93)	0.93 (0.01)
Baking soda	0.01	1.56 (0.48)	0.48 (0.02)
Black pepper	0	0 (0)	0 (0)
Bouillon, chicken	0.04	12.07 (7.76)	7.76 (0.51)
Chili powder	0.05	15.04 (5.87)	5.87 (0.74)
Chocolate drink powder	0.09	4.61 (1.59)	1.59 (0.43)
Cinnamon*	0	18.11 (6.78)	6.78 (0.09)
Cumin	0	35.84 (18.01)	18.01 (0.11)
Flour, white	1.42	0.8 (0.18)	0.18 (1.14)
Garlic powder	0	13.84 (2.82)	2.82 (0.03)
Gelatin, powdered	0.14	24.45 (13.07)	13.07 (3.46)
Italian herb	0	69.28 (31.57)	31.57 (0.12)
Onion powder	0.01	17.02 (8.1)	8.1 (0.23)
Oregano	0.01	67.1 (30.93)	30.93 (0.73)
Paprika	0.01	21.73 (8.85)	8.85 (0.15)
Salt	0.01	0.75 (0.19)	0.19 (0.01)
Vanilla	0.03	20.76 (17.58)	17.58 (0.64)
Protein			
Beans Garbonzo, canned	0.94	2.12 (1.93)	1.93 (1.98)
Beans, baked, vegetarian, canned	1.54	1.83 (0.49)	0.49 (2.88)
Beans, kidney, canned	0.93	1.53 (0.35)	0.35 (1.39)
Beef, ground, lean	3.89	4.26 (1.03)	1.03 (16.74)
Chicken, fryer	1.79	1.95 (0.68)	0.68 (3.5)
Chicken, thighs	2.71	1.96 (0.77)	0.77 (5.33)
Eggs	1.85	2.26 (0.4)	0.4 (4.19)
Fish, white	1.97	4.37 (2.75)	2.75 (8.63)
Pork, ground	1.42	3.85 (0.97)	0.97 (5.51)
Tuna fish	0.74	4.7 (1.25)	1.25 (3.48)
Turkey ham	0.68	4.42 (2.12)	2.12 (3.18)
Turkey, ground	0.99	3.3 (1.05)	1.05 (3.5)
Snacks & Sweets			
Chocolate chips, semi-sweet	0.12	4.55 (1.17)	1.17 (0.54)
Fudgsicles, ice milk	0.74	3.52 (1.87)	1.87 (2.58)
Popcorn	0.19	4.28 (1.39)	1.39 (0.79)
Sugars			
Jelly, grape	0.49	2.76 (1.05)	1.05 (1.36)
Molasses	0.06	5.56 (0.77)	0.77 (0.34)
Pancake syrup	0.12	2.65 (0.74)	0.74 (0.33)
Sugar, brown	0.06	1.66 (0.43)	0.43 (0.1)
Sugar, powdered	0.19	1.78 (0.36)	0.36 (0.33)
Sugar, white	0.56	0.95 (0.55)	0.55 (0.53)
Vegetables			
Broccoli, frozen	0.37	2.31 (0.69)	0.69 (0.86)
Carrots	0.99	1.28 (0.29)	0.29 (1.26)
Celery	0.31	1.55 (0.43)	0.43 (0.48)
French fries, frozen	0.68	1.74 (0.64)	0.64 (1.16)
Green beans, frozen	1.42	2.51 (1.53)	1.53 (3.56)
Green pepper	0.25	2.98 (1.47)	1.47 (0.73)
Lettuce, leaf	0.56	2.14 (0.61)	0.61 (1.19)
Mushrooms, canned	0.25	4.61 (1.61)	1.61 (1.14)
Onions, yellow	1.23	1.16 (0.31)	0.31 (1.43)
Peas, frozen	0.93	2.19 (1.14)	1.14 (2.03)
Potatoes	10.36	1 (0.35)	0.35 (10.33)
Tomatoes	0.37	1.85 (0.52)	0.52 (0.7)

WWEIA = What We Eat In America. [a] Weekly weightings in pounds (lbs) and prices represent mean and standard deviation (SD). [b] 2Includes Alaska, American Samoa, Commonwealth of Northern Marianas Islands, Guam, Federated States of Micronesia, Hawai'i, Palau, and the Republic of Marshall Islands. [c] Pricing and weighting based on the Community Food Security Assessment Toolkit protocol (Cohen BE. Community food security assessment toolkit. Washington, DC: US Department of Agriculture, Economic Research Service; July 2002).

Discussion

Food prices were compared throughout the USAPR as part of the CHL project following the USDA CFSAT approach. Food prices were weighted to generate an estimate of the weekly cost of food for a family of 4 with school-aged children. Weekly food cost varied throughout the surveyed jurisdictions by a factor of less than 1.5, which was unexpected given the vast geographic range of the USAPR region. However, the variation in weekly food cost as percentage of median household income was considerably greater, ranging from 13.5% in Alaska to 51.6% of median income in CNMI.

The weekly food costs across the USAPR jurisdictions exceed those of Portland in all cases. Pronounced differences in food costs relative to income were observed across jurisdictions. Alaska and Hawai'i had relatively high average household incomes in relation to food costs. For example, food costs as a percentage of income were lower in Alaska, and only slightly higher in Hawai'i, than in Portland. On the other hand, in CNMI, weekly food costs for a family of 4 represented more than half of the median weekly family income (55.5%). This outcome is particularly significant to policy makers when designing food assistance programs. For example, USDA has evaluated the feasibility of extending the SNAP program to CNMI.[23] The food environment and food costs are important considerations in determining changes such as this to food assistance programs in the USAPR.

The largest component of total cost was protein foods when grouped by WWEIA categories. Fruits and vegetables were also important contributors to the total weekly cost, as were non-dairy beverages. Although the source of the foods and wholesale prices were not determined in the present study, the majority of retail foods in Alaska, Hawai'i, Guam, and CNMI come from the US mainland; for instance, a recent survey of stores in Guam revealed about 58% of products came from the US mainland.[24]

Study Limitations

There are a variety of limitations to this study. The CFSAT may not reflect the dietary patterns of the people in the USAPR region well for several reasons. Foods such as bagels and oranges were contributors to the food plan, but less expensive and/or local alternatives may be preferred. Also, bagels were among the missing items in jurisdictions not having large retailers. Furthermore, diets in the USAPR vary across jurisdictions and in American Samoa, in particular, combine elements of local foods with those from the US, Europe, and Japan. Similarly, the WWEIA food categories, which relied on grouping foods, may not be appropriate to diets that significantly differ from those of the US mainland.

The types of stores surveyed varied across jurisdictions, reflective of the local food environments. In Alaska communities, only supermarkets were surveyed, while the survey in American Samoa, CNMI, and FSM was reliant on prices collected from small grocery stores. For some jurisdictions, several different food store types were surveyed. Furthermore, convenience stores were excluded if conventional food stores were available. Selection of food store may bias reported food costs.

The USDA TFP based CFSAT is among many tools used to survey the food environment.[12] The relevance of the TFP has come under criticism in recent years based on consumer preferences and the assumption that households have time available to prepare meals from ingredients.[25-27] In addition, the CFSAT protocol is based on a diet plan published in 1999.[28] Families at all income levels in the US now consume fewer meals prepared at home from ingredients, and purchase more meals outside the home, either fully or partially prepared.[29,30] Changing the foods within the survey may increase local relevance, but those changes would necessarily affect comparability among jurisdictions. Missing foods occurred in smaller communities. Many households in the USAPR rely on food sources such as gardens, roadside stands, farmers markets, and subsistence harvests that may lower food costs, and the desire to buy foods on the CFSAT. This may be particularly true in those jurisdictions where store-purchased food is relatively expensive in comparison to income.

Implications for Practice and Research

The TFP may not reflect diets in the USAPR completely. Yet, this tool serves as a reference for comparison. Further, the TFP is used to determine levels of food assistance for food programs such as the Supplemental Nutrition Assistance Program Education, also known as SNAP-ED, in the region. This study shows the very high food cost in the USAPR, which deserves consideration in determining benefits for food assistance programs. Although food prices are an important part of household economics, lower prices may not result in higher diet quality or reduced obesity rates.[31,32] Furthermore, higher income provides limited protection against low diet quality.[32,33] Nevertheless, in economic analyses, increased price does correspond to reduced sugar-sweetened beverage intake and price increases for certain foods may be a useful tool for disease prevention.[34,35] Beverages were a significant household expense (9% of CFSAT costs) in the current analysis and may constitute a reasonable intervention target. Of great benefit to the region would be research to develop a CFSAT equivalent that uses local food substitutes and a weighting that identifies and factors in local dietary preferences to meet a family's nutritional needs in most economical way possible.

The CHL food cost survey provided a snapshot of food costs across USAPR jurisdictions. A systematic tracking of food costs and documentation of local diets will be important for improved estimation of community food costs in those jurisdictions. It is a first step in understanding regional food costs and food environments.

Conflict of Interest

None of the authors identify a conflict of interest.

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Pulmonary Lymphangioleiomyomatosis: A Case Report and Literature Review

Sakda Sathirareuangchai MD; David Shimizu MD; Koah Robin Vierkoetter MD

Abstract

Pulmonary lymphangioleiomyomatosis (LAM) is a rare lung disease characterized by diffuse cystic changes caused by a destructive proliferation of smooth muscle-like cells or LAM cells. It is a part of the perivascular epithelioid cell family of tumors. LAM may be associated with the genetic disorder tuberous sclerosis complex or may occur sporadically. Individuals affected by LAM are typically females of child-bearing age who present with recurrent spontaneous pneumothorax. The microscopic findings can be subtle and careful examination is needed to identify the neoplastic cells of LAM. Immunohistochemical markers in cases of LAM demonstrate a characteristic co-expression of myogenic and melanocytic markers. We report a case of a 41-year-old woman who presented with multiple episodes of spontaneous pneumothorax and microscopic findings characteristic of LAM.

Keywords

Pulmonary lymphangioleiomyomatosis, spontaneous pneumothorax, tuberous sclerosis

Abbreviations

AML = Angiomyolipoma
BHD = Birt-Hogg-Dubé syndrome
BML = Benign metastasizing leiomyoma
COPD = Chronic obstructive pulmonary disease
CT = Computed tomography
DIP = Diffuse interstitial pneumonia
ER = Estrogen receptor
FDA = US Food and Drug Administration
HP = Hypersensitivity pneumonitis
ILD = Interstitial lung disease
IPF = Idiopathic pulmonary fibrosis
LAM = Lymphangioleiomyomatosis
MiTF = Micropthalmia transcription factor
mTOR = Mechanistic target of rapamycin signaling pathway
PEComatous tumors = Perivascular epithelioid cell family of tumors
PLCH = Pulmonary Langerhans cell histiocytosis
PR = Progesterone receptor
RB-ILD = Respiratory bronchiolitis-associated interstitial lung disease
S-LAM = Sporadic LAM
TSC = Tuberous sclerosis complex
TSC-LAM = TSC-associated LAM

Introduction

Pulmonary lymphangioleiomyomatosis (LAM) is a rare disease characterized by diffuse cystic changes in the lungs resulting from destructive proliferation of smooth muscle-like or LAM cells. LAM was formerly categorized as an interstitial lung disease (ILD) due to its diffuse nature. However, genetic studies later indicated that the process was best considered as a low-grade destructive neoplasm.[1] The neoplastic cells in LAM originate from perivascular epithelioid cells, which make LAM a part of the perivascular epithelioid cell family of tumors (PEComatous tumors), which include angiomyolipoma (AML), clear cell "sugar" tumor of the lungs and extrapulmonary sites, clear cell myomelanocytic tumor of the falciform ligament, and rare clear cell tumors of other anatomic sites.[2] While the true origin of the LAM cell is undetermined, there are 2 plausible hypotheses. The first theory proposes that LAM cells are either of airway or vascular origin. Another model suggests that LAM cells originate from AML in the kidney and are transported to the lungs by means of neoplastic dissemination.[3]

LAM exists in 2 main forms, the first is associated with the genetic disorder tuberous sclerosis complex (TSC-LAM), and the second is sporadic form (S-LAM). Overall, the majority of patients with LAM are sporadic (85%).[2] TSC-LAM is found in 26%-49% of females with TSC[4,5] and 10% of males with TSC,[5] while S-LAM occurs primarily in women with a single exceptional case report of S-LAM in a male patient.[6] Both TSC-LAM and S-LAM are associated with a mutation in either the *TSC1* or *TSC2* gene, causing a loss of function in the corresponding gene products, namely hamartin (*TSC1*) and tuberin (*TSC2*).[7]

We report a case of a middle-aged woman who presented with recurrent spontaneous pneumothorax. The microscopic findings are typical for pulmonary LAM.

Case Report

Clinical History

The patient is a 41-year-old woman with a medical history of hypertension and dyslipidemia. She presented to the emergency department at another institution with sudden shortness of breath and left sided pleuritic chest pain. The diagnosis of left pneumothorax was made and a chest tube placed. Prior to this admission, she experienced multiple episodes of spontaneous pneumothorax over the past 17 years, which resolved without intervention. She reported smoking tobacco, less than 2 cigarettes per day for the past 21 years. Computed tomography (CT) scan of the chest revealed multiple, thin-walled cysts in both lungs of variable dimension. As the pneumothorax persisted despite chest tube placement for 1 week, she was transferred to our institution for surgical management.

The patient underwent left parietal pleurectomy and doxycycline pleurodesis. Given the clinical suspicion for ILD, wedge resection biopsy of the lingual and left lower lobes was performed. Intraoperatively, diffuse cysts and blebs were described in the upper, middle, and lower lobes.

Pathology

The histologic sections of the pulmonary wedge resection exhibited numerous cysts and bleb formations corresponding to the intraoperative findings. There were multiple foci of smooth muscle-like, spindle cell proliferations (Figure 1). These foci were located at the periphery of the cysts and around bronchioles (Figure 2). The neoplastic cells demonstrated a distinct morphology, similar to that of smooth muscle cells of the airway but more corpulent with larger nuclei and higher nuclear to cytoplasmic ratios (Figure 3). There was no significant atypia or increased mitotic activity. Chronic inflammation and pleural fibrosis were also noted. Immunohistochemical staining revealed that the neoplastic cells were positive for HMB-45 and caldesmon (Figure 4). The overall morphologic and immunophenotypic features supported the diagnosis of pulmonary LAM.

Progression

During postoperative period, the chest tube was removed and the patient recovered appropriately. She was discharged without noted postoperative complications. The patient was seen by her pulmonologist 6 months after the operation. Her clinical status was stable. She reported no shortness of breath or chest tightness. Based on the LAM diagnosis, she was started on sirolimus therapy with suggested follow up at 6-month intervals.

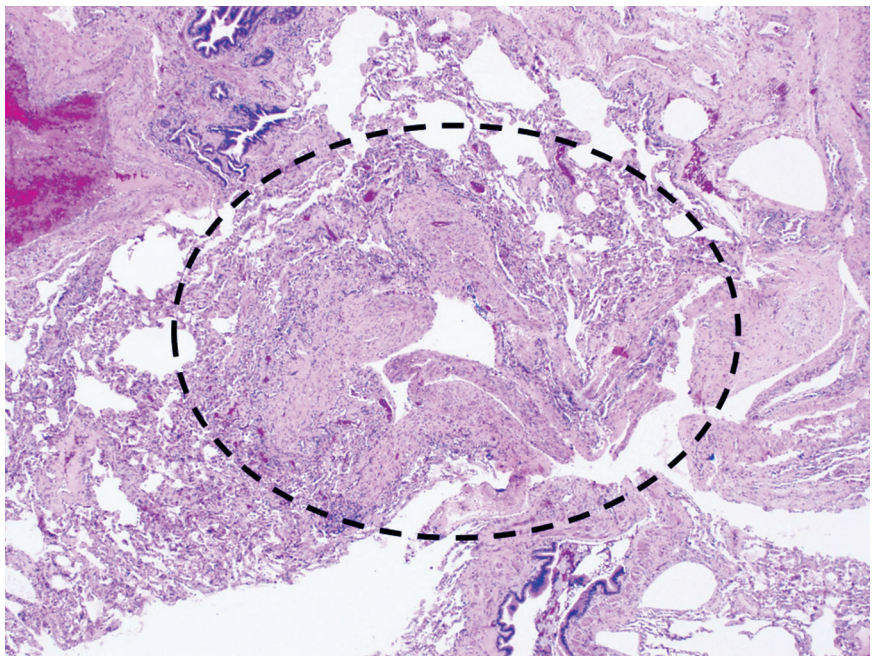

Figure 1. Low power view of the lung shows a nodule of lymphangioleiomyomatosis (dotted circle). The nodule is composed of smooth muscle-like neoplastic cells (hematoxylin-eosin, original magnification 40x).

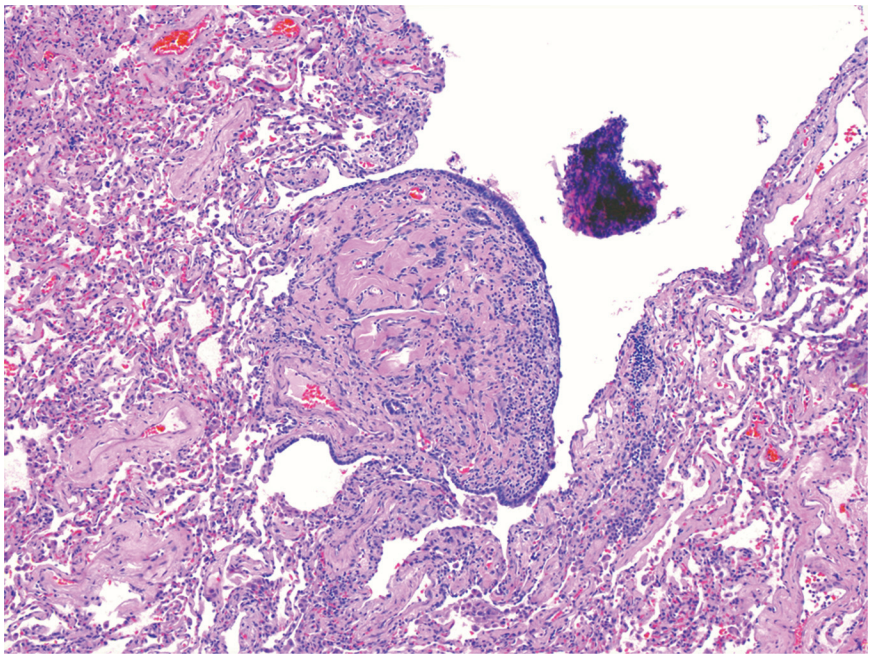

Figure 2. Nodule of lymphangioleiomyomatosis located at the periphery of a cystic lung lesion. An associated chronic inflammatory cell infiltrate is present (hematoxylin-eosin, original magnification 100x).

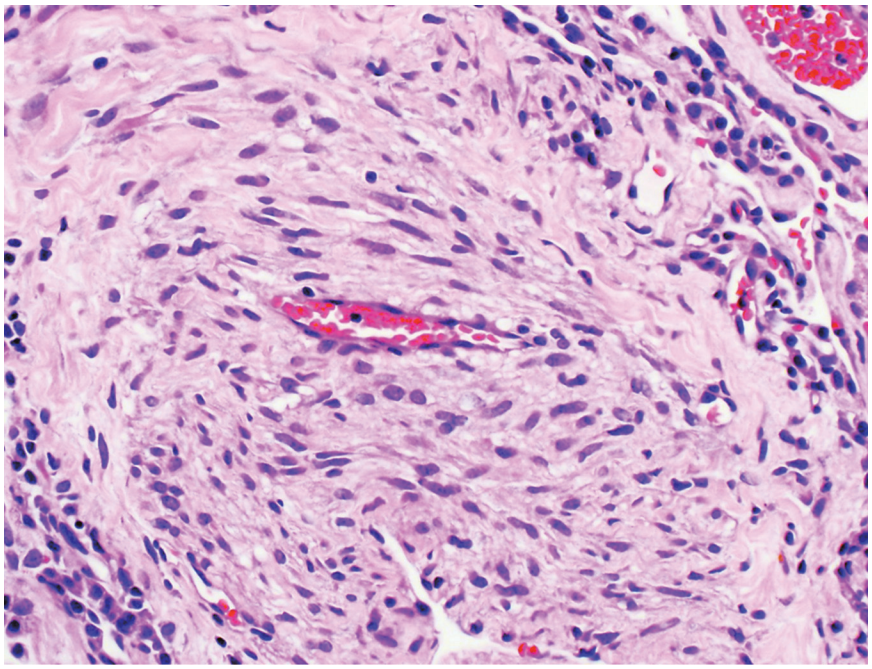

Figure 3. High power view of a lymphangioleiomyomatosis nodule encasing a vessel. The neoplastic cells are spindle-shaped to epithelioid with brightly eosinophilic cytoplasm and mildly pleomorphic nuclei with fine chromatin. Chronic inflammatory cells are seen in the adjacent lung parenchyma (hematoxylin-eosin, original magnification 400x).

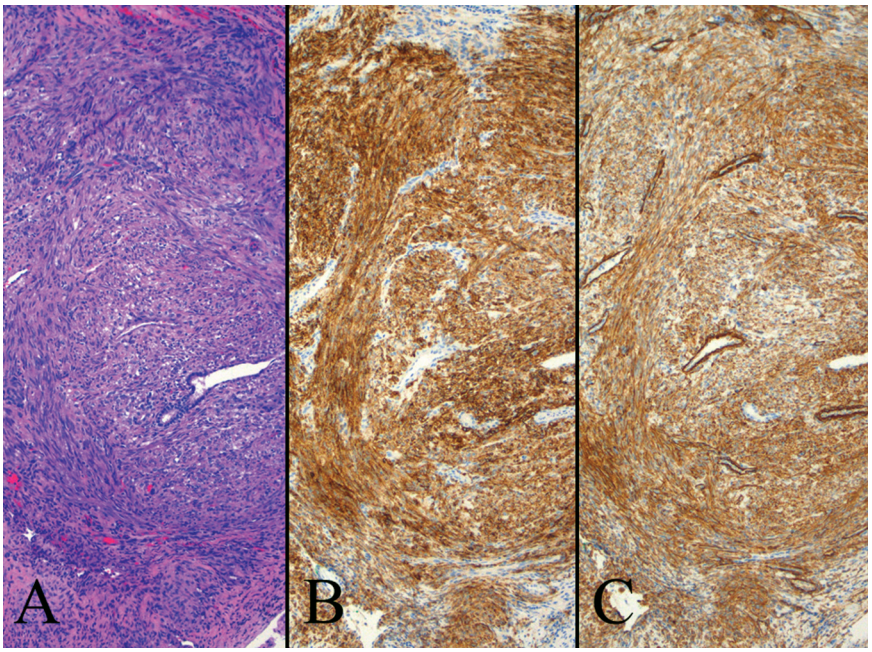

Figure 4. Immunohistochemical studies reveal the neoplastic cells are positive for HMB45 (figure 4B) and caldesmon (figure 4C). In figure 4C, caldesmon also highlights entrapped small airways (A. hematoxylin-eosin, B. HMB45, C. caldesmon, original magnification 100x).

Discussion

Patients with LAM are typically females of child-bearing age, with a mean age of 35 years.[7] The most common clinical presentation is dyspnea on exertion (>70%).[7] Recurrent pneumothorax is also a common presentation, as seen in the current case. Pneumothorax is the first presentation in 40% of patients and will occur in 66% of patients over the course of the disease.[8] Other less common presentations include chest pain, cough, hemoptysis, wheezing, chylothorax, and chylous ascites.[9] Apart from pneumothorax, chest X-ray may be unremarkable in early stages of the disease. In later stages, interstitial reticular opacities can be observed on chest X-ray, with predominant involvement of the lower lung zones.[9] CT scan is more sensitive and demonstrates the characteristic finding of numerous 2-5-mm thin-walled cysts throughout the lungs bilaterally.[9] In severe cases, cysts range from 6-12 mm in size and replace nearly all of the normal lung parenchyma.

Lungs involved by LAM have a cystic, honeycomb appearance, with cysts uniformly distributed throughout the lung parenchyma. Microscopic examination reveals a proliferation of plump spindle-shaped cells with pale eosinophilic cytoplasm. The architectural pattern is variable, with growth in nests, clusters, or as nodules, as seen in the present case. The neoplastic cells in LAM are broadly classified as spindle-shaped or epithelioid.[2] The spindle-shaped cells are usually located in the central regions of the nodules, whereas epithelioid cells exist in the periphery. The tumor cell nuclei are oval to cigar shaped, with fine or vesicular chromatin. Mitotic figures are rare. LAM cells are generally found at the edges of the cysts and along the alveolar walls, pulmonary blood vessels, lymphatics, and bronchioles. Some cases are subtle, necessitating a concerted effort to definitively identify LAM cells. The subtle changes in early stages of the disease can lead to misinterpretation as emphysema or even normal lung tissue.[2] Pneumocyte type 2 hyperplasia or micronodular pneumocyte hyperplasia can be seen, which may be particularly evident in cases of TSC-LAM.[10]

Immunohistochemical analysis is essential to definitively identify the neoplastic cells of LAM and distinguish LAM cells from non-neoplastic smooth muscle cells. While LAM cells consistently stain for myogenic markers such as smooth muscle actin and desmin, the characteristic immunophenotype is a co-expression of smooth muscle and melanocytic markers, including HMB-45, melan-A, and micropthalmia transcription factor (MiTF). This pattern of co-expression is also seen in other tumors of the PEComatous family. Currently, staining with HMB-45 is considered the gold standard for the identification of LAM cells.[11] However, as HMB-45 expression may be focal, the specimen should be sampled thoroughly for microscopic examination and subsequent immunohistochemical analysis. Recently, beta-catenin has been identified as another potential marker for LAM. One study shows that beta-catenin has higher immunoreactivity to LAM cell than HMB-45.[12]

The differential diagnosis includes other ILDs that present with cystic changes. Patients with chronic obstructive pulmonary disease (COPD) or emphysema may also present with recurrent pneumothorax and multiple lung cysts on imaging. The pathologist should ensure that LAM cells are not present in such cases. Smoking related-ILDs should also be considered, including pulmonary Langerhans cell histiocytosis (PLCH), diffuse interstitial pneumonia (DIP), and respiratory bronchiolitis-associated interstitial lung disease (RB-ILD).[13] Other ILDs may exhibit a cystic component secondary to a dominant disease pattern, as may be seen in idiopathic pulmonary fibrosis (IPF), hypersensitivity pneumonitis (HP), and sarcoidosis.[13] Certain infections also result in diffuse cystic changes in the lungs. A minority of individuals with *Pneumocystis jiroveci* infection (10%-34%) present with multiple lung cysts, referred to as pneumatoceles.[14] Other microorganisms that can cause pneumatoceles include *Staphylococcus* species, *Coccidioides* species, and parasitic infection caused by the lung fluke, *Paragonimus westermani*.[13] Birt-Hogg-Dubé (BHD) syndrome may also mimic pulmonary LAM, with a similar clinical presentation (young female with recurrent pneumothorax); however, the cysts in BHD are surrounded by normal lung parenchyma without evidence of a proliferative neoplastic cell population or significant inflammation.[15]

Benign metastasizing leiomyoma (BML) is another neoplastic disease with clinical and pathologic features that overlap with LAM. Clinically, both processes affect middle-aged females and present with variable respiratory signs and symptoms. Histologically, LAM and BML are similarly comprised of low-grade spindle cell proliferations. However, the smooth muscle cells in BML usually forms small nodules with entrapped pnuemocytes, whereas the LAM cells are located in the expanded interstitium. The imaging study in BML typically shows multiple nodular infiltrates rather than the cysts expected in LAM, cystic changes in a case of BML have been described.[16] In addition, estrogen receptor (ER) and progesterone receptor (PR) are positive in both entities.[17] As such, melanocytic inmmunohistochemical markers, such as HMB-45 remain important in the pathologic distinction between BML and LAM.

The United Kingdom's national LAM database showed that 55% of patients developed Medical Research Council grade 3 dyspnea (breathlessness while walking on level ground) at 10 years after the onset of symptoms, while 10% were housebound due to dyspnea.[18] Survival rates at 5 and 10 years from the time of lung biopsy are 85.1% and 71.1%, respectively.[19] The higher percentage of lung tissue involved by cystic changes and the infiltration of LAM cells at the time of biopsy negatively impact survival.[19] Cigarette smoking is also a significant risk factor in disease progression.[18] Overall, TSC-LAM tends to demonstrate a milder course of disease progression compared to S-LAM.[8]

Since the neoplastic cells in LAM commonly express ER and PR, hormonal manipulation was historically considered a mainstay of treatment. There are studies demonstrating reductions in mortality in LAM cases treated with hormonal therapy.[20] However, randomized controlled trials evaluating the utility of hormonal agents in LAM are lacking.[8] A quarter of patients with LAM respond to inhaled bronchodilators and thus the agents are often administered in patients with airflow obstruction.[8]

Both TSC-LAM and S-LAM are associated with either *TSC1* or *TSC2* mutations, which cause continuous activation of the mechanistic target of rapamycin (mTOR) signaling pathway. The mTOR pathway activation leads to increased protein translation and proliferation, with reduced autophagy.[21] This underlying mechanism of tumorigenesis prompted a clinical trial of the mTOR inhibitor, sirolimus, in the treatment of LAM. Sirolimus has been shown to improve lung function and quality of life in people with LAM compared to placebo.[22] Accordingly, in 2015, the United States Food and Drug Administration (FDA) approved sirolimus (Rapamune®) for the treatment of LAM.[23] Lung transplantation is also an accepted therapy for end-stage LAM.[24] LAM patients who receive a lung transplant demonstrate superior results compared to patients transplanted for other indications, with rare instances of recurrence.[8]

Conclusion

Pulmonary LAM is a rare lung neoplastic process with microscopic findings that are often subtle. When faced with recurrent pneumothorax in a middle-aged woman, LAM should be considered in the differential diagnosis. The characteristic co-expression of myogenic and melanocytic immunohistochemical markers is a useful diagnostic feature. Since FDA-approved therapy is available, prompt diagnosis is crucial.

Conflict of Interest

None of the authors identify any conflict of interest.

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Hawai'i's Alzheimer's Disease Initiative: Reflections on and Future Directions for Building a Dementia-Capable Health System

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Introduction

Dementia, an umbrella term for Alzheimer's disease and related dementias, presents a challenge to health and long-term care systems. In Hawai'i, there are an estimated 29,000 individuals with Alzheimer's disease, and this number will rise to 35,000 by 2025 with a significant proportion of the population undiagnosed (60%-80%).[1] Dementia is characterized by a gradual loss of brain function that becomes severe enough to affect daily life and signals the critical need for early detection and better support for patients and families. However, individuals rarely receive cognitive testing in primary care settings, which is recommended best practice. Often families do not bring memory concerns to the attention of providers as they attribute the memory loss to normal aging. Yet early diagnosis is key to early interventions and planning for care and supportive service needs.[1] As the disease progresses, families require coordinated long-term services and supports (LTSS) and advance care planning, but they often encounter a fragmented health and long-term care system in Hawai'i as in the rest of the United States.[2,3]

Federal directives push states to be "dementia capable" by addressing the needs of people with dementia and their caregivers through a person-centered and coordinated system of care. Specifically, dementia capability is defined as having professionals skilled in identifying individuals with possible dementia, working effectively with individuals and caregivers, understanding service needs, and referring to agencies able to provide such services.[4] In 2013, the Hawai'i's State Executive Office on Aging (EOA) published its State Plan on Alzheimer's Disease and Related Dementias and identified several critical goals and strategies toward becoming dementia capable, however, the EOA lacked the resources for implementation.[5]

Federal Administration for Community Living (ACL) funding given to the University of Hawai'i Center on Aging from 2015-2019 funded the Hawai'i Alzheimer's Disease Initiative (HADI) and provided critical resources to improve dementia capability in Hawai'i. HADI's main goal was to progress toward dementia capability through several objectives: (1) promote early detection of dementia, (2) provide improved coordinated services for people with dementia and their families, and (3) support dementia caregivers by providing needed skills and education. The purpose of this column is to describe HADI's efforts and accomplishments, highlight remaining gaps, and discuss next steps in fully realizing dementia capability statewide.

1. Promoting Dementia Capability and Early Detection

HADI's first key approach to promoting dementia capability in the state was through training Hawai'i's health care providers, including primary care providers, other allied health professionals, paraprofessionals, and family caregivers statewide. The core concepts covered by the training included: (1) basic dementia capability, specifically distinctions between normal aging and dementia, treatments, and communication strategies; (2) the use of the AD8 Dementia Screening Interview (AD8) and Mini-Cog screening tools[6,7] to promote early detection; and (3) special topics including non-pharmacological strategies to manage behavioral challenges and end-of-life care. To accomplish this, HADI coordinated in-person and virtual trainings in partnership with the John A. Burns School of Medicine, Department of Geriatric Medicine, Geriatric Workforce Enhancement Program, and Kōkua Mau, a Hawai'i non–profit organization which focuses on advance care planning, hospice, and palliative care.

To promote early detection, HADI trained health care providers on the use of the Mini-Cog and AD8 as reliable best practice screening tools.[6,7] The Mini-Cog is a brief cognitive screen that includes a clock drawing and three-word recall. The AD8 is an eight-question screening tool that can be administered over the phone or in person to the person with dementia or caregiver. During these trainings, professionals and paraprofessionals practiced administering these tools and HADI recommended protocols to integrate these tools into daily work. In total, 9166 individuals attended 206 trainings and public presentations. The

trainings were endorsed by non-profit organizations and health system leadership. While we did not specifically evaluate the degree to which the knowledge gained continues to be applied in practice and the sustainability of any system changes, evaluations administered post-training indicated that most trainees (86%) believed that the information was useful and will be applied in their professional practice.

2. Coordinated Care for Persons with Dementia

In addition to training, HADI created new models of care coordination to help families better navigate the health and long-term care system, including: (1) an interdisciplinary "memory clinic" model, and (2) memory care navigation.

Memory Clinic

The first memory clinic in the state was created in 2010 at Kōkua Kalihi Valley Comprehensive Family Services, a federally qualified health center (FQHC) based on the Patient-Centered Medical Home model.[8] HADI replicated this model in 3 additional FQHCs at Kalihi-Palama Health Center, West Hawai'i Community Health Center, and Moloka'i Community Health Center. To obtain buy-in from the FQHCs, HADI partnered with the Hawai'i Primary Care Association to present the memory clinic model during regular meetings of its FQHC membership as well as met individually with FQHC leadership. The goal of the memory clinic is to offer a comprehensive geriatric assessment, cognitive testing, behavioral health services, social services, advance care planning, and brain health and fitness services. The memory clinic is held once a month and persons with dementia and their caregivers are seen by an interdisciplinary team of providers (primary care provider, behavioral health specialist, social worker, care coordinator, and nutritionist) in a group visit setting. The model is financially sustainable because these providers bill the patient's health insurance for reimbursement of services. There is a huddle at the beginning and end of the memory clinic to discuss cases and ensure coordinated care.

Three newly established memory clinics served 141 patients and family caregivers over the course of the HADI grant. The following outcomes have been reported: patients' health and social issues that were identified during the clinic (including caregiver education and improved health literacy) were addressed in 94% of cases and referrals to LTSS were accepted in 72% of cases. The 3 FQHCs provided care to medically underserved patients, but to serve truly the state needs, the memory clinic model requires expansion to other areas and other types of health and long-term care organizations across the islands. Additional planning and resources will be needed for expansion. The most significant challenge HADI faced in creating the 3 new memory clinics was sustainability, as both rurally located memory clinics, in Kona and Moloka'i, experienced staff turnover and required re-training.

Memory Care Navigation

HADI created a memory care navigator (MCN) model, based on collaboration with expert advisors from the Barclay Group, LLC, nationally-recognized consultants in the field. MCNs are trained to work with people with dementia and their caregivers using a culturally-appropriate approach, educating families about dementia and connecting them to LTSS in the community. The initial training in 2016 was conducted with 117 nurses, social workers, and volunteers from non-profit organizations, health plans, and government agencies. Committed champions to the MCN model include a statewide friendly visitor program (Project Dana), the Hawai'i State Public Health Nurses (PHNs), and case management staff at Lanakila Multipurpose Senior Center (LMPSC) who continue to provide memory care navigation. To date, 147 clients received memory care navigation (average 3.6 visits per client). Navigators reported that the identified health and social challenges noted by the family caregivers and people with memory loss were addressed in 49% of cases, and clients and family caregivers utilized LTSS services in 68% of cases. The impact of this MCN model was driven by strong non-profit and health care organization leadership, which prioritized the need to better assist their clients with memory loss and reinforced the implementation of the memory care navigation model.

3. Support for Caregivers

In 2017, about 157,000 family caregivers in Hawai'i provided an estimated 131 million hours of care to an adult with limitations in daily activities at an estimated economic value of $2.1 billion.[9] Caregivers were an important target of HADI's efforts, recognizing the significant role that informal family caregivers play in dementia care. Often, the most challenging tasks in caring for individuals with dementia involve managing challenging behaviors, including wandering and agitation, which can occur during advanced stages.

Savvy Caregiver

To improve the ability of caregivers to address behavioral challenges, HADI adopted the evidence-based Savvy Caregiver program. The 6-week, in-person, group psychoeducational program provides dementia caregivers with the knowledge, skills, and attitudes needed to carry out their role as a caregiver. HADI trained 93 caregivers over 5 sessions at different locations on `Oahu and at the 6-week follow-up, findings indicated that participants had an improved caregiver reaction to caregiver recipient behavior ($P<.01$), and decreased depression ($P<.01$). Further reach to more dementia caregivers was limited by availability and capacity of the 2 trained facilitators, who taught dementia caregivers practical skills as well as led them in discussion and problem-solving activities. A train-the-trainer approach to expand the availability of this program statewide is needed.

Positive Approaches to Care

Additional caregiver education was provided through Positive Approach to Care (PAC) trainings, a nationally recognized training developed by an occupational therapist and delivered via in-person, group sessions by a local certified trainer.[10] The content focused on making positive connections, helping caregivers see more than just loss, addressing challenging behaviors, assisting with feeding and dining tasks, and preparing for the end of life. Both Savvy Caregiver and PAC focus on providing family caregivers with the practical knowledge needed to keep their loved one with dementia at home and maintain their quality of life.

Impact

Over the 4 years of federal funding and implementation, HADI successfully included a range of partners in the aging network, including the Executive Office on Aging, University of Hawai‘i Department of Geriatric Medicine, Alzheimer's Association Aloha Chapter, Hawai‘i Department of Health Developmental Disabilities Division and Public Health Nursing branch, Project Dana, Kōkua Mau, and Catholic Charities. These partnerships were critical in providing knowledge and skills to health care professionals, state agencies, and community organizations on the concept of dementia capability and the vision to create a dementia-capable Hawai‘i.

These partnerships were also important in building and implementing new models of care, including the memory clinic and MCN. In order to build interest and collaboration in interdisciplinary efforts, understanding the motivations of different providers was important. In particular, FQHCs are motivated in primary care and behavioral health integration as many are recipients of Substance Abuse and Mental Health Services Administration (SAMHSA) funding which advocates for integrated care models.[11] Buy-in from leadership and management at each FHQC, with support from Hawai‘i Primary Care Association, was also a critical component. These leaders championed HADI's work and were key in ensuring that staff were dementia capable and both the memory clinic and memory care navigation models were sustained. Connections and collaborations with non-profit service providers were also important to reaching and recruiting family caregivers. These partners were supportive and embraced evidence-based and best practice caregiver support programs, but lacked the resources and staffing to implement these programs on their own.

Remaining Gaps

HADI has made significant strides in strengthening the health care workforce and improving supports and services for families with dementia. But there are remaining gaps. Further expansion and scaling of the memory clinic and MCN models are needed, as well as connections to the larger state agencies and hospital systems. On an individual level, cultural tailoring of messages related to the early detection of dementia and risk reduction is needed to dispel myths and stigma around mental illness and caregiving within Asian American and Pacific Islander populations. Although the MCN training included discussion of diverse populations, and Savvy Caregiver was culturally adapted to Hawai‘i's diverse communities, additional work is needed. In particular, lessons learned from working with Pacific Islander populations indicate that messages about the importance of early detection are difficult to communicate because regardless of diagnosis or stage of the disease, the family tend to consider only informal sources of care rather than formal care and are reluctant to reach out for help.[12,13] An additional area of focus includes people with dementia who are living alone, a challenging population to reach and serve. Partnerships with community service providers, including community health workers, who are trusted by and can reach this population are needed. Finally, people with dementia need to engage in end-of-life and long-term-care planning early, while they retain the capacity to make decisions.

Future Steps

Efforts to strengthen the systems of care for people with dementia and their families are continuing (See Table 1). Hawai‘i is fortunate to have received additional federal ACL funding to strengthen dementia care. In particular, the Executive Office on Aging is focusing on ensuring dementia capability among state agencies that are part of the No Wrong Door network.[14] State agencies are being trained in dementia capability, so that when an individual with memory loss or dementia comes through their agency "door," staff are knowledgeable about the basics of dementia and available services. Staff will then make appropriate referrals to community-based memory care resources. In addition, this grant will address silos between the health and long-term care systems by streamlining care transitions among persons with dementia from hospital to home. Additional federal funding from ACL was also provided to Catholic Charities, which will provide additional outreach to culturally diverse faith-based communities and specifically target individuals living alone with dementia. Commitment to these issues continue to be strong, guided by an Alzheimer's Disease and Related Dementias (ADRD) state plan, which is in the process of being updated. Through these grants and planning efforts, Hawai‘i is responding to its rapidly growing older population and building the services and supports critically needed for families who have a loved one with dementia.

Table 1. HADI Goals, Activities, Gaps, and Next Steps			
Goals	**Activities**	**Gaps**	**Next Steps**
• Promote early detection • Coordinated dementia care services • Support dementia caregivers	• Training to professionals and family caregivers • Memory clinic • Memory care navigation • Savvy Caregiver • Positive Approach to Care training	• Scaling of models statewide • Cultural tailoring of programs and services • Reaching those who live alone with dementia • Promote end-of-life planning	• Strengthen further connections between state agencies and community LTSS • Address silos between health and long-term care systems • Update Hawai'i ADRD state plan

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Panic or Panacea, Changing the Pharmacist's Role in Pandemic COVID-19

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Clinical pharmacy has evolved over the last 40 years, especially in the hospitals and ambulatory clinics where clinical pharmacists round out the interprofessional care team with physicians, nurses, social work, case managers and other vital members of the health care team. Since the 1970s, pharmacists' training has become more clinical, meaning that our training emphasizes use of drug knowledge applied to specific patient care issues, linking laboratory and physical findings to make best medication choices, managing drug interactions, mitigating adverse drug reactions, and bridging patient care provider gaps. Our expertise, everything and anything about drugs, includes how they behave in the body and how drugs can be best utilized to treat illness and maintain health.

The public's most familiar view of the pharmacist, usually in the community retail pharmacy setting, places the pharmacist 'behind the counter' in a role that dispenses the medications pursuant to a prescription from a prescriber. The pharmacist is touted as being the most accessible of health professionals. This traditional function of the profession stems from a strong foundation built as chemists and purveyors of apothecaries. However, with recent challenges that include a triad of declining insurance reimbursements for the medication dispensing function; juxtaposed against skyrocketing drug costs and drug shortages; and rapidly evolving technology where prescriptions are automatically filled and then mailed to the patient, this traditional function of the community pharmacist leaves at least this part of the profession in a panic. No doubt, pharmacists' partner with prescribers to address the multitude of insurance issues that accompany a supposedly simple writing of a prescription such as gaining prior authorizations, and ensure all drug interactions are handled appropriately. Legislation has helped the state's progress with more advanced pharmacist practice acts. The community pharmacist has increased their clinical roles for direct patient care through collaborative agreements with physicians and nurse practitioners. Their role as immunizers, advocates for women's health, and point of care testing have helped to transition the pharmacist to in front of the counter.

Enter the COVID-19 pandemic. To spur business but to also assure that patients continue to take, especially, their chronic medications, pharmacies have stepped up by providing mail and home delivery services of refill prescriptions. A service that our profession has fought against because without the patient picking up the prescription, then with it, also goes the pharmacist's opportunity to interact with patients and offer any needed counseling and education. Pharmacies and pharmacists are listed as essential in this crisis. From the public's view, the question may arise, besides providing the medications themselves, what is it then that makes the pharmacist essential? When the COVID-19 pandemic resolves, will patients return to the pharmacy to pick up their medications that were conveniently delivered during the pandemic?

Many businesses from takeout food service to educational programs are probably asking these same questions. Health care in general, will be recalibrating the necessity for face to face interactions that take travel time, missed work hours, physical space and costly human resources. Due to the limitation of access to clinics and hospitals during this pandemic, an exponential number of primary care providers have moved to distance technology or telemedicine in order to provide care. Unlike physicians or nurse practitioners, professions with strengths in diagnosis and procedures, the pharmacist's expertise in medication management therapy does not necessarily need to be physically face to face. Since many clinical pharmacists in the ambulatory care clinics partner with primary care providers to help manage patients with medication centric chronic diseases such as diabetes and hypertension, this function could be performed more than adequately via telemedicine. In fact, there are many activities that a pharmacist can move to in the telemedicine world in order to help with health issues.

Even prior to COVID-19, a number of pharmacist services have used telehealth as a means to provide various clinical pharmacy services. Some examples include CPESN, which stands for Community Pharmacy Enhanced Services Network.[1] CPESN

provides an opportunity to patients to access a pharmacy network that supports the enhanced pharmacy service needs of patients. Some services are offered via phone, distance or in person. Patients who benefit might be on a long list of medications that need to be whittled down, or have a drug expert make recommendations to providers on medication selections. RX Live® is a telehealth service that links pharmacists to patients to help them with safe and effective medication regimens.[2] Arine® is a company that provides medication management services through data driven information in order to achieve better patient health.[3] More and more, pharmacists are being sourced as translators of using managed care big data in providing cost effective medication management services.

The Daniel K. Inouye College of Pharmacy has a successful model of embedding a faculty clinical pharmacist in family medicine physician practices. This model, known throughout many academic medicine patient clinics, the Kaiser HMO system, and the Veterans Administration, is known to decrease overall cost of patient care by reducing drug complications, adverse reactions, improve patient's medication adherence, and improve disease management outcomes. Pharmacists provide valuable and cost saving interventions especially in medication centric diseases.

However, there remains one problem. Pharmacists are not approved as providers in the Centers for Medicare and Medicaid Services (CMS).[4] The simplest way to explain the issue is with this comparison. A physician who spends 15 minutes treating a patient will bill the insurance company, Medicare or Medicaid, for that time and expertise and receive reimbursement. If a pharmacist spends 60 minutes with a patient teaching the patient about how to best take their heart medication, how to best manage side effects, and check on any interactions with other drugs or disease states, the pharmacist is not allowed to bill CMS or insurance companies for that time and expertise. In order for clinical pharmacists to directly bill and receive 3rd party insurance reimbursement for their services, they would need to be recognized by CMS as providers.

Pharmacist salaries are expensive and coupled without a mechanism to bill insurance, this then leaves the profession trying to make the case of their value. Numerous studies show that although a pharmacist caring for a patient with chronic diseases may utilize a higher cost medication, the pharmacist demonstrates better adherence, a safer side effect profile, avoid readmission or costly disease progression.[5-7] This then leads to a lower cost of a patient's overall care from a team-based model where not only one intervention but rather a team of interprofessional interventions provides value. This is the model utilized by the Kaiser HMO and VA systems, where the pharmacists' salaries are incurred in the operational cost of the clinic with overall outcome value based on the total care of the patient.

The transformation of the health care payment model from fee for service to value based care, is based upon providers achieving quality measures specific to disease states. Whether in a model of CMS and 3rd party insurance billing reimbursement or pharmacist salary integration into operations overhead, the point is that utilizing a dedicated pharmacist's skill, may help the provider with a means to add value and efficiency and allow them to concentrate on more complex patient cases, procedures and diagnostics.

Conclusion

The COVID-19 outbreak has forced the move to telemedicine to expand accessibility of providers to patients. This detour has been especially helpful for a state facing a massive shortage of primary care providers. For the pharmacy profession though, the move towards home delivery medication services, implies a tremendous loss for a pharmacist's face to face interactions with patients. Here is the silver lining for pharmacists in this pandemic. Telemedicine could provide the panacea for the profession's loss of physical patient contact and link their expertise either before or after a telemedicine visit. How about when the provider is finished with a patient on the telemedicine line, now says, "Here's the clinical pharmacist to go over your medications"? This interprofessional partnership would help providers to achieve their quality measures, assist insurance companies meet their star ratings, and offer comprehensive team services for our beloved patients.

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