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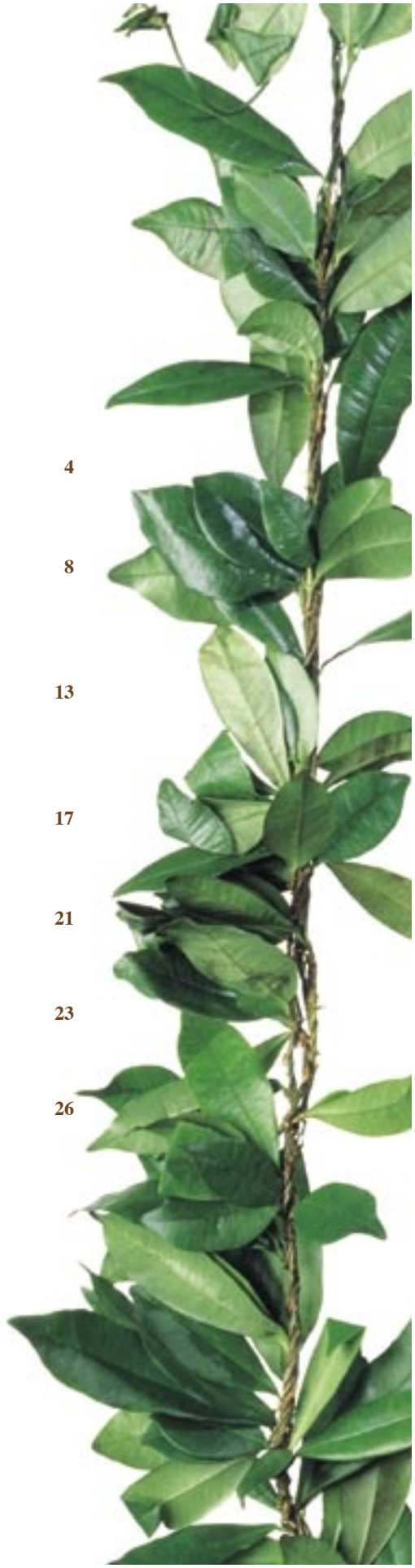

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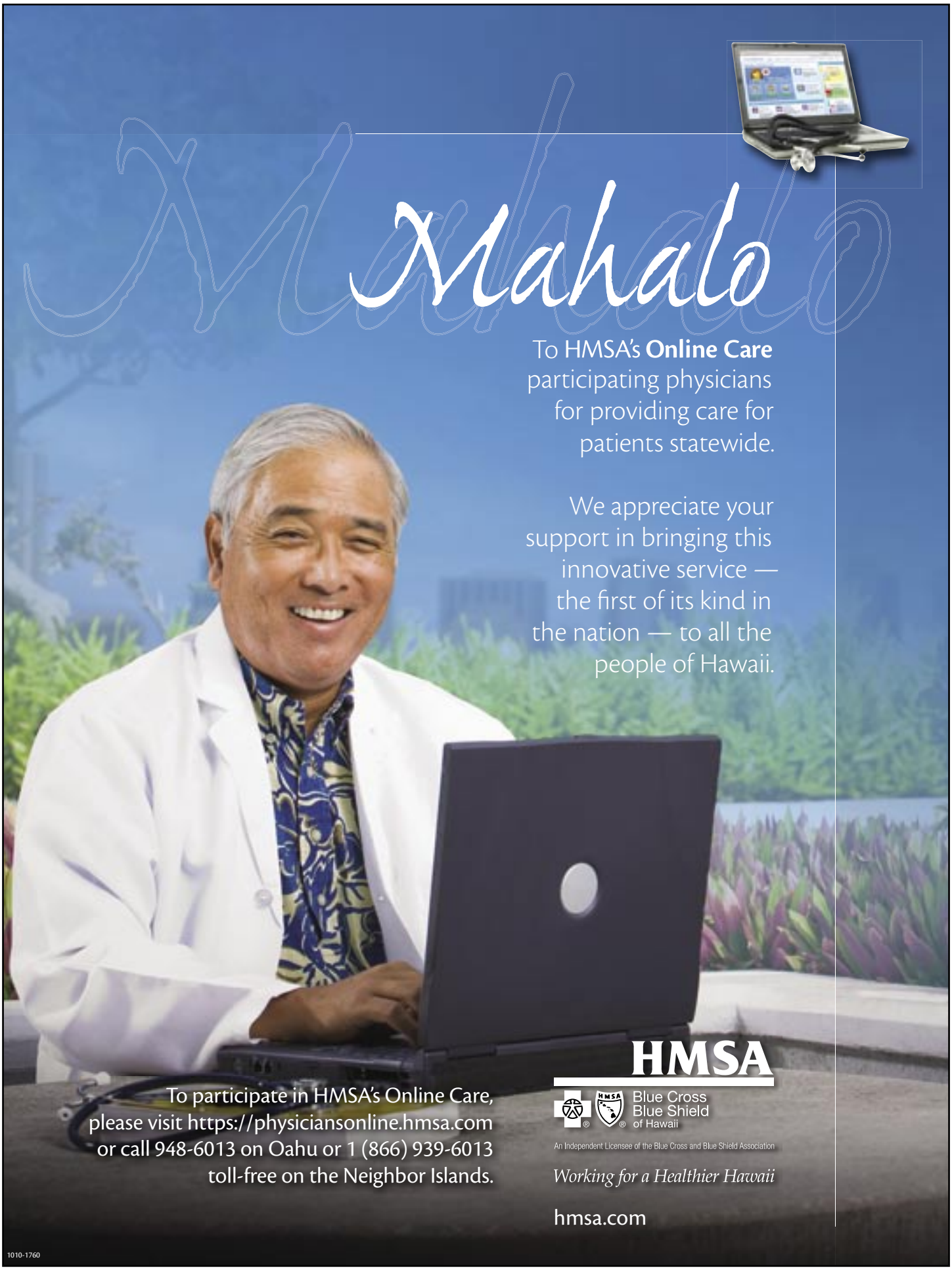
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Improving Medical Student Toxicology Knowledge and Self-Confidence using Mannequin Simulation

Brunhild M. Halm MD, PhD; Meta T. Lee MD, MSEd; and Adrian A. Franke PhD

Abstract

Background: Learning medicine without placing patients at increased risk of complications is of utmost importance in the medical profession. High-fidelity patient simulators can potentially achieve this and are therefore increasingly used in the training of medical students. Preclinical medical students have minimal exposure to clinical rotations and commonly feel anxious and apprehensive when starting their clinical years.

Objectives: The objective of this pilot study was to determine if toxicology knowledge and confidence of preclinical second-year medical students could be augmented with simulation training.

Methods: We designed and implemented a simulation exercise for second-year medical students to enhance learning of Basic Life Support, toxidromes, and management of a semiconscious overdose victim. Groups of 5-6 students were tasked to identify abnormal findings, order tests, and initiate treatment on a mannequin. Faculty observers provided video-assisted feedback immediately afterwards. On-line pre- and posttests were completed in the simulation lab before and after the exercise.

Results: This simulation exercise, completed by 52 students, increased test scores on average from 60% to 71% compared to a pre-test. Among the topics tested, students scored worst in identifying normal/abnormal vital signs. Mean confidence increased from 2.0 to 2.6 using a 5-point Likert scale (1-very low to 5-very high).

Conclusion: This study suggests that simulation exercises for second-year medical students may be a valuable tool to increase knowledge and student self-confidence at a key transition period prior to beginning clerkship experiences. Further research is needed to prove long-term educational benefits of simulation interventions in the preclinical setting.

Introduction

High-fidelity patient simulators are increasingly used in the training of physicians, nurses, medical students (MS), and many other healthcare professionals.[1] Learning medicine without placing a patient at an increased risk of complications is of utmost importance. In reality, MS are most commonly denied learning from mistakes because attending physicians are ethically bound to stop erroneous actions of students. However, learning from mistakes is highly effective in acquiring factual knowledge.[2-4] When teaching on a patient, the attending physician very often has limited time, especially in a busy Emergency Department (ED), and time constraints will negatively affect the MS' learning. Therefore, learning the consequences when making an error is ethically justifiable using a high-fidelity patient simulator, but not a patient.[5]

Technological advances in computer-enhanced simulation have introduced many medical management algorithms for preclinical MS and offer the ability to provide experimental learning in a risk free, fairly realistic environment, with events that can be repeated and videotaped for valuable feedback.[6] Scenarios can be created on demand and tailored to individuals, and skills can be practiced repeatedly without undesired interference, such as a noisy ED or time constraints. Through simulation laboratories, preclinical MS become familiar with the equipment and procedures used in clinical practice; they are introduced to the use of physiological monitoring instruments and clinical decision-making in a non-threatening environment. Data suggests that this is especially important for first and second-year MS, since formal learning is very limited in the hospital environment and MS at this stage of learning feel insufficiently prepared for clinical practice in the clerkships.[7,8]

Limited research has been conducted with direct relevance to simulator training for preclinical MS in an ED setting. Most trials were observational studies or self-reported satisfaction questionnaires involving small numbers of participants.[6] Proper objective evaluation of learning strategies of preclinical MS are limited.[9,10] However, the subjective response of MS regarding the benefits of simulation exercises has been clearly positive.[11-14]

The objective of this pilot study was to determine if knowledge and confidence of preclinical second-year MS could be augmented with simulation training. Learning objectives were to identify and act upon abnormal vital signs in a semiconscious overdose victim, demonstrate knowledge and protocol for basic life support (BLS), accurately perform a primary survey for a victim presenting in a semi-conscious state in an ED setting, and recognize the signs and symptoms of opioid toxicity.

Methods

Study Setting and Population

A full scale, high fidelity mannequin, model Laerdal SimMan (Laerdal Medical Corporation, USA) was utilized in a simulation center at a university-based medical school. Study participants included fifty-nine second-year MS. The University of Hawai'i Committee on Human Subjects determined that this study was an exempt educational study.

Measurements

The students completed an on-line pre-test immediately before starting the exercise. The pre-test consisted of 10 multiple-choice questions testing the students' understanding of BLS, toxidromes, and the management of a semi-conscious victim who overdosed. Students were given 4 questions about their confidence level in providing BLS and treating acutely sick patients in a clinical setting. After the simulation exercise and a constructive feedback session, the students completed a post-test which was identical to the pre-test, the same self-confidence questions, and a course evaluation survey.

Study Design

A medical management algorithm was constructed by the Principal Investigator (BMH) and was based on core concepts identified by the course director. The algorithm was programmed into the computerized simulation mannequin such that an adverse physiologic response (i.e. dropping oxygen saturation) would occur if a student did not complete an expected task in a timely fashion. A wall-mounted video camera was positioned to record student performance during the exercise and to assist in constructive feedback after the exercise.

Prior to implementation, the simulation exercise was piloted among four 3rd year MS, revised with input from several attending physicians, and then finalized. Faculty was trained to observe students, complete a performance checklist, and provide feedback immediately following each session.

One week before the simulation exercise for the current study, all second-year MS at a Problem Based Learning (PBL) medical school studied a PBL case that was part of their required preclinical curriculum. This case featured a semi-conscious adolescent female with a complex social situation who overdosed on Tylenol. Learning issues included workup and management of patients with poisoning, clinical features of toxidromes, differential diagnosis of altered mental status, and normal/abnormal vital signs.

Several days before the actual simulation exercise, all second-year MS spent some time with a clinical instructor becoming familiar with the mannequin and the laboratory layout and equipment. All participants were certified in BLS as part of medical school orientation procedures one year prior. They also had gained experience with bag-valve mask ventilation from previous teaching sessions with the mannequin. Details about the setting, the available resources, and the tasks at hand were explained.

After completing the pretest, groups of 5 to 6 students were given 30 minutes to complete a simulation exercise using the high-fidelity mannequin (Laerdal SimMan).

A brief history was provided on the computer screen featuring a semi-conscious adolescent that was found next to her bed with an almost empty bottle of pills and then taken to the ED by paramedics. Students were instructed to collaborate with each other in the clinical care of the victim, including history at the bedside, physical examination, monitoring of vital signs, generation of a differential diagnosis, and initiation of workup and therapy. The MS were prompted to consider basic intervention such as providing bag-valve mask ventilation, starting an intravenous line, ordering tests and intravenous fluids, and giving medications. The mannequin was programmed to react to student interventions. For example, a decrease in oxygen saturation would occur if bag-valve mask ventilation was not started within 5 minutes, or an increase in blood pressure would occur if the MS gave intravenous fluids. All simulation education sessions were recorded using standard videotape for playback during post-session debriefing. The attending physician who was debriefing the students was present, gave additional history if requested by the students and also gave a few prompts if the students needed assistance.

After the simulation exercise, the students were debriefed by an attending physician with the help of the computer facilitator and video playback. The 20 to 30 minute constructive feedback sessions were provided by four different attendings, one attending specializing in pediatrics and medical education, one in family practice medicine and simulation technology, one in emergency medicine and one in pediatrics and pediatric emergency medicine. The participants were asked not to communicate about the test and the content of the simulation with the other participants during the test period. Immediately after the debriefing, the students completed a posttest which was identical to the pretest.

Data Analysis

Data analysis for the knowledge questions was conducted using a paired t-test comparing pre- versus post-test. Statistical significance was set at $p<0.05$. The confidence questions were analyzed using a 5-point Likert scale (1-very low to 5-very high). Fifty-nine second-year MS participated in the study successfully. Data from 7 participants who failed to complete either pre- or post-test was excluded from analysis.

Results

The simulation exercise, completed by 52 students, increased correct test answers on average from 60% to 71% ($p<0.0001$ by paired t-test; see details in figure 1). Increases in test results were between pre- and post-simulation identical multiple choice questions. Among the topics tested, students scored worst in identifying normal/abnormal vital signs. Mean confidence in performing BLS, evaluating a patient with drug overdose, managing a semiconscious patient and treating a patient with an acute toxic ingestion increased from 2.0 to 2.6 ($p<0.0001$ by paired t-test) using a 5-point Likert scale (1-very low to 5-very high) (see figure 2). On the same scale students rated the quality of the debriefing session at 4.9 for attendings with emergency medicine training versus 3.6 for other attendings ($p<0.0001$ by unpaired t-test).

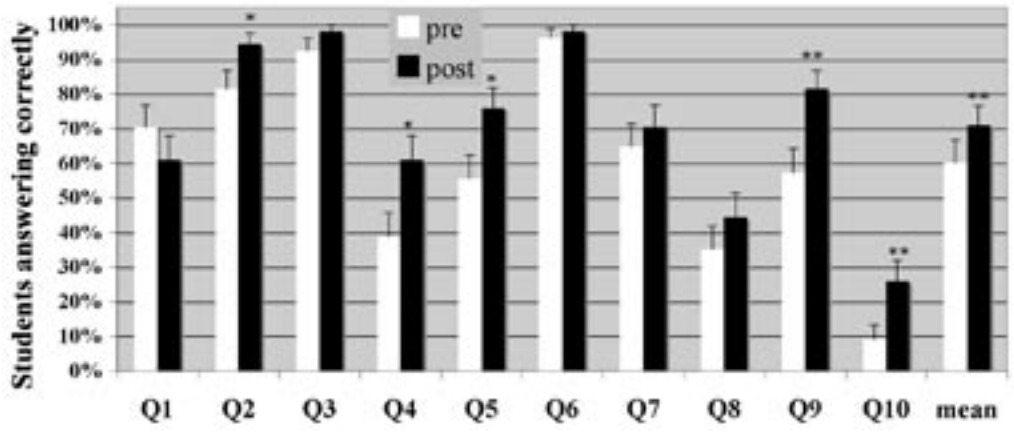

Figure 1.— Mean Knowledge Questionnaire Results

error bars indicate standard error; *p<0.02, **p<0.002; Q1: Normal/abnormal vital signs; Q2: Signs of crystal methamphetamine overdose; Q3: Signs of codeine overdose; Q4: Difference between a sympathomimetic and an anticholinergic overdose; Q5: Class of drugs causing dilated pupils; Q6: Role of primary survey; Q7: Interpretation of an ABG; Q8: Assessment of breathing in Basic Life Support; Q9: Complications of bag mask ventilation; Q10: Treatment of morphine overdose

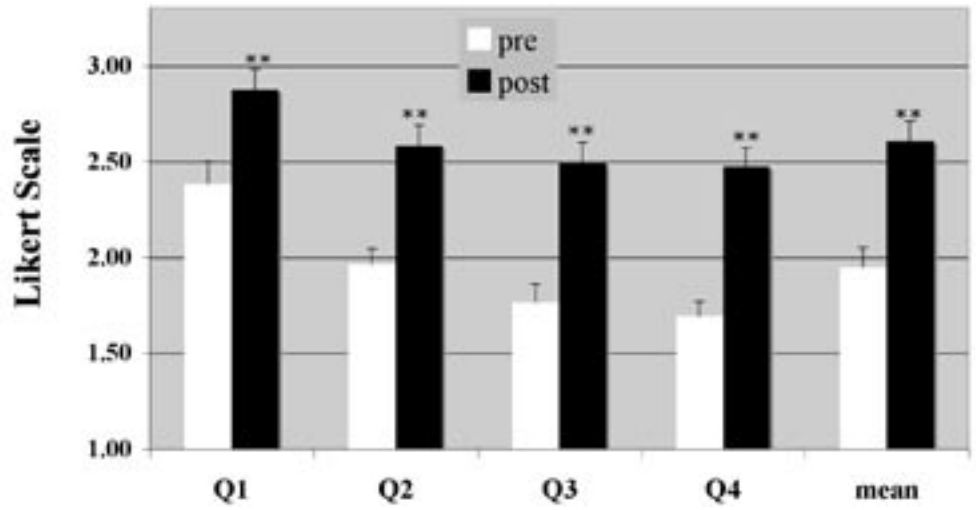

Figure 2.— Mean Confidence Questionnaire Results

error bars indicate standard error; **p<0.001; Q1: Confidence in performing basic life support; Q2: Confidence in evaluating a drug overdose case; Q3: Confidence in managing a semi-conscious patient; Q4: Confidence in treating a patient with an acute toxic ingestion

Thirty comments were submitted from students in the course evaluation survey, 80% were positive. Such comments included: "great chance to apply material used in the PBL case," "great job overall in terms of real-life scenario and complexity of simulation," "enjoyed the debriefing by our facilitator," "really fun and eye opening," "enjoyed the hands-on experience," and "great learning tool." Negative or constructive comments included: "six per group seemed too many, three or four would be a better number," and "too clinical – better for 3rd and 4th year students."

Discussion

This pilot study suggests that simulation exercises for second-year MS may be a valuable tool to increase self-confidence at a key transition period prior to beginning clerkship experiences. Although the clinical experience is simulated, this approach may produce a level of emotional realism that allows the students to learn as if it were a patient.

Furthermore, the study suggests that knowledge of preclinical second-year MS can be increased by augmenting a PBL case with a similar simulation exercise utilizing the same learning issues. This is logical since learning by doing and being allowed to make mistakes enhances critical thinking and acquisition of knowledge.[2-5]

For some learners, simulation may allow more complex information to be understood and to be retained more efficiently compared to PBL alone. The PBL curriculum at our institution emphasizes self-directed learning. In this classroom setting, first and second-year MS work cooperatively in groups of 5 to 6 students to solve a series of cases on paper containing specific health care problems. In this educational model, students determine their own learning agenda based on the problems identified in each paper case. Of note, students at the end of the second-year tend to be very focused on independently studying basic science material for their upcoming national board examination. To generate greater interest in studying clinically relevant learning issues, our faculty integrated this simulation exercise into the existing problem-based curricula to "bring to life" existing case material from the PBL classroom. In fact, course evaluations revealed that our simulation exercise was extremely well perceived by the students which is consistent with other reports across the disciplines.[11-16]

Other course evaluation comments from a minority of students suggested that the simulation experience was too advanced and "would be better for 3rd and 4th year MS." Although the authors are aware that second-year MS have not yet had clinical experiences in an ED setting, the learning objectives addressed in the simulation exercise were the same learning issues studied in a PBL case that these students were required to complete one week prior to the intervention. In order to learn most effectively the environment needs to be both participatory and interactive. Since simulation exercises are teaching methods that require the learner to think through and react to data on a minute-to-minute basis, this teaching method requires learners to apply theory to practice in an integrated manner and therefore may be more effective than reading a textbook, listening to a lecture, or PBL.[17,18] To facilitate the transition from theory to practice, simulation exercises can easily be integrated into PBL curricula.

Several MS also had constructive comments on the course evaluations and found group sizes of 5-6 too large. Although the authors agree that a group size of 6 may limit individual student involvement around a single mannequin, at the time of intervention, our simulation laboratory only had 2 Laerdal SimMan simulators available for use for this exercise. Scheduling required that simulation sessions be completed by all second-year students over two days. Although this meant assigning students to groups of 5-6, an overwhelming majority of students still enjoyed the experience and gained both knowledge and confidence as a result. Our findings support that a group size of 5-6, although not ideal, can still result in increased knowledge and confidence among second-year students.

Interestingly, although all students participating in the intervention were certified in BLS during their first year of medical school, students scored lowest in identifying normal/abnormal vital signs (Question 1) on the multiple-choice exam. Our findings from this experience support that second-year MS do struggle with applying

knowledge learned from textbooks and classroom settings. As such, a simulation exercise requiring the use and application of BLS with focus on normal/abnormal vital signs could be a valuable teaching tool for learners at this stage of training.

Students also found our feedback session to be a useful teaching strategy. The authors designed the learning in this simulation to occur through "hands-on" experience with the simulator as well as through faculty feedback in the debriefing session. Although this study was not designed to quantify which portion of the simulation experience resulted in greater learning, studies suggest that the inclusion of a debriefing session results in significantly increased performance when compared to a control group of students who do not receive feedback.[19]

Although no difference has been reported between the use of video-assisted feedback compared to oral feedback without videotaped review,[19] our study did find differences between faculty feedback facilitators. Students in our study rated the debriefing sessions with emergency medicine trained facilitators significantly higher than debriefing sessions with clinical faculty not trained in emergency medicine. Although this study is limited by the small number of student and faculty participants, our findings support that the utilization of a debriefing session after simulation is an important component of the leaning process in simulation education.

Improving knowledge soon after a teaching exercise would be expected. However, the students maximized their knowledge on the learning issues through their very recent PBL sessions suggesting that the additional increase in knowledge resulted from the new learning approach with the simulation exercise.

The outcomes were measured immediately after the simulation and feedback sessions and more extensive research is needed to prove long-term educational benefits of simulation interventions in the preclinical setting.

In conclusion, this pilot study suggests that a simulation exercise for second-year MS may be a valuable tool to increase knowledge and student self-confidence at a key transition period prior to beginning clerkship experiences. Faculty who are interested in utilizing simulation should recognize that an emphasis on decoding normal/abnormal vital signs might be important at this stage of learning. Feedback sessions provided by attendings specializing in the topic presented may also be of benefit since they are more knowledgeable in their specialty. Smaller group sizes of about 3 to 4 may be of benefit by encouraging increased involvement of all students in the group. More extensive research is needed to look at long-term effects of simulation interventions in the preclinical setting in regards to retention of knowledge and acquired skills.

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Quantitation of Staphylococcus aureus in Seawater Using CHROMagar™ SA

Alan D. Tice MD; David Pombo MD; Jennifer Hui BS; Michelle Kurano BS; Matthew J. Bankowski PhD; and Steven E. Seifried PhD

Abstract

A microbiological algorithm has been developed to analyze beach water samples for the determination of viable colony forming units (CFU) of Staphylococcus aureus (*S. aureus*). *Membrane filtration enumeration of* S. aureus *from recreational beach waters using the chromogenic media CHROMagar™ SA alone yields a positive predictive value (PPV) of 70%. Presumptive CHROMagar™SA colonies were confirmed as* S. aureus *by 24-hour tube coagulase test. Combined, these two tests yield a PPV of 100%. This algorithm enables accurate quantitation of* S. aureus *in seawater in 72 hours and could support risk-prediction processes for recreational waters. A more rapid protocol, utilizing a 4-hour tube coagulase confirmatory test, enables a 48-hour turnaround time with a modest false negative rate of less than 10%.*

Introduction

Staphylococcus aureus (*S. aureus)* has been reported in recreational beach waters[1-6] and been discussed as a potential hazard in swimming pools.[7] The growing clinical and public health concern regarding increasing community acquired methicillin resistant *S. aureus* (MRSA) infection rates[8,9] makes identification and perhaps quantitation from environmental sources a timely issue. Seawater, and seawater spiked with *S. aureus* innocula, were used in pilot studies to assess the possibility of adapting existing methods for the quantitation of *S. aureus* in seawater. A number of new products are available for the detection of *S. aureus*, based upon microbiological or molecular methods. Bio-Rad's MRSA Select (BioRad Laboratories, Hercules, CA, USA) chromogenic media plate is specific for MRSA, and demonstrated reduced specificity when challenged with the off-label mixed population of halophiles of our ocean water samples. Petrifilm Staph Express Disk (3M Microbiology, St. Paul, MN), tube culture[10] and modified mannitol salt plating methods[3,11,12] yielded poor specificity from seawater (data not shown), and/or detection levels significantly higher than levels expected from recreational beach water (data not shown).[5, 13] Methods based upon modified Baird-Parker media[5, 12] yield insufficient selectivity and unknown sensitivity[3] (data not shown).

Commercial molecular detection products do not provide quantitative measures of contamination because an intermediate biological amplification step is required, but they do provide an answer as to the presence of *S. aureus* in the sample. For example, the PCR-based TaqMan *Staphylococcus aureus* Detection Kit (Applied Biosystems, Life Technologies, Carlsbad, CA, USA), developed for detection of *S. aureus* in the food industry, yielded variable and unreliable results in off-label pilot studies to detect and quantitate low levels of *S. aureus* in beach water (data not shown). Interpretation of gene-based quantitative results is complicated by concerns related to viable organisms and the amount of free or apoptotic DNA contained in the environmental sample.

The ability to reliably quantify the number of *S. aureus* organisms in recreational water is necessary for the development of risk models and potential water quality monitoring. This study examines the reliability of the chromogenic media CHROMagar™ SA (CSA), developed for clinical application, to quantify viable colony forming units (CFU) of *S. aureus* in seawater.

Materials and Methods

Determination of Filter Efficiency: Filtered and autoclaved seawater or 0.9% saline were spiked with log-phase MRSA (ATCC 25923) or methicillin sensitive *S. aureus* (MSSA) (NCTC 8325) to 10^3CFU/mL and processed to determine the efficiency of filter capture and the effects of dilution or media on *S. aureus* viability. Filter efficiency compared 100μL samples that were either i) applied directly to a plate and spread or ii) diluted to 20mL, filtered, then the filter applied to the plate. Dilutions were made with either sterile seawater or 0.9% saline. Samples were placed either on CSA (CHROMagar™ SA, BD BBL 214982, BD Diagnostics, Franklin Lakes, NJ, USA) or SBAP (TSA II with 5% Sheep Blood, BD BBL 221261, BD Diagnostics, Franklin Lakes, NJ, USA) plates. Twenty-four (24) replicates were recorded for each condition. One-Way ANOVA was performed using JMP-IN (SAS, Inc.). Positive values for the all-pairs Tukey-Kramer HSD matrix indicate slight yet statistically significant differences between the compared means of the CFU determinations.

Environmental sample collection and candidate colony development: Seawater samples from active recreational beaches were collected by hand immersion of 500mL autoclaved wide-mouth bottles with screw caps to sufficient depth to completely cover the opening of the bottle.[14] Collection occurred at 6 sites for 15 days over the course of a month, from the surface of beach waters with a water column of approximately 50cm. Filled bottles were placed on ice and processed within four hours of sample collection. A 20mL aliquot of seawater was filtered on a vacuum manifold through a 47mm 0.45 micron mixed cellulose ester gridded white filter (Advantec A045H047A, Advantec MFS, Inc., Dublin, CA, USA) using autoclaved polysulfone filter holders. The filter was applied face up on a CHROMagar™ SA plate and incubated at 35C for 24 hours.

For the purpose of this experiment, all mauve colonies and others with closely related colors (mauve-like) were chosen for secondary plating. An additional 10% of colonies with other colors were also selected for secondary plating on CSA to assure the color screen was not over-selective.

Tests to Confirm Algorithm: Candidate colonies were scored as *S. aureus* if they showed a microscopic morphology of gram positive cocci in clusters and yielded a positive 24-hour tube coagulase test (BD BBL Coagulase Plasma, Rabbit with EDTA, BD Diagnostics,

Franklin Lakes, NJ, USA). Candidate colonies were also tested for latex agglutination (SLIDEX Staph-Kit, Biomerieux, Inc., Durham, N.C., USA). The latex agglutination test was a parallel confirmatory test. Our intent was to evaluate the relative performances of coagulase and agglutination tests (Table 2). 174 candidate isolates from filters plated on CHROMAgar SA were tested for confirmation as *S. aureus* by i) the presence of clumping factor and/or protein A by the SLIDEX latex agglutination test, or ii) the presence of coagulase activity determined by tube coagulase test. Isolates yielding positive SLIDEX results were contemporaneously tested for agglutination activity with the latex bead. Those isolates yielding positive results for both anti-*Staphylococcus aureus* reagent and the negative control reagent (+/+) were counted as uninterpretable. Tube coagulase assays were read following 4- and 24-hours of incubation at 37C.

Strains ATCC 25923 and NCTC 8325 were used as species phenotype controls for *S. aureus,* but not included in the statistical analysis. Species identification was confirmed by biogram (VITEK 2, Biomerieux, Inc., Durham, N.C., USA) or by rDNA sequencing.[15] Statistical analyses were carried out with the JMP-IN (SAS Institute Inc., Cary, NC, USA) platform.

Results

Filter Recovery Efficiency and Media Viability: Table 1 details the results of the filter recovery study. The two initial log-phase cultures (MRSA and MSSA) were of slightly differing concentrations, as evidenced by the mean CFU observed for the MRSA samples versus the MSSA mean CFU. A ratio of means near unity and a small R-squared value from the ANOVA (testing the hypothesis that the paired means are identical) indicates no statistical difference in viability of either reference strain on CSA compared to SBAP media. There may be a slight increase for the MRSA strain viability when diluted in saline compared to seawater. No such preference was observed with the MSSA strain. The number of viable CFU enumerated from filtered samples was greater, and more reproducible (smaller coefficient of variation), than those counted from spread plates. These conclusions are corroborated by the relevant occurrence of positive values in the Tukey-Kramer HSD matrices (Table 1).

CHROMagar™ SA detection of candidate S. aureus colonies: BBL CHROMagar™ SA (CSA) is intended for the identification and isolation of *S. aureus* based upon the development of mauve-colored colonies. The chromogenic CSA media developed color in the colonies that grew on top of the filter, although color could be visualized on the underside of the filter as well.

24 hours growth of the filtered seawater sample filter on a CSA plate was followed by a secondary CSA plate used to further develop candidate colonies for confirmation as *S. aureus*. 48 hours growth on the filter/primary CSA plate yielded significant overgrowth of colonies and color drift. For example, some mauve colonies became brown on the top surface yet retained a mauve tone when viewed from the underside of the filter.

613 candidate colonies from the filter/primary CSA plates of 90 environmental sampling events from recreational beaches were selected and transferred to secondary CSA plates in a 25-place grid format (Figure 1). Eighty-eight (88) mauve and 86 additional mauve-like candidate colonies from the secondary plate were subjected to further species-confirming tests, described below. The secondary colonies were mixed colonies in about 10%, as evidenced by Gram stain reaction, color, and morphology on the CSA plate. Further isolation to single colony isolates was not performed.

Table 1.— Capture Efficiency of S. aureus by filtration

MRSA	mean CFU	C.V.	ratio of means	R-Squared	Tukey-Kramer HSD	
Spread	35.9	27.6			-5.30	6.92*
Filter	47.7	7.6	0.75	0.369	6.92*	-4.60
Seawater	37.8	24.8			0.46	-5.86
Saline	44.1	21.2	0.86	0.106	-5.86	0.46
CSA	42.6	23.5			-5.67	-2.20
SBAP	38.7	24.0	1.10	0.040	-2.20	-6.55
MSSA	**mean CFU**	**C.V.**	**ratio of means**	**R-Squared**	**Tukey-Kramer HSD**	
Spread	18.0	37.8			-3.45	0.13
Filter	21.6	22.8	0.83	0.087	0.13	-3.45
Seawater	19.7	29.9			-3.55	-3.60
Saline	19.8	32.8	0.99	0.001	-3.60	-3.55
CSA	18.7	35.8			-1.42	-3.55
SBAP	20.9	25.8	0.90	0.031	-3.55	-1.42

Viable S. aureus colony forming units (CFU) were counted from spiked solutions and treated variously to determine recovery efficiency. Paired comparators included spread on plate vs. filtered, diluted in sterile seawater vs. 0.9% saline, and growth on media of CHROMagar™ SA (CSA) vs. TSA-II + 5% Sheep Blood (SBAP). C.V. = coefficient of variation; MRSA = methicillin resistant S. aureus; MSSA = methicillin sensitive S. aureus.

Table 2.— Confirmatory Tests of Isolates from CHROMagar™ SA

SLIDEX	S. aureus	NOT S. aureus
positive (+/-)	57	1
negative (-/0)	0	83
uninterpretable (+/+)	6	27
tube coagulase	**S. aureus**	**NOT S. aureus**
4-hr. positive	57	2
24-hr. positive	63	2
24-hr. negative	0	109

Tube Coagulase Test: A 4-hour coagulase test yielded 6 fewer positive results than the 24-hour reading (Table 2). Of 233 candidate colonies tested, 6 colonies (4 mauve and 2 light purple) yielded negative 4-hr coagulase test results but were positive after 24hr incubation and were subsequently deemed *S. aureus*. All 6 were SLIDEX-positive. Two colonies were false–positive for the coagulase, had brownish tone on CSA, gram positive (g+) large cocci tetrads, and were SLIDEX-negative.

SLIDEX Staph-Kit Test (agglutination from clumping factor or protein A or species-specific modified surface proteins): 174 mauve and mauve-like secondary colonies were tested, with one false-positive reaction from a purple colony that yielded a negative coagulase

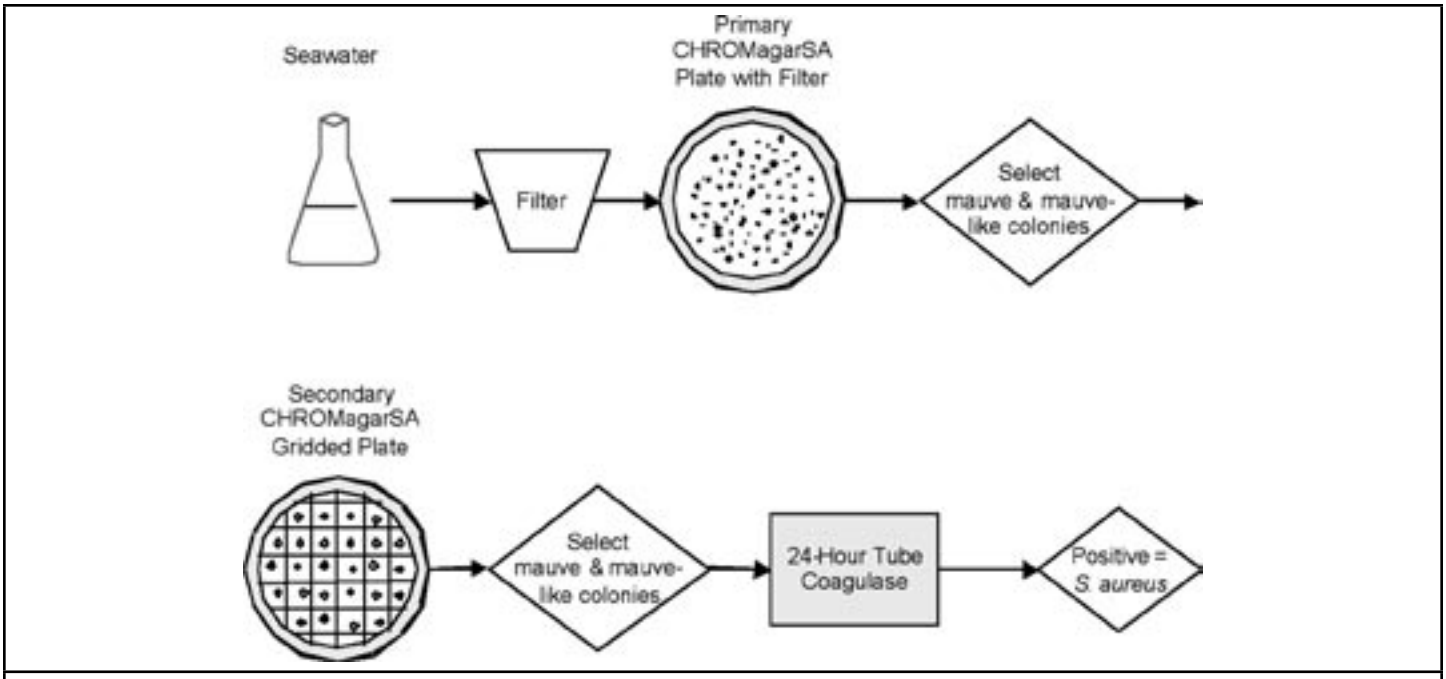

Figure 1.— Algorithm for Identification of *S. aureus* by CHROMagar™ SA and Tube Coagulase
Colonies are picked from a filter placed on CSA, then gridded to a secondary CSA plate. Mauve-like (including mauve) candidate colonies are subjected to confirmatory testing by tube coagulase. The gram-stained microscopy and species confirmation discussed in the text were methodological validation tests, and are not considered part of the quantitative algorithm.

Table 3.— Predictive Power of Identification Algorithm

	Number of Mauve Colonies			
Result	Confirmed S. aureus	NOT S. aureus	Predictive Values	
CHROMagar™ SA alone				
positive	58	25	PPV	0.70
negative	5	525	NPV	0.99
CHROMagar™ SA + 24-hour tube coagulase				
positive	58	0	PPV	1.00
negative	5	550	NPV	0.99

A positive result for the CHROMagar™ SA alone indicates a mauve colony on the secondary (gridded) plate. A positive result for CHROMagar™ SA + tube coagulase indicates the colony yielded positive results for both the CHROMagar™ SA chromogenic selection and 24-hour tube coagulase activity tests. PPV = positive predictive value; NPV = negative predictive value.

result. 33 colonies (including 6 mauve) yielded uninterpretable (+ / +) results; (i.e. the latex control and reagent both yielded positive results).

Gram Stain: Microscopic color and morphology of Gram-stained isolates were evaluated on 92 colonies from the secondary plates, including all colonies that yielded a positive result for either the tube coagulase or SLIDEX test, and a subset of 25 other colonies. All colonies deemed *S. aureus* were gram positive (g+) cocci clusters. Eight *S. aureus* colonies were mixed populations, and were either mauve (6) or mauve with white spots (2) on the secondary plate colony. The 5 non-*S. aureus* mauve colonies tested by gram stain were either g+ cocci clusters (2) or large g+ cocci tetrads (3).

Species Confirmation: Six randomly selected putative *S. aureus* colonies (6/58 colonies), as defined by mauve colony and positive coagulase test, were confirmed as *S. aureus* by sequencing the 16S rDNA. VITEK 2 biograms were performed to identify species of other classes of results. A random 10% (3 of 25 colonies) of the false color-positive colonies (mauve colonies that failed gram stain, SLIDEX, and coagulase tests) were identified as alpha-hemolytic streptococci (1) and *S. caprae* (2). All five false color-negative colonies (i.e. were mauve-like in color, but not mauve, and were g+ and coagulase positive) were identified as S. *aureus*. Alternatively, a random 8 of the 86 mauve-like but not mauve colonies that yielded negative coagulase test results were variously identified as *Kokuria sp*. (6 colonies), and gram negative undetermined (2 colonies).

Discussion

Bacteria dominate the abundance and diversity of the ocean (Reviews[16,17]). One microliter of seawater is considered to contain 1,000 bacteria, and 100 other individual cells.[18] It is therefore a challenge to selectively detect and enumerate a particular genus in volume of seawater; this challenge is even greater for an individual species. The species heterogeneity of beachwater samples prevented the reliable use of traditional clinical microbiologic screens with selective media like mannitol salt agar. The advent of chromogenic media specific for *S. aureus* obtained from clinical samples lead us to consider the use of CHROMagar™ SA for enumeration of viable *S. aureus* in recreational beach waters, even though a large background of non-*S. aureus* growth was expected. This is a report of an inexpensive reliable methodology for the enumeration of *S. aureus* in sea water that does not rely on molecular biology techniques requiring expensive capital equipment and reagents.

High capture efficiency and good growth characteristics of viable *S. aureus* are observed on 0.45μM filters, indicating a high sensitivity of the methodology. The pore size is sufficiently small to yield good filter retention; apparently *S. aureus* does not shrink in these solutions, contrary to concerns expressed for chlorine-treated waters (Health Protection Agency, 2004). The principle limits to sensitivity are the volume of sampled water to be filtered and the growth of non-*S. aureus* colonies on the primary filter that mask the selective color formation of the CSA media. The practical limit of detection by this technique is estimated to be on the order of 1 CFU of *S. aureus* /100mL of seawater. A larger volume of filtrate results in excessive numbers of non-mauve colonies that make recognition of mauve colonies unreliable. This limit of detection may vary, depending upon the non-*S. aureus* load of the samples waters.

In controlled experiments, elevated CFU counts from filtered samples were observed relative to spread plates. This result has been previously reported[19,20] and might be explained by greater clumping of the coccal clusters in the spread samples. This accents the uncertainty of how many individual bacteria are contained in a CFU. An open question is whether a risk analysis or water quality monitoring program should follow viable CFU, which this technique reports, or monitor the total number of genomic copies (from clumped viable CFU, unfit or apoptotic cells, and free DNA) that might be reported by quantitative molecular biology techniques such as quantitative PCR.

Ocean beach waters contain a broad variety of organisms, including those that may develop mauve colonies on the CSA. Furthermore, because of the high concentration of organisms in the beach water, colony density on the plate can result in over-lapping colonies or growth in close proximity, making a firm color determination of a colony difficult. It is therefore necessary to confirm the identity of putative *S. aureus* colonies identified through colony color developed on CSA. Selectivity of this method for *S. aureus* relies on chromogenic media, followed by a confirmatory coagulase test. Development of mauve colonies on a CSA plate alone is not an accurate or reliable method for enumerating *S. aureus* colonies retrieved from recreational beach waters. The CHROMagar™ SA manufacturer package insert notes some species of staphylococci other than *aureus*, as well as yeasts and corynebacteria, may develop mauve-colored colonies (Data on File, BD Diagnostic Systems [21]). Both false-positive (30%) and false-negative (8%) results were observed prior to the application of the confirmatory coagulase test. Based on results of 613 candidate colonies (including mauve and mauve-like on the filter/primary CSA plate), the most reliable method for counting *S. aureus* colonies is to select all mauve and mauve-like colonies, sub-culture on a gridded secondary CSA plate to assure color selection, and confirm with a 24-hour tube coagulase test. A coagulase test is preferable to the latex agglutination test, as the SLIDEX test yielded a number of uninterpretable results. The false-positive rate was reduced to zero by the inclusion of the coagulase confirmatory test. Inclusion of mauve-like colored isolates to the analysis increased the number of tested isolates by a factor of two, and reduced the apparent false-negative rate to zero. No 4-hour coagulase positive colonies converted to coagulase negative after 24-hr incubation; there was therefore no evidence of staphylokinase production, a potential interference in the tube coagulase test.[22] The most frequent source of false-negative results was from colonies that exhibited a brown/mauve color. The most commonly recognized confounding species yielding false-positive results for the tube coagulase and latex agglutination tests are *S. lugdunensis* and *S. schleiferi*.[23] False-positive results from the SLIDEX Staph-Kit Test are likely from *S. schlieferi, S. lugdenensis, S. delphini*, *S. hyicus,* and *streptococci* expressing receptors for immunoglobulins and fibrinogen (*Strep*. A, C, and G) and other non-*aureus* expression of clumping factors.[24-27] A 4-hour tube coagulase test will slightly under-represent the CFU/mL in the water, but is more rapid.

The dynamic range of this assay can reasonably be tuned to higher incipient *S. aureus* concentrations by diluting the analyte waters. The CFU/mL range potentially measurable is determined by the number of non-mauve colonies growing in interference on the primary plate, and will vary from source to source. 10 and 20 mL of water were routinely filtered to yield detectible amounts of *S. aureus* from environmental waters.

Although it is unknown how many environmental *S. aureus* colonies did not produce mauve or mauve-like colors, false-negative, the sensitivity of the CSA + coagulase selection criteria if the algorithm presented here is comparable to or exceeds clinical sensitivity studies for detection of MRSA using the CHROMagar™ MRSA (Becton Dickinson and Company).[28] Our experience does not support a 48-hour incubation on CSA.

The implications of establishing a reliable and practical approach to quantifying the presence of *S. aureus* in environmental waters are profound. Previous reports highlight the presence of MSSA and MRSA in public recreational water facilities.[1-6,29] Clearly the epidemiological impact of knowing when these waters are potentially problematic is of major public health importance. The development of risk-models to predict what thresholds are appropriate for actions needed to reduce or prevent *S. aureus* contamination or infection can only be based on accurate point estimates of *S. aureus* and likelihood of acquisition following exposure. Furthermore, isolation of *S. aureus* followed by susceptibility testing and genetic typing may assist in the clinical management of subsequent infections acquired from these sources.

The positive predictive value of CHROMagar™ SA as a single test is low. However, when used in conjunction with other accepted methods it can provide a simple, reliable algorithm to both identify and quantify *S. aureus* from environmental sources. The tube coagulase test yields the most reliable and cost-effective confirmatory results.

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An Analysis of Vulvar Necrotizing Fasciitis in the Unique and Ethnically Diverse Hawaiian Population

John Nakayama MD and Raydeen Busse MD

Abstract

Vulvar necrotizing fasciitis is a surgical emergency with a high rate of morbidity and mortality. Our case series adds seven patients to the literature and presents the first group that is predominantly of Pacific-Islander origin. This study not only confirms traditional risk factors such as diabetes mellitus, obesity and hypertension but investigates ethnicity and socioeconomic status as risk factors. Also presented is a case of recurrent necrotizing fasciitis initially involving the vulva, then the back. In any patient for which there is suspicion of vulvar necrotizing fasciitis, surgical diagnosis remains the gold standard and facilitates rapid debridement of all necrotic tissues. Aggressive surgical debridement with broad spectrum antibiotic coverage is required to minimize mortality.

Introduction

Necrotizing fasciitis is an often fatal bacterial infection that quickly spreads through the subcutaneous tissue and superficial fascia. Although the cutaneous appearance of necrotizing fasciitis is often unimpressive, this is a surgical emergency requiring immediate debridement. If treatment is not initiated in a timely manner, the infection will spread along the fascial plane, liquefying the subcutaneous tissue. Necrotizing fasciitis in any anatomic location can be fatal, but the vulvar and perineal forms are associated with mortality as high as 50%.[1]

There are many predisposing conditions to necrotizing fasciitis including diabetes mellitus, immunocompromise, peripheral vascular disease, increasing age, hypertension, obesity, and radiation exposure. Diabetes mellitus is of particular importance since it not only increases frequency of disease but also mortality.[2] Stephenson et al found diabetes mellitus to be a comorbid condition in 69% of patients.[1] This high comorbidity and mortality is likely due to tissue ischemia secondary to peripheral vascular compromise, decreased phagocytosis and decreased chemotaxis of polymorphonuclear leukocytes, and hyperglycemia promoting bacterial growth. For these reasons, diabetes mellitus is the single greatest risk factor of mortality in necrotizing fasciitis.[2] Another factor important to outcome is developing necrotizing fasciitis postpartum. Mortality can be as high as 50% in this setting.[1,3]

Necrotizing fasciitis is not a single disease entity but manifests as two types. Type I is a synergistic polymicrobial infection of both aerobes and anaerobes that is most commonly seen in the setting of diabetes, peripheral vascular disease and postoperative patients. The most commonly seen bacteria are S. *aureus*, *Streptococci*, *Enterocci*, E. *coli*, B. *fragilis*, and *Clostridia*.[4] Type II is a monomicrobial infection of group A streptococcus (*Streptococcus pyogenes*) and less frequently methicillin-resistant *Staphylococcus aureus* (MRSA) seen in patients without underlying comorbidities. The majority of vulvar necrotizing fasciitis infections are type I.[3, 5] It is believed that an aerobic species is the primary infection, which devitalizes affected tissues creating an oxygen-free environment for anaerobes to infect secondarily.

The primary site of infection is a surgical incision in about 50% of necrotizing fasciitis cases. Most other cases develop in areas where the skin has been damaged by infection or trauma.[2]

The signs and symptoms of necrotizing fasciitis can be divided into early and later manifestations. The early presenting signs include localized edema, induration, and exquisite pain at the site of infection. High fever, leukocytosis, anorexia, and hypocalcemia secondary to fat saponofication are also possible early signs. As the infection spreads, usually 1-2 days after initial presentation, late signs appear. Common features include skin discoloration to a reddish-purple hue, bullae eruption, systemic toxicity, and wound anesthesia. These findings are the result of tissue ischemia leading to denervation and vessel thrombosis.[1] It is important to note that the extent of subcutaneous necrosis is not reflected by the cutaneous appearance. By the time skin necrosis is visible, the subcutaneous infection has extended widely. Therefore, surgical diagnosis is performed to look for devitalized tissues which fail to bleed when incised. The pathognomonic sign of necrotic subcutaneous tissue, which appears as a "gray-brown 'dirty dishwater' fluid," is also found on surgical exploration.[2] Hypotension and shock may be present at any time but are more commonly late signs and are due to massive third spacing. Crepitus is noted 10% of the time and indicates the presence of gas producing organisms such as *Clostridia*.[4]

Early diagnosis is essential given that delayed treatment leads to increased mortality. Stephenson et al found a 75% mortality rate when surgical treatment was delayed by ≥48 hours compared to 12% mortality in those treated in ≤12 hours.[1] Therefore, early surgical intervention is the key to optimizing survival and is needed for histological diagnosis. Although exact diagnostic criteria has not been agreed upon, one set of diagnostic features proposed by Fisher et al, is summarized in Table 1.[6] Recently, CT and MRI scans have been advocated and may have utility in excluding necrotizing fasciitis when the clinical likelihood is low, but MRI in particular has a higher sensitivity than specificity and overestimates deep fascial involvement.[7] Surgical exploration remains the only diagnostic method able to rule out necrotizing fasciitis definitively and should not be delayed for imaging. In addition to surgical diagnosis, blood cultures are often taken but have limited utility. Gallup et al found cultures useful mainly for detecting secondary candidal septicemia and Wong et al had positive blood cultures in only 20% of patients with type I necrotizing fasciitis.[4,8] Diabetic patients with vulvar infection are considered to have vulvar necrotizing fasciitis until proven otherwise.[9]

Table 1.— Necrotizing Fasciitis Diagnostic Criteria
1) Extensive necrosis of the superficial fascia with peripheral undermining of skin
2) Moderate to severe systemic toxicity
3) Absence of muscle involvement
4) No demonstration of clostridia in wound and blood cultures
5) Absence of major vascular occlusion
6) Intensive leukocytic infiltration, necrosis of subcutaneous tissue, and microvascular thrombosis on pathologic examination of debrided tissue

The mainstay of treatment for necrotizing fasciitis remains early aggressive surgical debridement with broad spectrum antibiotic coverage. Optimal surgical treatment removes all necrotic tissue, which is achieved by debriding down to the fascia and outward until bleeding is encountered. Incisions are often left open to facilitate daily re-exploration of the wound with frequent wound changes and additional debridement as warranted. Antibiotic choice is often empiric and is dependent on the type of necrotizing fasciitis. Vulvar necrotizing is primarily type I which is a mixed infection of aerobes and anaerobes. To cover all possible organisms, treatment often consists of a penicillin, clindamycin, and an aminoglycoside (e.g.GAC regimen: gentamicin, ampicillin, and clindamycin) until the patient stabilizes and granulation tissue begins to form.[2]Recently, hyperbaric oxygen therapy added to surgery and antibiotics have been found to decrease morbidity and mortality.[8,10]

Materials and Methods

This retrospective chart analysis includes all patients admitted to the Kapiolani Medical Center for Women and Children from August 1, 1986 through September 1, 2006. Patients were identified using International Classification of Diseases (ICD) 9 coding for the diagnoses of vulvar necrotizing fasciitis and cellulitis. The charts of these patients were reviewed for the following information: age, weight, ethnicity, risk factors, onset of symptoms, appearance of initial lesion, time of diagnosis, time to treatment, procedures performed, level of pain, bacteria identified, length of stay, and outcome. Pathological reports confirming subcutaneous tissue necrosis of the vulva, perineum, pubis or lower abdomen were available for all patients reviewed. Pediatric patients were excluded from this study.

Necrotizing fasciitis is defined in this article as an infectious process of subcutaneous tissue leading to necrosis on pathological section and often resulting in moderate to severe systemic toxicity without major vascular occlusion or Clostridia in wound or blood cultures. Vulvar and perineal necrotizing fasciitis is defined to include patients with vulvar, perineal, pubic, or pelvic involvement.

Results

During the twenty year period studied, seven women were identified to have necrotizing fasciitis that involved the vulva, perineum, pelvic, or pubic areas. Each patient's chart in this study was examined and the major findings of this review are presented in Table 2. Six of the seven patients presented from 2002-2006, and one patient in 1992. Their ages ranged from 28 to 67 years of age with a mean of 41.1 years. The ethnic distribution of our patients consisted of four Pacific-islanders (3 Hawaiians and 1 New Zealander), two Caucasians, and one Filipina. Five patients were uninsured or on public assistance, a group which contained all the Pacific-Islander patients.

Of the seven women, six had at least one risk factor. The most prevalent risk factor was obesity in 71%. Diabetes mellitus type II was seen in 57% and hypertension in 29%. One patient was receiving chemotherapy. There were two puerperal patients. Both had surgical incisions and one had chorioamnionitis as well.

A primary event was noted in six out of seven cases. There were four infected surgical incisions, one recurrent vulvar abscess, one vulvar folliculitis, and one case where no primary event could be identified. Patient number 2 initially presented with recurrent vulvar abscesses which led to vulvar necrotizing fasciitis. After recovering completely, she was readmitted in thirteen days for necrotizing fasciitis of the back which developed from a back abscess. In both cases of necrotizing fasciitis, only MRSA was found in wound cultures.

Table 2.— Clinical Characteristics of Necrotizing Fasciitis Patients

Patient #	Age	Ethnicity	Dx to Tx (in Days)*	Length of Stay (in Days)	Predisposing Factors	Wound Culture	Outcome
1	28	Pacific Islander (Hawaiian/ Filipino)	<1	4†	Infected episiotomy	Coag. neg. staph‡, *B. fragilis, E. coli Peptostreptococcus sp., K. pneumoniae, C. perfringens*	Died
2	44	Pacific Islander (Hawaiian)	<1	3	DMII, Obesity, HTN, Hx of perineal abscesses bilaterally with surgery	MRSA	Recovered
3	35	Pacific Islander (Hawaiian)	<1	1§	Obesity	*S. pyogenes*	Recovered
4	32	Caucasian	<1	51	Chorioamnionitis Status post cesarean section	*S. agalactiae*	Recovered
5	67	Caucasian	<1	44	DMII, Obesity, Chemotherapy, HTN, Status post TAH-BSO	*P. mirabilis, E.coli, Peptostreptcoccus sp., S. agalactiae,* Anaerobic GNR	Recovered
6	41	Filipino	<1	17	DMII, status post TAH	Diphtheriods, Coag. neg. staph, *S. agalactiae, Peptostreptococcus sp.*	Recovered
7	41	Pacific Islander (New Zealand)	<1	29	DMII, Obesity	Coag. neg. staph	Recovered

HTN=hypertension, DMII= Diabetes mellitus Type II, MRSA= methicillin resistant *S. aureus*, GNR=gram negative rods; *Dx to Tx: Time from Diagnosis to treatment in days; † Transferred on day 2 and died at other hospital 2 days later; ‡ Coag. neg. staph.= Coagulase negative staphylococcus; § Transferred to other hospital for recovery

Initial presentation of the patients showed wound erythema in 100% and induration in 86%. Six of seven patients (86%) were in pain. The one patient without pain presented with necrotizing fasciitis arising from an infected incision on post-operative day twenty-five. She had pain earlier but at presentation, the affected area had lost sensation. White blood cell (WBC) counts were > 13,000 in five of seven patients (71%). Of those who had lower WBC counts, one was receiving chemotherapy and the other had a WBC count of 12,900. 71% of the patients were febrile on presentation, and 57% had purulent discharge from the affected area. Three patients (43%) presented with hypotension, and only one patient was noted to have crepitus upon wound palpation (14%).

All patients were taken for debridement within 24 hours of diagnosis. Wounds were debrided to viable tissues, and two women required multiple debridements. Cultures were taken from all patients' wounds, and the results are summarized in Table 2. The most common organisms encountered were Coagulase negative *staphylococcus*, *Peptostreptococcus*, and S. *agalactiae*, which were found in three of the seven patients. Multiple organisms were found in three of the seven patients (43%). Six of the seven women received broad spectrum antibiotics immediately. The patient not put on broad spectrum antibiotics was originally given cefazolin and was changed to cover MRSA after wound cultures returned. Blood cultures were taken from six patients and were all negative. One patient was given hyperbaric oxygen therapy.

There was one mortality in the series. This patient was a 28-year-old G5P1A4 status post vaginal delivery with episiotomy, who developed a fever of 101.4 Fahrenheit on the night of post-operative day two. The fever was associated with perineal pain and swelling, and her WBC count was 37,900 with 67% neutrophils and 19% bands. Initially she was diagnosed with perineal cellulitis and started on penicillin G, gentamicin, and clindamycin. The following morning, it was noted that the cellulitis borders were expanding and her WBC count was worsening. The patient was taken for immediate debridement. All necrotic tissue was removed from the episiotomy site and right vulva. The patient remained febrile and her WBC count increased to a maximum of 134,200 over the next two days. She was transferred to the local trauma center for intensive care, but the patient became septic and died a day after transfer.

Discussion

Vulvar necrotizing fasciitis is rare, as are all types of necrotizing soft tissue infections with an incidence of 0.04 cases per 1,000 person-years, but there is no available incidence for the vulvar type alone.[11] This report uses the features of subcutaneous tissue infection, systemic toxicity, and pathological confirmation of necrosis as the major features of necrotizing fasciitis.

Early treatment is paramount which makes early disease recognition and individual risk assessment crucial. Local symptoms are present in early and late stages of the disease and were found in almost all patients. Systemic symptoms such as fever and WBC count >13,000 were present in 71% of our patients, which is consistent with the Stephenson study.[1] This supports the concept that the majority of patients will present with symptoms that should raises the index of suspicion. Combined with risk factor identification, it is possible to recognize those at high risk of morbidity and mortality. Although there are no established criteria to stratify illness by severity, high risk factors are known. Increased mortality has been associated with delayed treatment, diabetes, vulvar involvement, postpartum onset, WBC >30,000/microL, serum creatinine >2.0 mg/dL, clostridial infection, septic shock, and heart disease on admission.[2,8,12] Diabetes mellitus is particularly important to recognize because these patients have vulvar necrotizing fasciitis until proven otherwise. Prevalence of diabetes mellitus in this group ranges from 62%-97%.[1,8,9] Our study has a similar finding of 57%. The most common co-morbidity noted in our series was obesity at 71% which is similar to the 70%-87% found previously.[1,8]

The one mortality in this series was a 28-year-old woman who developed necrotizing fasciitis at the site of her episiotomy. Despite rapid debridement, the patient remained febrile and her WBC rose to 134,200. Septic shock soon followed and the patient died. This patient highlights that despite being young and healthy, high mortality persist when high risk factors such as vulvar or perineal surgery are present. Overall our mortality was low (14%) which is likely due to all patients receiving debridement within 24 hours of diagnosis and prompt initiation of broad spectrum antibiotics in all but one patient. This is comparable to the three in fourteen and one in eighteen mortality rates reported in recent papers for patients treated within 24 hours of diagnosis.[1,8] Interestingly, none of the diabetic women in this study died considering previous diabetic mortality rates of 35%-50%.[1,9,13] Perhaps the improved mortality in this study is the result of an increased index of suspicion leading to faster surgical debridement.

The findings in this study include the first reporting of Pacific-Islanders and Filipinas with vulvar necrotizing fasciitis in the English literature. 57% of the cases of vulvar and perineal necrotizing fasciitis were found in Pacific-Islanders, an ethnic group that made up just 9% of Hawai'i's population according to the 1995 census. Five of the seven patients, which included all the Pacific–Islanders, were without health insurance or had government provided insurance. This distribution suggests that socioeconomic factors may be a risk factor for vulvar necrotizing fasciitis.

To the best of our knowledge, there are three cases of recurrent necrotizing fasciitis in the English literature.[14,15,16] Our case of vulvar necrotizing fasciitis followed by necrotizing fasciitis of the back is the fourth case overall and the second with vulvar involvement. Only one of the four cases had recurrence in the same location. It would seem logical that if a particular anatomic location is susceptible to infection, the same location would be affected by any recurrent infection. This does not seem to be the case, but the number of cases is small and further study is necessary. Also noted is that with our patient, two of the four patients had MRSA isolated in both the primary and secondary infection. Perhaps a personal history of necrotizing fasciitis, especially with MRSA, predisposes to recurrence.

The limitation of the study is the low number of patients. Despite reviewing the records of necrotizing fasciitis and cellulitis cases in the only women's specialty hospital in the state of Hawai'i for the last 20 years, numbers were low. This is probably due to a lack of awareness of vulvar necrotizing fasciitis as a distinct entity and unclear coding conventions for vulvar and perineal disease until recently. It is also possible that as obesity and diabetes mellitus prevalence, and the number of elderly women increased, necrotizing fasciitis has also increased.

The key points in the management in vulvar and perineal necrotizing fasciitis remain rapid diagnosis, identification of high risk factors and immediate, aggressive debridement of all effected tissues. Broad spectrum antibiotics should be used initially and narrowed as culture results become available to minimize treatment delay. Adherence to this treatment regimen is the best explanation of the low mortality in our series.

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Changes in Antidepressant Medications Prescribing Trends in Children and Adolescents in Hawai'i following the FDA Black Box Warning

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Abstract

Objectives: *To study prescribing trends for antidepressants in Hawai'i following the FDA black box warning regarding the possible risk of suicide in children and adolescents. We also explored relationships between changes in prescribing trends and patient and provider characteristics.*

Study Design: *Analysis of an existing insurance data set of prescriptions to children and adolescents within the State of Hawai'i.*

Study Population: *Children and adolescents under 18 years old insured through the largest (>60%) third- party insurance company in the state.*

Results: *Our results showed variations in changes in prescribing trends for different selective serotonin reuptake inhibitors (SSRIs) following the FDA black box warning. SSRIs with more evidence-based research supporting their safety and efficacy were least affected as were those that were less implicated by the FDA analysis of the possible link between SSRIs and Suicidality. Trends were apparent for all age groups examined and for both females and males.*

Conclusions: *Changes in prescribing patterns of psychiatric medications for children and adolescents in Hawai'i were identified. Differing patterns have evolved since 2003 following the series of concerns raised regarding SSRIs and suicidality in children and adolescents.*

Introduction

In early 2004, the Food and Drug Administration (FDA) asked manufacturers of several antidepressants to include a label warning of possible increased risk of suicidal ideations or behavior, particularly at times of treatment initiation or dosage change.[1] Later in October 2004, the FDA directed manufacturers of all antidepressants to include a warning that antidepressants increased the risk of suicidal ideations and behavior in children and adolescents.[2,3] The FDA also decided that all patients receiving these medications be given a Medication Guide so that patients would be aware of possible risks and necessary precautions. Medication Guides were to be distributed by the pharmacist with each new prescription or refill of antidepressant medications.[4]

The FDA warning has triggered a significant number of concerns from the scientific and medical community.[5-7] The American College of Neuropsychopharmacology (ACNP) Task Force on SSRIs and Suicidal Behavior in Youth reported that SSRI benefits in treating adolescent depression exceeded the risks of suicidal thoughts or attempts.[8] ACNP's position was supported by the American Academy of Child and Adolescent Psychiatry (AACAP). AACAP maintained that child and adolescent psychiatrists should continue to treat depression with all available effective means including the use of antidepressants alone, or antidepressants combined with Cognitive Behavioral Therapy (CBT) or CBT alone. The combined treatment approach was thought of as the most efficacious.[9-12] AACAP reached out to the parents of depressed children and adolescents to provide education and information to reduce the risk of undesirable treatment outcomes.[13]

This study was undertaken to explore the possible relationship between the FDA warning in Hawai'i and treatment approaches specifically with focus on SSRIs since MAO inhibitors and other antidepressants see little use in this population. The study's goals are:

- To explore changes in SSRIs prescribing trends in children and adolescents in Hawai'i, as evidenced by prescriptions being filled
- To compare changes in prescribing patterns of SSRIs by specific SSRI categories.
- To examine variations in prescribing behavior of SSRIs by provider characteristics
- To examine variations in provider's prescribing trends by patient age and gender.

Methods

The study is an analysis of existing data on prescriptions for SSRIs among children & adolescents obtained from the largest third- party insurance company in Hawai'i. Children and adolescents were eligible if under 18 years old and on psychiatric medication during the time period 2002-2005. Study variables included:

- Psychiatric medication: The number of antidepressant prescriptions that are filled by patients;
- Patient characteristics: age and gender;
- Provider characteristics: psychiatrist provider vs. non-psychiatrist provider;
- The category of psychiatric medications the patient was on

The study hypothesis was that the FDA directives in 2004 regarding use of antidepressants would alter prescribing trends for psychiatric medications for depression and anxiety among child & adolescent psychiatric patients.

Statistical Analysis: Data were initially analyzed by descriptive techniques examining frequencies and cross-tabulations of variables of interest. Further analyses included logistic regression to identify significant trends.

Protection of Privacy: Patient data were identified by a coded number to maintain subject confidentiality. The study was conducted in strict compliance with HIPPA rules & regulations. Because the analyses used existing data without patient identification the study was granted an exemption from Institutional Review Board (IRB) review by the University of Hawai'i.

Results

Prescribing patterns were compared by calendar year (2002-2005) and within three different age groups: 0-12, 13-15 & 16-18. These analyses were followed by evaluating SSRIs prescriptions by gender then by type of provider (psychiatrist/ non-psychiatrist provider).

Total SSRI prescriptions decreased slightly from 2724 in 2002 to 2238 in 2005 with variations by specific brand (Figure 1). Citalopram (Celexa) and paroxetine (Paxil) had statistically significant decreases (p-values < 0.001 and odds ratios per year (and 95% confidence intervals) of 0.6 (0.5, 0.6) and 0.5 (0.4, 0.6), respectively); whereas fluoxetine (Prozac) and escitalopram (Lexparo) had statistically significant increases (p-values < 0.001 and odds ratios per year (and 95% confidence intervals of 1.3 (1.2, 1.4) and 1.5 (1.3, 1.6), respectively). Citalopram use decreased from 21.2% in 2002 to 17.85% in 2003 to 10.6% in 2004 to 5.9% in 2005. Paroxetine prescriptions dropped from 21.4% in 2002 to 9.0% in 2003 to 5.0% in 2004 to 4.2% in 2005. On the other hand, fluoxetine prescriptions increased gradually as follows: 10.2% in 2002 to 8.9% in 2003 to 17.0% in 2004 to 19.4% in 2005. Escitalopram prescriptions increased from 1.1% in 2002 to 12.2% in 2003 to 16.4% in 2004 to 17.2% in 2005. The number of Zoloft prescriptions also increased slightly (38.4% in 2002 and 48.0% in 2005).

The percentage of SSRI prescriptions decreased by 35.0% in the 0-12 age group between 2002 and 2005 as compared to 3.1% for the 13-15 age group and 19.4% in the 16-19 age group (Table 1). The decreases in citalopram and paroxetine use and the increase in fluoxetine and escitalopram use were observed with all SSRI prescriptions and were present within all three age groups. When prescriptions by year were stratified by gender both genders also showed the same changes observed overall and within age groups (Table 2). Differences were also apparent when psychiatrist and non-psychiatrist prescribers were compared (Figure 2). The steady climb in fluoxetine prescriptions by psychiatrists (from 8.5% in 2002 to 20.0% in 2005) was not observed among non-psychiatrists (19.6% of prescriptions in 2002 and 14.6% of prescriptions in 2005). A consistent increase in long-acting paroxetine prescriptions by non-psychiatrists was observed from 0.0% in 2002 to 3.1% in 2003 to 4.1% in 2004 to 6.5% in 2005. This was not seen among psychiatrists (1.6% of prescriptions in 2002 and 0.9% in 2005)

Discussion & Conclusion

Since 2003, a series of concerns have been raised regarding SSRI use and suicidality in children and adolescents. These concerns have resulted in an FDA black box warning which, given the trends in our results, may have impacted providers' prescribing patterns of SSRIs in Hawai'i. To our knowledge, there has not been any previously published data on the changes in prescribing patterns to SSRIs in children and adolescents in Hawai'i. Total patients on SSRIs prescriptions decreased from 2003 to 2005. Changes in use of specific brands were observed in both males and females and across different age groups. There were, however, variations in the extent of changes in prescribing trends of different SSRIs following the FDA black box warning. SSRIs with more evidence based research supporting their safety and efficacy were least affected, as well as those that were less implicated by the FDA analysis on the link between SSRIs and suicidality.

Citalopram use declined over three fold between 2003 (21.2%) to 2005 (5.9%). A sharp decrease was also noted in paroxetine prescriptions, which decreased from 21.37% in 2002 to 5.04% in 2005. Fluoxetine, an SSRI with more evidence based clinical research supporting its efficacy and safety in children and adolescents, showed an overall increase in use from 10.17% to 19.44%. Sertraline (Zoloft), having been approved by the FDA for children and adolescents with obsessive-compulsive disorder, maintained a high percentage of overall prescriptions and showed an increase in use from 38.47% in 2002, to 47.9% in 2005. Escitalopram use also increased gradually to 16.71% in 2005. Longer acting preparations carry a higher risk of complications due to decreased ability to get the medication out of the patient's system, should a decision be made to discontinue the medication. Longer acting preparations were prescribed less. Fluoxetine weekly use decreased from 1.51% in 2002 to 0.71% in 2005. Changes in SSRIs prescribing were apparent in both genders and in different age groups.

Limitations

The insurance data utilized for this study is a fair representation of the population in the Hawaiian Islands since it relies on the largest insurer with coverage of about half the population in the state. While analysis of insurance data has been helpful in demonstrating variations in prescribing patterns with psychiatric medications in children and adolescents, one can only note the parallel association observed between such changes in prescribing patterns and the timing of the FDA black box warning. A direct causal relationship cannot be inferred from these analyses. The results, however, suggest a need for further studies of SSRIs, specifically for a prospective survey of providers and patients regarding effects of the FDA warning. Additionally, it would be interesting to evaluate changes in noninsured population and compare the differences.

Recommendations

Variations in prescribing patterns were noted over time, with the use of several SSRIs decreasing significantly. The data suggest that, following the FDA black box warning, the use of SSRIs with more evidence based research supporting their safety and efficacy as well as SSRIs less implicated by the FDA in association with suicidality changed the least. However, SSRIs continued to be frequently prescribed to manage depression in children and adolescents. Possibilities to explore in future research include prospective studies of these associations over a longer period of time and in different populations as well as changes in type of non-SSRIs antidepressants [bupropion (Wellbutrin), mirtazapine (Remeron), venlafaxine (Effexor), and duloxetine (Cymbalta)] prescribed and psychotherapy/non-prescription approaches. In addition, other issues that deserve further exploration are relationships between type of medication used and economic factors including listings in insurance company formularies. Outcomes of treatment in association with type of medication used are also needed. Further investigation of the consequences of the FDA warning should include studies to increase the evidence related to the efficacy of treatment approaches to this vulnerable population. It is very important to conduct more clinical research studies in child and adolescent psychiatry related to management of depression, both pharmacologic and psychotherapeutic, with the goal of developing evidence-based "best practices" that contribute to the well-being of this population.

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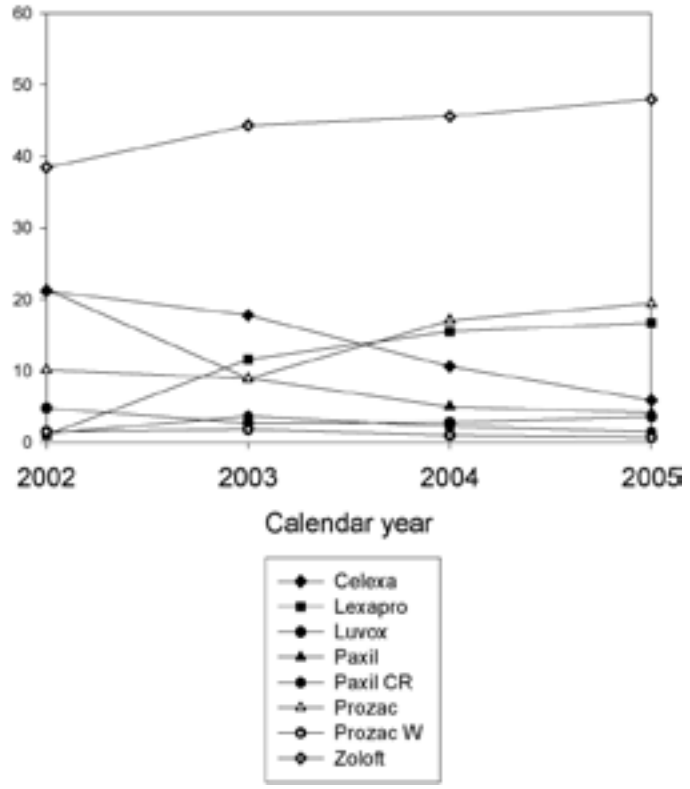

Figure 1.— Percent of serotonin reuptake inhibitor prescriptions by specific brand and by calendar year.

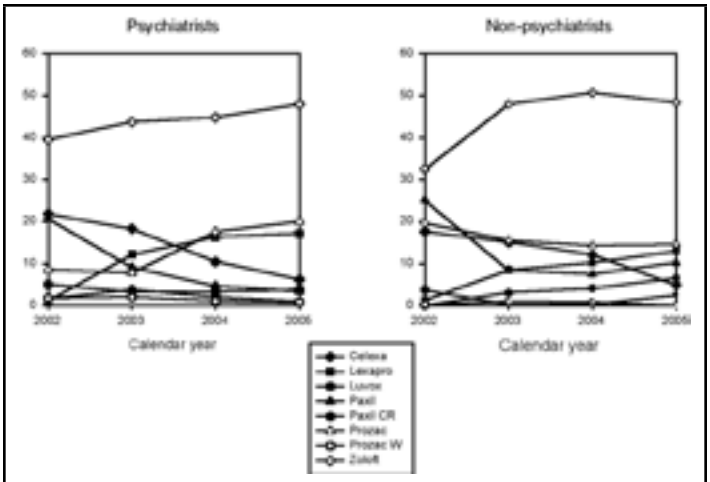

Figure 2.— Percent of serotonin reuptake inhibitor prescriptions by specific brand and by calendar year and by psychiatrist or non-psychiatrist prescriber.

Name in the original submission Brand Name	Chemical name
Celexa	Citalopram
Lexapro	Escitalopram
Luvox	Fluvoxamine
Paxil	Paroxetine
Paxil CR	Paroxetine CR
Prozac	Fluoxetine
Prozac Weekly or Prozac W	Fluoxetine Weekly or Fluoxetine W
Zoloft	Sertraline

Table 1.— Number and percentage of selective serotonin reuptake inhibitor (SSRI) prescriptions by prescription year and by age group.

	Age Group: 0-12				Age Group: 13-15				Age Group: 16-18			
SSRI	2002	2003	2004	2005	2002	2003	2004	2005	2002	2003	2004	2005
Celexa	124	125	61	16	215	235	115	60	239	166	109	56
	17.4%	18.5%	10.6%	3.5%	22.8%	21.0%	10.8%	6.6%	22.3%	14.3%	10.5%	6.5%
Lexapro	1	59	106	92	14	131	155	142	15	154	155	140
	0.1%	8.7%	18.4%	19.9%	1.5%	11.7%	14.6%	15.5%	1.4%	13.3%	14.9%	16.2%
Luvox	51	24	12	10	42	36	42	45	38	22	21	26
	7.2%	3.6%	2.1%	2.2%	4.5%	3.2%	3.9%	4.9%	3.6%	1.9%	2.0%	3.0%
Paxil	158	58	23	3	194	99	43	46	230	109	69	44
	22.2%	8.6%	4.0%	0.7%	20.6%	8.9%	4.0%	5.0%	21.5%	9.4%	6.6%	5.1%
Paxil CR	2	22	4	0	18	48	23	22	16	39	34	11
	0.3%	3.3%	0.7%	0.0%	1.9%	4.3%	2.2%	2.4%	1.5%	3.4%	3.3%	1.3%
Prozac	56	48	74	57	110	91	217	203	111	124	167	175
	7.9%	7.1%	12.9%	12.3%	11.7%	8.1%	20.4%	22.2%	10.4%	10.7%	16.1%	20.3%
Prozac Weekly	1	0	0	0	34	36	5	5	6	18	23	11
	0.1%	0.0%	0.0%	0.0%	3.6%	3.2%	0.5%	0.6%	0.6%	1.6%	2.2%	1.3%
Zoloft	318	341	295	284	316	442	465	391	414	527	462	399
	44.7%	50.4%	51.3%	61.5%	33.5%	39.5%	43.7%	42.8%	38.7%	45.4%	44.4%	46.3%
Total	711	677	575	462	943	1,118	1,065	914	1,070	1,160	1,040	862

Table 2.— Number and percentage of selective serotonin reuptake inhibitor (SSRI) prescriptions by gender.

	Females				Males			
SSRI	2002	2003	2004	2005	2002	2003	2004	2005
Celexa	279	256	160	64	507	462	241	120
	22.2%	17.8%	11.7%	5.2%	21.8%	18.3%	10.4%	6.0%
Lexapro	17	172	184	200	25	308	379	342
	1.4%	12.0%	13.4%	16.2%	1.1%	12.2%	16.4%	17.2%
Luvox	30	11	16	15	116	81	74	75
	2.4%	0.8%	1.2%	1.2%	5.0%	3.2%	3.2%	3.8%
Paxil	305	139	71	59	481	230	108	68
	24.3%	9.7%	5.2%	4.8%	20.7%	9.1%	4.7%	3.4%
Paxil CR	16	57	43	24	36	96	46	17
	1.3%	4.0%	3.1%	1.9%	1.6%	3.8%	2.0%	0.9%
Prozac	137	118	236	259	198	197	406	399
	10.9%	8.2%	17.2%	21.0%	8.5%	7.8%	17.5%	20.0%
Prozac Weekly	21	28	17	12	40	50	25	16
	1.7%	2.0%	1.2%	1.0%	1.7%	2.0%	1.0%	0.8%
Zoloft	447	655	644	603	917	1106	1038	955
	35.7%	45.6%	47.0%	48.8%	39.5%	43.7%	44.8%	47.9%
Total	1,253	1,437	1,371	1,236	2,321	2,530	2,317	1,992

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John A. Burns School of Medicine (JABSOM) Class of 2013 Profile

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John A. Burns School of Medicine, University of Hawai'i

Dr. Seiji Yamada, recipient of the 2009 Leonard Tow Humanism in Medicine Award at JABSOM and keynote speaker at the White Coat Ceremony, opened his address with the following passage from Harrison's Principle of Internal Medicine, 1988, 14th edition:

> *"No greater opportunity, responsibility, or obligation can fall to the lot of a human being than to become a physician. In the care of the suffering he needs technical skill, scientific knowledge, and human understanding. He who uses these with courage, with humility, and with wisdom will provide a unique service for his fellow man, and will build an enduring edifice of character within himself. The physician should ask of his destiny no more than this; he should be content with no less."*[1]

With those words, 29 women and 33 men began their journey towards becoming physicians. The class of 62 where selected from a total of 1700 applicants of whom 1477 were non-residents and 223 were Hawai'i residents. Two hundred fifteen, 64 non-residents and 151 residents, qualified to be interviewed. The final class of 62 first year students represented 55 residents and 7 non-residents, one of whom is a Guamanian (Pacific Islander). Residency for application purposes is determined by examining six issues: legal resident, birth place, parent's legal residence, high school attended, professional or college degree, and legacy (a dependent of an alumna/alumnus or a faculty member who has at least a 50% appointment in JABSOM). To be considered a resident of the State of Hawai'i for application purposes, a candidate must have three of the six.

JABSOM continues to describe itself as the most ethnically diverse student body among all medical schools in the United States. Self-identified ethnic origins are: 23 Chinese, Chinese/Other; 12 Japanese, Japanese/Other; 7 Filipino, Other; 6 White; 2 Koreans; 2 Vietnamese; 1 American Indian, Japanese, Okinawan, White; 1 Cambodian; 1 Guamanian or Chamorro; 1 Korean, Black or African American, White; 1 Native Hawai'ian, White; 1 Thai; 4 Declined to Response.

Forty-three were new applicants; 11 reapplicants; and 8 from Imi Ho'ola (Post Baccalaureate Program at JABSOM). Ages ranged from 21-33 years, with a median of 23 Forty-seven attended Hawai'i high schools—30 private and17 public. Eleven attended mainland high schools; 3 came from high schools in the Pacific Basin; and 1 from Korea.

All accepted have a Bachelor of Arts or Bachelor of Science degree. In addition, seven have Masters degrees; with one each in law, pharmacy, and PhD (biomedical sciences). Forty-eight graduated from colleges on the mainland; 13 from the University of Hawai'i, and one from University of Guam. The Universities represented were: Southern California, Stanford, Berkeley, San Diego, Washington, Occidental College, Los Angeles, Santa Barbara, Pennsylvania, Arizona State, Barnard College, Brigham Young, Brown, Carnegie Mellon, Case Western Reserve, Claremont McKenna, Creighton, Gonzaga, Illinois Institute of Technology, Northern Arizona, Oberlin College, Pomona College, Tufts, Chicago, Denver Redlands, University of Pacific, Wisconsin-Madison, Washington University in St. Louis, Whitman, University of Guam. Graduate colleges attended were: University of Hawai'i, Pepperdine University, University of California-San Diego, University of Missouri-Kansas City, and University of Southern California.

Undergraduate majors included: 16 Biology; 6 Biochemistry; 6 Biological Sciences; 6 Biology, other; 4 each in Biosystems Engineering and Microbiology; 3 in Psychology; 2 each in Anthropology and Molecular and Cell Biology; 1 in each of the following: American History Law; Bioengineering; Chemistry; Chinese/Molecular Biology; Comparative History of Idea; Economics; Environmental Science; Health Science & Society; Human Biology; Management Information Systems; Neuroscience; Physiological Science; and Physiology.

The academic credentials for the entire, entering class were: Median Cumulative Gradc Point Average (GPA), 3.65; and median Science GPA, 3.55. Medical College Admissions Test (MCAT) median scores were: Verbal Reasoning- 9; Physical Sciences-10; Writing Sample-P; and Biological Sciences-11. Median Total Score was: 30.

The process of gaining admission into the John A. Burns School of Medicine is similar to that practiced by 131 US medical schools accredited by the Liaison Committee on Medical Education of the American Association of Medical Colleges. All applicants must take the Medical College Admissions Test (MCAT) and apply through the American Medical College Admissions Service (AMCAS). This Service compiles transcripts, academic data, personal histories, and letters of recommendations that are sent to medical schools designated by the applicants.

All applicants who pass an academic screen are assigned two interviewers and meet, at the end, the Vice Dean who is also Chair of the Admissions Committee. The interviewers (54 faculty, regular and clinical, and fourth year medical students) are interested in learning about the applicant as a person. Therefore, MCAT and GPA scores are not transmitted to the interviewers. Interviewers receive three essays written by the applicants: the personal history for AMCAS and two for JABSOM that answer: 1) "Describe succinctly the important experience(s) in your life which began the process that motivated you to enter the career of medicine" and 2) "Please explain why you are applying to the University of Hawai'i John A. Burns School of Medicine." The interviewers are interested in assessing an applicant's leadership skills, interpersonal skills, quality of compassion to help people, and stamina and motivation to pursue at least eight years of training and education. The meeting with the Chair of the Admissions Committee ensures that all questions and issues related to admissions are answered in a timely, accurate manner.

There are eleven members on the Admissions Committee: 6 clinicians, 2 basic scientists, 2 clinicians who are also basic scientists, and 1 psychologist. There are 6 men and 5 women who represent the major ethnic groups in Hawai'i and the various age levels. The committee convenes at least 20 times beginning in September and ending in March. The activities of the Committee are as follows: a few days prior to a meeting, the dossier of the applicant to be discussed will be assigned randomly to a member of the Committee. The member will go "on line" with a designated password to examine the applicant's folder that consists of: MCAT scores, academic transcripts, and the personal history statement. In addition, the members will review the applicant's hard copy interview reports, letters of recommendations, and the applicant's JABSOM essays. The respective committee member at the meeting will follow a pre-determined sequence in reporting the highlights of each section of the dossier. Queries about the applicant being presented will come from members of the Admissions Committee. When the Chair of the Admissions Committee determines that there is an understanding of the "whom" and "what" of the candidate, he will call for a secret ballot. An individual, confidential ballot is caste by rating the candidate from 1-10. The ratings are not discussed and submitted to the Registrar (Marilyn Nishiki) who will average the ratings. These ratings are ranked when all applicants have been evaluated. Fifty-two are notified of acceptances. The "wait list" is usually determined by the first natural "cut-off" of the rank order. Ten from the Imi Ho`ola Program will join the incoming class if they complete successfully the one-year Post Baccalaureate Program. For the class of 2013, eight of the ten completed the Imi Ho'ola (post baccalaureate) Program.

Considered each year is ten percent of the class, or six, out-of-state candidates. The six matriculants are those non-residents who have risen to the top 52. All non-residents from this group are separated from the top 52 with their correspondent ratings. The top six are selected, followed by a waiting list. In an entering first-year class, there are generally 56 who are "residents" and 6 who are from out-of-state. For the class of 2013, there were seven in that a candidate from Guam was identified as a non-resident.

Sixty-two competent, eager, academically well-educated men and women began their journey on July 13, 2009 to become the best well-educated physicians who will serve human kind in the years to come. The faculty and staff are poised and prepared to fulfill their commitment and contributions to this endeavor.

Reference

1. Fauci AS, Braunwald E, Isselbacher KJ, Wilson JD, Martin JB, Kasper SL, Longo DL. The Practice of Medicine. In Harrison's Principles of Internal Medicine, 14th Ed. New York: McGraw-Hill, 1998, p. 1.

Cancer Information Service Bids Aloha After 26 Years

Hali R. Robinett MPH; Program Director, Cancer Information Service Pacific Region, Cancer Research Center of Hawai'i, University of Hawai'i

CIS Pacific team (l-r) Hali Robinett, Jeannette Koijane, Kevin Cassel, Dr. Carl-Wilhelm Vogel, Angelina Mummert, James Rarick, and Paula Higuchi.

On January 14th, 2010, the lights will go off for the last time at the Cancer Information Service (CIS) Pacific Region, a National Cancer Institute-funded outreach and dissemination program based at the University of Hawai'i's (UH) Cancer Research Center of Hawai'i (CRCH), with an office located at the University of Guam. Despite considerable outcry from regional, state and community-based organizations in the Hawai'i-Pacific region and across the US Mainland, as well as opposition voiced by our nation's Congressional Representatives and Senators, leadership at the National Cancer Institute (NCI) remain steadfast in their decision not to recompete the partnership and research components of the CIS, thus bringing an end to the services and assistance provided by the CIS Partnership Program at the Cancer Research Center of Hawai'i. Little has been said regarding the rationale behind NCI's decision other than the decision was not based on budget or performance, per Lenora Johnson, MPH, Director of NCI's Office of Communication and Education to whom CIS contractors report.

Realizing that time is running out and with no miracles in sight, CIS staff, partners and friends have gathered on several occasions in the recent months to celebrate the accomplishments and contributions of the CIS Partnership Program. Likewise, this column highlights the most significant contributions of the program during its 26 year history at CRCH while addressing the implications of NCI's decision for the Cancer Research Center of Hawai'i and partnering organizations in the Hawai'i-Pacific region.

The CIS was NCI's response to The National Cancer Act of 1971 and its 1974 amendments which include a mandate that the NCI provide a program to disseminate and interpret scientific and other information regarding the causes, prevention, detection and treatment of cancer to scientists, health professionals and the general public. Launched in 1976, the CIS began as a telephone-based program with individual contracts awarded to a handful of leading cancer research institutions on the US Mainland. In 1983, the UH Cancer Research Center of Hawai'i joined an expanding CIS network with the award of its first CIS contract to provide information via telephone about cancer prevention, screening, diagnosis, treatment, including clinical trials, and survivorship to the people of Hawai'i. Soon after CRCH joined the CIS network the now familiar 1-800-4-CANCER number was launched, replacing 34 toll free numbers promoted at the time by CIS contractors across the nation.

In the early 1980s as evidence pointed to the need to address the growing disparities in cancer screening, early diagnosis, treatment and survival, the NCI expanded the CIS scope of services to include an outreach and dissemination component known as the CIS Partnership Program. It is the CIS Partnership Program that has, through decades of relationship building, established long-standing, mutually-beneficial partnerships with organizations in Hawai'i and, beginning in 2000, the US-Associated Pacific Islands (USAPI) to address cancer health disparities and to reduce the overall burden of cancer in the region. Since 1999, with the transfer of the telephone service component of our program to our sister office on the Mainland, reaching those most in need of cancer information through the CIS Partnership Program has been our focus. Our team of nationally trained public health professionals has provided free training and capacity building assistance to organizations in support of programs designed to promote healthy lifestyles and reduce cancer risk, increase access to cancer screening and care services, and increase the public's knowledge about cancer. Additionally, in representing the NCI and the UH Cancer Research Center in Hawai'i, the CIS has served as a link between cancer research and the community, translating and disseminating new and exciting scientific discoveries to the public.

CIS Pacific's Partnership Program pursued many priorities in cancer prevention and control over the years, some handed down by NCI and others by CRCH, with most priorities identified through various strategic planning initiatives led by CIS and fellow cancer control stakeholders in the region.

In supporting strategic planning and implementation efforts in Hawai'i and the US-Associated Pacific Islands, CIS advised 11 federally funded Comprehensive Cancer Control Programs in the region, having provided training and technical assistance in areas such as health promotion, evidence-based programs and practice, clinical trials and palliative care. In supporting the objectives of the Comprehensive Cancer Control (CCC) Programs, CIS staff in our Honolulu and Guam-based offices served in various positions of leadership on CCC coalitions and committees.

In addressing tobacco use, the leading, most preventable cause of death and disease in the US, CIS led earlier efforts of Hawai'i's Cessation Advisory Group, a committee of the Coalition for Tobacco Free Hawai'i organized to facilitate communication, coordination and collaboration among cessation providers while advising the launch and promotion of Hawai'i's state quitline (1-877-44U-QUIT) in July 2005. CIS joined others in influencing tobacco control policy as a member of the Coalition for Tobacco Free Hawai'i's Board of Directors during a period when Hawai'i led the nation with the passage of its smoke-free legislation in 2006. A term on the Tobacco Trust Fund Advisory Board provided opportunities to influence tobacco control priority setting and spending by the Hawai'i State Department

of Health, and partnerships with the Kalihi-Palama Health Center and the Hawai'i Primary Care Association respectively supported the implementation and evaluation of a tobacco prevention drama education program for middle school youth and a project designed to build cessation capacity building across Hawai'i's primary care system.

CIS Pacific shared Hawai'i's knowledge gained and lessons learned with the US-Associated Pacific Islands, having tailored and reported an evidence-based brief tobacco intervention skills training to Guam, the Commonwealth of the Northern Marianas and the Federated States of Micronesia. This training will continue to be available as our Guam-based partners trained in brief tobacco intervention have recently presented and secured funding support from the World Health Organization's Western Pacific Regional Office to provide brief tobacco intervention skills training to stakeholders in the US-Associated Pacific Islands. Other efforts to address tobacco control priorities beyond Hawai'i include technical assistance provided to the Guam Department of Public Health and Social Services which led to the launch of Guam's tobacco cessation quitline in September 2007, leadership provided to the Tobacco Free Guam Coalition, and more recently, the promotion of Guam's quitline with the development of a public service announcement featuring our own Angelina Mummert, CIS staff based at the University of Guam.

CIS has been well known locally for its trailblazing work in the area of clinical trials education and promotion, having launched Hawai'i's Clinical Trials Education Coalition (CTEC) in 2001 comprised of cancer clinical trials stakeholders representing health care institutions and programs invested in clinical research, including representatives of Hawai'i's NCI-funded Minority Based Community Clinical Oncology Program at the CRCH. In 2007, CTEC launched a message development project using focus group research to shape and pilot test clinical trials promotional messages. Thanks to leadership provided by Hawai'i's CTEC and input from focus group members comprised of cancer survivors, including clinical trials participants, this project is near completion. At the writing of this column, CTEC's promotional messages and materials are undergoing field testing.

In building on the work of the Clinical Trials Education Coalition, CIS enjoyed a longstanding collaboration with the UH John A. Burns School of Medicine (JABSOM) to introduce clinical trials education and resources, specifically NCI's Clinical Trials Education Series, to first year medical students. This sustainable program which has trained over 500 medical students since 2003 now includes problem-based learning scenarios and opportunities for students to participate in internships at the CRCH. Likewise, in bringing clinical trials education to nursing students in Hawai'i, CIS partnered with the schools of nursing at Hawai'i Pacific University and University of Hawai'i at Manoa, Hilo, Kauai and Maui to train over a 1,000 undergraduate and graduate nursing students in cancer clinical trials.

Other key partnerships include work in and with the Native Hawaiian community, having assisted Papa Ola Lokahi's Imi Hale, an NCI-funded Community Network Program, in numerous cancer training, education and health promotion efforts since their inception in 2000. Additionally, as a member of the American Cancer Society's (ACS) Native Hawaiian Committee, CIS supported various projects and initiatives aimed at reducing cancer morbidity and mortality in Native Hawaiians. In recent years the Committee engaged Native Hawaiian men in the development of the Kane Project - a peer to peer education project designed to increase awareness and knowledge among Native Hawaiian men about cancer risks and the importance of cancer screening. This year the Kane Project received regional attention at the Inaugural National Maori Men's Health Conference in Aotearoa where Dr. Kekuni Blaisdell featured the project in his keynote address.

As a founding member of Hawai'i's Public Health Training Hui, CIS organized and led a group of public health professionals still dedicated to building the capacity of Hawai'i's public health community through continuing education and training focused more recently on adapting evidence-based programs and interventions. With newly elected leadership, we're hopeful that the work of the Hui will continue long after the CIS has gone.

Efforts in the US-Associated Pacific Islands have focused on regional priorities such as establishing resource-appropriate standards of practice, capacity building in human resources for health, building and adapting evidence-based programs, and developing infrastructure and capacity in palliative care. Partnerships with the CDC-funded programs in the region, most notably the jurisdiction and regional Comprehensive Cancer Control Programs and the Pacific Center of Excellence in the Elimination of Disparities program at UH JABSOM, have served to leverage limited resources to address cancer control priorities and reduce cancer health disparities in the region.

There are many other projects and initiatives that CIS Pacific contributed to and supported during its 26-year history. Equally important are the many valued partnerships we've enjoyed across the US Pacific and in Hawai'i, without which the accomplishments highlighted above would not have been possible.

Since learning of the NCI's decision last October, we have been working with leadership at the Cancer Research Center of Hawai'i as well as cancer control stakeholders in the region to identify strategies to sustain the many projects already in the field and to continue communication and collaborations between the cancer research community and the larger cancer control community in the Hawai'i-Pacific region. While some of the projects launched and/or supported by the CIS, such as the clinical trials education project at UH JABSOM, have already been institutionalized thanks to the efforts and commitment of our partners, the sustainability of other projects is not guaranteed. Still, it is our hope that the information, resources, knowledge and skills shared with our partner organizations will continue to benefit the cancer control community's collective efforts to reduce the burden of cancer and eliminate cancer health disparities in the region.

The CIS team wishes to thank the CRCH Ohana for their years of collaboration and unwavering support. Working alongside such committed staff and world renown investigators has been a privilege. We especially wish to recognize and thank CIS principal investigators and former CRCH leadership, Drs. Carl-Wilhelm Vogel, Brian Issell and Carolyn Gotay for their guidance and support over the years. Finally, we salute our dedicated partners as they carry on with the work that lies ahead!

UPCOMING CME EVENTS

Interested in having your upcoming CME Conference listed? Please contact Nathalie George at (808) 536-7702 x103 for information.

Date	Specialty	Sponsor	Location	Meeting Topic	Contact
February 2010					
2/7-2/12	Multi	Mayo Clinic	Wailea Beach Marriott, Maui	Mayo Clinic Interactive Surgery Symposium	Tel: (480) 301-4580
2/10-2/13	Multi	The Society of Laparoendoscopic Surgeons	Hilton Hawaiian Village, Honolulu	Asian Amierican MultiSpecialty Summit IV: Laparoscopy & Minimally Invasive Surgery	Tel: (305) 665-9959 Email: Conferences@SLS.org
2/11-2/12	Multi	Department of Surgery, John A. Burns School of Medicine, American College of Surgeons - Hawai'i Chapter	Hyatt Regency Waikiki, Honolulu	Cross-Cultural Health Care Conference: Collaborative and Multidisciplinary Interventions	Tel: (808) 586-2925 Web: www.cchc-conference.com
2/13-2/16	OTO	University of California San Francisco School of Medicine	Hilton Hawaiian Village, Honolulu	Pacific Rim Otolaryngology Head and Neck Surgery Update Conference	Tel: (415) 476-4251 Web: www.cme.ucsf.edu/cme
2/13-2/19	PD	American Academy of Pediatrics & the AAP California Chapter	Hyatt Regency Maui, Ka'anapali Beach, Maui	Pediatric Potpourri: State of the Art	Tel: (323) 361-2752 Web: www.childrenshospital lamedicalgroup.org
2/14-2/17	PUD, CCM	Hawai'i Thoracic Society and American Lung Association in Hawai'i	Maui Westin Resort and Spa, Ka'anapali, Maui	10th Annual Symposium: Current Concepts in Pulmonary and Critical Care	Web: www.ala-hawaii.org
2/14-2/19	DR	University of California San Francisco School of Medicine	The Fairmont Orchid, Kohala Coast, Hawai'i	Body & Musculoskeletal Imaging in Paradise	Tel: (415) 476-4251 Web: www.cme.ucsf.edu/cme
2/14-2/19	IM, ID	University of California San Francisco School of Medicine	The Fairmont Orchid, Kohala Coast, Hawai'i	Infectious Diseases in Clinical Practice: Update on Inpatient and Outpatient Infectious Diseases	Tel: (415) 476-4251 Web: www.cme.ucsf.edu/cme
March 2010					
3/26-3/30	AN	International Anesthesia Research Society	Hawai'i Convention Center, Honolulu	84th Congress	Tel: (216) 642-1124 Web: www.iars.org
3/29-4/1	Multi	Scripps Conference Services & CME	Kaua'i Marriott Resort & Beach Club, Kauai	15th Annual Primary Care in Paradise Email: med.edu@scrippshealth.org	Tel: (858) 652-5400 Web: www.scripps.org/primary careparadiseCME
April 2010					
2/14-2/19	IM	University of California San Francisco School of Medicine	Wailea Beach Marriott, Maui	Primary Care Medicine: Update 2010	Tel: (415) 476-4251 Web: www.cme.ucsf.edu/cme
4/4-4/10	EM	Stanford School of Medicine	Grand Hyatt, Poipu Beach, Kaua'i	16th Annual Stanford Symposium for Emergency Medicine	Tel: (650) 497-8554 Web: www.stanfordhospital.org/forPhysiciansOthers/cme/
May 2010					
5/4-5/7	PD	Pediatric Orthopaedic Society of North America	Hilton Waikoloa Village	POSNA/APOA Annual Meeting	Tel: (847) 698-1692 Web: www.posna.org
July 2010					
7/3-7/9	DR	Radiology Department, Stanford School of Medicine	Kea Lani Hotel, Maui	18th Annual Diagnostic Imaging Update	Tel: (888) 556-2230 Web: radiologycme.stanford.edu
7/3-7/9	PD	Childrens Hospital Los Angeles Medical Group	Hyatt Regency Maui, Ka'anapali Beach, Maui	Pediatrics in the Islands: Clincal Pearls	Tel: (323) 361-2752 Web: www.childrenshospital lamedicalgroup.org
7/10-7/15	IG, N	Alzheimer's Association	Hawai'i Convention Center, Honolulu	2010 International Conference on Alzheimer's Disease	Tel: (312) 335-5790 Web: www.alz.org/icad/2010_icad.asp
7/26-7/29	DR	Radiology Department, Stanford School of Medicine	Hyatt Regency, Maui	4th Annual LAVA (Latest Advances in interVentionAl techniques)	Tel: (888) 556-2230 Web: radiologycme.stanford.edu

THE WEATHERVANE

RUSSELL T. STODD MD, CONTRIBUTING EDITOR

❖ WE MAKE A LIVING BY WHAT WE GET, BUT MAKE A LIFE BY WHAT WE GIVE.

Researchers at the University of Minnesota collected data on kidney transplants from 1963 to 2007. In evaluating medical information from 3,698 people who gave away a kidney during that time, they found that the donors have about the same probability of survival over several decades as people in the general population. They also randomly selected 255 of the donors to test for kidney function to compare with a cohort matching race, gender, body weight and age, but having two kidneys. The donors had lower rates of end-stage renal disease. This is quite reassuring information for kidney transplant centers.

❖ COMPUTERS WILL HELP YOU MAKE VERY FAST AND VERY ACCURATE MISTAKES.

A criminal case which could set a dangerous precedent occurred in California. A psychiatrist in Fort Collins, Colorado, prescribed an antidepressant, fluoxetine, to a 19-year-old through an Internet pharmacy. The patient later committed suicide. A civil action filed by the patient's parents was dismissed by the U.S. District Court for Northern District of California which found that the antidepressant played no role in the death. Not satisfied with the outcome, the county prosecutor's office conducted an investigation and referred the case to authorities for criminal prosecution. The doctor pleaded no contest to felony charges of practicing medicine without a California license (he is licensed in Colorado) and was ordered to pay $4,000 to reimburse the Medical Board of California for investigation costs. He is serving nine months in jail. The doctor's attorney claimed that this legal interpretation required proof that the doctor intended harm, a factor the prosecutor and court ignored. Bear in mind that information technology can be an avenue to screw up your life.

❖ THIS SUNSHINE ACT SHOULD BE PUT WHERE THE SUN DON'T SHINE.

Senator Grassley's (Rep, Iowa) current proposed version of the Physician Payment Sunshine Act is a bill that would toughen the $500 minimum to $100 per year for fees, food, honoraria, entertainment or other compensation. The bill would apply to physicians who receive payments through Medicare, Medicaid or the State Children's Health Insurance Program. It would establish penalties as high as $1 million for knowingly failing to report the gift information. Our pure-as-the-driven-slush congress is preaching money morality to us greedy docs for accepting a dinner invitation.

❖ YOUTH IS A DISEASE FROM WHICH WE ALL RECOVER.

Michael Phelps, swimming champion in eight olympic events, was photographed puffing marijuana from a bong at a college party. He made a public apology and appeared to be very contrite, stating that he felt he had let his fans down. Kellog's cereals dropped him from their boxes, and the over all loss of endorsements could reach as much as $100 million over his lifetime according to marketing experts. That should have been enough but USA Swimming suspended him from competition for three months, not for using performance enhancing drugs, but presumably his failure as a "role model." Hey, wait a minute! An athlete's actions should be judged by what is done relative to competition, and not his stupidity out of the water.

❖ THE CHEAPER THE POLITICIAN, THE MORE HE COSTS THE COUNTRY.

An example of where your tax dollars go with congressional "earmarks" and stimulus money is Jack Murtha Airport. This seldom used facility located near a small Pennsylvania town is in the territory of 19-term Congressman Murtha, nicknamed the House king of pork. With three commercial flights, the airport sees a few people at that time, but otherwise has little action. The $8 million air traffic radar system installed in 2004 has never been staffed. When Murtha made a direct appeal to the Federal Aviation Administration (FAA) for funds to repave the seldom used crosswind secondary runway, the FAA turned it down since it did not meet traffic criteria. What a surprise! This year the FAA notified Murtha airport officials that $800,000 in stimulus money had been approved for the runway.

❖ I PREFER THE OLD WAY OF HAVING CHILDREN.

So far, hundreds of women have had their ovarian tissue removed and stored at sub-zero temperatures for medical reasons when they were about to undergo chemotherapy treatment for cancer that would leave them infertile. The procedure involves making a small incision below the umbilicus and removing all or part of an ovary. Now some women want to consider the procedure for matters of convenience, such as planning to advance their careers or waiting for the right man. "This has the potential to be the largest breakthrough in reproductive choice in women," according to Pamela Madsen, executive director of the American Fertility Association. Some fertility experts note that the technique's safety and efficacy are unproven, since only a handful of births have taken place. Pioneers in the technique think it should be available broadly, and that if patients are properly informed about their options why should they not have the right to preserve their fertility. And what about an age limit? The oldest recorded natural childbirth is believed to be that of a U.K. mother at age 59, but that had to be one of nature's really rare accidents.

❖ IF THERE IS NO GOD WHO POPS UP THE NEXT KLEENEX?

Yet another religious nut case occurred in Wisconsin where the mother of an eleven-year old girl relied on prayer to heal her diabetic child. Prosecutors have charged the 41-year-old mother with second degree reckless homicide. The girl was so weak she could not walk, talk or drink water, and the mother called a prayer group couple to come and pray with her. They did so, exhorting God to show his power. When the girl twitched and ceased breathing, panic set in and an ambulance was called. A diabetic expert at the Marshfield Clinic who examined the medical and police reports stated that with proper treatment she could have been saved, "very late into the day of her death." One has to wonder about the husband who admitted that he had considered calling a doctor, but failed to do so.

❖ WHAT'S THIS PUSHBUTTON THING? I WANT MY DIAL PHONE BACK.

A survey managed by the National Institutes of Health found that the majority of American homes still have a land telephone line as well as a wireless phone, but that number is changing. The Communicable Disease and Control Center (CDC) collected data from July to December 2007 including 24,500 responding adults. One in six households (15.8%) no longer have a land line, compared with 11.6% in 2006 and 5.4% in 2004. Demographics revealed that 56.7% of adults living with unrelated roommates had the highest wireless only while homeowners were at 7.3% and those over age 65 were the smallest group at 2.2%.

❖ TWENTY-FOUR HOURS IN A DAY, TWENTY FOUR BEERS IN A CASE – COINCIDENCE? I THINK NOT!

Anheuser-Busch InBev, the Leuven, Belgium, company, has come out with an unusual advertising campaign featuring Bud Light cans decorated with the local college team colors. Although the cans do not mention the school or bear a school logo, critics believe the colors imply an endorsement of the beer. Janet Evans, a senior attorney for the Federal Trade Commission (FTC), said that the agency has "grave concern" that the ad campaign acts to encourage underage and binge drinking on college campuses. The Bud Light campaign features twenty-seven different color combos and began this fall along with the college football season. At least 25 schools have complained and formally advised Anheuser Busch to stop the distribution in their neighborhood. A few others, namely University of Texas and Louisiana State University, stated that they would not oppose the colored can marketing. Of course, the Anheuser Busch spokesperson said the company has a long history of supporting efforts to curb alcohol abuse.

❖ DAYLIGHT WAS SAVED BUT LIVES WERE LOST. SPRING FORWARD AND DIE!

Researchers in Sweden analyzing data from 1987 to 2006 found that heart attacks increased by 6% on the day following the "spring forward" to daylight savings time. Contrarily, in autumn the day after "falling back" Swedes had 5% fewer attacks. The hypothesis is that waking up earlier has an adverse effect on some people. The researchers believe their data suggest that vulnerable people might benefit from avoiding sudden changes in biologic rhythm.

❖ PAYING TAXES IS OKAY AS LONG AS THE MONEY GOES TO A FRIENDLY COUNTRY.

In September the U.S. Tax Court ruled against 78-year-old retired lawyer William Halby for improperly deducting $300,000 over a five year period for "medical expenses." He admitted the expenditures were for sex toys and prostitutes which he claimed were necessary to treat his depression, and that he had no other sexual outlet. In its negative ruling the court reminded lawyer Halby that prostitution is illegal in New York.

ADDENDA

❖ The top 1% of U.S. households earn 79% of the nation's income and pay 28% of all taxes.

❖ Stress is when you wake up screaming and you haven't even been to sleep yet.

❖ Life is like a roll of toilet paper. The closer to the end the faster it goes.

❖ Absent-minded cows give milk of amnesia.

ALOHA AND KEEP THE FAITH — **rts**■

(Editorial comment is strictly that of the writer.)

Hawaii's Physicians CHOOSE HAPI as their Medical Malpractice Carrier

In recent years, hundreds of Hawaii's physicians have switched their coverage to HAPI, saving thousands of dollars on their medical malpractice coverage costs.

Started 32 years ago, HAPI is Hawaii's first, physician-owned medical malpractice coverage provider.

As a leading medical malpractice coverage provider, HAPI protects and defends Hawaii's most influential and respected physicians.

With a strictly local presence and NO profit motive, savings are distributed to our members.

HAPI's rates have remained stable, with several rate decreases or no change in rates in recent years.

In these tough economic times and challenging industry trends, you don't have to worry about your medical malpractice coverage costs. Let HAPI's financially sound, affordable plan protect you. Join your fellow colleagues...**contact HAPI and start saving today.**

2009 HAPI's Total Quarterly Costs (Including Fully Mature Retroactive Coverage)	
General Surgery	$4,168
Internal Medicine	$1,373
Pediatrics	$1,662

The above illustration is an example of HAPI's 2009 fully mature costs. These costs apply to physicians who need three years or more of retroactive coverage upon joining HAPI. If you do not need retroactive coverage or if you join HAPI out of a residency or fellowship, you will pay significantly less than shown above. The above specialties were selected for illustrative purposes only. Call HAPI for your specialty's costs.

If you are a D.O. or M.D. in private practice, call Jovanka Ijacic, HAPI's Membership Specialist to discuss the cost savings HAPI could offer you.

"What prompted me to search for a new malpractice insurance provider was the steep increase in premiums. I am a strong believer that you get what you pay for, but also want value. Malpractice insurance companies should provide good legal support if that fateful day arrives. In addition, I was concerned that certain companies would not have enough reserves to handle large or multiple claims. I checked with the insurance commission and researched the integrity of the attorneys and felt that HAPI has the support that I need at an affordable price. Now, that's value!"
Lance M. Kurata, M.D., Internist

"After converting my coverage to HAPI, I was pleased with the cost savings but even more impressed with their immediate attention to my concerns. It is very reassuring to know that HAPI is highly accessible if there is a concern. I've experienced excellent customer service since day one."
Art Wong, M.D., Pediatrician

"I was pleasantly surprised with the additional savings I received when signing up with HAPI. They have been extremely accommodating in providing liability coverage for my practice, and I would recommend other Osteopathic Physicians to consider HAPI as their carrier as well."
Leland Dao, D.O., Family Practitioner

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