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## Implementing a pharmacy driven inpatient antimicrobial stewardship at an Indian Health Service medical center

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### Introduction

Over the last few decades, there is an increase in the prevalence of antimicrobial-resistant pathogens, and the use of antibiotics is the most important factor in the development of antimicrobial resistance. Reducing antibiotic use in a single facility has been shown to reduce resistance in that facility (WHO, 2001). Antimicrobial stewardship programs (ASPs) aim to measure and promote the use of appropriate antimicrobial agent, dose, duration, and route of administration in order to improve patient outcomes while minimizing toxicity and the emergence of antimicrobial resistance.

The rationale behind the implementation of an intravenous (IV) to oral (PO) conversion policy at a rural community hospital is to promote and meet Pharmacy and Therapeutic Initiatives. Changing patients from an IV to a PO form of select medications, if clinically feasible, will 1) increase patient safety and comfort, 2) reduce medication cost, 3) reduce nursing administration time, 4) reduce indirect expenses from IV sets, pumps, monitoring labs, and personnel time, and 5) possibly facilitate earlier discharge without compromising patient care. Conversion from parenteral to oral therapy through a set of clinical criteria and guidelines at an institution is a level A-III recommendation from the Infectious Disease Society of America (IDSA)<sup>1</sup>.

### Methods

*Procedure.* An inpatient pharmacist will generate a specific IV medications report to review daily. The six medications to be targeted for evaluation are the following: azithromycin, ciprofloxacin, linezolid, metronidazole, doxycycline, and clindamycin. These medications are selected based on their high oral bioavailability and cost. Pharmacists will identify the appropriate patients to switch from IV to PO drug formulations by following empirical guidelines, and will then review the patient charts and medication administration records for the criteria listed by the guidelines. If necessary, pharmacists will confer with the patient's nurse or physician to obtain patient status. When the inclusion criteria for route change are met, pharmacists will notify the physician of the requested change and provide an appropriate oral dose. The physician will then order to switch the route of the medication.

*Guidelines.* Criteria required for converting a patient clinically responding to IV therapy:

### *In this Issue...*

- 83 Implementing a pharmacy driven inpatient antimicrobial stewardship at an Indian Health Service medical center
- 86 The Great Lakes Native American Research Center For Health: Building Upon Successful Student Development in Indian Country
- 94 Electronic Subscriptions Available

- Patient does not have a diagnosis of endocarditis, neutropenia, meningitis, sepsis, septic arthritis or osteomyelitis
- Patient has been on IV therapy for 48 hours or longer and is hemodynamically stable
- Patient is afebrile (temperature < 100.4 oC) for 24 hours
- Patient has not received anti-emetics within 24 hours
- Patient has not received vasopressive agents within 24 hours
- Patient is tolerating oral or liquid diet and scheduled medications with a functioning gastrointestinal tract

#### Target Medications

Drug	IV Dose	PO Dose
Azithromycin	500 mg	500 mg
Ciprofloxacin	200 mg	250 mg
Ciprofloxacin	400 mg	500 mg
Clindamycin	600mg	300mg
Doxycycline	100mg	100mg
Linezolid	600 mg	600 mg
Metronidazole	500mg	500mg

*Quality Assurance Analysis.* Data on antibiotic usage will be collected on the inpatient ward to determine the percentage of patients who are converted from IV to PO therapy. Patients will be followed until they are no longer receiving IV therapy. A pre-implementation audit will be done over a two-month period prior to initiating the conversion program on patients receiving the targeted medications to determine the percentage of patients who are not converted from IV to PO in a timely manner. A quarterly audit will be done after initiating the IV to PO conversion program on patients receiving the targeted medications to determine the percentage of patients who are converted from IV to PO in a timely manner and also who are not converted.

#### Results and Discussion

During the pre-implementation period between March 1 and April 3, 2014, a total of 779 patients were admitted of which 180 received antibiotic treatment. Initial pharmacist screening results showed that 114 patients were found to be treated with antibiotic intravenously (Table 1). Antibiotic usage was broken down by drug name and is listed in Table

2. Out of the six antibiotics of interest, azithromycin was given to 62 patients and was the most frequently prescribed antibiotic. This was followed by ciprofloxacin, then metronidazole, doxycycline, and clindamycin which were all equally prescribed subsequently. Azithromycin and metronidazole, however, showed more missed potential of IV to PO conversion, followed by clindamycin and linezolid with two misses, and ciprofloxacin with one.

The inpatient ward admitted a total of 193 patients during the post-implementation audit period between May 28 and June 14, 2014. There were 42 patients treated with antibiotics, of which 28 were given intravenously (Table 3). Due to the time constraint of this study, prolonging the duration of the audit was not possible. In spite of that, the percentage of patients who were administered with antibiotics and who received them intravenously during the post-implementation audit is similar to that of which during pre-implementation.

Due to seasonal weather patterns, the inpatient ward historically receives a higher number of patients with respiratory-related diagnoses between the months of March and May. Perhaps this explains the disproportionate use of azithromycin compared to other antibiotics. The primary diagnosis associated with azithromycin in this study period was community acquired pneumonia, followed by upper respiratory infection.

#### Conclusion

Approximately 9.65% of all patients started on IV antibiotics in the study were identified as candidates for a switch but were never converted. During the implementation of the IV to PO guidelines, the amount declined to 7.14%. No consistent or compelling reasons could be ascertained for not switching IV to PO after patients had met the set criteria. The quarterly audit may address whether recurrent of infections or readmissions due to re-infection did or did not occur.

This study was not designed to prove in a double-blind fashion that an early switch to oral therapy has the same efficacy as a full IV course. Since there is a compelling reason to change the current prescribing practices, it is important to explore other means besides education alone. Bar Code Medication Administration (BCMA), which can provide computer-assisted data collection, may be a consideration in not only implementing antibiotic stewardship but also enhancing reporting and reducing or preventing multi-drug resistance infections.

**Table 1. Pre-implementation vs. Post-implementation antibiotic use**

	PRE-IMPLEMENTATION	POST-IMPLEMENTATION
TOTAL INPATIENT ADMIN:	779	193
TOTAL PT ON ABX:	180 (23.1%)	42 (21.8%)
TOTAL PT ON IV ABX:	114 (14.6%)	28 (14.5%)

**Table 2. Pre-implementation antibiotic use**

Table 2	AZITHROMYCIN	CIPROFLOXACIN	DOXYCYCLINE	CLINDAMYCIN	LINEZOLID	METRONIDAZOLE
TOTAL PT	62	31	23	23	17	24
PT ON IV	35	17	11	21	16	14
PO ELIGIBLE	3	1	0	2	2	3

**Table 3. Post-implementation antibiotic use**

Table 3	AZITHROMYCIN	CIPROFLOXACIN	DOXYCYCLINE	CLINDAMYCIN	LINEZOLID	METRONIDAZOLE
TOTAL PT	8	12	6	10	2	4
PT ON IV	5	8	2	10	2	1
PO ELIGIBLE	1	1	0	0	0	0

**References**

1. Dellit et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. *Clinical Infectious Diseases* 2007;44:159-77.
2. Global Strategy for Containment of Antimicrobial Resistance. WHO / CDS/ CSR / DRS / 2001.2. Geneva: World Health Organization, 2001. Print.

# The Great Lakes Native American Research Center For Health: Building Upon Successful Student Development in Indian Country

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## Abstract

The Great Lakes Native American Research Center for Health (GLNARCH) implements multiple activities designed to ensure multigenerational success in student/professional development and culturally congruent health research. The NARCH applicant organization, Great Lakes Inter-Tribal Council, works with academic institutions on inter-related activities combining research and training to achieve measurable program outcomes. This interdisciplinary approach increases both research and training capacity at the tribal level. The current GLNARCH Student Development Program (SDP) has made substantial progress towards achieving the goal of increasing the number of AI/AN students, scientists, health professionals and organizations engaged in biomedical, clinical and behavioral research.

The GLNARCH SDP began implementation in 2003. Expectations of the GLNARCH SDP have been exceeded as a result of great commitment by staff, extensive cohort building, cooperative planning and recruitment, and AI/AN students initiating health careers. Since 2003, through NARCH II, IV, and VI grants, GLNARCH has placed 130 students in research internships at both undergraduate and graduate levels with a successful graduation rate of 80%.

## Introduction

The Great Lakes Native American Research Center for Health (GLNARCH) application has developed from interest in tribally-driven health research programming. This need was first identified during a strategic planning session held between the Wisconsin Tribal Health Director Association and the Great Lakes Inter-Tribal Council (GLITC) Indian Health Program in fall of 1999. During that session, eleven member tribes identified a long-term goal to establish health research initiatives that would help reduce

tribal health disparities while building tribal health sciences capabilities. The NARCH program was identified as a valuable opportunity to meet these needs and GLNARCH was established in 2003. GLITC successfully secured funding during the NARCH II, IV, and VI application processes and has worked with institutions, communities and students to address health issues for Great Lakes Native Americans.

This paper describes the development process, the successes, and some of the problems encountered in creating and maintaining this student development program (SDP). GLNARCH and the SDP are designed to strengthen collaborative academic-tribal community partnerships as well as foster a feedback process between research and the tribal community. This paper offers other tribally affiliated organizations an example of how to proceed if they are interested in moving more tribal students into careers in the health sciences.

## Background

Since the 1950's American Indian (AI) health in the United States and the three-state area has improved. For example, infant mortality dropped precipitously due to the elimination of certain infectious diseases like tuberculosis (HHS, 1999). In spite of the progress made, health disparities still exist for American Indians. In the Indian Health Service Bemidji area (Michigan, Minnesota and Wisconsin), death rates for American Indians are higher than the total population after taking differences in population age into account (GLITEC, 2011). Furthermore, the Native population in Wisconsin demonstrate elevated morbidity rates for diseases such as of heart disease and diabetes (WDHS, 2005). Indian Health Service Bemidji area data (2004-2008) indicates the following conditions for which American Indian/Alaska Natives have significantly higher mortality rates: all cancer, lung cancer, chronic liver disease & cirrhosis, diabetes, heart disease, influenza & pneumonia, nephrotic syndromes, suicide, and unintentional injury (GLITEC, 2011).

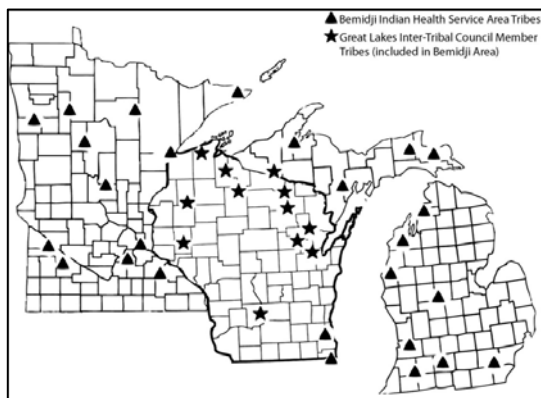
Tribal health leaders and health professionals possess knowledge of community health priorities, are familiar with community cultures, traditions and concerns, and seek relevant, accurate community health data. These professionals have identified a need for assistance with community-based clinical and epidemiologic research. By

expanding interdisciplinary collaborations between academic and Tribal communities GLNARCH, and its SDP, create a feedback process to improve AI/AN health and ameliorate health disparities.

Some historical barriers to AI participation in research include distrust, absence of effective mentoring, absence of role models, and inadequate training for research. Distrust is a major impediment and is often reinforced by repeated cases of research conducted in AI/AN communities without the full knowledge and participation of the community. Further, researchers from outside AI/AN communities often lack knowledge of and sensitivity to Tribal cultures and structures (HHS, 1999). Even though the number of AI/AN health care providers has increased, American Indians/Alaska Natives remain grossly underrepresented among biomedical researchers and academic faculty members. GLNARCH uses community based research approaches and a culturally congruent student development program to overcome these barriers.

American Indian/Alaska Native (AI/AN) students are underrepresented in higher education. AI/AN students and their AI/AN research mentors often come from families where they are the first generation to attend college. Though indigenous knowledge systems are crucial, mainstream higher education often fails AI/AN students (ASHE, 2012). Innovative approaches that build upon the central importance of relationships in American Indian culture are required to attract, foster and maintain AI/AN students research careers (Demmert, 2001). The National Institute of Health (NIH)-funded Great Lakes Native American Research Center for Health provides a unique and powerful student development program to address these disparities. A key element of the GLNARCH SDP is to help students recognize the importance and feasibility of advanced education, and the skills and academic background needed to do so.

**Figure 1:** Tri-State Indian Health Service Bemidji Area and Great Lakes Inter-Tribal Council Member Tribes



GLNARCH operates in the Indian Health Service (IHS) Bemidji region (Figure 1) and works to increase the amount of tribally focused health research in addition to developing tribal capacity through the development of AI/AN health professionals. The road to obtaining a health professional degree is long and disproportionately less AI/AN youth follow this path. The AI/AN population in the Bemidji region is younger than that of all races in the area and have lower educational attainment levels (Table 1). While AI/ANs may obtain some college exposure, retention of AI/ANs represents a significant challenge once they have enrolled in college. In Wisconsin, for example, six-year graduation rates at UW institutions were lowest for American Indian students at 30.1%, compared to 62.1% for all students entering UW in fall 1998 just before implementation of GLNARCH. Enrollment of AI students in the overall UW system has decreased in the past four years, and graduation and retention rates remain well behind the general student population (UW, 2013).

From the years 2001-2005, the total number of AI/AN students enrolled in the University of Wisconsin system has ranged from 1,002-1,095 or about 0.7% of the student population. During that same time period the number and percentage of graduate students in the UW system ranged from 141 to 150 or 0.7% of the graduate student population. In recent years these proportions have decreased (Table 2). As of 2009, the total AI/AN faculty in the UW system numbered 43 individuals (0.68%) (UW, 2013). The new GLNARCH academic partner, Medical College of Wisconsin, Reports 0.0% enrollment of AI/AN medical/graduate students, compared to 60% enrollment for whites, as of Fall 2011 (NCES, 2013). Trends in Minnesota show a similar lack of improvement for AI/AN student enrollment (MOHE, 2012).

Furthermore, AI/AN students do not often envision, or prepare for, a college education. In Wisconsin, in 2011, only 28% of Wisconsin AI/AN students took the ACT test compared to all students, of which 60.4% took the ACT.6 Further data show that UW-Madison enrolls more than half of the 224 Wisconsin American Indian high school students who took the ACT test.

This underrepresentation in higher education impedes the reduction of health disparities through community health care and research capacities. The GLNARCH student development and research components combat these trends by providing essential support to AI/AN students anywhere they choose to study in the tri-state Bemidji region.

The figures in Table 2 indicate an undesirable trend in AI/AN student enrollment and demonstrate the need for programs like GLNARCH. The number of AI/AN faculty is also lower than is desired. With such small numbers, the UW System has been challenged to develop and maintain an

environment that supports and encourages the development of AI/AN students and faculty members. GLNARCH has implemented a four phase program to address the challenges to student development and representation for AI/AN students.

Valentine, & Cooper, 2002; D. L. DuBois & Neville, 1997; Grossman & Rhodes, 2002). The literature frequently stresses the importance of sufficient mentoring time being spent with the student to provide timely feedback, and also the importance of linking the research activity to the student's academic studies.

	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Freshman	0.65%	0.69%	0.77%	0.74%	0.77%	0.71%	0.61%	0.55%	0.49%	0.43%
Undergrads	0.65%	0.69%	0.77%	0.74%	0.77%	0.75%	0.61%	0.55%	0.49%	0.43%
Graduate	0.68%	0.66%	0.64%	0.79%	0.74%	0.65%	0.62%	0.59%	0.48%	0.49%

**Table 2: AI/AN Students On UW-Campuses (UW, 2013)**

## Methods

Best Practices for Native American Student Development. Over the years, GLNARCH has developed methodology for Native American student and professional development based on experience and a growing body of literature. This literature provides general recommendations for mentorship programs, as well as American Indian-specific mentorship best practices. Key concepts include: service learning and student placement, mentorship, cultural congruence, epistemology, structured support, and community (both cultural and professional).

In a study investigating service learning and placement (Astin, Vogelgesang, Ikeda, & Yee, 2000), longitudinal data were collected from 22,236 undergraduate students at colleges and universities. Service participation showed significant positive effects on all outcome variables (e.g. GPA, writing and critical thinking skills, racial understanding, self-efficacy, leadership ability, interpersonal skills, and service after college). The positive effects of the service experience were explained in part by “emotional support from faculty” and the students’ degree of interest in the subject matter. Thusly demonstrating the utility of a program which assists the AI student to develop an interest in research, and see the importance of its practical applications.

Mentoring programs are proven to provide great benefits. The following attributes are associated with successful mentoring programs: 1) a high level of contact, typically at least three meetings a month of several hours length between mentor and youth; 2) screening to identify mentors who will commit to the mentoring relationship; 3) training of mentors, including communication skills and tips on relationship building; and 4) support for mentoring relationships by a "case manager" who serves to mentor and facilitate these relationships (D. DuBois, Holloway,

An implication of this research is that stability and duration of the mentoring relationship should be stressed to maximize positive results. Grossman and Rhodes (2002) analyzed data from the national Big Brothers/Big Sisters study to investigate the effects of mentoring as a function of duration. The mentored youth were categorized by how long the mentoring relationship lasted: less than three months (6%); three to just under six months (13%); six to just under 12 months (36%), and 12 months or more (45%). The results showed no significant positive effects for matches lasting less than six months, and only a few significant findings in the 6 – 12 month group. The largest number of perceived positive effects occurred in the 12 month or longer group, in the areas of parental relationship, scholastic competence, self-perceived social acceptance, and reductions in truancy and substance use. Positive effects increased with relationship length.

The keys to achieving better student outcomes, as enumerated above, is described by Du Bois & Neville (1997) in a meta-analysis of 55 evaluations of youth mentoring programs. As shown in the above studies, stronger effects were present among youth who had closer mentoring relationships (i.e. frequency of contact, emotional closeness and longevity). In summary, it is clear that adequate “support and structure” is required for mentoring relationships, and in particular initial preparatory processes such as screening, initial training and orientation, and matching of youth with mentors. GLNARCH has worked with great success to apply these principals to mentorship.

In additional to the general literature, a growing body of research and reviews exists specific to American Indian learning styles and mentorship practices. This literature affirms the conclusions of the more general studies, and adds important understandings and implications for student development programs.

William Demmert (2001) describes the existence of a “firm belief within many Native tribal communities and professional Native educators that [a] cultural context is absolutely essential if one is to succeed academically and to build a meaningful life. “ Demmert quotes Jerome Brumer that “culture shapes mind....it provides us with the toolkit by which we construct not only our worlds, but our very conceptions of ourselves and our powers.” Jon Reyhner, in an overview of AI/AN educational literature, noted the importance of the October 1991 report by the US Dept. of Education Indian Nations At Risk Task Force (Reyhner, 1992). The hearings indicated that many American Indian students attended schools with “an unfriendly school climate that fails to promote appropriate academic, social, cultural and spiritual development among many Native students.”

complex interconnections among people and with nature.” (Jacobs & Reyhner, 2002). The following methodologies, structured activities, mentorship, institutional support, and epistemologically-diverse development tools, represent a powerful toolkit employed by GLNARCH to overcome the barriers to AI/AN health professional/student development.

Through this methodology the GLNARCH team exercises best practices as supported by both literature and experience.

GLNARCH partners with Mayo Clinic, Marquette University, University of Minnesota- Duluth, Concordia University of Wisconsin, University of Wisconsin campuses, and Medical College of Wisconsin to provide ample and diverse experience for students in the GLNARCH

**Table 3: Student Development Phases, Participants and Activities**

<b>GLNARCH SDP Phases</b>	<b>Participants</b>	<b>Duration</b>	<b>Activities</b>
Phase I: Indigenous Health & Wellness Days (IHWD) reinstated	100 6th – 12th graders	3 days in summer	Hands on Organ Curriculum
Phase II: American Indian Science Scholars Program (AISSP) reinstated	40 10th – 12th graders (two groups of 20)	10 days x two groups in summer	Intensive Lab Experiences themed “Outbreak Virus” - Learning to solve mock crime scenes – other hands-on dental/medical laboratory experiences
Phase III: Fostering Native American Students, Interns and Postdocs)	12 sophomore through senior undergraduate students	School year	To provide mentoring and internships to AI/AN students
Phase IV: Fostering Native American Students, Interns and Postdocs	8 Graduate & Ph.D. level students	School year	To provide mentoring and internships
Phase V: Fostering Native American Students, Interns and Postdocs (proposed for 2014)	One Post-doctoral fellow	2 year experience	One fellowship annually - Transition to career independence- Publication of the research results

In order to AI youth to be academically successful, Reyhner and other educators have stressed the need for a culturally appropriate learning experience involving parents and community.

Ideally, this training would build upon cultural perspectives acquired in early childhood as opposed to contradicting these values. Jacobs and Reyhner (2002) also discuss the role of paradigms in promoting American Indian academic success. They see evidence that teachers must be prepared so that European American paradigms can “coexist” for students with “Native worldviews about life’s

SDP program. These institutions also demonstrate commitment to achieving greater racial diversity among their student and faculty populations. The GLNARCH SDP program is implemented in four phases, with a fifth proposed for future work (Table 3).

**Methods: Phase I**

Indigenous Health and Wellness Days (IHWD) event demonstrates successful nine year collaboration between GLNARCH, primarily co-sponsored with the UW School of Medicine and Public Health (UW SMPH), with the

Collaborative Center for Health Equity serving as the lead academic partner, and Madison College. The goal of this annual three-day event is to expose AI/AN students to careers in the health sciences. AI/AN students 6th through 12th grades from throughout MI, MN and WI have been recruited; current UW undergraduates have also participated. Students return for multiple visits to the IHWD. GLNARCH SDP has successfully created two tracks of programming content for these junior scholars on the Madison campus: one tailored for 7th-9th graders and a second for high school aged scholars.

The event is organized each year by a planning committee composed of members of the UW Native American Health Working Group partnering with GLNARCH, Wunk Sheek, the UW American Indian student organization, the UW chapter of the American Indian Science and Engineering Society (AISES), and UW American Indian Academic Student Services, to develop the program and recruit participants. The IHWD program includes cultural elements such as a welcome song by the Wunk Sheek singers and opening prayer by a Native Elder. It always features a presentation by an AI/AN health professional telling his/her story, a set of hands-on health-related student activity centers, and a panel of UW science and health professions students, including former GLNARCH interns.

IHWD is supported by funds solicited annually from the UW SMPH and all of the co- sponsoring schools, colleges and programs. Key participants at UW- Madison include: Rick Strickland, MS, Senior Research Specialist University of Wisconsin-Madison; Sarah Esmond, Collaborative Center for Health Equity; Alexandra Adams MD, PhD, Director, Collaborative Center for Health Equity University of Wisconsin School of Medicine and Public Health; Erik Brodt, MD, UW-Madison Department of Family Medicine Hospitalist Director, UW-Native American Center for Health Professions; and Byron Crouse, MD, Associate Dean/Professor; Wisconsin Academy of Rural Medicine (WARM).

## **Methods: Phase II**

The second phase of GLNARCH builds on the first phase to increase the number of AI/AN college students who pursue health sciences and medicine. This is accomplished by: (1) increasing high school students' knowledge of higher education opportunities and entrance requirements, and (2) increasing their understanding of the important roles of health sciences and professionals in Native communities. The American Indian Student Scholars Program (AISSP) allows students to explore UW-Milwaukee, Concordia University, Medical College of Wisconsin and Marquette University campuses, to learn about college application

processes and about health science careers, and to participate in hands-on science and cultural activities.

GLNARCH AISSP activities introduce students who have exhibited interest in health sciences and research to many areas of the health sciences, role models, and hands-on lab work while emphasizing the need for culturally competent providers of health care, researchers, and other science based professionals. The hands-on laboratory activities include: Molecular Diagnostics, Introduction to Electron Microscopy, Medical Microbiology, Exercise Physiology, Environmental Toxicology, Marine and Freshwater Biomedical Sciences, and Ecology Boardwalk at the UW-Milwaukee Field Station. These are provided in partnership with off- campus academic partners Marquette School of Dentistry, Medical College of Wisconsin, and Concordia University Schools of Pharmacy, Nursing, and Sports Medicine. Various cultural activities complete the campus experience, such as (voluntary) participation in a sweat lodge ceremony.

Starting in 2012, twenty high school students participated with an extended program (10 day session) in middle of July, living in the dorms at the UWM and participating in a wide variety of scientific and cultural activities. The AISSP has been coordinated by GLNARCH and partnering schools for 12 years, and every year has seen expansion of the kinds of activities offered to the students. For example, Marquette University Dental School has emerged as a dynamic new partner. Students have the opportunity to cast molds, drill artificial teeth, and make a partial denture. Nearly every student ranked this session as one of their top experiences.

Recruitment is accomplished by GLNARCH Student Development Coordinators via maintained contact with various groups and organizations in Tribal education realms, e.g. Home School Coordinators, High School Guidance Counselors, Tribal Education Directors and Health Directors, WI Education Association, cohorts within the UW System and other academic partners who work with AI/AN students, and recruiting via site visits within Tribal communities.

## **Methods: Phase III/IV**

Twelve selected undergraduate students (sophomore through senior standing) and eight graduate students enter a period of academic mentoring and summer research experience under GLNARCH. The faculty/research mentor placements in this phase are coordinated by the Student Development Coordinators, with appropriate approvals. The students are paired with identified research mentors, based on locations, shared student/researcher interests, and student career paths. Qualifications for mentorships include: 1) PhD with health science research interest and 2) a professor



working at a university or health professional in an AI community, with preference for AI/ANs. The research PIs of current and past center grant projects serve as research mentors, as well as other academic partners from other grants and programs.

The internship experience also introduces students to the importance and feasibility of training beyond a bachelor's degree. With assistance from the SDP team, each student completes an Individual Development Plan (IDP), in conjunction with their mentor, to encourage planning of educational goals and to outline expected outcomes of the internship experience. IDPs define goals, expected outcomes and a date by which each activity will be completed. Previously, GLNARCH utilized a "Learning Contract" to document goals and objectives of both mentor and mentee, which served as an important tool in maintaining a meaningful research experience. GLNARCH now requires that students complete the IDP plans and revisit them as needed with the student's mentor.

GLNARCH also assists AI communities in locating students, and, using service principles, helps place AI/AN interns within AI communities. This forges appropriate partnerships with the AI communities, as well as employers and educational institutions, in the three states (MI, MN and WI) to find student placements. The Student Development Coordinators also distribute a newsletter among these entities, as well as by flyers, personal contacts and verbal reports. The SDP team maintains a database of all participants in Phases I and II, maintain regular contact with them, and recruit for Phase III among this student pool upon graduation from secondary school.

## Results

Since 2003, through NARCH II, IV, and VI grants, GLNARCH has placed 130 AI/AN students in research internships at both undergraduate and graduate levels. AISSP has been successfully implemented with at least 20 AI/AN students annually since 2003. Starting in 2012, AISSP began offering a campus experience of 10 days, to target 20 AI/AN high school students total, increasing the duration of the weeklong experience by 3 days as a result of student evaluation feedback. The duration of Indian Health and Wellness Day (IHWD) has also been extended from one day to three days to increase exposure and role modeling opportunities for AI/AN high school students.

GLNARCH SDP partners with academic institutions and programs to build strong support and mentoring relationships. This is reflected in data following student progress: 80% of all GLNARCH students who have completed Phase III internships have obtained undergraduate degrees in health sciences (6.8% of the general AI population hold a bachelor's degree (Table 2)).

Last year, more students expressed interest than the 15 internships allowed; the program is planned to expand five additional internships to accommodate the additional students. Previous NARCH projects (which include NARCH interns) have been successful by producing 19 accepted or published manuscripts, 52 scientific presentations and/or posters (including students), and leading to six non-NARCH grants totaling approximately \$4.1 million.

GLNARCH Student Development accomplishments are summarized as follows:

- 130 American Indian students from MI, MN and WI enrolled in higher education since 2003
- 171 American Indian high school students exposed to higher education and health careers since 2003, including a majority of students coming from the Wisconsin Tribes:
  - Bad River Band of the Lake Superior Tribe of Chippewa Indians (23 students)
  - Forest County Potawatomi Community (21 students)
  - Ho-Chunk Nation (19 students)
  - Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin (13 students)
  - Lac du Flambeau Band of Lake Superior Chippewa Indians (20 students)
  - Lac Vieux Desert Band of Lake Superior Chippewa Indians (12 students)
  - Menominee Indian Tribe of Wisconsin (21 students)
  - Oneida Tribe of Indians of Wisconsin (28 students)
  - Red Cliff Band of Lake Superior Chippewa Indians (3 students)
  - St. Croix Chippewa Indians of Wisconsin (6 Students)
  - Stockbridge-Munsee Community (2 students)
  - Fond du Lac (Minnesota) Band of Lake Superior Chippewa Reservation (3)
- Four poster presentations given: Jackson, Brian, Poupart, Amy (2005, 2007, 2008, & 2009). Native American Research Center for Health Student Development Poster Presentations, National Institute Health, Bethesda, MD
- Two GLNARCH Student Development DVDs created, and 1 DVD currently being developed.

## Discussion

The primary objective of GLNARCH and the SDP is to build upon a decade of experience to strengthen collaborative academic-community partnerships and foster a feedback process between research and community spheres. We aim to expand the tribal health sciences resources base, further American Indian/Alaska Native (AI/AN) student development, and strengthen regional academic partnerships. This serves to achieve the National Institute of Health NARCH goal to reduce health disparities, support health research projects prioritized by the tribal communities, enhance health research partnerships and reduce distrust of research by American Indian/Alaska Native (AI/AN) communities while developing the next generation of AI/AN scientists and health research professionals. GLNARCH Phases I and II are innovative in that they outreach to middle and high school students, encouraging them from a young age to consider higher education options, reducing apprehension and stimulating interest in the health sciences. GLNARCH is now working to expand its services to support students at higher levels (graduate and post-doc) to more comprehensively foster professional development.

In 2010-12, GLNARCH VI staff created three DVDs about the SDP: one explaining and marketing GLNARCH SDP to AI/AN students, a documentary about GLNARCH interns, and one on the history of GLNARCH (See <http://www.glitc.org/programs/narch-home/>). Moving forward, interns will be trained to create digital stories about their research internship, as well as create poster presentations as in previous years. These generate interest and excitement in AI/AN students, and market the GLNARCH SDP to Tribes and other agencies. UW- Native American Center for Health Professions has recently partnered with GLNARCH to enhance access to a broader library of digital stories which bring health sciences student and provider journeys into visibility.

The digital storytelling efforts represent a key innovation to develop forms of knowledge that facilitate information transfer between GLNARCH activities and AI/AN communities. These narratives are designed to document the professional development of tribal health professionals and the training of non-Indian scientists to work in Indian Country. This storytelling is also used to leverage additional support and activities well beyond the original IHS/NIH support.

These outreach materials are meant to serve both as data-reporting tools as well as community-engagement mechanisms. The materials will also be viewed during Community- Based Participatory Research (CBPR) training sessions. These videos will be distributed to interested tribal officials to help them understand how to build sustainable

and tribally accepted health research programs. The videos will also be available to potential federal funding officials to help educate those agencies as one example of how to successfully work with tribes. Finally, as community-engagement tools, the digital stories will be presented at indigenous health and wellness fairs, health director meetings, education committee meetings, recruitment and intern events, and any other appropriate venue.

The UW system and campuses have taken steps to address the problem of poor AI/AN student representation, and the GLNARCH initiatives contribute to this shared goal. Furthermore, The Institute for Health and Society at MCW has recently pledged a renewed dedication to increasing AI/AN enrollment through partnership with GLNARCH. Increased enrollment of AI/AN students at MCW would make an excellent step towards developing AI/AN medical professionals. To improve AI/AN participation in the health sciences, the UW system has two major programs and on the Madison and Milwaukee campuses. There are at least six specific AI student projects designed to improved AI student recruitment and retention into the sciences. The GLNARCH American Indian Student Scholars program is one of these.

Future plans include a partnership with Wisconsin Indian Education Association and Wisconsin Tribal Education Directors Association to implement a new component of AISSP: introducing students to the ACT test, and helping them to prepare for the ACT test. Funding from the Forest County Potawatomi Foundation has allowed GLNARCH to continue Phases I and II through 2014. This is a testament to the growing support of GLNARCH SDP activities

Future IHWD will include presentations by AI/AN health professionals, as well as new activities such as the "The Wonders of Physics," an engaging physics demonstration program presented by Professor Clint Sprott, which, like other Phase I and II activities, helps students overcome apprehensions they may have for science; dispelling such fears is critical, since all health sciences require prerequisite physical sciences courses.

The number of postdocs in the U.S. has been steadily increasing due to the fact that the post- doctoral position has become the de facto next career step following the receipt of a doctoral degree in many disciplines. GLNARCH is therefore instituting a new Phase V, offering one fellowship per year to a GLNARCH post-doc. Long-term, focused approaches are not only more successful in attrition prevention and increasing graduation rates, but also serve to increase trust between students, communities, and institutions (Demmert, 2001). Transitioning from undergraduate to graduate studies is a critical time when many students struggle. GLNARCH SDP will continue to

work to ease this transition, creating cohort support networks and matching students with faculty mentors.

## Conclusion

Much concern remains over health disparities and lack of tribal health professionals in the Great Lakes region. GLNARCH, however, has made good progress in conducting CBPR and providing AI student/leadership development. Building trust between the tribes, academic institutions and research remains a priority; GLNARCH has fostered valuable collaborations and long-term partnerships to address this concern. GLNARCH systematically address issues of trust and mutual benefit. Each of the community based research projects has identified Tribal and/or GLITC staff as co-investigator, intern, or research associates. This assures direct tribal participation in the research process and builds tribal research capacity and trust.

GLNARCH AISSP activities introduce students who have exhibited interest in health sciences to many areas of the health sciences, role models, and hands-on lab work while emphasizing the need for culturally relevant providers of health care, researchers, and other science based professionals. The more successful programs that achieve their stated evaluation outcomes and increase student completion rates are those that have significant longitudinal pipelines for students throughout the trajectory of their academic experience, from middle- to high school and into postsecondary institutions. GLNARCH offers benefits to the academic institutions in their three-fold missions of education, research, and service. GLNARCH builds upon previous success of developing institutionalized support to enhance the potential for recruitment and retention of AI students, strengthen the research skills among faculty, and expands the base of science in an arena of mutual interest and shared goals. These efforts will, in turn, expand future opportunities for tribal participatory research.

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