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The Importance of Communication in the Management of Postoperative Pain

Daniel Y. Sugai MD; Peter L. Deptula BA; Alan A. Parsa MD; and Fereydoun Don Parsa MD

Abstract
This study investigates the importance of communication in surgery and how delivering preoperative patient education can lead to better health outcomes postoperatively, via promoting tolerable pain scores and minimizing the use of narcotics after surgery. Patients who underwent outpatient surgery were randomly divided into groups to compare the pain scores of those who received preoperative patient education, the experimental group, and those who did not receive any form of patient education, the control group. Two weeks before surgery, the experimental group subjects received oral and written forms of patient education consisting of how the body responds to pain, and how endorphins cause natural analgesia. Moreover, patients were educated on the negative effects narcotics have on endorphin production and activity, as well as mechanisms of non-opioid analgesics. Of the 69 patients in the experimental group, 90% declined a prescription for hydrocodone after receiving preoperative education two weeks prior to surgery. The control group consisted of 66 patients who did not receive preoperative patient education and 100% filled their hydrocodone prescriptions. Patients in both groups were offered and received gabapentin and celecoxib preoperatively for prophylaxis of postoperative pain unless they declined. The control groups were found to have average pain scores significantly greater (P <.05) than the experimental groups and also a significantly longer (P <.005) duration of pain. This study illustrates the power of patient education via oral, written and visual communication, which can serve as an effective means to minimize narcotic analgesia after surgery.

Keywords
endorphins, education, narcotics, communication

Introduction
The role of communication is emphasized to physicians from the earliest stages in their training in medical school. The value of communication in medicine lies within effectively obtaining a patient history, collaborative communication between members of the treatment team, patient education, informed consent, and forming a therapeutic alliance between physician and patient. The importance of patient communication in surgery is paramount and is not only a means of educating the patient but is also a method for preserving a patient’s well-being after a surgical procedure. There is an art behind delivering information to patients and this topic has been reported on extensively in the literature. It has been reported that optimal physician-patient communication can improve the patient’s health outcomes in various ways including symptom resolution, emotional healing and recovery, and pain control. If the surgeon is able to apply this in the preoperative setting, positive surgical outcomes are more likely. Here, we investigate the power of patient education on pain mechanisms and endorphin physiology in order to promote the movement toward discouraging the use of narcotics in postoperative pain management.

It has been shown that the body’s endogenous opioids are responsible for counteracting physical stressors, as well as maintaining our mental wellbeing via acting on the mu receptors in the central nervous system. Universal post-surgical pain management usually involves the use of opioid narcotics. Unfortunately, the negative effects of opioid medications, like morphine, on our endogenous network of endorphins are detrimental to our natural analgesic response to pain. Narcotics alter our pain response by decreasing the production of endorphins as well as down-regulating the expression of mu receptors acted on by both endorphins and exogenous narcotics. By inhibiting the activity of endorphins via two mechanisms (production of endogenous peptides and mu receptor expression), patients on chronic morphine regimens actually experience a paradoxical increase in pain, or hyperalgesia. Moreover, with chronic pain and low levels of endorphins, the patient is more susceptible to suffer from psychiatric illnesses including depression and feelings of hopelessness. An overall insult on one’s wellbeing — physically and mentally — is the main concern when using opioid narcotics postoperatively.

Studies where alternative pain regimens are being proposed in replacement of opioids for postoperative pain management have been done to address this concern. Parsa, et al, investigated the effectiveness of patient education regarding the role of endorphins and the negative effects of narcotics on endorphins combined with the preoperative administration of gabapentin and celecoxib. The biological rationale for the authors’ use of gabapentin and celecoxib is the drugs’ opioid-sparing mechanisms; celecoxib acts through cyclooxygenase-2 inhibition, while gabapentin is postulated to reduce excitability of the dorsal horn neurons of the central nervous system. The results of the study were successful in showing that the combination of gabapentin and celecoxib yielded less need for postoperative analgesia (hydrocodone or acetaminophen) as the pain scales were impressively nil to mild in patient-reported ratings. The use of communication was shown to effectively convince patients to disregard their prescription of opioid analgesics as the patients were educated about the importance of endorphins.

In order to further investigate the power of patient education regarding the body’s natural analgesic system, this study tests the management of postoperative pain with patient education being the main variable between the experimental and control groups. The authors hypothesize that in most surgeries of lower severity, patients’ postoperative pain can be effectively managed without supplemental narcotics if patients are properly educated preoperatively about the body’s endogenous opioids.

Methods
Between January 2008 and October 2011, 135 patients undergoing elective outpatient aesthetic procedures were asked to volunteer for this study. Patients who were excluded from the study were those who suffered from chronic pain, had a history
of substance abuse or a recent history of long-term opioid use (used any opioid analgesics for longer than 30 days in the 5 years prior to surgery). Moreover, patients with an allergy to acetaminophen, COX-2 inhibitors, gabapentin or hydrocodone were excluded from the study. The patients were 58.4% Asian or of mixed-Asian ancestry. The remaining identified themselves as Caucasian, Filipino, part-Hawaiian, or “other.” No opioids, including morphine, meperidine, or fentanyl, were administered during the procedure. These qualifying patients were randomly divided into experimental and control groups.

The experimental group contained a total of 69 patients who were educated about the importance of “endorphins” or “natural narcotics” (these two words were used repeatedly throughout the session for better understanding). Not only were the patients educated on the side effects of opioid narcotics, including nausea and vomiting, but they were also taught the negative effects of “synthetic narcotics” or “fake narcotics” (two words also repeated for better understanding) have on the body’s endorphins. The experimental group underwent two educational sessions led by the same surgeon, each lasting from 15 to 30 minutes: one session was held about two weeks before the surgical procedure, and the second session was done on the same day before the procedure. The earlier session, two weeks prior to the procedure, included both oral and written forms of communication where the patient underwent a 15 to 30 minute preoperative patient education session as well as received a handout re-emphasizing the main points about endorphins. During the pre-operative session, a schematic was used to illustrate the ligand protein-receptor nature between the mu receptor and its ligands, eg, endorphins. The surgeon explains that if synthetic narcotics, such as hydrocodone or oxycodone, are administered, they will block the receptors and thus have a dual effect of blocking the action of the natural narcotics (endorphins) as well as diminishing their production. Patients were educated that as a result, patients using opioid analgesics not only face the side effects of narcotics (nausea/vomiting), but also have more intense pain for a longer period since it takes time for the endorphins/natural narcotics to be produced.

The preoperative teaching sessions also included information about non-opioid analgesics, namely gabapentin, celecoxib, and acetaminophen. Specifically, patients learned that these drugs are known to produce analgesic effects though opioid-sparing mechanisms. Taking these medications would preserve the body’s natural endorphin production and response, while avoiding the negative side effects of narcotics.

After receiving instruction, the patients had the choice to receive preoperative treatment consisting of oral administration of 600mg of gabapentin and 400mg of celecoxib 30-60 minutes before surgery. The patients who preferred no prescription of hydrocodone as well as gabapentin and celecoxib after patient education were separated into experimental group A. Experimental group B consisted of patients who received preoperative patient education, refused to take a prescription of hydrocodone, but accepted preoperative administration of gabapentin and celecoxib. Those who accepted a prescription for hydrocodone, in case acetaminophen (Tylenol) was not adequate, were put into experimental group C.

The control group consisted of 66 patients who received 600mg of gabapentin and 400mg of celecoxib 30-60 minutes before surgery, but did not receive any pre-operative oral or written patient education regarding endorphin physiology. Patients were handed prescriptions for the preoperative medications (gabapentin and celecoxib) and hydrocodone. These patients were divided into control group A (those who did not request refills on hydrocodone) and control group B (those who requested refills on hydrocodone).

All patients had access to acetaminophen (1000mg every 6 hours as needed) postoperatively. The rationale for the administration of celecoxib and gabapentin was explained to the patients by the operating surgeon during their preoperative visit, which occurred approximately 2 weeks before surgery, and was re-emphasized on the day of the procedure prior to the operation. However, control group patients did not receive preoperative education on the mechanisms of preserving endorphin function in these non-opioid analgesics. Rather, the patients were simply informed that celecoxib and gabapentin would be used for prophylaxis of postoperative pain. Additionally, 500mg of cephalexin was given to all patients 30-60 minutes before surgery for infection prophylaxis, following the surgeon’s usual infection protocol. The incidence of nausea and vomiting in the post-anesthesia care unit for both control and experimental groups was recorded.

Beginning on the day of surgery and ending on the fifth postoperative day, patients were asked to self-rate their perceived level of pain intensity daily. Pain intensity was quantified using the following 0-5 scale: 0 for none, 1 for mild pain (annoying, nagging), 2 for discomforting (trouble-some, nauseating, grueling, numbing), 3 for distressing (miserable, agonizing gnawing), 4 for intense (dreadful, horrible, vicious, cramping), and 5 for excruciating pain (unbearable, torturing, crushing, tearing). This pain scale is consistent with the scale used by Parsa, et al, in their study on the combined use of celecoxib and gabapentin in postoperative pain management. Self-rating was done on a daily basis. If patients experienced different intensities of pain throughout the day, they were asked to record the time and intensity of their perceived pain accordingly. Patients who required analgesic medication were asked to record the date, time, type of medication (Tylenol or hydrocodone), and the intensity of their pain on a provided form.

The questionnaires were collected on postoperative day 5. The investigators calculated an average pain score for each patient over the five days. These scores were compiled and organized in the following fashion: nil to mild pain, pain score of 0 to 1.99; mild to moderate pain, pain score of 2 to 2.99; intense pain, pain score of 3 to 5. Additionally, a combined average pain score for each of the 5 subject groups was calculated. Patients’ use of opioid analgesics and self-rated pain are the primary outcome measures of this study. Statistical analyses were conducted using Fisher’s exact test with mid-P, two-sided values of P<.05 considered significant.
Results
Of the 69 patients in the experimental group, 63 (90%) declined taking home a prescription of hydrocodone at the preoperative session two weeks prior to surgery (Figure 1). These 63 patients expressed clear understanding of the role endorphins/natural narcotics played in postoperative pain control and the need to preserve the body’s own natural narcotics. Moreover, none of these patients called the office requesting hydrocodone postoperatively. The results for the experimental and control groups are summarized in Table 1.

In experimental group A, 43 patients (62% of experimental group) did not take preoperative celecoxib and gabapentin. The mean pain score for the first 5 days postoperatively was 2.6. Experimental group B consisted of 20 patients (29% of experimental group) who chose to take celebrex+gabapentin preoperatively on the morning of surgery. The mean pain score for the first 5 days postoperatively was 2.0 and 100% of patients believed that Tylenol alone provided adequate postoperative analgesia. The average duration of pain was 1.9 days.

Among the 6 patients who despite preoperative education, insisted on receiving a prescription of hydrocodone (experimental group C), 33% filled and utilized hydrocodone after surgery. Patients who utilized hydrocodone had intense pain with average pain scores of 4.4 and 4.2. One patient filled the hydrocodone prescription but did not utilize it, and had a pain score of 2.9 (moderate pain). Three patients requested hydrocodone but did not fill their prescriptions and had an average pain score of 2.2 (moderate pain). In this group, those who utilized hydrocodone had a higher pain score than those who did not use the drug ($P<0.05$). Overall, the pain score in this group (experimental group C) was higher than in patients who did not request hydrocodone for their postoperative use, as in the experimental groups A and B ($P<0.05$). The average duration of pain was 3.1 days in this group.

In control group A, where no education was provided and hydrocodone was provided, but no refill was requested, the average pain score was 3.2. This average is significantly ($P<0.05$) greater than that of the experimental groups receiving patient education. In control group B, where patients received no preoperative education, all patients utilized hydrocodone postoperatively and in addition asked for refills at least on one occasion, the average pain score was 3.1. This value is similar to those who requested no refill and also significantly higher than patients who had received preoperative education ($P<0.05$). Of note is that the average duration of pain in these latter two groups (control group A and control group B) was significantly longer ($P<0.005$) than in those patients who had received preoperative education: 4.2 days in control group A and 4.9 in control group B (combined average of 4.5) compared to the average of 2.6 days when the experimental groups A (average 2.8 days), B (average 1.9 days) and C (average 3.1 days) are combined.

Table 1. Summary of Results in 5 Patient Groups

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>n</th>
<th>Average Age</th>
<th>Mean Pain Score for the first 5 days post-operatively</th>
<th>Mild Pain</th>
<th>Moderate Pain</th>
<th>Intense Pain</th>
<th># Patients with postoperative nausea/vomiting</th>
<th>Duration of Pain (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group A: Patient education only</td>
<td>43</td>
<td>46.8 yrs</td>
<td>2.6</td>
<td>9 (21%; Avg: 1.3)</td>
<td>29 (67%; Avg: 2.3)</td>
<td>5 (11%; Avg: 4.1)</td>
<td>0</td>
<td>2.8</td>
</tr>
<tr>
<td>Experimental Group B: Patient education and Gabapentin + Celecoxib</td>
<td>20</td>
<td>39.4 yrs</td>
<td>2.0</td>
<td>5 (25%; Avg: 0.9)</td>
<td>11 (55%; Avg: 1.7)</td>
<td>4 (20%; Avg: 3.3)</td>
<td>0</td>
<td>1.9</td>
</tr>
<tr>
<td>Experimental Group C: Patient education and hydrocodone</td>
<td>6</td>
<td>24.3 yrs</td>
<td>3.0</td>
<td>2 (33%; Avg: 1.6)</td>
<td>3 (50%; Avg: 2.6)</td>
<td>1 (17%; Avg: 4.6)</td>
<td>6 (100%) [only 2 (33%) filled and utilized hydrocodone]</td>
<td>3.1</td>
</tr>
<tr>
<td>Control Group A: No patient education and no refill of hydrocodone</td>
<td>53</td>
<td>34.2 yrs</td>
<td>3.2</td>
<td>13 (24%; Avg: 0.9)</td>
<td>18 (34%; Avg: 1.7)</td>
<td>22 (42%; Avg: 3.3)</td>
<td>53 (100%)</td>
<td>4.2</td>
</tr>
<tr>
<td>Control Group B: No patient education and refill of hydrocodone</td>
<td>13</td>
<td>26.3 yrs</td>
<td>3.1</td>
<td>0</td>
<td>2 (15%; Avg: 3.4)</td>
<td>11 (85%; Avg: 4.9)</td>
<td>13 (100%)</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Figure 1. Experimental Group Breakdown After Patient Education
Discussion

Opioid narcotics carry multiple side effects which can complicate postoperative recovery including ileus, anorexia, nausea and vomiting, sedation, respiratory depression, and addiction. The harm inflicted on the body due to the intake of opioid narcotics is being investigated and has been shown to negatively affect our endogenous neuropeptides called endorphins. Endorphins act on the mu opioid receptors throughout our nervous system and naturally disrupt the pathways involved in pain transmission. Proopiomelanocortin (POMC) is the precursor to beta-endorphins and is secreted by the anterior pituitary. Studies have shown that after prolonged exposure to exogenous opioids like morphine, the production of POMC from the anterior pituitary is reduced and thus beta-endorphin levels decrease. In premenstrual dysphoric disorder, a study found that patients with the disorder had lower levels of plasma beta-endorphins which correlated to lower pain thresholds and increased pain sensitivity. In addition to pain modulation, endorphins have also been involved in behavior and mood. Stanley, et al, investigated the cerebral spinal fluid levels of endorphins in those with self-injurious behavior and found that those who were depressed and suffered from feelings of hopelessness had significantly lower levels of CSF endorphins.

New advances toward managing postoperative pain without narcotics are underway. In this study, the use of patient education via oral, written, and visual communication was shown to be an effective way to minimize narcotic analgesia after surgery. This was successfully illustrated as 90% of patients who received preoperative teaching declined a hydrocodone prescription at the time of their preoperative visit, and did not request narcotics postoperatively. Conversely, 100% of patients who did not receive preoperative teaching filled their narcotic prescription when it was offered to them. Moreover, the average pain scores in experimental group A and experimental group B were lower than those who filled and utilized their narcotic prescription (experimental group C and control groups). In other words, those who requested and used hydrocodone postoperatively reported significantly more intense \( P < .05 \) postoperative pain than those who did not utilize hydrocodone, suggesting that the use of opioids has an adverse effect on the intensity of postoperative pain (Table 1). The duration of postoperative pain was also found to be significantly longer \( P < .005 \) in patients receiving opioids (average 4.5 days) than those only utilizing postoperative acetaminophen for pain relief (average 2.6 days). Additionally, patients who utilized hydrocodone postoperatively had nausea and vomiting of varying degrees in contrast to none of the patients in other groups who did not use opioids \( P < .001 \). These results were similar to a meta-analysis investigating the positive outcomes after preoperative and postoperative patient education in order to alleviate psychological distress and postsurgical pain. Various postoperative improvements were seen with patient education including decreased length of stay in the hospital, decreased blood loss, and reduced time to regain bowel function.

Studies have shown that visual aid use is an effective strategy to educate patients of different cultural and educational backgrounds. Given the substantial difference between the experimental and control groups, it can be postulated that the use of visual aids was an effective method in illustrating the ligand-receptor nature of opioids and endorphins with their respective receptor. In addition to the benefit of educating the patient on endorphins, patients perhaps also experience a sense of control in their care as opposed to the historical paradigm of physician paternalism. Numerous studies have shown that when patients are adequately informed about their medical conditions and take an active part in decision-making, improved outcomes are more likely. In regards to pain tolerance, a correlation has been found between a sense of control in the patient and increased pain tolerance. This phenomenon could have been involved with educating the patient on the mechanism of pain and endorphins and thus giving the patient a choice in whether to accept a prescription for a narcotic or not. Authors also note that the amount of time spent between patient and physician; differences in age between the experimental and control groups; and severity of surgical procedures represent potential confounding factors.

Another phenomenon that could have been present in this study was the placebo effect. In this study, authors offered a preoperative educational intervention, not an inert treatment. However, it is possible that the educational intervention described in this study did elicit the same physiological response seen in the placebo effect. A 2005 meta-analysis of 40 years of literature studying the placebo effect came to the conclusion that there is evidence that endogenous opiates are mediators in the mechanism of the placebo effect. This concept has been repeated in multiple studies in which an administered placebo could achieve pain reduction in experimental and postoperative pain. Moreover, administering naloxone, an opioid antagonist, would reverse this response and thus increase pain responses. The authors acknowledge that pain scores analyzed in this study are self-reported by the patients. Thus, patient perception and reporting bias should be considered in the interpretation of the findings. Additionally, the patients may have behaved in manners they perceived to be socially desirable. In this case, social desirability bias could have been introduced and is a limitation of this study.

The importance of effective communication with the patient should be emphasized with not only the operating surgeon, but also the anesthesiologist and possibly with other members of the surgical team. Ideally, the concept of “endorphins” should be reviewed with the patient in the preoperative evaluation visit with the anesthesiologist. This collaboration is paramount to the patient’s quality of recovery as demonstrated in this study. That endorphins are involved in many aspects of our wellbeing including pain sensitivity and psychological wellbeing, it is crucial to educate patients undergoing surgery on the importance of endorphins and eliminating the need for narcotics in postoperative pain management. By empowering the patient with a sense of control and proper education, it is possible to minimize and in many instances eliminate the use of opioid.
analgesics. Other non-opioid analgesics such as acetaminophen and COX-2 inhibitors are available that have fewer side-effects in postoperative pain management. This study illustrates the power of communication and how influential a physician can be in the mental and physical management of the surgical patient.

Disclosure Statement/Conflict of Interest

The authors have no financial interest in the medications reported in this study. The authors report no conflict of interest.

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Retained Pill Camera at an Entero-Uracho-Vesical Fistula Site in a Patient with Crohn’s Disease

Christopher G. Yheulon MD; Daniel C. Derosa DO; and Ronald A. Gagliano MD

Abstract
An 18-year-old female patient with Crohn’s disease had abdominal pain secondary to a retained pill camera. After several weeks of medical management, the patient also had an intra-abdominal abscess that worsened, despite medical therapy. Surgical therapy was recommended and a 5cm infected urachal cyst with entero-urachal and vesico-urachal fistulas was discovered. An en-bloc resection of the entire area was performed to include the urachal cyst, the adherent portion of the dome of the bladder, and 15cm of associated ileum. The bladder was repaired, a suprapubic catheter was placed, and an ileo-ileo-anastomosis was performed. Microscopic findings were consistent with active Crohn’s disease and fistula formation. The entero-urachal-vesical fistula site was likely the site of the retained pill camera. The patient did well postoperatively and was discharged on postoperative day six without complications.

Keywords
Crohn’s Disease, Capsule Endoscopy, Pill Camera, Retained Pill Camera, Entero-Urachal Fistula, Entero-Urachal-Vesical Fistula

Case Report
An 18-year-old woman presented with several days of diffuse abdominal pain. Although she had a history of Crohn’s Disease (CD), this diagnosis was questioned by her new adult gastroenterologist because he interpreted a capsule endoscopy (CE) performed at his facility to be normal. Due to this interpretation, she was taken off of her previously prescribed mesalamine medication and discharged to her primary physician. She subsequently developed bouts of abdominal pain. At the time of presentation, the patient denied any dysuria, flank pain, hematuria, pneumaturia, or discharge from her umbilicus. Upon initial evaluation, she was tachycardic, had a leukocytosis of 28,000 (normal range 3,900-10,600), and a normal urinalysis. A computed tomography (CT) scan of her abdomen demonstrated a metallic artifact within the bowel in the left lower quadrant (LLQ) and a 4 cm phlegmon in her right lower quadrant (RLQ) with apposition to and thickening of the adjacent bladder. After reviewing the film, it was hypothesized that this metallic artifact represented a retained pill camera. She was admitted and started on intravenous (IV) steroids and antibiotics. Four days later, a repeat CT scan showed interval improvement of her inflammatory process. The phlegmon had matured into an abscess, although it had decreased to 2cm in size, and the intraluminal metallic foreign object persisted. Given the proximity of inflammation to the bladder, a cystoscopy was performed to rule out an enterovesicular fistula. However, other than a large mass compressing the dome of the bladder, likely representing her inflammatory process, the remainder of her cystoscopy was unremarkable. After several days of medical management, her abdominal pain improved, her diet was quickly advanced, and she was discharged home on oral steroids and antibiotics.

Two weeks later, as an outpatient, another CT scan showed no remaining metallic object within the abdomen. This signified spontaneous passage of the retained pill camera. However, there was an increase in the size of the intra-abdominal abscess. Surgery was recommended at this time. Yet, the patient had just started enrollment in college and opted to continue medical management.

Two months later, another CT scan again demonstrated an increase in the size of the abscess. As she had worsened, despite optimal medical therapy, she elected to undergo an exploratory celiotomy. At surgery, active CD in the terminal ileum and a 5cm infected urachal cyst with vesico-urachal and entero-urachal fistulas were identified. We suspected that the entero-urachal fistula site developed an inflammatory stricture during a CD flare resulting in her retained pill camera. An en-bloc resection of the entire area was performed to include the urachal cyst, the adherent portion of the dome of the bladder, and 15cm of associated ileum. The bladder was repaired, a suprapubic catheter was placed, and an ileo-ileo-anastomosis was performed. Microscopic examination of the specimen showed an urachal cyst and bladder with acute and chronic inflammation, reactive changes, and granulation tissue consistent with the clinical history of a fistula. The resected ileum demonstrated focal mucosal ulceration and perforation consistent with the history of inflammatory bowel disease with fistula. The patient did well postoperatively and was discharged on post-operative day six without complications.

Capsule Endoscopy
CE is a useful adjunct to visualize the mucosal surface of the small bowel. The Endo Capsule ® and the Pillcam ® SB – a subsequent generation of the original M2A camera – are the two FDA approved capsules to evaluate small bowel pathology. There are three other capsules available, but not approved for use in the United States.1 The two capsules are similar in size, weight, frame rate, field of view, illumination, and antennas. Both are safe and have comparable diagnostic yields. Each capsule traverses the small bowel in about 4 hours, while the battery life enables the camera to continue taking images for up to 8 hours.2 Thus, it is feasible that important pathology may be missed in patients with slow transit times, and one can ensure that all of the small bowel has been evaluated only when the colon is seen after passage via the ileocecal valve.

CE has an important role in the diagnosis of CD. A recent meta-analysis demonstrated that CE is superior in diagnosing CD when compared to barium radiography, colonoscopy with ileoscopy, CT enterography, and push enteroscopy.3 A recent systematic review of 227 articles and 22,840 procedures deter-
mined that the detection rate of CD via CE is 55.3%. Patients with CD also had a higher rate of a complete exam than the entire population, 85.4% vs 83.5%.

CE, although minimally invasive, is not without complications. Retention, perforation, aspiration, and small bowel obstruction are all potential morbidities, with retention being the most common. Patients with CD are especially at risk for retention compared to the entire population, with rates of 2.6% and 1.4%, respectively. Individual studies have published retention rates in patients with CD as high as 13%. In a systematic review, 58.7% of patients with retained capsules underwent surgical removal. A recent study by Cheon et al. investigated the spontaneous passage of retained capsules and showed that 52% of those who initially underwent medical management were able to pass their capsules spontaneously. In addition, interventions like the disintegrating Patency Capsule have been developed to identify patients who are at high risk for retention.
Fistulizing Crohn’s
Fistula formation is a common occurrence in CD as patients have a 50% cumulative 20 year risk of developing fistulae. The most common sites are peri-anal (54%), enteroenteric (24%), and rectovaginal (9%) with enterocutaneous, enterovesical, and enterointra-abdominal representing less than 13% combined. Urologic complications in CD are rare. In a review of over 1500 patients with CD, urinary complications developed in only 4.8% of patients, with urinary fistulae occurring in less than 1%. Medical management is the mainstay of external fistulizing CD, however, surgical therapy is the preferred treatment for internal fistulae.

Urachal Crohn’s Disease
The urachus is an embryonic remnant that extends from the umbilicus to the dome of the bladder. This structure typically obliterates, but may remain patent in 1/5000 individuals. This results in four urachal anomalies: patent urachus, urachal sinus, urachal cyst, and urachovesical diverticulum.

Urachal involvement in CD is extremely rare. There are only 5 cases in the literature documenting spontaneous urachoenteric fistulae in patients with CD. Of those cases, four presented with umbilical drainage, dysuria, or abnormal urine studies. The presenting symptoms of the fifth case are unknown. The absence of these symptoms, as well as lack of findings on imaging and cystoscopy made the diagnosis in this case very difficult. In 4 of those cases, the patient underwent an en-bloc resection of the urachal remnant, sinus tract, associated bowel, and bladder wall (if involved). This is the preferred surgical approach, and patients in these reports did well with limited – if any – follow up.

Conclusion
This patient had a retained pill camera that spontaneously passed after medical management. After her abscess failed to improve with medical management, she consented to surgical therapy where an enterourachovesical fistula was discovered. This fistula site was also likely the site of the retained capsule. Although CE is an effective diagnostic tool in CD, these patients are also at higher risk of retention. If a patient with a retained capsule is stable and without enteric obstruction, a trial of medical therapy may facilitate spontaneous passage and avoid the need for surgical intervention. Urinary involvement in CD is uncommon and urachal involvement is exceptionally rare. En-bloc excision of the urachal remnant and associated structures with restoration of continuity is the preferred treatment.
Disclosure/Disclaimer
The views expressed herein are of the authors and do not reflect the official policy of the Department of the Army, Department of Defense, or the US Government. The authors report no conflict of interest – financial, personal, or professional – concerning the preparation of the manuscript.

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References
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Characteristics of Patients with Type 2 Diabetes Mellitus in Two Rural, Medically Underserved Communities

Jocelyn Ko BA; Rebecca Delafield MPH; Jim Davis PhD; and Marjorie K. Mau MD, MS

Abstract
In the state of Hawai‘i, Native Hawaiians and Filipinos suffer from increased disparities, compared to other groups, in diabetes prevalence and adverse health outcomes that are exacerbated by challenges to health care access among rural communities. To address the limited literature describing rural, underserved patients with diabetes in Hawai‘i, this paper aims to characterize two rural communities that are located on Moloka‘i and Lana‘i in federally-designated medically underserved areas and that are served by a single Native Hawaiian health care system entitled Na Pu‘u‘uai. Descriptive analyses examining associations between variables were performed using the baseline demographic information, clinical measures, and questionnaire responses collected from 40 adult study participants with diabetes. The data revealed that the study participants had a high prevalence of insulin use (60%); a HbA1c level greater than or equal to 9% (55%); a high-fat diet (73%); and comorbidities, including hyperlipidemia (85%), hypertension (83%), and obesity (70%). Furthermore, among the participants, the mean SF-12v2 General Health Perceptions Score was significantly lower for those with controlled diabetes compared to those with controlled diabetes (P = .02); however, this association was not statistically significant in the multivariable regression model that adjusted for age and number of diabetes medications. Based on these results, the participants appear to belong to a high-risk group with a complicated manifestation of diabetes. This study adds to the growing body of literature demonstrating disparities in diabetes among rural, minority, and underserved communities, highlighting the need for further investigation, development, and implementation of strategies for reaching these vulnerable populations.

Keywords
Adult; Diabetes Mellitus, Type 2; Diabetes Epidemiology; Hawai‘i; Health Status Disparities; Healthcare Disparities; Minority Health; Rural Health

Introduction
Currently the fifth leading cause of death in Hawai‘i, diabetes represents a significant burden for the state’s people, affecting 8.3% of the Hawai‘i adult population in 2010 and accounting for $1 billion in costs to the state in 2006. Among the five largest ethnic groups of Hawai‘i, diabetes disproportionately impacts Native Hawaiians and Filipinos. Compared to Whites in Hawai‘i, Native Hawaiians and Filipinos not only are on average 5-8 years of age younger at the time of diabetes diagnosis, but also have a 3-4 fold higher prevalence of diabetes. Between 2004 and 2006, Native Hawaiians suffered from the highest rate of death from diabetes at 29.6 per 100,000, followed by 20.6 per 100,000 in Filipinos, 12.4 per 100,000 in Japanese, and 10.3 per 100,000 in Whites. The health disparities suffered by Native Hawaiians and Filipinos are further exacerbated when these racial/ethnic populations reside in rural communities, where health care access remains a challenge. In fact, one-third of Hawai‘i’s state population resides in rural communities, in contrast to only 17% of the US population. Compared to Honolulu County, Hawai‘i’s rural counties have more diabetic patients per medical specialist. Rural residents are particularly vulnerable to developing serious and deadly diabetes-related complications due to limited access to non-urgent preventive care that is known to ameliorate the development of diabetic microvascular and macrovascular complications; this type of care includes diabetes self-management education, retinal screening, and cardiovascular risk management. Ultimately, these challenges may result in a population that is less healthy overall and that may require higher tertiary care services at a higher cost to the health care system.

While diabetes prevalence is comparable among the counties of Hawai‘i, issues in rural health could potentially explain the disparities in diabetes mortality rates by county. For example, in 2009, Maui County (includes the islands of Maui, Lana‘i, and Moloka‘i) and Kaua‘i County suffered from higher rates of death due to diabetes (33.0 per 100,000 and 34.1 per 100,000 respectively) than Honolulu County (21.9 per 100,000). To address issues related to diabetes medical management in rural Hawai‘i, we undertook a quasi-experimental pilot study to examine the effectiveness of using telemedicine technology to provide diabetes specialty care in two remote communities on Lana‘i and Moloka‘i islands. The pilot study, entitled Pūlama Pau ‘Ole I Ka Mimikō (Continually Taking Care of People with Diabetes), enrolled volunteers through the community-based organization, the Na Pu‘u‘ui Health Care System that services both Lana‘i and Moloka‘i islands.

Although diabetes prevalence rates in the rural communities of Hawai‘i have been reported in the literature, characterization of the diabetic patients living in these areas remains limited. A better understanding of the health status and needs of these patients would be valuable for tailoring diabetes interventions and treatments to more effectively care for the rural, underserved populations of Hawai‘i. To address this gap in knowledge, this paper aims to use patient baseline clinical measures and questionnaire responses to characterize a predominantly Native Hawaiian and Filipino, diabetic, and clinic-based population residing in two rural neighbor islands of Hawai‘i.

Methods
Study Design
This paper analyzes the baseline characteristics collected from participants who enrolled in the Pūlama Pau ‘Ole I Ka Mimikō study (aka, the Pūlama Study). The goal of this 6-month pilot study was to test a culturally competent chronic disease management program using telemedicine technologies (ie, video-teleconferencing) compared with usual care in type 2 diabetics. The Pūlama study was conducted on Moloka‘i and Lana‘i, which are two islands in federally-designated medically underserved areas with large numbers of Native Hawaiians and
Filipinos. Both communities are served by the Na Pu‘uwai Native Hawaiian Health Care System. Patients were recruited at Na Pu‘uwai’s Moloka‘i and Lana‘i clinical services programs, which routinely provide outpatient care services and community outreach health screenings in both rural communities. Recruitment was conducted via flyers, education outreach programs, and clinic staff. Approval was received from the University of Hawai‘i Institutional Review Board prior to the start of any research activities.

Eligibility and Enrollment
A total of 113 individuals were contacted and screened for eligibility. A total of 40 people with diabetes met all eligibility criteria and agreed to participate. To be eligible, participants had to be age 18 years or older, have a diagnosis of type 2 diabetes, have a Hemoglobin A\textsubscript{1c} (HbA\textsubscript{1c}) level of ≥ 7.5% in the month prior to enrollment, be taking at least one anti-diabetic medication, and be residing on Moloka‘i or Lana‘i. The enrollment cutoff point of HbA\textsubscript{1c} of 7.5% or higher was selected to ensure that all potential participants who qualified to enroll would benefit from having an HbA\textsubscript{1c} of <7%, the American Diabetes Association goal for HbA\textsubscript{1c} levels.\textsuperscript{15}

Individuals were excluded if they had any major medical (eg, hemodialysis, pregnancy, etc.) or psychiatric disorders that would prevent full participation (ie, non-adherence due to conflicting medical recommendations or psychiatric problems) in the study as determined by the study protocol. After giving written informed consent, participants underwent a baseline assessment according to study protocol.

Data Collection
Demographic factors including date of birth, sex, education, marital status, ethnicity, and smoking status were collected via a patient questionnaire. At baseline, participants were assessed for height, weight, and blood pressure. The participant’s HbA\textsubscript{1c}, fasting glucose, and lipid profile results were abstracted from laboratory tests, which were conducted within one month of study enrollment. Information on past medical history and medications were obtained with a questionnaire and/or from the participant’s medical record.

Participants also completed a collection of surveys that were administered by the study nurse or self-administered. The 10-item short version of the Center for Epidemiologic Studies Depression Scale (CES-D) assessed self-reported depressive symptoms. Higher scores indicate more depressive symptoms and a score of 10 or greater signifies self-reported evidence of depression.\textsuperscript{16,17} The Short Form-12v2\textsuperscript{TM} Health Survey (SF-12v2\textsuperscript{TM}) was administered to measure health-related quality of life, and the study focused on the General Health Perceptions sub-scale, which is based on a single question asking patients to rate their general health. The SF-12v2\textsuperscript{TM} uses a norm-based scoring method based on the 1998 general US population having a mean of 50±10, with higher scores indicating a better health-related quality of life.\textsuperscript{18} The proportion of fat intake in each participant’s diet was determined using the Fat Factor Summary Score generated by the Eating Habits Questionnaire, which was adapted from the Eating and Exercise Patterns (EEPs) Questionnaire. Higher scores indicate greater fat intake and a Fat Factor Summary Score of greater than 2.5 predicts fat intake at greater than 30% of total calories.\textsuperscript{19} The participants’ level of physical activity was assessed through an adapted version of the Brief Physical Activity Questionnaire, which addresses the frequency of the participants’ vigorous and moderate intensity activities. The range of possible Physical Intensity Scores is 1 to 5 with lower scores indicating greater intensity.\textsuperscript{20} Finally, the Patient Assessment of Care for Chronic Conditions (PACIC) was used to evaluate how closely the participants’ care aligned with the Chronic Care Model, which supports patient-centered and collaborative care. The PACIC produces a summary score based on sub-scales measuring patient activation, delivery system design and decision support, goal setting, problem-solving and contextual counseling, and follow-up and coordination. The PACIC Summary Score ranges from 1 to 5 with higher scores indicating a higher quality of care.\textsuperscript{21}

Statistical Methods
Initial analyses examined the questionnaire responses and physiological measures descriptively. Continuous variables were summarized with means and standard deviations both for individual variables and within categories such as ethnic groups. Means of questionnaire responses comparing patients with controlled to uncontrolled diabetes were analyzed using t-tests. For the analyses, an HbA\textsubscript{1c} level of 9% or higher was chosen as an indicator of poor diabetes control, a cutoff employed in the National Committee on Quality Assurance’s Healthcare Effectiveness Data and Information Set (HEDIS).\textsuperscript{22} Categorical variables were summarized using counts and percentages. Associations between categorical variables were examined using the Cochran-Mantel-Haenszel chi-square test for assessing group differences in outcomes having ordered categories, and using logistic regression. Exact logistic regression was employed when the number of outcomes within predictor categories was small. Results of the regression models are summarized as odds ratios with 95% confidence intervals.

Results
Participant Characteristics
A total of 40 diabetic patients (16 women and 24 men) with suboptimal glycemic control were enrolled with a mean age of 58 years and an age range of 24 to 88 years (Table 1). Most patients were married (80%) and had attended some college or had obtained a college degree (70%). About half had smoked in their lifetime. The majority identified ethnically as either Native Hawaiian (58%) or Filipino (25%). Nearly three-fourths of participants resided on the island of Moloka‘i and the remainder resided on the island of Lana‘i.

Table 2 and Table 3 report the participants’ mean baseline clinical measures and questionnaire results respectively. The majority of participants had a history of hypertension (83%) and hyperlipidemia (85%), and almost a third had a history

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Table 1. Demographic Characteristics of Patients with Type 2 Diabetes Mellitus in Two Rural, Medically Underserved Communities in Hawai‘i (N = 40)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>Pulama Study Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at enrollment (years)</td>
<td>58 ± 13</td>
</tr>
<tr>
<td>Women</td>
<td>16 (40)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>32 (80)</td>
</tr>
<tr>
<td>Not marriedb</td>
<td>8 (20)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>High school or less</td>
<td>12 (30)</td>
</tr>
<tr>
<td>Some college or college graduate</td>
<td>28 (70)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Native Hawaiian</td>
<td>23 (58)</td>
</tr>
<tr>
<td>Filipino</td>
<td>10 (25)</td>
</tr>
<tr>
<td>Otherc</td>
<td>7 (18)</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
</tr>
<tr>
<td>Moloka‘i</td>
<td>29 (73)</td>
</tr>
<tr>
<td>Lanai</td>
<td>11 (28)</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>18 (45)</td>
</tr>
<tr>
<td>Current or former smoker</td>
<td>22 (55)</td>
</tr>
</tbody>
</table>

aSome percentages do not add up to 100% due to rounding
b“Not married” includes never married, divorced or separated, and widowed
c“Other” includes White (n = 4), Japanese (n = 2), and Samoan (n = 1)

Table 2. Clinical Characteristics of Patients with Type 2 Diabetes Mellitus in Two Rural, Medically Underserved Communities in Hawai‘i (N = 40)

<table>
<thead>
<tr>
<th>Clinical Characteristic</th>
<th>Pulama Study Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical/Laboratory Assessments</td>
<td></td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>33 ± 9</td>
</tr>
<tr>
<td>Body mass index ≥ 30</td>
<td>28 (70)</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>131 ± 20</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>76 ± 13</td>
</tr>
<tr>
<td>Hemoglobin A₁c (%)</td>
<td></td>
</tr>
<tr>
<td>Hemoglobin A₁c ≥ 9%</td>
<td>9.6 ± 1.6</td>
</tr>
<tr>
<td>Hemoglobin A₁c ≥ 9%</td>
<td>22 (55)</td>
</tr>
<tr>
<td>Fasting glucose (mg/dL)</td>
<td>182 ± 62</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>167 ± 36</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>207 ± 206</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dL)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>45 ± 10</td>
</tr>
<tr>
<td>Men</td>
<td>42 ± 13</td>
</tr>
<tr>
<td>Calculated LDL-cholesterol (mg/dL) (n = 34)*</td>
<td>87 ± 23</td>
</tr>
<tr>
<td>History of:</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>33 (83)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>34 (85)</td>
</tr>
<tr>
<td>Gout</td>
<td>5 (13)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>12 (30)</td>
</tr>
<tr>
<td>Diabetes Medications</td>
<td></td>
</tr>
<tr>
<td>Biguanide</td>
<td>24 (60)</td>
</tr>
<tr>
<td>Sulfonylurea</td>
<td>26 (65)</td>
</tr>
<tr>
<td>Thiazolidenedione</td>
<td>7 (18)</td>
</tr>
<tr>
<td>DPP4 Inhibitor</td>
<td>12 (30)</td>
</tr>
<tr>
<td>Insulin</td>
<td>24 (60)</td>
</tr>
<tr>
<td>Exenatide (Byetta)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Number of diabetes medications</td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>9 (23)</td>
</tr>
<tr>
<td>Two</td>
<td>14 (35)</td>
</tr>
<tr>
<td>Three</td>
<td>11 (28)</td>
</tr>
<tr>
<td>Four</td>
<td>6 (15)</td>
</tr>
</tbody>
</table>

*Unable to calculate LDL values for some participants (n = 6) due to their high levels of triglycerides.

Factors Associated with Poor Glycemic Control
Fifty-five percent of the study participants had an HbA₁c level of at least 9% (Table 2). Logistic regression analysis revealed that participants with controlled diabetes (HbA₁c < 9%) did not differ significantly from participants with uncontrolled diabetes (HbA₁c ≥ 9%) in terms of their age, sex, ethnicity, number of diabetes medications, number of comorbidities, or odds of having a SF-12v2™ General Health Perceptions Score below 50 (Table 4). However, the mean SF-12v2™ General Health Perceptions Score was 8 units lower for participants with uncontrolled diabetes compared to those with controlled diabetes (P = .02). When examined in a multivariable regression model, poor glycemic control was not significantly associated with increasing age, the number of diabetes medications, or a better health-related quality of life (Table 5).

Discussion
The predominantly Native Hawaiian and Filipino, rural, and clinic-based participants of the Pūlama study appeared to be less healthy than other diabetic patients surveyed nationally. Over half of the study participants suffered from uncontrolled diabetes. Poor glycemic control has also been observed in other rural communities in Hawai‘i. For example, a study conducted at the Waianae Coast Comprehensive Health Center (WCCHC) which serves a medically underserved, predominantly Native Hawaiian community on O‘ahu, also found more than 38% (n = 52) of their diabetic patients had poorly controlled diabetes (HbA₁c >10%), while 25% of their patients were found to have a HbA₁c of 7.5% or less.7,23 Compared to the general US
diabetic population, the Pūlama study participants had a higher prevalence of insulin use, comorbidities (heart disease, hypertension, hyperlipidemia, and obesity), and fat intake exceeding the recommendations for a reduced fat diet, suggesting that this clinic-based population is at increased risk for adverse clinical outcomes such as microvascular and macrovascular complications.24-27 Additionally, nearly one-third of participants had an average rating for overall health that was lower than the average score of diabetic individuals who participated in the 1998 National Survey of Functional Health Status.18

Compared to participants with controlled diabetes, those with uncontrolled diabetes had a statistically significant lower mean SF-12v2TM Health Survey General Health Perceptions Score; however, this association was not statistically significant in the multivariable regression model that adjusted for age and number of diabetes medications. One study conducted with 150 patients seen at four diabetes clinics in Malaysia did find statistically significant differences between patients with controlled and poorly controlled diabetes in their mean General Health Perceptions Score after controlling for age and diabetes duration.28 However, this study differed from the Pūlama study in its use of the longer SF-36 Health Survey and less stringent criteria for poorly controlled diabetes. One possible explanation of the observed relationship between glycemic control and self-reported health status is that those with worse HbA1c values may suffer from greater complications and symptoms, and thus be more likely to give a lower rating of their overall health. Nevertheless, the literature examining the relationship between glycemic control and health-related quality of life remains inconsistent.28-30 Furthermore, it is difficult to draw generalizable conclusions from the Pūlama study, since the data was obtained from a single time point as well as a small sample size, and there was a lack of control for confounders.

Other studies identifying predictors of glycemic control similarly have not found statistically significant differences between controlled and uncontrolled diabetic patients in terms of
Some predictors of higher HbA1c levels in diabetic patients that have been documented include increased waist circumference, poor adherence to diabetes self-care management behaviors, low income, lack of insurance, and increased distress about diabetes, none of which were examined in the Pūlama study.31,33,35 Moreover, medication type, diabetes duration, and age have been shown to be associated with poor glycemic control in some studies, although the evidence is contradictory.31-37 These studies used different cut-off points for uncontrolled diabetes (HbA1c ≥ 7%, ≥ 8%, > 9.2%), which may affect comparisons with the Pūlama study (HbA1c ≥ 9%).

Study Limitations
This paper is descriptive in nature and possesses multiple limitations in addition to those detailed above. Because of its small sample size (N = 40), this study has low statistical power and confidence intervals that may be difficult to interpret. Furthermore, conclusions from this study may not be generalizable to other rural communities in Hawai‘i, and because of the selection criteria, the study may not have captured all the variability that exists within the communities from which the participants were sampled. Because the data was collected from a single point in time, temporality and causal relationships cannot be established. The participants were also sampled from clinic-based populations associated with Na Pu‘uwai and by definition were required to have a HbA1c value of ≥7.5%, so they are more likely to be sicker and have more complicated diabetes management (ie, insulin-requiring diabetes) compared to the general diabetic population. While some information was obtained from patient medical records, most data was collected via participant self-report, which could have introduced recall bias or social desirability bias. The survey instrument used to measure fat intake (Eating Habits Questionnaire) was introduced late into the study, so the measure was only available for 65% of the participants, which may have impacted the results of that variable considering the small size of the study.

Implications
This paper describes some of the characteristics of diabetic patients living in two isolated, medically underserved regions of Hawai‘i. This clinic population represents a high-risk group of patients with complicated diabetes mellitus, as reflected by the high prevalence of insulin use, poor glycemic control, a high-fat diet, and co-existing morbidities. Though the study included a relatively small select group of patients, these results highlight the burden of poorly controlled diabetes in remote locations that often have limited access to specialty care to address multi-complex management needs of patients with diabetes. Patients in these remote locations with poorly controlled diabetes also tended to have lower ratings of their overall health with about one-third of participants scoring lower than diabetic individuals surveyed in the 1998 National Survey of Functional Health Status.

With a high prevalence of uncontrolled diabetes, Native Hawaiian and Filipino diabetic patients in these rural communities of Hawai‘i may potentially have increased vulnerability to complications, such as heart disease, stroke, vision loss, kidney disease, nervous system damage, and amputations.38 These health issues may be compounded when communities face problems of reduced access to health care resources. Analysis of the 2009 BRFSS revealed that compared to non-rural diabetic adults, rural diabetic adults, and especially non-Caucasian rural diabetic adults, were less likely to receive adequate diabetes care, which included engaging in self-management behaviors; receiving diabetes education; and having one cholesterol check-up, at least two HbA1c check-ups, at least two feet check-ups, and a dilated eye exam in the past 12 months.39

This study adds to the growing body of literature demonstrating disparities in the burden of diabetes in rural, minority, and underserved communities, highlighting the necessity for further investigation, development, and implementation of strategies for reaching these vulnerable populations.40-42 The results of this small descriptive study suggest that further research on the factors that could improve diabetes control and influence morbidity and mortality due to complications of diabetes in these high risk populations is needed. Research examining the issue of access to specialty care (endocrinology, ophthalmology, etc.) and other health providers (Certified Diabetes Educators, dieticians, etc.) could also identify opportunities to improve diabetes management within these communities. A component of the Pūlama study intervention includes the use of telemedicine technologies to provide enhanced diabetes management (including specialty care) to diabetic patients on the island of Moloka‘i, which is a potentially promising strategy for reaching these small, remote/rural communities with complex diabetes related health problems.40,43,44 Finally, due to the high prevalence of self-reported depression (38%) among the participants, developing interventions designed to integrate behavioral health programs that address depression within the diabetic patient community could benefit the rural Native Hawaiian and Filipino communities examined here.

Conflict of Interest
None of the authors identify any conflict of interest.

Acknowledgments
We would like to thank Dr. Erin MCMurtray, Dr. Haya Rubin, Dr. Jimmy Efird, Donna Gamiao, and Valerie Janikowski for their invaluable contribution to this study. We would also like to acknowledge support from the following grants: P20 MD00173-07S1, S21 MD000228, and U54 MD007584.

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References

Predictors of 25-hydroxyvitamin D Levels in HIV-infected Patients in Hawai‘i

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Abstract
HIV-infected individuals are at increased risk for several metabolic diseases, including low 25-hydroxyvitamin D [25(OH)D]. Data on the prevalence and risk factors for low 25(OH)D in HIV patients living in the tropics is scarce. Patients ≥40 years old on stable antiretroviral therapy were enrolled from March 2009 to July 2011 in Hawai‘i (latitude 21° North). Chemiluminescent immunoassay (DiaSorin) was used to determine plasma 25(OH)D levels. Patients were grouped by whether 25(OH)D was collected in summer (May 1–September 30) or winter (October 1–April 30). Of 158 patients enrolled, 88 (56%) and 70 (44%) were enrolled in winter and summer, respectively. There were 57.6% Caucasians and 88% men. Over-all median (quartile1, quartile3) age was 51 (46, 57) years and median 25(OH)D was 32.4 (24.0, 41.0) ng/ml. Forty-three percent (n=68) had 25(OH)D<30.0 ng/ml. Median 25(OH)D levels were 29.6 (22.0, 38.0) ng/ml in winter and 36.9 (25.0, 44.5) ng/ml in summer (P<.01). Ethnicity and BMI were better predictors of 25(OH)D levels than season in the tropics.

Keywords
vitamin D; Hawai‘i; 25-hydroxyvitamin D; HIV; season

Introduction
Low vitamin D is associated with poor health outcomes such as increased risk for falls and fractures, arterial dysfunction, and autoimmunity. Decreased levels have also been associated with increased mortality rates in some, but not all, studies. Vitamin D has also been shown to have protective effects against ultraviolet-induced DNA damage. HIV-infected individuals are known to be at risk for several metabolic diseases, including low serum 25-hydroxyvitamin D (25(OH)D). Antiretroviral therapy, particularly zidovudine and efavirenz, have been linked to low 25(OH)D levels. Decreased cutaneous vitamin D production from lack of sun exposure during long winter months is another risk factor that has been extensively studied among patients in high-latitude regions. However, data regarding predictors of 25(OH)D levels in HIV patients living in tropical areas is scarce.

Hawai‘i is located within the tropical zone (latitude 21° North) and, according to the National Weather Service Forecast Office, has two seasons—summer (between May and October) and winter (between October and April). We identified risk factors for low 25(OH)D and analyzed the influence of seasons on 25(OH)D levels using data obtained from patients enrolled into the Hawai‘i Aging with HIV – Cardiovascular (HAHC-CVD) Cohort, a longitudinal study of aging HIV-infected patients on potent antiretroviral therapy intended to examine the role of oxidative stress and inflammation on cardiovascular risk.

Patients and Methods
The current study is a cross-sectional analysis of the baseline data of patients enrolled into the HAHC-CVD Cohort. Entry criteria required patients to have documented HIV infection, be at least 40-years-old, and on stable antiretroviral therapy ≥6 months. Patients who were institutionalized or with active malignancy, infection, or AIDS-defining illness at the time of enrolment were excluded.

After informed consent, fasting blood samples were collected, stored in EDTA tubes, frozen at -140°C and forwarded to LipoScience Inc. (Raleigh, NC). Chemiluminescent immunoassay (DiaSorin) was used to determine 25(OH)D levels. Low 25(OH)D was operationally defined as having serum 25(OH)D<30.0 ng/ml, which includes both vitamin D insufficiency and deficiency as previously defined by The Endocrine Society, 2011. Weight and height were obtained in the clinic in triplicate during the entry visit and averaged.

Patients were grouped by whether 25(OH)D were collected in summer (from May 1 to September 30) or winter (from October 1 to April 30). Group comparisons of continuous variables, including 25(OH)D levels, were tested by two-sided Mann-Whitney test. Chi-square test was used to compare the proportion of patients having low 25(OH)D between seasons. After 25(OH)D levels were normalized by log-transformation and removal of one outlier, simple and multiple linear regression were conducted to identify factors associated with 25(OH)D analyzed as a continuous variable. Dichotomized at 30.0 ng/ml, factors associated with low 25(OH)D were identified using univariate and multivariate logistic regression models. STATA IC 12.0 (College Station, Texas) was used for the analyses. The study was approved by the Committee on Human Studies of the University of Hawai‘i.

Results
Patient Characteristics
Of 158 patients enrolled from March 2009 to July 2011, 88 (56%) and 70 (44%) were enrolled in winter and summer, re-
spectively. The cohort consisted of 57.6% Caucasians, 12.6% Native Hawaiians of mixed or full ancestry, 8.2% Asians, 3.8% African-Americans, 1.9% Native American/Alaskan, and 15.9% of mixed (non-Hawaiian) or unknown ethnicity. The majority (88%) were males. Median age (quartile 1, quartile 3) was 51 (46, 57) years. Median nadir CD4+ T-lymphocyte count was 140.5 (27, 249) cells/mm³ and median CD4+ T-lymphocyte count at the time of enrolment was 498.5 (341, 661) cells/mm³. No significant difference in age, current CD4 count, or nadir CD4 count between summer and winter patients were found. On the other hand, body mass index (BMI) was significantly different between summer and winter patients (P = .03). Median BMI of winter patients was 26.4 (24.3, 29.8) kg/m², while median BMI of summer patients was 25.5 (23.4, 27.1) kg/m². Baseline characteristics of the HAHC-CVD cohort are summarized in Table 1.

Table 1. Baseline clinical and demographic characteristics of patients enrolled into the Hawaii Aging with HIV-Cardiovascular Cohort Study.

<table>
<thead>
<tr>
<th></th>
<th>Summer Patients (May 1 to Sept. 30)</th>
<th>Winter Patients (Oct. 1 to April 30)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=70</td>
<td>n=88</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td>.23</td>
</tr>
<tr>
<td>Male</td>
<td>64</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td>.38</td>
</tr>
<tr>
<td>Caucasian</td>
<td>43</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Non-Caucasian</td>
<td>27</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>Body mass index</strong></td>
<td></td>
<td></td>
<td>.03*</td>
</tr>
<tr>
<td>(kg/m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (18.5-24.9)</td>
<td>31*</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Overweight (25.0-29.9)</td>
<td>34</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Obese (&gt;30.0)</td>
<td>5</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>Current use of efavirenz</strong></td>
<td></td>
<td></td>
<td>.16</td>
</tr>
<tr>
<td>Yes</td>
<td>34</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>36</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td><strong>Current use of zidovudine</strong></td>
<td></td>
<td></td>
<td>.23*</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>67</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td><strong>25-hydroxyvitamin D levels</strong></td>
<td></td>
<td></td>
<td>.048*</td>
</tr>
<tr>
<td>&lt;30 ng/ml</td>
<td>24</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>&gt;30 ng/ml</td>
<td>46</td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

*One patient with BMI of 17.5 was combined into this cell count.

*P-value was based on Fisher’s exact test.

*Statistically significant.
### Table 2. Simple linear regression and univariate logistic regression of factors associated with 25-hydroxyvitamin D.

<table>
<thead>
<tr>
<th></th>
<th>Simple Linear Regression</th>
<th>Univariate Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta coefficient</td>
<td>95% CI</td>
</tr>
<tr>
<td>Age</td>
<td>-.0015</td>
<td>-.0053 to .0023</td>
</tr>
<tr>
<td>Female gender</td>
<td>-.0148</td>
<td>-.1055 to .0758</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>-.0111</td>
<td>-.0177 to -.0044</td>
</tr>
<tr>
<td>Caucasian ethnicity</td>
<td>.1194</td>
<td>.0627 to .1761</td>
</tr>
<tr>
<td>Winter visit</td>
<td>-.0737</td>
<td>-.1320 to -.0154</td>
</tr>
<tr>
<td>Current use of efavirenz</td>
<td>-.0187</td>
<td>-.0765 to -.0411</td>
</tr>
<tr>
<td>Current use of zidovudine</td>
<td>-.1233</td>
<td>-.2329 to -.0138</td>
</tr>
</tbody>
</table>

Dependent variable for simple linear regression models was Log10 25-hydroxyvitamin D; dependent variable for univariate logistic regression was low 25-hydroxyvitamin D dichotomized at 30ng/ml. Abbreviation: CI: confidence interval. *statistically significant.

### Table 3. Multiple linear regression and multivariate logistic regression of factors associated with 25-hydroxyvitamin D.

<table>
<thead>
<tr>
<th></th>
<th>Linear Regression</th>
<th>Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta coefficient</td>
<td>P-value</td>
</tr>
<tr>
<td>Model 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>-.0091</td>
<td>&lt;.01*</td>
</tr>
<tr>
<td>Caucasian ethnicity</td>
<td>.1066</td>
<td>&lt;.01*</td>
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<tr>
<td>Model 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter visit</td>
<td>-.0563</td>
<td>.06</td>
</tr>
<tr>
<td>BMI</td>
<td>-.0097</td>
<td>&lt;.01*</td>
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<tr>
<td>Model 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter visit</td>
<td>-.0652</td>
<td>.02*</td>
</tr>
<tr>
<td>Caucasian ethnicity</td>
<td>.1145</td>
<td>&lt;.01*</td>
</tr>
<tr>
<td>Model 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter visit</td>
<td>-.0671</td>
<td>.02*</td>
</tr>
<tr>
<td>Current use of zidovudine</td>
<td>-.1091</td>
<td>.049*</td>
</tr>
<tr>
<td>Model 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter visit</td>
<td>-.0467</td>
<td>.10</td>
</tr>
<tr>
<td>BMI</td>
<td>-.0078</td>
<td>.02*</td>
</tr>
<tr>
<td>Caucasian ethnicity</td>
<td>.1004</td>
<td>&lt;.01*</td>
</tr>
<tr>
<td>Current use of zidovudine</td>
<td>-.0913</td>
<td>.08</td>
</tr>
</tbody>
</table>

Dependent variable for linear regression models was Log10 25-hydroxyvitamin D; dependent variable for logistic regression was low 25-hydroxyvitamin D dichotomized at 30ng/ml. *statistically significant. Abbreviations: aOR: adjusted odds ratio; BMI: body mass index (kg/m²).

### Group Comparisons of 25-hydroxyvitamin D Levels

Median 25(OH)D of the cohort was 32.4 (24.0, 41.0) ng/ml and mean was 34.0 ng/ml (standard deviation, 14.8). Forty-seven patients (29.8%) had 25(OH)D from 20.0 to 29.9 ng/ml, while 21 patients (13.3%) had 25(OH)D <20.0 ng/ml. No patient was taking vitamin D as a prescribed medication; however, information regarding the use of over-the-counter vitamin D or multivitamins was not collected. When 25(OH)D was dichotomized at 30 ng/ml, a greater proportion of patients enrolled in winter had low 25(OH)D (P = .046). Obese patients (BMI ≥ 30 kg/m²) had significantly lower 25(OH)D levels compared to non-obese patients (28.3 ng/ml versus 34.0 ng/ml, P = .03). No significant difference in median 25(OH)D levels was found by drug groups (use of efavirenz or zidovudine).

By season of enrolment, patients enrolled in winter had significantly lower median 25(OH)D compared to patients enrolled in summer (29.6 ng/ml versus 36.9 ng/ml, P = .01) (Figure 1). Data was also analyzed by excluding patients enrolled after the end of winter (May) and towards the end of summer/beginning of winter (October) to eliminate patients whose 25(OH)D levels were potentially affected by the season immediately preceding enrolment. Excluding 24 patients who were enrolled in May...
and seasons, a significant difference in median 25(OH)D levels between seasons was still found (29.0 ng/ml in winter and 37.3 ng/ml in summer, \( P < .01 \)).

Subgroup analyses of 25(OH)D levels stratified by ethnicity, BMI, and season are presented in Figure 2. Obese patients enrolled in summer had median 25(OH)D level of 31.4 ng/ml, while those enrolled in winter had median level of 25.0 ng/ml (\( P = .20 \)). Non-obese patients enrolled in summer had median 25(OH)D level of 37.2 ng/ml, while those enrolled in winter had median level of 31.3 ng/ml (\( P = .04 \)). The median 25(OH)D level of Caucasians enrolled in summer was 38.3 ng/ml versus 33.5 ng/ml among Caucasians enrolled in winter (\( P = .11 \)). Among non-Caucasians enrolled in summer, median 25(OH)D was 28.6 ng/ml versus 24.9 ng/ml among non-Caucasians enrolled in winter (\( P = .13 \)).

Factors Associated with 25-hydroxyvitamin D Levels

Linear regression was used to identify factors associated with 25(OH)D analyzed as a continuous variable. Serum 25(OH)D was not normally distributed and was log-transformed. By simple linear regression (Table 2), lower 25(OH)D was associated with winter visit (\( \beta = -.0737, P = .01 \)), BMI (\( \beta = -.0111, P < .01 \)), and current use of zidovudine (\( \beta = -.1233, P = .03 \)). On the other hand, Caucasian ethnicity (\( \beta = .1194, P < .01 \)) was associated with higher 25(OH)D levels. No significant association was found with age, gender, or current use of efavirenz. Beta-coefficients from log-transformed models were exponentiated to return an estimate of average change in 25(OH)D levels expressed in ng/ml. For significant variables in univariate linear regression, exponentiated \( \beta \)-coefficients are as follows: BMI, 0.9748; Caucasian ethnicity, 1.3164; winter visit, 0.8439; and current use of zidovudine, 0.7528.

Multiple linear regression models were used to analyze the association of winter visit, BMI, ethnicity and current use of zidovudine with 25(OH)D. In the final multiple linear regression model (Table 3, Model 5), only Caucasian ethnicity (\( \beta = .1004, P < .01 \)) and BMI (\( \beta = -.0078, P = .02 \)) remained significant. The exponentiated \( \beta \)-coefficient for Caucasian ethnicity in Model 5 was 1.2601, indicating that 25(OH)D in Caucasians tend to be 1.26 ng/ml higher, on the average, than non-Caucasians. Exponentiated \( \beta \)-coefficient for BMI was 0.9822, indicating a decrease of 0.98 ng/ml in 25(OH)D for every 1.0 kg/m² increase in BMI.

Factors associated with low 25(OH)D dichotomized at 30 ng/ml were identified using univariate logistic regression (Table 2). Winter visit (odds ratio (OR):1.96, \( P = .04 \)) and BMI (OR 1.10, \( P = .02 \)) were significantly associated with low 25(OH)D. On the other hand, Caucasian ethnicity was protective (OR 0.27, \( P < .01 \)). In the final multivariate logistic regression model (Table 3, Model 5), only Caucasian ethnicity remained significant (adjusted OR: 0.30, \( P < .01 \)).

Discussion

Ethnicity, BMI, winter visit, and use of zidovudine were factors identified in the current study to be associated with low 25(OH)D levels on univariate analysis. Both ethnicity and higher BMI are well recognized predictors for low 25(OH)D.\(^{17,18}\) Melanin filters ultraviolet-B light, which is necessary for cutaneous synthesis of vitamin D.\(^{19}\) Hence, persons with less skin pigmentation are less likely to have low 25(OH)D. Conversely, those with darker skin color are more susceptible to lower 25(OH)D levels.\(^{14,18}\)

Multiple hypotheses have been proposed to explain the association between obesity and low 25(OH)D. It is thought that fat-soluble vitamin D is stored in adipose tissue leading to decreased bioavailability.\(^{20}\) Other behavioral factors such as lower outdoor exercise among obese patients have been implicated to contribute to decreased 25(OH)D in persons with higher BMI.\(^{21}\) More recently, a bi-directional Mendelian randomization study of multiple cohorts from North America and Europe has concluded that obesity is a causal risk factor for the development of vitamin D deficiency.\(^{22}\)

The effect of winter is accepted as a confounding variable in studies of vitamin D metabolism in temperate climates. Whether seasonal variation occurs in the tropics is a significant research question for vitamin D studies planned in Hawai‘i and other similar settings. Located at latitude 21° North, Hawai‘i is fully within the tropics, bounded by the Tropic of Cancer (latitude 23.3°N) in the northern hemisphere and by the Tropic of Capricorn (latitude 23.3°S) in the south. Published studies adjacent to the tropical zone have shown seasonal variations in vitamin D. Among female out-patients in Saudi Arabia (latitude 24.2°N), season was found to be a significant factor in a subgroup analysis of postmenopausal women.\(^{23}\) In three regions of Australia (spanning 27°S to 43°S), season, vitamin D effective daily dose, and simulated maximum daily duration of vitamin D synthesis, each explained about 14% of 25(OH)D variation.\(^{24}\) In northern India (26.8°N), mean serum 25(OH)D levels in rural girls and pregnant women were significantly lower during winter.\(^{25}\) In South Florida, United States (25.46°N), a significant seasonal variation in vitamin D levels among male and female ambulatory patients was found.\(^{26}\)

The length of day in Hawai‘i is consistent throughout the year but results in some, albeit minimal, seasonal variations in incoming solar radiations.\(^{15}\) In our cohort, winter visit was found to be significant on univariate analyses but had varying significance on multivariate regression models (Table 3). Ethnicity and BMI seemed to be relatively more important factors affecting 25(OH)D levels as suggested by retained significance (\( P < .05 \)) in the final multiple linear regression model. Further analysis of patients stratified by BMI (Figure 2a) showed that the effect of season on 25(OH)D is likely to be more profound among non-obese patients.

Previous research has associated efavirenz and zidovudine with low 25(OH)D levels and bone demineralization.\(^{11,12}\) Zidovudine has been implicated to activate osteoclastogenesis, while efavirenz cause increased metabolism of 25(OH)D into inactive compounds by inducing cytochrome P450 enzymes.\(^{27}\) In the current study, the use of zidovudine was associated with lower 25(OH)D levels on simple linear regression but was not significant in the final multiple linear regression model. No
association between current use of efavirenz and 25(OH)D levels was found.

Interestingly, the median 25(OH)D of the HAHC-CVD cohort was 32.4 ng/ml with 43% having 25(OH)D levels below 30 ng/ml. This proportion of vitamin D insufficiency is lower when compared to 79.1% of the United States general adult population (National Health and Nutrition Examination Survey (NHANES), 2003-2004 and 2005-2006) and to 70.3% of patients in the SUN cohort (Study to Understand the Natural History of HIV and AIDS in the Era of Effective Therapy) who were found to have 25(OH)D below 30 ng/ml. Results of the current study are more consistent with another study among HIV-negative adults in Hawai‘i which reported that 51% had 25(OH)D below 30 ng/ml. The relatively lower prevalence of vitamin D insufficiency and deficiency may be due to the substantial availability of sunlight in Hawai‘i.

Our research is limited by the lack of data on over-the-counter vitamin D, multivitamin supplementation, diet, and amount of sun exposure of the study participants. It is also focused on older individuals, which may explain the lack of significant association between age and 25(OH)D levels.

In conclusion, seasonal differences in 25(OH)D levels were observed in our cohort of ambulatory HIV-infected patients in Hawai‘i. BMI and ethnicity were better predictors of 25(OH)D levels than season in multivariate analysis. Future interventional studies to investigate the effect of increasing 25(OH)D levels on morbidity and mortality of HIV-infected patients living in the tropics are warranted.

Acknowledgments
We thank the patients of the HAHC-CVD cohort for their participation in the study, as well as the staff of the Hawai‘i Center for AIDS for facilitating participant recruitment and specimen processing.

Disclosure Statement/Conflict of Interest
This study was supported by NIH grants (R01HL095135, U54RR026136) and U54RR026136. None of the authors identify any conflict of interest.

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References
Graduation Speech, May 12, 2013 Convocation Ceremony, John A. Burns School of Medicine, University of Hawai‘i

David P. Sklar MD

Graduation Speeches are usually hard to remember because most of you who are graduating have other things on your mind—Who will be coming to the graduation party? Will I slip when the Dean calls my name as I walk to the podium? Will someone in my family scream out my name at some embarrassing moment? Could this all be a dream and will I wake up in the middle of the biochem test unable to remember the Krebs Cycle? So, I will try to keep my speech brief and simple with three short stories that each has a message. Although I don’t expect you to remember the messages, because they are about lessons that you will probably have to learn on your own, perhaps they will help you when the time comes. The first message is about you. Each of you is unique with your own individual capabilities, personality, and learning styles. Your first job is to nurture and protect yourself, develop your habits of learning and become the best of whatever you would like to be — surgeon, psychiatrist, emergency physician, primary care doctor. And remember that you will not always be able to cure a person but you should always be able to listen, provide comfort and reduce suffering.

As many of you know, I began my medical career in a rural clinic in Mexico with few skills. I will never forget the night my friend Ricardo’s father, Daniel, had a devastating stroke and the family worked to do everything possible to help him — they brought a doctor from the nearest city who traveled three or four hours over a dirt road to our village that lacked electricity, telephones and clean water.

I suspect it must have cost them dearly to bring the city doctor to their home. And I remember him stepping gingerly past the mules and chickens to examine Daniel who lay on a cot unable to move the right side of his body or speak. The doctor surveyed the situation, listened with his stethoscope to Daniel’s heart and lungs and pronounced the situation hopeless and collected his fee and quickly returned back to the city. I stayed with the family that night watching Daniel gasp for air and administering intravenous fluids and antibiotics while I comforted the various family members. And when Daniel died that night I cried with them over their loss and mourned the death of the patriarch of the family who had cleared their land and raised all of the children in a small adobe house. During that night and others like it, I learned that being a doctor was about more than knowing the bacteria or antibiotics or neuro-anatomy. It was about being with people during their greatest moments of need so that they were not alone in facing pain or fear or death, and I committed myself to be fully present even when the situation was hopeless. To be able to do this we must nurture ourselves, our own physical and mental health, and develop our own inner strength. The first message I have for you is take care of yourself so that you can take care of others.

The second message is to become a student of people and to appreciate their stories. Every patient has a story to tell. Whether it is about the way an illness has changed them, causing pain when they move or difficulty in breathing or whether it is about how they came to be who they are over time and how they fear that disease will rob them of their unique identity. If you become a student of people you will never be bored with medicine because each person will be a gift, providing some surprise to be shared and discussed. And if you understand a person’s story their illness can be placed in a context that will help you find the right treatment for that person. In some cases a patient’s story will provide the vital key to unlocking a puzzling diagnosis. This is why we emphasize the importance of “talking story.” The story I would like to share with you about this message is from my experience in Guatemala after a devastating earthquake in 1976. I was a volunteer in a relief hospital and a very short man, no more than five feet tall, in a straw hat brought his five year old son to me. The round-faced boy with a dripping nose was coughing and wheezing and I suspected a viral infection with some bronchospasm. As we talked the man told me he had two other younger children with similar symptoms. I asked him to take me to them and at first he hesitated, explaining that it was too far and too difficult a walk. But I insisted, partly because I was concerned about how sick the babies might be and partly because there was something in the expression on his face, some fear or anxiety that suggested hidden danger that I had detected as we spoke. We hiked over the countryside past collapsed houses that were scarcely more than piles of rubble. When we came to his house I realized why the man was hesitant to take me to his children. He was ashamed because his wife and children were living under a piece of plastic strung over the remnants of the house. The roof had collapsed and the only protection from the rain and cold was the sheet of plastic. Smoke and dust filled the interior of the...
house and everyone was coughing including me as soon as I entered. What this man and his family needed was a new roof for their house not antibiotics or bronchodilators for the cough. Over the next week I set out to find the metal laminate for the roof that various aid groups had been distributing across the country and eventually was able to cure the children of their cough with the new roof and repairs to the house. Only through understanding the patient’s story was I able to provide the correct help to solve the problem.

The third message is that it is not enough to train yourself and understand your patients. You also need to understand the health care environment and become engaged in the changes that will be needed over the coming years. I realize that you will need to focus on acquiring the various skills of your specialty areas over the coming years, but I would like to share one final story with you that I hope will encourage you to also pay attention to what is happening in the health care environment.

Last year I did a health policy fellowship in Washington, DC, and found myself working on the Senate Finance Committee. This committee provides the oversight of the Medicare and Medicaid Programs as well as the Affordable Care Act. The committee has a health staff and I was one of those staff. As many of you remember, the US Supreme Court had decided to review the law’s constitutionality and the fate of the law and the coverage of millions of people depended upon the court’s decision. Senator Baucus who chaired the Senate Finance Committee asked us, his health policy staff, to prepare for every possible option because he knew that as soon as a decision was announced the President would want our analysis of the decision and its implications. We invited experts in health policy from around the country to identify possible options for a decision and we came up with about 15 possibilities which we eventually narrowed to the five most likely scenarios. Our experts confidently predicted which of the scenarios was most likely with the majority believing that the entire law would be constitutional, but if anything was found to be unconstitutional it would be the individual mandate. Well the day for the decision came and we listened breathlessly as it was announced. Lo and Behold, the Supreme Court came up with a decision that none of our experts had predicted. We had no idea what to make of the decision but before we could discuss it, we were summoned to Senator Baucus’ office. As we stood around the office the phone rang and Senator Baucus put the phone on speaker — And I heard a familiar voice on the other end of the speakerphone discussing the decision and I’ll have you guess who it was. As Senator Baucus turned to us for our analysis a hush spread across the room as we looked at each other. The President was waiting and we had no answer. I realized that our experts had been fooled, but even more than that we had made the mistake of not seeking out the opinion of the outlier experts, convincing ourselves to believe those who were widely believed to be in the know – This is something all of you will have to do for patients when problems arise outside your areas of expertise and I would caution you against listening to just one or even two experts when trying to find the best options for a patient. My year in Washington allowed me to understand the momentous changes coming down the road in health care payment reform and delivery system reform. I learned that our health care system was too expensive and did not provide any better quality of care than countries that spend half as much money as we did. I also realized that to help individual patients I would need to be engaged in the changes in the care delivery system and the payment incentives that would align with these changes. Ultimately I decided I could do this best by influencing the opinions of academic medical leaders and our legislators and this led me to the position of Editor in Chief of Academic Medicine. Just as the ideas that built La Clinica spread far beyond the village, I hope that the ideas that we present in the pages of Academic Medicine will help us to find the best solutions for our current health care problems.

So these are the three messages: (1) Take care of yourself while developing your habits of learning, (2) Become a student of people and their stories, and (3) Understand and become engaged in the larger world of health care. But I would like to leave you with one additional message.

To do all of this you must also take a step back from time to time to reflect on what you are doing, what you have seen, what mistakes you have made and what lessons you learned. All of us have our flaws, but we can still do amazing things in spite of them. If you like to write you can jot down your thoughts or even write a story or a poem and look at it later. All of the events of a medical career go by quickly like the scenery speeding past when you look out the windows of a train. They will quickly become a blur and the blur will disappear from memory. By reflecting, you can learn from your experience. Over the years many of my students have reflected and written about their experiences in medicine and shared them in books or stories. These stories about the people we touch are what medicine is about and each of us has a unique vantage point from which to tell our story. Your journey will be to find your own vantage point, that solid base that is yours alone. And when you find it I hope you will pause and reflect upon the vistas that spread out before you. Your graduation today is one such vantage point. Enjoy the view. I want to congratulate you and your families on this momentous day and thank you for allowing me to be a part of it.

Ho’omaika’i Ana Ia ‘Ou Kou

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Hawai‘i’s Silent Epidemic: Children’s Caries (Dental Decay)

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Background
Significance: 10 Million US Children, and 100,000 Hawai‘i Children Have Untreated Caries
Caries is a preventable Gram-positive microaerophilic bacterial infection. Yet, 10 million (>29%) US children have untreated dental decay. This is five-times the prevalence of asthma. Caries is, according to the US Surgeon General, a silent, preventable, epidemic.¹

Caries has profound disparities by geographic location, race, and socio-economic status.¹ ² In Hawai‘i, untreated caries rates are almost twice the national average and affect approximately 100,000 (>50%) 5-9 year old children. Untreated caries are significantly more prevalent among Native Hawaiians, Pacific Islanders, and children living outside of Honolulu.³

Untreated tooth decay can have multiple significant negative effects for children. For example, it impairs classroom learning—children with an acute toothache have trouble paying attention in school, exhibit increased school absenteeism, and do not keep up with their peers academically.² Even worse, 5% of children with untreated decay develop sepsis.⁵

Effective Prevention Programs are Available
Fortunately, evidence-based caries preventive interventions with proven effectiveness are available, as are evidence-based guidelines for school-based implementation (Table 1).⁶ ⁷ ⁸ These guidelines were developed through a collaborative effort of participants from the Centers for Disease Control and Prevention (CDC), the American Academy of Pediatric Dentistry (AAPD), and the American Dental Association (ADA), along with academic experts. These evidence-based guidelines now set national, if not international, standards.

Table 1: Evidence-Based Oral Health Interventions

<table>
<thead>
<tr>
<th>General Guideline Recommendations</th>
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</thead>
<tbody>
<tr>
<td><strong>Diagnosis</strong></td>
</tr>
<tr>
<td>Visual examination after cleaning and drying the tooth is sufficient to detect early noncavitated lesions in pits and fissures.</td>
</tr>
<tr>
<td>The use of explorers is not necessary for the detection of early lesions, and forceful use of a sharp explorer can damage tooth surfaces.</td>
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<tr>
<td>The clinician should not obtain radiographs for the sole purpose of placing sealants.</td>
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<tr>
<td><strong>Primary Prevention</strong></td>
</tr>
<tr>
<td>Sealants should be placed on pits and fissures of children’s primary and permanent teeth when it is determined that the tooth, or the patient, is at risk of experiencing caries.</td>
</tr>
<tr>
<td><strong>Secondary Prevention</strong></td>
</tr>
<tr>
<td>Sealants should be placed on early (noncavitated) carious lesions, to reduce the percentage of lesions that progress.</td>
</tr>
<tr>
<td><strong>Follow up</strong></td>
</tr>
<tr>
<td>Provide sealants to children even if follow-up examinations for every child cannot be guaranteed.</td>
</tr>
</tbody>
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Additional School-based Program Recommendations

| Diagnosis | Unaided visual assessment is appropriate and adequate. |
| Radiographs and other diagnostic techniques are unnecessary for sealant placement. |
| Primary Prevention | Seal teeth of children even if follow-up cannot be ensured. |

Hawai‘i Underutilizes Prevention Programs
Sealants are recommended by the CDC because they are safe and effectively prevent decay. Unfortunately, in Hawai‘i, school-based delivery of this effective caries prevention measure is under-utilized. Dental hygienists in Hawai‘i are trained and licensed to provide sealants. However, state laws present substantial hurdles to doing this by requiring: (1) an examination by a dentist prior to sealant placement, and (2) the presence of a dentist when a sealant is placed. As indicated in the previous paragraphs, these requirements do not reflect the scientific evidence or current guidelines, and advanced diagnostic skills or tools are not required to determine the need for sealants.

To address the need for sealants, currently, a few community health centers have school-based prevention programs to serve schools in their community. However, these efforts are localized, and there are no state-wide programs available.

As a direct consequence of Hawai‘i’s lack of adequate programs for children’s oral health, three sequential Pew Trusts Oral Health Reports have given Hawai‘i an “F” grade. The 2013 report was based on four indicators of an effective prevention strategy:⁹

1. Having sealant programs in high-need schools,
2. Allowing hygienists to place sealants in school-based programs without requiring a dentist’s exam,
3. Having programs for children in dedicated schools,
4. Providing children with follow-up examinations.

As a result of these efforts, Hawai‘i’s oral health performance remains significantly lower than the national average for children’s oral health.
3. Collecting data regularly about the dental health of school-children and submitting it to a national oral health database, and

4. Meeting a national health objective (Healthy People 2010) on sealants. The Healthy People goal calls for sealants to be applied to the molars of 50 percent of children, and it also says there should be no disparities among children based on income and other factors.

2013 Hawai‘i Senate Bill 343, House Bill 658: Improving Children's Oral Health

To address the oral health needs of Hawai‘i’s children, the 2013 Hawai‘i Senate Bill 343 and House Bill 658 both supported increased access to and improved oral health care. Both bills proposed aligning Hawai‘i’s public oral health care programs with the CDC’s and ADA’s evidence-based guidelines in the following ways:

- Require the Department of Health to participate in the National Oral Health Surveillance System, a national database managed by the federal Centers for Disease Control and Prevention and the Association of State and Territorial Dental Directors;
- Permit dental hygienists to apply preventive sealants in a school-based dental sealant program;
- Require the Department of Health to establish and administer a school-based dental sealant program in high-need demonstration schools;
- Require the Department of Health to report to the legislature about the department’s efforts to prioritize prevention of tooth decay amongst the State’s children; and
- Appropriate funds to establish and administer a school-based dental sealant program in a high-need demonstration school, including plans to implement the program on a statewide level.

Unfortunately, in marked contrast from the available evidence and CDC guidelines, SB 343 did not pass due to a “language discussion” on the need for “direct” supervision by a dentist while a dental hygienist places a sealant in public health setting.

Testimony for and Against the House and Senate bills

Testimony for and against the House and Senate bills revealed that Hawai‘i’s Dental Hygiene Association supported the bill, while Hawai‘i’s Dental Association appeared to be against the bill. In documented testimony, both professional organizations claimed to be primarily concerned about patient safety and the efficacy of prevention programs. Yet, neither testimony identified the evidence-based guidelines or the national standards. The outcome of the deliberations was that the bill died in conference. When the legislature, professional associations, and the public begin to reconsider these bills, and their potential implementation, it will be important that they also consider the larger legal and scientific context. As clinical evidence becomes more widely available, standards of care are quickly being adapted more widely, progressing from local to national to international. Thus, in a public health setting, by not passing and implementing public health measures with documented safety and efficacy, Hawai‘i may be inadvertently opening itself for potential legal liability.\(^{11}\)

The Mino‘aka (Smile) Pilot Program, Delivering School-based Caries Prevention

Despite legislative setbacks, Hawai‘i is engaged in efforts to increase oral health care in public settings. One example to address children’s oral health needs in Hawai‘i is the Mino‘aka (smile) Program. This pilot program is a community-based collaborative effort among Kama‘aina Kids, YMCA, and the University of Hawai‘i at Manoa, supported by the US National Institutes of Health. The long-term goal is to increase access to oral health care and improve the oral health of Hawai‘i’s children. The immediate goal is to develop and implement a model afterschool-based caries prevention program that meets the precepts and standards of the CDC and ADA guidelines, and adheres to all state and federal regulations.

The pilot study has 3 segments:

Segment 1

Identify locations for the pilot program. Due to pre-existing relationships we elected to collaborate with after-school programs of Kama‘aina Kids and YMCA. As part of the site selection process, afterschool site coordinators (N=125) completed a survey examining a social network analysis and oral health attitudes.

Social Network Analysis (SNA) is a study of how people connect and influence each other. We examined how oral health can be promoted by after-school program site coordinators. We hypothesized that site-coordinators who are well connected with each other would help other site coordinators to promote the importance of oral health care to children. The SNA (Figure 1) identified multiple social networks that divided people both within and between programs. In these figures, the high connected site coordinators are near the center of the network, while low connected site coordinators are on the periphery. We also carried out a school-based oral health program attitude and behavioral intent assessment to evaluate if the site coordinator’s attitude on oral health care would affect the promotion of oral health care for children in the after-school program. The assessment divided responders into two categories: High oral health attitude; and low oral health attitude. The two components, attitude and SNA, were integrated and factored in for the selection of site coordinators Table 2 shows the integration of connectedness and attitude.

Segment 2

From the four cells of the table we randomly selected 1 control school and 1 intervention school from each cell (8 schools total) to participate in the pilot study. The control schools’ site coordinators (n=4) received information about the caries prevention program, were given parental informed consent forms, and were asked to distribute and collect them from 3rd graders parents/guardians. The experimental schools’ site coordinators (n=4) also received information about the caries prevention program, were given parental informed consent forms, and
received a brief motivational interviewing (MI) training prior to distributing and collecting the consent form from 3rd graders parents/guardians. The brief MI training (lasting about 1-hour) included: (1) empowering and encouraging autonomy of the site coordinators to come up with their own way of maximizing consent form return rates; (2) developing discrepancy (helping participants recognize that their present situation does not necessarily fit their values and envision what they would like in the future); (3) rolling with resistance (allowing participants to explore their views, and avoid arguing for change; and not directly opposing resistance so as to avoid a communication breakdown); (4) expressing empathy (showing acceptance to increase the chance of developing a rapport with participants); (5) supporting self-efficacy (allowing the participants to realize the belief that they have the ability and power to change); (6) and employing reflective listening (acknowledging, confirming and rephrasing what the participants are saying). We hypothesized that the brief MI would increase child and parental consent rates (participation).

Segment 3
Upon return of informed consent the clinical team provided preventive care to children with consent. Care included a dental examination by a dentist, a cleaning, sealants with glass ionomer, interim restorations with glass ionomer when applicable (eg, sealing cavities to prevent progressions), oral hygiene instructions, and the provision of a care package including a toothbrush, toothpaste, fluoride varnish, and an interactive booklet including crosswords, coloring, and activities promoting oral health behaviors.
Outcomes
The primary outcome variable is program impact, defined as the product of its reach and its effectiveness. Reach is defined as the number and percent of participants with returned informed consent forms. Effectiveness is defined as change in the number and percent of children with untreated decay or acute abscess, assessed based on data collected during the initial care, and in follow-up care.

Summary of Project’s Current Status
The research team completed the afterschool site coordinators (N=125) social network and oral health attitudes survey, and the sites were selected. In April 2013, the clinical team completed both rounds of prevention (initial and follow-up care), as described in segment 3. The collected data will be analyzed and will provide information needed to enable a power calculation and evaluate the feasibility of conducting a larger trial.

Program Benefits and Barriers to Care
The benefit of the program is that all children in the participating after-school programs with informed consent can obtain free comprehensive caries prevention that meets current national and international standards. The program, however, has two significant barriers to care. The first barrier to care is the limited time frame for after-school programs of 2-3 hours, which significantly restricts the program’s reach. A preventive visit typically takes 15-30 minutes; as a result, only 4-6 children can be seen in an afternoon. Being limited to late-afternoon programs is also costly in terms of disrupting a clinician’s day, and substantially lengthening the travel time to and from the school. This barrier to care could be obviated by allowing preventive care to be delivered during school hours, as recommended by national guidelines and as occurs in 40 states.9 Children could also be bused en masse to a dental clinic with multiple chairs and where the intervention is administered. That would allow several patients to be seen at a time and minimize time away from work for the dental health professionals. The argument against utilizing school-time for dental care is that it (a) significantly increases access, and (b) substantially lengthening the travel time to and from the school.

Conclusions: An Opportunity for the Community to Control a Silent Epidemic
It is clear from evidence-based guidelines that the incidence and prevalence of dental cavities can be significantly reduced by comprehensive prevention that includes fluoride varnish, brushing instruction/cleaning, high viscosity glass ionomer sealants, and interim restorations. Children receiving dental sealants in school-based programs have 60% less new decay in the pit and fissure surfaces of back teeth (90% of decay occurs in pits and fissures)15. Further, increasing the percentage of children at high risk for tooth decay who participate in school sealant programs to 50% would prevent more than half of the caries that these children would otherwise have and save public health dollars.17 These studies also indicate that these preventive measures are safe as well as clinically effective and cost-effective.

Conflict of Interest
None of the authors identify a conflict of interest.

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Revised November 1, 2012
of research indicating aging brains continue to grow and change. New brain that processes visual information significantly increased in volume. In a Danish study published in Acta Ophthalmologica, the part of the brain associated with visual function showed a significant increase in volume post-surgery. MRI scans showed a significant increase in the visual cortex. More research is needed to determine if cortical plasticity contributes to improvement in visual function.

FOR SURE, IT IS A LOT OF BULL. In 2006-07 the so-called energy drinks hit the marketplace. Various products such as Red Bull claim to stimulate physiologic functions to enhance performance. Composed of multi-vitamins, natural compounds like ginseng, plus taurine, sucrose, glucose, and a heavy load of caffeine, they are advertised to prolong energy and stimulate alertness. While the assertion is that the stuff gives a person an “edge,” experts say there is no evidence that is true. Doctors are seriously concerned that the heavy dose of caffeine can be detrimental to young people. So far the Food and Drug Administration calls it a grey area, and no action is pending.

SOMETHING NEW TO CHEW ON. Not to be outdone, Wrigley’s gum wants you to have a chew of Alert Energy Caffeine Gum to tap into the fast growing sale of so-called energy products. Juicy Fruit and Spearmint are losing their appeal, so Wrigley wants to promote this new product with a hexagonal shape that doesn’t resemble traditional gum shape. On the retail shelf for $2.99 a pack, it is about twice the cost of a normal pack of gum. Each pellet carries 40 mg. of caffeine and the label includes a warning, “not recommended for children or persons allergic to caffeine.” Mayo Clinic says that for healthy adults, 200 to 300 milligrams of caffeine (two cups of coffee a day) is okay, but 500 mg. can cause insomnia, tachycardia and nervousness. One big problem for Wrigley, even flavored with mint or fruit Alert has a bitter medicinal taste.

YOU WON’T GET LOST. HE’LL KEEP AN EYE OUT FOR YOU. In a Philadelphia courtroom in February, a witness was describing how miserable and depressing his life had become after he lost his left eye in a bar room fight with the defendant. During his testimony his prosthetic eye fell out, and two jurors became ill. Although he judge believed the incident was an accident, he ordered a mistrial. I hope his stomach is stronger. A new jury will be seated, but he keeps the case.

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