

Training New Dental Health Providers in the U.S.

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Training New Dental Health Providers in the U.S.

There is growing interest in establishing new “midlevel” dental providers in the U.S. The genesis of this interest is concern about access to care for underserved populations whose higher oral disease rates and unmet oral care needs are well documented.

This interest is evidenced by actions of federal and state governments that have the authority to sanction such providers:

- In 2003, the Alaska Native Tribal Health Consortium established [the Dental Health Aide Therapist \(DHAT\)](#) – the first “midlevel” dental provider in the U.S. to deliver a specified set of services that were previously delivered only by dentists. The DHAT provides care only to Alaska Native beneficiaries through the Consortium.
- In December 2005, the Congressional Committee that funds the U.S. Department of Health and Human Services directed the Department to “*explore development of an advanced dental hygiene practitioner ... to provide diagnostic, preventive, restorative and therapeutic services directly to the public in rural and underserved areas.*”¹
- In February 2009, the U.S. Congress mandated a study on “*the feasibility and appropriateness of using qualified midlevel dental health providers, in coordination with dentists, to improve access for children to oral health services.*”²
- In May 2009, the Minnesota State Legislature established the Dental Therapist, the first midlevel dental provider sanctioned to provide care to U.S. non-Native populations “*in settings that serve low-income, uninsured, and underserved patients or are located in dental health professional shortage areas.*”³

- In October 2009, the federal Department of Health and Human Services commissioned a study by the Institute of Medicine (IOM) “*to guide federal investments in service delivery models that expand access to oral health care and improve its quality.*”⁴ This study will build, in part, on a February 2009 IOM *Workshop on The Sufficiency of the U.S. Oral Health Workforce in Coming Decades.*⁵
- In November 2009, the U.S. Senate health care reform proposal included a midlevel dental provider training demonstration and expanded training authorization for dental hygienists.⁶

As this interest in new mid-level providers continues to mount, questions arise about their scope of practice, roles, and responsibilities relative to existing providers, and the training they will need to assure public safety, quality care, and acceptance. This paper addresses training considerations for a variety of new providers within the contexts of their scope, supervision, and placement. It examines international and U.S. training experiences of current dental personnel and considers the underlying motives and goals of establishing these new providers.

The level, length, and content of training depend upon the range of procedures providers will offer to patients, how they will coordinate their care with dentists, where they will work, and who they will serve. As such, the question of how to train new midlevel providers is complex. To set the stage for understanding options and tradeoffs, this paper begins with a taxonomy of dental providers and then explains the types of procedures inherent in dental care before addressing training issues *per se*.

Taxonomy of Dental Providers

The full cast of dental providers whose training is addressed by this analysis is comprised of:

1. *Conventional U.S. providers*: dentists, dental hygienists, dental assistants, and expanded function dental hygienists and assistants.
2. *Unconventional U.S. providers*: dental health aide therapists in Alaska and the Minnesota dental therapists.
3. *Proposed U.S. providers*: community dental health coordinators, oral preventive assistants, and advanced dental hygiene practitioners.
4. *Conventional non-U.S. providers*: dental therapists and dental hygienist-therapists.

Conventional U.S. Providers

The conventional trio of dental providers in the U.S. is comprised of the Dentist, or dentist-specialist,* who is assisted in carrying out procedures at the dental chair by the Dental Assistant and who typically supervises the Dental Hygienist. The dental hygienist functions as an oral disease prevention and health promotion specialist. Dentists and dental hygienists are licensed in all states, while some states additionally license dental assistants when they are authorized to perform expanded functions. Expanded functions are intra-oral procedures for which the dental assistant is required to obtain additional training and/or certification. Dental assistants who are authorized to perform these functions are termed Expanded Function Dental Assistants (EFDAs).† Similarly, dental hygienists who are trained to

* Recognized specialties in dentistry are: Dental Public Health, Endodontics, Oral and Maxillofacial Pathology, Oral and Maxillofacial Radiology, Oral and Maxillofacial Surgery, Orthodontics and Dentofacial Orthopedics, Pediatric Dentistry, Periodontics, and Prosthodontics. (Source: American Dental Association at http://www.ada.org/prof/ed/specialties/specialty_certifying_report.pdf).

† Terminology varies by state and may include “expanded function dental assistant” (7 states); expanded duties dental assistant (5 states), dental assistant qualified to perform expanded duties/functions (5 states), registered dental assistant (4 states),

provide services beyond their customary scope of preventive services are called Expanded Function Dental Hygienists. According to the American Dental Association’s 2006 Survey of Dental Practice, the average staffing of a private general dentistry office is one dentist, 1.4 hygienists, 1.6 dental assistants, and 1.2 receptionist personnel.⁷

Dentist

The dentist provides or is responsible for all patient care services including those that can be authorized, allocated, or delegated to other types of providers. The dentist is expansively educated to manage, independently or with specialists on referral, the full spectrum of oral health care needs of all people, including those who are medically complex or have other special treatment needs.

The dentist is responsible for care provided by others under a variety of “supervision” arrangements termed “direct, indirect, general, prescriptive, and collaborative.” Direct supervision requires the dentist’s physical presence while others perform intra-oral procedures. Indirect supervision requires the dentist’s physical accessibility to the treatment location while others perform intra-oral functions. General supervision requires that the dentist assume responsibility for the work of others but does not require the dentist to be physically present or available to the care site.

Prescriptive and collaborative supervision are subsets of general supervision. Prescriptive supervision requires that the dentist examine, develop a plan of treatment for the patient, and formally prescribe in writing a care plan for those procedures that are to be delegated to other providers. Collaborative supervision is an arrangement in which the non-dentist provider functions independently or quasi-independently in a system of care and has pre-established consultative and referral

advanced dental assistant, dental assistant with state certification in expanded functions, dental assistant with expanded duties training, dental assistant qualified in general duties, licensed expanded function dental auxiliary and registered dental assistant with expanded duties training (1 state each). Additionally, state practice acts may designate specific expanded functions, e.g. monitoring analgesia or sedation administration (12 states), coronal polishing (13 states), sealant placement (9 states), amalgam placement (1 state) etc. (Source: Dental Assisting National Board at <http://www.danb.org/PDFs/JobTitles.pdf>)

arrangements with a dentist for care that is beyond the non-dentist's scope of practice. Teledentistry and information technology have somewhat blurred these distinctions as out-stationed midlevel providers can now consult visually and verbally but not physically with a supervising dentist. These types of supervisory relationships are established in state-specific dental practice acts which are typically generated by the legislative branch of government and interpretable to varying degrees by regulatory bodies, commonly called "State Boards of Dental Examiners." Practice acts also articulate, and state boards interpret, requirements regarding training and continuing education required for each type of dental providers' continued licensure as well as practice ownership (commonly proscribing that only a dentist licensed in the state may own any form of dental practice), and dental practice standards.

Dental Hygienist

The basic scope of practice for dental hygienists includes visual and radiographic assessment of patients' oral health status, removal of deposits on the teeth both above and below the gum line, application of cavity-preventive agents including fluorides and sealants, and patient education and counseling regarding oral hygiene, nutrition, and smoking cessation.⁸ The American Dental Hygienists' Association's *Standards for Dental Hygiene Practice* document further details six components of practice including assessment (history, clinical evaluation, and risk assessment), dental hygiene diagnosis, planning, implementation, evaluation, and dissemination.⁹ Additionally, some dental hygiene programs provide varying intensities of training in dental reparative procedures that are consistent with their state practice acts regarding expanded function dental hygienists which vary widely.^{10 11} The most expansive states—for example AK, CO, HI, KY, MO, OH, WA and WY—typically authorize dental hygienists to provide all preventive and restorative services except "irreversible procedures" that require cutting soft tissues (e.g. biopsy, gingivectomy), "drilling" teeth, and extracting teeth.¹⁰

Supervision requirements of dental hygienists also vary significantly by state with only four states—AL, GA, IN, MS—requiring direct supervision in both private practice and safety net settings and four additional states—LA, NJ, NC, and PA—requiring a dentist on-site in private

practice settings only.¹⁰ Twenty-nine states allow dental hygienists "direct access" to patients. According to the American Dental Hygienists' Association, direct access means that "the dental hygienist can initiate treatment based on his or her assessment of a patient's needs without the specific authorization of a dentist, treat the patient without the presence of a dentist, and can maintain a provider-patient relationship."¹⁰ Only Colorado and Maine currently allow practice ownership by dental hygienists and the completely independent practice of dental hygiene when providing preventive services.¹² Eleven states have provisions for quasi-independent practice in safety-net settings under collaborative arrangements with licensed dentists and/or experience or additional training requirements (CA, CT, ME, MI, MO, NE, NV, NM, OR, WA, WI).

One particularly expansive example of direct access dental hygiene that requires enhanced training but no expansion in scope of services is Oregon's "*Limited Access Permit Dental Hygienist (LAP)*." The LAP, upon educational and experiential qualification and possession of professional liability insurance, is allowed to practice preventive services and placement of temporary restorations without supervision in designated sites.¹³ Required are 40 hours of specified classroom instruction and 5,000 hours of supervised dental hygiene clinical practice within the prior five-year period.¹⁴ Classroom instruction is geared to the needs of geriatric and other underserved populations and includes coursework in general medicine and physical diagnosis, pharmacology, medical emergencies and cardiopulmonary resuscitation, oral pathology, management and psychology of geriatric and disabled patients, and jurisprudence related to unsupervised practice with limited access patients. Limited access patients are specified as those "who, due to age, infirmity or disability are unable to receive regular dental hygiene treatment"* as well as homebound adults, children in nursery schools and day care programs along with their siblings under age 18, Job Corps and other employment training facilities, WIC recipients, and primary and secondary schools.

* Specified are those in nursing homes, foster homes, residential care facilities, adult congregate living facilities, mental health residential programs, correctional facilities and juvenile justice facilities, youth centers, and community health clinics.

Dental Assistant and “Expanded Function Dental Assistant (EFDA)”

By definition, dental assistants assist other providers in the direct delivery of dental services. Any activity that involves intra-oral manipulation, including the exposure of dental radiographs, is considered an “expanded function” for dental assistants. Dental assistants who are authorized to perform these functions are “expanded function dental assistants.” The range of allowable functions for dental assistants as with dental hygienists is detailed in each state’s dental practice act and varies considerably across jurisdictions. Some states allow dental assistants—with various levels of training, examination, and oversight—to perform all preventive procedures allowable to hygienists except cleaning below the gum line (“scaling and root planing”) as well as most dental reparative procedures except for those that are “irreversible.”

Pennsylvania is an example of a state with significantly expanded dental functions.¹⁰ In Pennsylvania, EFDAs may perform all dental treatment functions except final impressions for, and placement of, dental prosthetics; examination, diagnosis, and treatment planning; cutting hard or soft tissues; prescribing medication; performing endodontic (root canal) treatments; and administering anesthesia or analgesic agents. In short, they can perform all of the steps involved in placing fillings except administering anesthesia and cutting teeth. To qualify for such expanded functions, a person must graduate from an accredited two-year associate degree dental assisting program or from a dental hygiene program that requires at least 75 hours of clinical and didactic instruction in restorative functions or successfully complete a state certification program of at least 200 hours of clinical and didactic instruction. To be certified as an EFDA in Pennsylvania, the assistant or hygienist must also pass a state board-accepted written examination.¹⁵

Unconventional U.S. Providers

The Dental Health Aide Therapist (DHAT) is the dental version of the longstanding community health aide,* a native Alaskan peer community health practitioner. Sanctioned by Congress since 1968, the community health aide provides health assessment and basic medical services in rural villages under a referral relationship with licensed health professionals. The DHAT, established in 2003, provides a range of community-level and personal oral health services (see chart and detailed discussion of scope of practice below) in coordination with a supervising dentist. Services include preventive and reparative procedures as detailed by the Community Health Aide Program Certification Board.¹⁶

The Minnesota [Basic] Dental Therapist and Advanced Dental Therapist[†] were established by the Minnesota legislature in 2009 and, like the DHAT, are authorized to provide services previously delivered only by licensed dentists. These unconventional U.S. providers are trained to deliver a mix of preventive and basic reparative dental services (see chart on the following page) under a variety of relationships with supervising or collaborating dentists. The MN basic dental therapist is authorized to provide most services under indirect supervision of a dentist while the MN advanced dental therapist is authorized to provide most services under general supervision through a collaborative arrangement.

* The Alaska Community Health Aide program precedent was developed in the 1950s “in response to a number of health concerns including the tuberculosis epidemic, high infant mortality, and high rate of injuries in rural Alaska” (source: <http://www.akchap.org/GeneralInfo.cfm>).

† While the legislation originally used the term “oral health practitioner,” the statute creating the new midlevels calls these new providers “dental therapists” despite being distinctly different in training requirements from established dental therapists in other countries. The legislation distinguishes “dental therapists” from “advanced dental therapists.” For purposes of clarity in this report and to distinguish other country’s dental therapists, the Minnesota “dental therapist” is referred to herein as the “MN basic dental therapist” and the “advanced dental therapist” is referred to as the “MN advanced dental therapist.”

	AK Dental Health Aide Therapist	MN Advanced Dental Therapist	MN Basic Dental Therapist
Level of Supervision	General/ Collaborative	General/ Collaborative	Indirect except as noted
Scope of Practice			
Evaluation and Preventive Services			
Examination/assessment/inspection	yes	yes	no
Dental radiography	yes	yes	yes
Provide, dispense, administer select medications	no	yes	no
Counseling	yes	yes	yes
Cleaning above the gum line	yes	yes	polish
Fluoride application	yes	yes	yes
Sealant placement	yes	yes	yes
Cleaning below the gum line (scaling)	no	no	no
Space maintainers	yes	yes	yes
Basic Restorative Services			
Temporary filling/ ART technique	yes	yes	yes (general supervision)
Isolation (placement of rubber dam)	yes	yes	yes (general supervision)
Injection of local anesthetic	yes	yes	yes
Tooth preparation (drilling primary & perm. teeth)	yes	yes	yes
Tooth restoration (filling primary & perm. teeth)	yes	yes	yes
Primary tooth SSC (preformed cap)	yes	yes	yes
Primary tooth pulpotomy (a nerve treatment)	yes	yes	yes
Surgical Services			
Extract primary teeth (uncomplicated)	yes	yes	yes
Extract permanent teeth (conditional uncomplicated)	yes	yes	no
Other surgical care	no	no	no
Advanced Restorative Services			
Periodontal treatment (gums)	no	no	no
Endodontic treatment (root canals)	no	no	no
Fixed prosthodontic treatment	no	no	no
Removable prosthodontic treatment	no	no	no
Orthodontic treatment	no	no	no
Adjunct Services			
Community level oral health programming and promotion	yes	yes	yes
Care coordination	yes	yes	yes
Population assessment (epidemiology)	no	yes	yes
Research	no	yes	yes

Proposed U.S. Providers

The American Dental Association (ADA) has called for two additional dental providers in the U.S., the Community Dental Health Coordinator (CDHC) and the Oral Preventive Assistant (OPA). According to the ADA, the CDHC “will come from the [underserved] community in which they will serve” and will thereby inherently understand the “culture, language and barriers to care.”¹⁷ This new caregiver is proposed as a high school graduate who has 12 additional months of didactic and six additional months of clinical training. The CDHC is envisioned as providing care in safety net facilities that includes educational, care coordination, intra-oral assessment, and very limited intra-oral treatment services.* The OPA will be similarly trained and will provide a limited set of preventive procedures in the dental office or in safety net settings.

The American Dental Hygienists’ Association (ADHA) has advocated for an additional new provider, the Advanced Dental Hygiene Practitioner (ADHP), who is envisioned as an analog to the nurse practitioner in medicine to deliver a range of services based on competencies that include “provision of primary oral healthcare, healthcare policy and advocacy, management of oral healthcare delivery, translational research, and professionalism.”¹⁸ This advanced professional hygienist will be trained to address oral health disparities at multiple levels: through education, administration, advocacy/policy, and expanded direct patient care services that include primary dental restorative treatments. ADHA’s definition of the ADHP stresses the competency related to patient care, stating: “The ADHP is a dental hygienist who has graduated from an accredited dental hygiene program and has completed an advanced educational curriculum approved by the American Dental Hygienists’ Association, which prepares the dental hygienist to provide diagnostic, preventive, restorative and therapeutic services directly to the public.”

* Intra-oral services are limited to oral inspection, exposing dental radiographs, placing temporary fillings, and cleaning teeth above the gum line.

Conventional Non-U.S. providers

In many countries, the Dental Therapist has played a critical role in delivering dental care,[†] initially for children and now for both children and adults. These countries include not only developing countries but also technologically advanced nations, including Canada, Great Britain, The Netherlands, Australia, and New Zealand. Dental therapists deliver a limited set of both preventive services and reparative services that are fewer than provided by hygienists and dentists respectively. Services are typically organized under a collaborative arrangement with a dentist who may be responsible for diagnosis and developing a plan of treatment. In recent years, there has been a trend toward combined training as both dental therapists and dental hygienists, resulting in a dually qualified practitioner: the dental hygienist-therapist.*

† At least 54 countries are known to engage some numbers of Dental Therapists (Source: World Health Organization). Ranked by order of numbers, countries with substantial Dental Therapist roles in dental delivery systems include Thailand (3,707), Malaysia (2,090), Australia (1,242), Nigeria (1,100), Paraguay (908), Viet Nam (800), Great Britain (691), New Zealand (660), Sri Lanka (425), South Africa (411), Hong Kong (301), Canada (300), The Netherlands (300), and Switzerland (250).

* Various terms have been applied to this dually qualified hygienist-therapist including “oral health therapist” in Australia, “oral health practitioner” in New Zealand, “dental hygiene-therapist” in Great Britain, and “dental hygienist” in the Netherlands. To prevent confusion, this paper refers to dual trained providers as the “dental hygienist-therapist.”

Taxonomy of Dental Procedures

Classification of Procedures

Understanding the training required of these various providers requires an understanding of dental treatments and how they are most commonly delivered in the U.S. today. Dental procedures are broadly classified by dental payment programs as clustered under four types of care: diagnostic, preventive, basic restorative, and advanced restorative care.

- *Diagnosis* and treatment planning based on visual examination and radiographic interpretation is regarded by dentists as their purview alone. To ensure that this is maintained as an exclusively Dentist authority, states have used the terms “inspection” or “assessment” when patient evaluation is conducted by other dental personnel.
- *Preventive care* includes scaling, cleaning tooth surfaces above the gum line (coronal polishing); cleaning deposits from below the gum line (scaling and root planing); application of fluoride products and other preventive medications; placement of sealants; provision of space maintainers for prematurely lost primary teeth; and prevention counseling.
- *Basic restorative care* includes provision of uncomplicated extractions, fillings of all kinds, and pulpotomies (nerve treatments) and preformed stainless steel crowns in primary teeth.
- *Advanced restorative care* includes root canal treatments, periodontal surgeries, complicated extractions and all other oral surgery, prosthodontics of all types (full and partial dentures, custom crowns, bridges), and all other services not included in diagnostic, preventive, and basic care.

Delegation

The question of which of these procedures can be appropriately delegated to non-dentist oral health providers is not simply one of procedural complexity. Procedures, regardless of how technical, are not mechanical units of production like economists’

proverbial “widgets,” but are medical and surgical procedures delivered on live patients, many of whom have complex medical, physical, behavioral, and social conditions that significantly influence their care. Thus, a simple dichotomy of delegatable versus non-delegatable services does not suffice in determining the proportion of care that can be appropriately provided by non-dentists. Demographic trends in the U.S. population suggest an ever increasing need for the sophisticated knowledge and skills required of dentists. The U.S. population is aging yet substantially retaining intact dentitions.¹⁹ Elders with teeth are high users of dental services²⁰ and the “baby boomers,” with their traditionally high rates of dental care utilization, their increasingly complex health conditions, and many with their expendable retirement incomes are just beginning to retire. Overall, the dentist-to-population ratio has been declining while the dentist population has been aging and the numbers of rural providers are declining, auguring for further reductions in the equitable availability of the most advanced dental providers.⁵ At the same time, the U.S. population is become more diverse, the numbers of people living with disabilities and complex medical conditions is increasing, and the concomitant demand for dentists to manage such complexity is increasing.

The dentist of the future is envisioned as one whose dental school education is responsive “to shifting patient demographics and patient/population desires and expectations, changing health system expectations, evolving interdisciplinary expertise and practice requirements, new scientific discoveries and scientific information, focus on quality improvement, and/or integration of emerging technologies.”²¹ Assuming these responsibilities both elevates the role of the dentist within the dental and healthcare milieu and requires that a substantial portion of current roles and responsibilities be delegated to others.

In addition, not determinable from the data below are the proportion of delegatable services which present atypical technical challenges that require referral to a dentist for successful completion. Thus, the percentage of delegatable services in the chart below is intrinsically overstated and the dental therapist or dental hygienist-therapist must be well connected to a “supervising,” “prescribing,” or “collaborating” dentist in order to

ensure that care beyond their capabilities is provided by the dentist.

The chart below details the types of procedures that have been delegated or have been proposed to be delegated to both dental therapists and combination dental hygienist-therapists. For both general and pediatric dentists, this chart identifies the percentage of patients who received one or more of each category of service during the 2005-2006 survey period, according to the American Dental Association.²² Procedures with one asterisk indicate categories of services that can be delegated to dental therapists. Procedures with two asterisks indicate additional categories of services that can be delegated to

combination dental hygienist-therapists, in whole or in part.

More than a third (36.8%) of general dentists' patients and more than a quarter (27.2%) of pediatric dentists' patients receive dental services that could be delegated exclusively to dental therapists if unique technical complexities and special patient needs are not factored into the analysis. Similarly, with the addition of hygienists' scope of practice and the potential for some midlevels to perform diagnoses, almost all of general and pediatric dentists' patients could be delegated to a combination dental hygienist-therapist without consideration of technical complexities or unique patient needs that require the far more advanced education and training of dentists.

Procedure	General Dentists	Pediatric Dentists
	<i>% of patients who receive this service in a year</i>	
Diagnostic		
Diagnosis**	25.6%	24.5%
Diagnostic delegatable*	20.1%	18.0%
Preventive		
Preventive except scaling/root planing*	27.3%	38.1%
Scaling and root planing**	0.7%	0.0%
Basic Restorative		
Basic reparative procedures*	12.3%	9.8%
Uncomplicated extraction*	1.4%	1.9%
Adjunctive delegatable*	2.7%	4.8%
Advanced Restorative		
Advanced reparative procedures	8.0%	0.0%
Surgery other than uncomplicated extraction	0.3%	0.1%
Other periodontics	1.1%	0.0%
Orthodontics	0.4%	2.1%
Adjunctive non-delegatable	0.1%	0.5%

The American Dental Association also reports on the distribution of procedures that general and pediatric dentists perform, on average, during a year's time (chart below). As with patients, the proportion of procedures that can be delegated to dental therapists (without consideration of technical complexity or special patient needs) may also be quite substantial: 75.3% for general dentists and 78.7% for pediatric dentists. Consistent with this analysis, the dental director of Health Partners in Minnesota observed that approximately 80% of general dentistry procedures could be delegated assuming that only dentists retained authority for diagnosis and treatment planning.²³

Less than 10% of general dentists' and less than 3% of pediatric dentists' procedures reported by the American Dental Association are subsumed under the category of advanced restorative care, leaving the majority of procedures delegatable. This may be a substantial overestimate as an analysis of dental services provided by a 2007 British study determined that 70% of visits and 53% of clinical hours could be delegated if dental therapists can diagnose and treatment plan.²⁴ However, dental therapists in Britain are reportedly underutilized, suggesting that employing dentists do not delegate to the full extent allowable.²⁵

Procedure	General Dentists	Pediatric Dentists
	<i>% of all procedures delivered by dentists in a year</i>	
Diagnostic		
Diagnosis**	16.4%	19.2%
Diagnostic delegatable*	42.9%	25.9%
Preventive		
Preventive except scaling/root planing*	18.3%	34.4%
Scaling and root planing**	0.7%	0.0%
Basic Restorative		
Basic reparative procedures*	10.9%	11.8%
Uncomplicated extraction*	1.4%	2.4%
Adjunctive delegatable*	1.9%	3.9%
Advanced Restorative		
Advanced reparative procedures	6.3%	0.0%
Surgery other than uncomplicated extraction	0.3%	0.1%
Other periodontics	0.7%	0.0%
Orthodontics	0.2%	1.6%
Adjunctive non-delegatable	0.1%	0.4%

In the U.S., prior to institution of the unconventional dental providers (DHAT and MN Dental Therapists), diagnosis, treatment planning, basic restorative care, and advanced restorative services were strictly the domain of dentists, while preventive services were provided by either dentists or dental hygienists. Exceptions to this generalization are plentiful in states that authorize expanded functions for dental assistants and dental hygienists.

As indicated and specified in the chart below, the various types of dental therapists are authorized to provide preventive and basic restorative care previously reserved for dentists (e.g. assessment and irreversible procedures including extractions and cutting of teeth) or dental hygienists (e.g. polishing above the gum line). This expansion of responsibility raises questions about the level of training that dental therapists require relative to established dental providers.

Provider Type	Categories of Intraoral Procedures ordered from most to least restrictive				
	Advanced Restorative Care	Diagnosis & Treatment Planning	Basic Restorative Care	Preventive Care including Scaling and Root Planing	Preventive Care including Coronal Polishing
Dentist					
Dentist	x	x	x	x	x
Combination Dental Therapists/Dental Hygienists					
Advanced Dental Hygiene Practitioner		x	x		x
Minnesota Advanced Dental Therapist		note (1)	x		x
Dental Hygienist-Therapist, international			x	x	x
Dental Therapists					
Dental Therapist, international		note (2)	x		x
Alaska Dental Health Aide Therapist		note (3)	x		x
Minnesota Basic Dental Therapist			x		x
Dental Hygienist					
Dental Hygienist				x	x
Expanded Function Dental Hygienist			note (4)	x	x
Dental Assistant					
Expanded Function Dental Assistant			note (4)		x
Dental Assistant					note (6)
Oral Preventive Assistant				note (5)	x
Community Dental Health Coordinator					
Community Dental Health Coordinator					x

Notes:

- Under MN statute, the advanced dental therapist is authorized to “perform...an oral evaluation and assessment of dental disease and the formulation of an individualized treatment plan authorized by the collaborating dentist.”³
- Dental therapists’ authority to make a diagnosis and plan of treatment varies by country and sub-jurisdiction.²⁶
- The DHAT may “diagnose” caries.¹⁷
- EFDA and EFDH authorities vary. In the most expansive U.S. states (e.g. AK, CO, HI, KY, MO, OH, WA and WY), EFDAs can perform all of the clinical steps involved in basic restorative care except those that are irreversible, i.e. extraction and cutting of teeth in preparation for a filling.^{10 11 27}
- ADA considers “scaling for plaque induced gingivitis” to be an anticipated service to be provided by the OPA but not complete scaling and root planing.²⁸
- As of 2007 at least 26 states allowed dental assistants to perform coronal polishing.¹⁰

Training of Dental Providers: U.S. and International

Training of Conventional U.S. Dental Providers

Dentists

Dentists are trained in the U.S. and Canada in four-year post-baccalaureate university-based graduate programs. As of 2009, there are 58 accredited dental schools²⁹ and at least five additional schools in development. Total enrolment approaches 16,000 students with one quarter (4,300) graduating annually.³⁰ No additional training is required for licensure except in Delaware and New York which require at least one year of post-doctoral residency or fellowship. Thirty-eight percent of dental school graduates pursue one or more years of post dental school training in either general dentistry or one of the dental specialties and nearly 60% enter private practice or government service.³¹

Curricula of U.S. dental schools must meet accreditation requirements established by the Council on Dental Accreditation (CODA), an American Dental Association agency authorized by the U.S. Secretary of Education to establish standards for dental education. Averaging across all U.S. dental schools, curriculum content by clock hours is approximately 18% biomedical sciences, 6% social and behavioral sciences, and 76% clinical sciences.³² However, the contribution of these three domains to the total clock hours varies considerably across U.S. dental schools as does the time allocated to specific dental disciplines. For example, the maximum and minimum number of clock hours reported by dental schools for the 2006-07 academic year ranged for biomedical sciences from 478 to 1,780 hours (a 3.7 fold difference); for dental/clinical sciences from 1,729 to 6,227 hours (a 3.6 fold difference); and for behavioral, social, informational, and research sciences from 78 to 979 hours (a 12.6 fold difference). The overall total clock hours of instruction ranged from 2,704 to 7,212 hours (a 2.7 fold difference). Since graduates of all schools

become licensed to practice dentistry in the various states, this wide range of preparation and emphases suggests that the minimal hours of instruction is sufficient to ensure competency to practice primary care dentistry.

Dental Hygienists

The majority of dental hygienists obtain entry-level training in two year certificate (n=9) and associate degree programs (n=260)* while a minority study in four-year baccalaureate programs (n=44), a subset of which are collocated in dental schools (n=24).³³ Approximately 15,000 hygiene students are enrolled at any time with over 6,600 graduating in a year.³⁴ As with dentistry, curricula must meet accreditation requirements of CODA. ADHA reports an average of 2,666 clock hours of instruction for associate degree programs and 3,093 for bachelors degree programs and notes that (1) academic preclinical and laboratory preparation hours are roughly equivalent between associate and baccalaureate programs; (2) patient care hours are 13% greater for baccalaureate programs than associate degree programs (607 hours versus 535 hours); and that (3) baccalaureate programs offer more instruction in communication, chemistry, patient education and counseling, and patient management.³⁵ The dental training component of both associate and bachelor program curricula content is similar: approximately 27% is biomedical sciences, 13% social and behavioral sciences, and 60% clinical sciences.³⁶

Dental Assistants

Dental assistants are trained on the job or in formal programs that may be proprietary or associated with accredited high schools, technical/vocational schools, or junior/community colleges.³⁷ Among the uncounted numbers of formal programs, 283 are accredited.³⁸ Formal academic training is typically one year or less leading to a certificate or diploma although a few two-year programs leading to an associate degree are

* ADHA reports associate degree programs in dental hygiene vary in degree requirements and length of study but that the current educational requirements for this degree typically exceed 80 credit hours. Review of various programs on the web suggests that programs range from 4 to 6 semesters, with or without summer semester requirements.

available. While dental assistants and EFDAs are rarely licensed, they may elect to become certified through the Dental Assisting National Board (DANB). DANB reports that approximately 31,600 dental assistants are certified, roughly 11% of the estimated 280,000 U.S. dental assistants.³⁹

Expanded Function Dental Assistants

States vary considerably in opportunities and required training for a dental assistant to become an EFDA. For example, some allow on-the-job training by the supervising dentist leading to qualification to take a certifying examination while others honor the DANB examination. EFDAs are typically certified in specific procedures, e.g. exposing radiographs, placing dressings, placing temporary or permanent restorations, and administering nitrous oxide analgesia or local anesthesia. As both dental hygienists and dental assistants can qualify for EFDA functions, training required for each type of provider may be different. The chart below summarizes the training of U.S. conventional dental providers.

Training of Unconventional U.S. Dental Providers

Dental Health Aide Therapists

The DHAT is currently trained in a two-year program administered by the Alaska Native Tribal Health

Consortium.⁴⁰ The first year, which takes place at the Anchorage “DENTEX Training Center,” is primarily didactic and pre-clinical. The University of Washington’s MEDEX Northwest Physician Assistant Training Program provides contracted educational services to DENTEX including curriculum development, administrative support, and instructor development. In the first year of training, students are enrolled as undergraduate certificate students at the University of Washington. The second year, which focuses on clinical training, takes place at the Yuut Elitnaviat Dental Training Clinic in Bethel, Alaska. The DHAT curriculum is approved by the Community Health Aide Program Certification Board, the federal board that oversees all aspects of the Community Health Aide Program. After successful completion of the two-year training program, a DHAT must complete a supervised clinical preceptorship of three months or 400 hours, whichever is longer. During the preceptorship, a supervising dentist must be satisfied with the trainee’s independently demonstrated competence to perform each of the procedures and services articulated in the DHAT scope of practice. The trainee is then eligible to be certified as a DHAT and to work under standing orders of a dentist.¹⁷

US Conventional Providers			Course Distribution			
Program	Degree	Duration	Measure of Course Distribution (national averages)	Biomedical	Social-Behavioral	Clinical
Dentists						
CODA Accredited Dental Schools	Doctor of Dental Surgery Doctor of Dental Medicine	4 years post baccalaureate (8 years post high school)	ADA survey of course hours	18%	6%	76%
Dental Hygienists						
CODA Accredited Dental Hygiene Programs	Associate and Bachelor in Dental Hygiene	2-4 years post high school	ADA survey of course hours	27%	13%	60%
Dental Assistants						
CODA Accredited Dental Assisting Programs (Diploma or Associate in Dental Assisting	1-2 years post high school	ADA survey of course hours	23%	10%	67%

DHAT Training						
Program	Degree	Duration	Course Distribution			
			Measure of Course Distribution	Biomedical	Behavioral	Social-Clinical
ANTHC	Certificate	2 years	clock hours	22.5%	8.5%	69%

Source: Dr. Mary Williard, DENTEX Clinical Site Director

The program, now in its third year, is currently training 14 students: six in their second year and eight in their first year of training.⁴¹ Previous to opening the Alaska training centers, DHATs were trained at the University of Otago in New Zealand in a prior-existing two-year dental therapy program.* As certified DHATs can only provide care in Alaska within the Tribal Health System under the general, indirect, or direct supervision of a dentist, they must have an affiliation with one of 17 tribes or Native Corporations. Enrollment in DHAT training requires a high school diploma or equivalent (General Equivalency Diploma/GED) and completion of a six-week, online anatomy and physiology course.⁴²

Unlike CODA-governed programs which determine competencies based on graduation and examination, the DHAT program determines competencies based on demonstration of knowledge and skills in training and practice. Specifically, the DHAT must “demonstrate and maintain” understanding of “medical and dental evaluation, periodontic techniques, clinic management and supervision, restorative dentistry, oral surgery and local anesthesia, infection control, equipment maintenance and repair, and community and preventive dentistry.” They must additionally “satisfactorily perform skills” in a list of enumerated procedures and responsibilities within the DHAT scope of practice.[†]

* The Otago two-year dental therapy program has been incorporated into its current three-year combined dental hygienist-therapist program.

† These are radiology, preventive dentistry, EFDA supervision, diagnosis and treatment of caries, primary tooth pulpotomies, uncomplicated primary and permanent tooth extractions, relief of pain and infection, administration of local anesthesia, recognition

The chart above details current curriculum content of DHAT training. The DHAT program cannot currently address the high rates of unmet need for adults and elders with advanced periodontal conditions because scaling and root planing are not within their approved scope of services or training. When asked whether these additional services can be taught within the current two-year DENTEX training program, Clinical Site Director Dr. Mary Williard suggested that full training equivalent to that of a hygienist to include fine hand scaling could not be incorporated in the existing two-year program but that training with automated scalers (e.g. Cavitron® or Piezo®) could likely be accomplished.

Minnesota Dental Therapists

The MN dental therapy programs are now enrolling their first students. The Basic MN Dental Therapist will be trained in both baccalaureate and master’s level programs at the University Of Minnesota School Of Dentistry. The advanced MN dental therapist will be trained at the master’s level at the Metropolitan State University in affiliation with Normandale Community College. As detailed in the chart on the next page, the three programs vary in prerequisites, length, course work, and degree granted.

of and referring conditions needing space maintenance, equipment maintenance, and community/preventive dentistry.

	Metropolitan State Advanced Dental Therapist	University of MN MS Basic Dental Therapist	University of MN BS Basic Dental Therapist
Degree	Master of Science: Oral Health Care Practitioner Program	Master of Dental Therapy	Bachelor of Science in Dental Therapy
Host	Department of Dental Hygiene in the College of Nursing and Health Sciences, Metropolitan State	University of Minnesota	University of Minnesota
Length	26 months	28 months	40 months
Admission requirements			
1. Prior Education	BA or BS in dental hygiene	BA or BS in any field	One year of college (included in the 40 month program)
2. License	Current hygiene licensure including nitrous oxide and local anesthesia	n/a	n/a
3. Prerequisites	Courses available in Metropolitan State's BSDH program including "collaborative and advanced dental hygiene practice, management of oral healthcare delivery, restorative functions theory and lab"	8 of the following 9 courses: Chemistry General biology English composition General psychology Microbiology Biochemistry Statistics Human anatomy Physiology Intensive writing	Chemistry General biology English composition General Psychology Biochemistry Statistics Human anatomy 3 Liberal arts courses
Courses	<ul style="list-style-type: none"> • Research methods • Community-based intercultural communications • Epidemiology • Health policy and leadership • Health assessment and oral diagnostic reasoning • Management of dental emergencies and urgent care • Pharmacology principles of clinical application • Community-based oral healthcare (clinical) I, II, III, IV, V • Advanced specialty practices • Advanced community specialty internship • Comprehensive competency - based clinical capstone 	<p>Year 1:</p> <ul style="list-style-type: none"> • Head/neck anatomy • Oral anatomy/lab • Clinical application • Electives (2) • Patient relations • Oral histology/embryo • Cariology/nutrition • Radiology • Selectives <p>Year 2</p> <ul style="list-style-type: none"> • Pathology • Local anes/pain control • Pharmacology • Radiology/lab • Biomaterials • Periodontology • Preclin. pediatric dentistry • Operative/lab • DPH/service learning • Ethics and law • Clinical application 2 • Operative/lab • Preventive pediatr clinic • Practice management • Research methods • Comprehensive care clinic • Radiology clinic • Operative clinic • Dental auxiliary utilization • Pediatric dent clinic <p>Year 3</p> <ul style="list-style-type: none"> • Team building • Comprehensive care clinic • Radiology clinic • Operative clinic • Dental auxiliary utilization • Pediatric dentistry clinic • Outreach experience • Selectives 	<p>Year 1:</p> <ul style="list-style-type: none"> • General biology • Chemical principles • Biochemistry • Human anatomy/physiology • Psychology • Statistics • Composition • Liberal arts (3 courses) <p>Year 2:</p> <ul style="list-style-type: none"> • Microbiology/disease • Human physiology • Head/neck anatomy • Clinical application I • Oral anatomy/lab • Oral radiology • Oral histology/embryo • Patient relations • Cariology/nutrition • Liberal arts (2) • Periodontology I • Preclin. pediatric dentistry • Pharmacology • Local anes/pain control • Radiology II/ lab • Pathology • Dental materials • Operative I/lab <p>Year 3</p> <ul style="list-style-type: none"> • DPH/ Service learning • Clinical application II • Ethics and law • Operative II & III • Preventive pediatric clinic • Liberal arts (1) • Technical/prof writing • Research methods • Pediatr dent clinic • Radiology clinic • Comprehensive care clin. • Dental auxiliary utilization • Practice management • Operative clinic • Team building • Outreach experience <p>Year 4</p> <ul style="list-style-type: none"> • Pediatric dent clinic • Oral radiology clinic • Comprehensive care clinic • Outreach experience • Operative clinic • Liberal arts (1)

The Metropolitan State Masters Program that builds on prior education as a bachelor's level dental hygienist is comprised of 26% social and behavioral sciences and 74% clinical experiences including its capstone final paper. Biomedical training is assumed as a prerequisite from initial dental hygiene training. Distribution of requirements by biomedical, social/behavioral, and clinical experiences cannot yet be determined for the University of MN programs as these programs have not assigned credits for clinical care (masters program) or because assigned credits do not reflect clinical clock hours (bachelors program). The course content of the two university programs is very similar except that the masters program requires prerequisites for admission that are analogous to the bachelor's level first-year coursework.

DHATs and the MN dental therapists are not the first unconventional dental personnel trained in the U.S. The first two-year training program combining dental therapy and dental hygiene was funded in 1949 as a research experiment by what is now the federal Maternal and Child Health Bureau under authorization of the Massachusetts legislature. The authorizing legislation was repealed in 1950 under opposition from dentists. Similar programs providing two years of training in restorative dentistry and/or periodontal therapy beyond dental hygiene training were initiated at Howard University in 1969 and the Universities of Iowa and Kentucky in 1972, but state practice acts prohibited graduates from providing unconventional services to the public. The 1972-1974 "Forsyth Experiment" in Boston trained dental hygienist-therapists and verified the quality, patient acceptance, cost effectiveness, and productivity of restorative care provided by them.⁴³

MN Therapist Training						
Program	Degree	Duration	Measure of Course Distribution	Course Distribution		
				Biomedical	Social-Behavioral	Clinical
Metropolitan State	Master of Science	26 months	courses	0%*	26%	74%
			courses including DH prerequisites	18%	17%	65%
University of MN	Master of Dental Therapy	28 months	courses	indeterminate		
University of MN	Bachelor of Science in Dental Therapy	40 months	courses	indeterminate		

* Biomedical sciences are a prerequisite for admission

Community Dental Health Coordinators Content Categories	Community Dental Health Coordinators Course Content Areas
General Education	<ul style="list-style-type: none"> • Human psychology • Social psychology • Diversity, cultures, and religion & their association with health and health practices • Behavioral change models • Communications • Community mobilization and social networking • Prevention and complications of substance abuse
Biomedical Sciences	<ul style="list-style-type: none"> • Bloodborne pathogens and hazardous waste contamination standards • Nutrition, diet, and oral healthcare • Principles of developing referral and preventive recommendations • Prevention of dental disease and conditions
Dental Sciences	<ul style="list-style-type: none"> • Oral/dental physiology and anatomy • Oral/dental disease and conditions • Pharmacology • Dental materials • Oral/systemic health
Clinical Sciences	<ul style="list-style-type: none"> • General dentistry • Foundation of public health dental practice • Oral health education • Principles of health promotion • Principles of scaling • Legal and ethical aspects of dentistry • Dental emergencies • Dental-related environmental hazards • Dental informatics • Introduction to dental practice management • Dental equipment and maintenance

Training of Proposed U.S. Dental Providers

Community Dental Health Coordinators

The ADA’s proposed Community Dental Health Coordinator (CDHC) is envisioned as someone who is at a minimum a high school graduate trained in a 12-month didactic program and an additional six-month internship. According to the ADA, the competency-based curriculum has seven domains: (1) community- based health promotion and disease prevention; (2) collection of diagnostic data; (3) skills to provide “variety of clinical supportive treatments”; (4) administrative skills; (5) population prioritization skills; (6) individualized preventive care services; and (7) “palliative temporization of dental cavities in preparation for restorative care by a dentist.” In order to obtain these

competencies, the proposed curriculum includes content at a familiarity level in four categories – general education, biomedical sciences, dental sciences, and clinical sciences (see chart above)— which are further divided into two main areas: community health worker skills and dental skills. Pilot programs, at the University of Oklahoma and the University of California Los Angeles, began in March 2009.

As the relative contributions to biomedical sciences, social and behavioral sciences, and clinical care content areas have not yet been analyzed, the chart below allocates distribution of training across these three domains based on equal representation for each course content area. The ADA reports that total curricular hours are 1,872.25 of which 36% are dedicated to didactic instruction (672.25 hours); 9% to “in person task assessment” (160 hours); and 55% to an internship (1,040 hours).⁴⁴

Community Dental Health Coordinator						
Program	Degree	Duration	Course Distribution			
			Measure of Course Distribution	Biomedical	Social-Behavioral	Clinical
Begun at the University of Oklahoma and UCLA	Certificate	18 months	modules	~11%	~52%	~37%

Advanced Dental Hygiene Practitioners

ADHA’s proposed advanced dental hygiene practitioner (ADHP) is envisioned as a bachelors level dental hygienist who will be educated at the masters level in a program that includes an estimated 37 credits of graduate coursework and clinical experience that can be

met in one and a half or more years of study, depending upon the candidate’s prior experience. The curriculum will be designed to meet a series of competencies established by ADHA’s “educational framework” which is organized around five general “domains,” each of which defines a set of competencies and sub-competencies.⁴⁵ (chart below)

ADHP Domains	ADHP Competencies
Provision of Primary Oral Healthcare	<ul style="list-style-type: none"> • Health promotion and disease prevention • Primary care (including restorative care and uncomplicated extractions) • Case management • Multidisciplinary collaboration
Healthcare policy and advocacy	<ul style="list-style-type: none"> • Healthcare policy • Advocacy
Management of oral healthcare delivery	<ul style="list-style-type: none"> • Practice management • Quality assurance • Fiscal management
Translational research	<ul style="list-style-type: none"> • Evidence based practice • Clinical scholarship
Professionalism	<ul style="list-style-type: none"> • Ethics and professional behavior • Lifelong learning

Training of Conventional Non-U.S. Dental Providers

Dental Therapists

Training of dental therapists and dental hygienist-therapists varies across the countries that employ them.

Of relevance to the U.S. are training programs in “first world” countries including Australia, Canada, Great Britain, The Netherlands, and New Zealand. Of these, three—Great Britain, The Netherlands, and New Zealand—have transitioned their dental therapy programs into dental hygienist-therapist programs and Australia’s last dental therapy program is planning a transition to the combined program within two years. (chart below)

Training in Australia

With the introduction of the U.S.-style dental hygienist to Australia in the late 1970s, Australia has gradually replaced the two-year dental therapist training programs with combined three-year dental hygienist-therapist programs to graduate dually trained “oral health therapists (OHTs).” Only one dental therapy program, at Curtin University of Technology, continues to offer the traditional two year dental therapy program for entering students through 2010. Training for this program and Australia’s seven combined programs is detailed in the chart on the following page. Prior-trained dental therapists can enroll in one-year “lateral conversion” training to additionally qualify as dental hygienists. “Academic upgrade” programs to Bachelor of Oral Health degrees are planned in both streams. All programs are offered at the college-entry level.

Dental Therapy Programs					
	Australia	Canada	Great Britain	Netherlands	New Zealand
Number of programs	1*	1	0**	0	0
Title	Dental Therapist	Dental Therapist			
Degrees	Associate in School Dental Therapy (DT)	Diploma in DT			
Length	2 years	2 years			
Combined Dental Hygiene and Dental Therapy Programs					
Number of programs	7	0	13	4	2
Title	“Oral Health Therapist”		“Dental Hygiene Therapist”	“Dental Hygienist”	“Oral Health Practitioner”
Degrees	Bachelor of Oral Health (OHT)		BSc in DH/DT (3) BSc (Hon) in DH/DT (2)*** BSc in Oral Health Science (1) Diploma in DH/DT (6) Unknown (1)	Bachelor degree	Bachelor of Oral Health (1) Bachelor of Science (Oral Health) (1)
Length	3 years		Diploma: 27 months BSc: 3 years BSc (Hon): 4 years	4 years	3 years

*The one remaining Dental Therapy program at Curtin University is transitioning into a combined DH-DT program by 2011.

**The program at Barts in London continues to offer separate diplomas in DT and DH but the training is combined for all students.

*** The Bachelors of Science with Honors requires an additional academic year for training in research.

Dental hygienist-therapists (OHTs) and dental hygienists, but not dental therapists, are trained to clean teeth below the gum line. Both OHTs and dental therapists are trained to diagnosis, treatment plan, provide preventive treatments, restore carious and traumatized teeth,* and extract primary teeth. Neither dental therapists nor OHTs perform advanced restorative care although some Australian states allow therapists to extract permanent teeth.

Curricula for dental therapy and OHT programs are designed to meet accreditation requirements of the Australian Dental Council but licensure policies vary by state. Variations in program accreditation and licensure standards among Australia’s six states and two territories are being resolved into a single standardized approach that was formulated in March, 2008.

Under this *Intergovernmental Agreement for a National Registration and Accreditation Scheme for the Health Professions*,⁴⁶ nine health professions[†] will be regulated by a single body comprised of national profession-specific boards. Key governance principles agreed to for the regulatory body include (1) that “it should recognise that restrictions on the practice of a profession should only occur where the benefits of the restriction to the community as a whole outweigh the costs” and (2) that “it should operate in a transparent, accountable, efficient, effective and fair manner.” These principles were adopted to reduce the interstate and inter-professional conflicts that arise within and between the health professions and to facilitate portability across states.

Australian Dental Therapy and Oral Health Therapy Programs as of 6/09						
Program	Degree	Duration	Course Distribution			
			Measure of Course Distribution	Biomedical	Social-Behavioral	Clinical
Dental Therapy						
Curtin University of Technology	Associate in School Dental Therapy	2 years (4 semesters)	credits	24%	28%	48%
“Oral Health Therapy” (Dental Hygiene and Dental Therapy)						
University of Sydney	Bachelors of Oral Health	3 years (6 semesters)	credit points	29%	19%	52%
University of Queensland	Bachelors of Oral Health	3 years (6 semesters)	units	17%	42%	42%
University of Adelaide	Bachelors of Oral Health	3 years	credits	24%	32%	44%
Charles Sturt University	Bachelors of Oral Health	3 years (6 semesters)	points	23%	23%	54%
University of Melbourne	Bachelors of Oral Health	3 years	contact hours	14%	27%	59%
Griffith University	Bachelors of Oral Health	3 years (6 semesters)	credit points	46%	21%	33%
LaTrobe University	Bachelors of Oral Health Science	2.5 years (6 semesters)	credit points	22%	30%	48%

* According to Dr. Julie Satur, head of oral health therapy and senior lecturer at the Melbourne Dental School, dental therapists “prepare class 1, 2, 3, 4, and 5 cavities in deciduous and permanent teeth and restore them using amalgam, glass ionomer cement, and composite resins.” They also “do pulpotomies and stainless steel crowns in deciduous teeth, pulp caps and “Cvek” pulpotomies [partial pulpotomy for treatment of traumatic pulp exposures of healthy pulp] in permanent teeth along with cuspal overlays and management of trauma” (email correspondence 8/5/09).

† The nine health professions are: physiotherapy; optometry; nursing and midwifery; chiropractic care; pharmacy; dental care (dentists, dental hygienists, dental prosthetists, and dental therapists); medicine; psychology; and osteopathy

According to Dr. Julie Satur, head of oral health therapy at the Melbourne Dental School, the OHT program is “more broad-based than the preexisting non-university dental therapy programs to reflect more complex treatment decisions and contemporary issues in oral health care.” OHT training therefore extends to instruction in “ethics and professional practice, research, and evidence-based practice.” She characterized OHT training as different from training of dentists in being more focused on the social sciences, “understanding context, people, behaviors, and health promotion” and “by having more of a community and public health orientation.”

For decades, dental therapists worked only in the School Dental Service caring for children ages 5-18 years and, in most states, preschoolers. Since 2000, dental therapists and OHTs can practice additionally in dental offices, hospitals, and community health clinics providing restorative care to patients to age 18 or 25 (depending upon the state), and dental hygiene and orthodontic services to patients of all ages in dentists’ offices, hospitals, and community health clinics. While they have always practiced autonomously (i.e. without the presence of a dentist), they have always been affiliated with a supporting dentist who is available for advice and referral of patients whose needs are beyond the therapists’ scope of practice. With the introduction of

dental hygiene training, movement is underway to expand the age range of patients treated by therapists. For example, Victoria State sanctions care of adults by OHTs and dental hygienists in private and public practice, including in nursing homes.

Training in Canada

Since 1995, Canada’s single dental therapy program, the National School of Dental Therapy, has been offered by the First Nations University of Canada in Prince Albert, Saskatchewan.⁴⁷ The two-year (20-month) program offers a “Diploma in Dental Therapy.” The program’s mission is “to promote the oral health of First Nations and the Inuit peoples by preparing individuals to provide culturally appropriate oral health services.” The school was originally founded in 1972 in Fort Smith, Northwest Territories, as a modification of the New Zealand dental therapy program and was supported by faculty from the University of Toronto Faculty of Dentistry. Unlike the New Zealand program, however, it trained therapists to treat adults (at least on an emergency basis) as well as children, and to be community-based but not within school systems. The National School of Dental Therapy college-entry program for high school graduates features a didactic “pre-clinic” year and a clinical year, which includes at least eight weeks of clinical experience placement in a First Nations or Inuit community.

Canadian Dental Therapy Program as of February 2009						
Program	Degree	Duration	Course Distribution			
			Measure of Course Distribution	Biomedical	Social-Behavioral	Clinical
Dental Therapy						
First Nations University	Diploma in Dental Therapy	2 years (4 semesters; 20 months)	courses	20%	30%	50%

The first-year curriculum is organized around four domains: (1) community dentistry; (2) diagnostic dentistry; (3) operative dentistry; and (4) program support activities. Specific competencies have been articulated by the Saskatchewan Dental Therapists Association, which regulates therapists.*⁴⁸ Competencies and sub-competencies by domain are:

1. community and preventive dentistry: health education, primary prevention, secondary prevention, needs assessment, community development
2. diagnostic dentistry: patient assessment, oral diagnosis, treatment planning/case management/referral, and dental radiography;
3. operative dentistry: restorative dentistry, local anesthesia, oral surgery, periodontic techniques, and infection control; and
4. program support activities/practice management, principles of professionalism, and ethics.

Pre-clinical coursework on manikins covers infection control, dental radiography, and restorative dentistry. Clinical training in year two of at least 1,200 hours features intra- and extra-oral examination, tooth cleaning and preventive care, local anesthesia, and restorative dentistry. Additional second year experience includes patient consultation, clinic administration and equipment maintenance, and an eight week field placement in a First Nations or Inuit community. Qualification for graduation requires that the student “must be able to consistently provide acceptable services in a professional manner without instructor intervention.”

The 19 required courses are:

- Biomedical courses: head and neck anatomy; dental morphology, cariology, and histology; medical evaluation; and oral pathology.
- Social and behavioral courses: First Nation and Inuit health issues; administration; community dentistry; and case presentation.
- Clinical courses: patient examination; dental radiography; treatment planning and referral; local

* Dental Therapists are regulated in Saskatchewan by the Saskatchewan Dental Therapists Association Bylaws, under authority granted subsequent to Saskatchewan’s Dental Disciplines Act of 1997. (Source: The Dental Therapy Profession in Canada, Scope of Professional Practice/Competencies available at <http://www.sdta.ca/media/docs/Scope%20of%20Practice.pdf>).

anesthesia; periodontics; restorative dentistry; pediatric dentistry; oral surgery; infection control; field and school clinical experience; and equipment maintenance.

In Canada, dental therapy (aka “dental nursing”) training originated in 1972 in two different settings: one federal and one provincial. The federal program continues as the National School of Dental Therapy program described above. It was designed to treat children and adults on an emergency basis. Federally sanctioned therapists serve children and adults in federal government programs for military, indigenous, veteran, federal prisoner, and refugee populations.⁴⁹

Independently, the Province of Saskatchewan established a program to train dental therapists to work with dental assistants as a team in the care of children with an emphasis on indigenous populations. This Provincial program was established at the community college level at the Wascana Institute of the Saskatchewan Institute of Applied Science and Technology in Regina, Saskatchewan. Provincial graduates were placed in community sites in both Saskatchewan and Manitoba until political and fiscal pressures led to marked constrictions in their placements. Since 1997, in Saskatchewan, therapists have worked in private practice, teaching institutions, health agencies (as health educators, coordinators, and administrators), and for tribal councils.⁵⁰ But today, only two provincially authorized therapists remain working in school-based programs in Saskatchewan.⁵¹

In a 2009 interview, Dr. Todd Hartsfield, who trained dental therapists in Canada for 20 years, compared the clinical training of dental therapy students with dental students in Canada. He expressed the opinion that “clinical training experience for those procedures within dental therapists’ scope of practice is substantially greater than for the average Canadian dental student since the therapy students concentrate on learning technical skills in restorative dentistry, pulpotomies, stainless steel crowns, and uncomplicated oral surgery while dental students have to gain experience in prosthetics, endodontics, orthodontics, periodontics, etc in addition to the limited scope of procedures that dental therapists learn. Therefore, dental students simply lack

the clinical hours necessary to perform the number of procedures that dental therapy students perform.”⁵² *

Looking to the implication of the Canadian experience for the U.S., Carlos Quinonez and David Locker of the University of Toronto Community Dental Health Services Research Unit argue that the Canadian experience suggests that “training of pediatric oral health therapists [in the U.S.] should be prepared to meet the societal need for them.” They imply that private practice interest in employing therapists may detract from their service to underserved populations[†] and that training should perhaps extend to a required “commitment to work in underserved areas [as] part [of] educational loans.”⁵²

Training in New Zealand

Dental therapy training originated in New Zealand in 1921 to expand the numbers of dental providers caring for children and is today provided in two institutions: the Auckland University of Technology and the University of Otago. (chart next page) Since 2008, the two-year

Bachelors of Health Sciences in Dental Hygiene and Bachelors of Health

Sciences in Dental Therapy programs have been combined into a single three-year (27-month) program granting the Bachelor of Oral Health (Otago) or Bachelor of Health Science in Oral Health (Auckland) degrees. Upon completing this program, successful candidates meet requirements to register as dental hygienists, dental therapists, or both.⁵³ When practicing as dental hygienists, these new dual-trained dental hygienist-therapists tend to work with dentists in private practice settings serving adults’ periodontal needs. When practicing as dental therapists, they more commonly work in the School Dental Service under a collaborative agreement with a supervising “public health dentist, attending to caries in children.”⁵⁴ Since registration continues to be separate for the two professions, the newly combined therapist may be known by either of the two preexisting titles, depending upon how they are functioning at any given time.

* Dr. Hartsfield noted that during his tenure training Canadian therapists from 1994-2001, the average numbers of procedures performed by therapy students by procedure were: vital pulpotomy, 16; stainless steel crown, 16; primary extractions, 50; permanent extractions, 50; amalgam restorations of primary teeth, 40, and of permanent teeth, 60; resin restorations of primary teeth, 40, and of permanent teeth, 80, for a total of 452 operative procedures. While there are few publications detailing dental student productivity by procedure, in comparison to dental therapy students, dental students typically perform far fewer of each of these procedures. For example, during the years 1993-4 and 1996-7, dental students at the Columbia University College of Dental Medicine (then the School of Dental and Oral Surgery) completed, on average, 24 amalgam restorations and 15 resin restorations on permanent teeth (Evangelidis-Sakellson. Student productivity under requirement and comprehensive care systems. *J Dent Educ* 1999;63:407-413). Similarly the 1999 and 2000 classes of the University of Colorado School of Dentistry completed 172 to 179 operative procedures, on average, while also completing a total of 458 and 586 total dental procedures, inclusive of all types of care (Holmes DC, Trombly RM, Garcia LT, Kluender RL, Keith CR. Student productivity in a comprehensive care program without numeric requirements. *J Dent Educ* 2000;64:745-54.)

[†] In a 2009 presentation to the American Student Dental Association, Dr. Todd Hartsfield reported that 105 of the 181 (58%) practicing Dental Therapists in Saskatchewan are working in private practice. An April 15, 2003 report by the National Aboriginal Health Organization entitled “The Profession of Dental Therapy: Discussion Paper” reports that “...in Saskatchewan, provincial legislation that allowed dental therapists to enter private practice has made it even more difficult to recruit dental therapists to remote communities.”

New Zealand Dental Hygiene-Therapy Program as of February 2009						
Program	Degree	Duration	Course Distribution			
			Measure of Course Distribution	Biomedical	Social-Behavioral	Clinical
Dental Therapy						
Auckland University of Technology	Bachelor of Health Science (Oral Health)	3 years (27 months)	credits	8%	38%	54%
University of Otago	Bachelor of Oral Health	3 years (27 months)	credits	12%	28%	60%

Courses must satisfy requirements established by the Dental Council of New Zealand. Training emphasizes health promotion and socio-cultural influences on health. At Otago, trainees study alongside dental and dental technology students. The curriculum, which is similar at Auckland, is structured as:

- First year: Trainees study biomedical sciences, social issues, information technology, and “the study and practice of oral health,” and are introduced to clinical practice on plastic models.
- Second year: Courses in pathology, pharmacology, and medicine are complemented with study of health promotion and Maori (indigenous peoples) society, and extensive clinical training in both dental hygiene and dental therapy skills is provided.
- Third year: Training focuses on clinical care, community oral health, and oral health promotion. A research project is required.

The Auckland program further emphasizes care of underserved populations noting “student placements to areas of high need...contribut[ing] to improving the oral health of New Zealanders whose needs are greatest.”⁵⁵ For prior-trained dental therapists who do not wish to be dually trained but do wish to advance their professional development, Otago also offers a postgraduate diploma in dental therapy that expands knowledge of clinical practice, practice management, and innovations in practice.

Training in Great Britain

Dental therapy training in Britain has expanded dramatically to 72 annual graduates today⁵⁶ from a low point of eight graduates in 1982.⁵⁷ Training dates back to 1948, when a small program staffed by instructors

from New Zealand began at New Cross Hospital in London. Until 2004, therapists could practice only in public programs, but now they can practice in both private and public sectors.

As noted in the chart on the next page, all British programs combine dental hygiene and dental therapy and can be completed in two and a half to four years. Training programs must meet requirements of the General Dental Council as well as both “higher education rules” and local rules that are specific to each institution. The names of the various degrees granted by these programs reflect variations in the level of integration between the hygiene and therapy programs – ranging in integration from the dual but independent Diplomas in one program to the Bachelor of Oral Health Science in three programs. They also reflect the types of institutions providing the training. “Professional programs” are offered in training hospitals (“second care sector hospitals”), which grant diplomas because they are not authorized to grant degrees. Degree programs in academic institutions are required to meet higher education rules, which include satisfaction of 300 credits for the Bachelor of Science degree and 360 credits for the same degree with honors. “Honors” indicates expanded coursework in research and electives. As up to 120 credits can be earned during each academic year, programs range from two and a half to three years with one honors program extending training by an additional year to accommodate the expanded didactic curriculum.

In Great Britain, both dentistry and dental hygiene-therapy candidates matriculate directly from high school. Dentists train for five years after which they are required to complete two years of supervised experience, called “vocational training.” In contrast, dental hygiene-therapy incorporates the vocational training experience within the three year curriculum. Sara Holmes, head of the

School of Professionals Complementary to Dentistry at the University of Portsmouth in Portsmouth England, suggested that “the third year involving extended clinical experience is needed, especially if graduates are to be efficient.” She also stated her belief that the more extensive training will result in greater retention in practice and will facilitate career advancement to dentistry since advanced standing into dentistry is now offered to dental hygienist-therapists.

Scopes of practice for each discipline, which are to be assured by training, are defined by the United Kingdom General Dental Council. Dental hygienists are defined therein as “professionals who help patients maintain

their oral health by preventing and treating gum disease and promoting good oral health practice ... under prescription of a dentist.” Dental therapists are defined as “professionals who carry out certain items of dental treatment under the prescription from a dentist.” Therapist services involve basic restorative care including extraction of primary teeth but “do not carry out a patient’s initial diagnosis or take overall responsibility for planning a patient’s treatment.” Both provide preventive topical fluoride and sealant services to children and health promotion services (including oral hygiene and dietary counseling) to children and adults. Both can work in private and public settings.

Great Britain Dental Therapy Program as of June 2009						
Program	Degree	Duration	Course Distribution			
			Measure of Course Distribution	Biomedical	Social-Behavioral	Clinical
Birmingham	Bachelor of Science in Dental Hygiene and Dental Therapy	3 years	Unknown			
Cardiff	Higher Education Diploma in Dental Hygiene and Dental Therapy	3 years (27 months)	Unknown			
Dundee	Bachelor of Oral Health Science	3 years (26 months)	Credits	28%	8%	63%
Edinburgh	Bachelor of Oral Health Science (Honors)	4 years (8 semesters)	Unknown			
Glasgow	Diploma in Dental Hygiene and Dental Therapy	3 years (27 months)	Unknown			
Leeds	Diploma in Dental Hygiene and Dental Therapy	3 years (27 months)	Credits	23%	20%	56%
Liverpool	Combined Diploma in Dental Hygiene/Dental Therapy	3 years (27 months)	Credits	17%	22%	61%
Eastman	Diploma in Dental Hygiene and Dental Therapy	3 years (27 months)	Unknown			
Guy's, King's, St. Thomas's	Unknown					
Barts and The London	Diploma in Dental Hygiene and Diploma in Dental Therapy	3 years (27 months)	Unknown			
Manchester	Bachelor of Oral Health Science	3 years	Unknown			
Portsmouth	Bachelor of Science (Honors) in Dental Hygiene and Dental Therapy	3 years	Credits	12%	34%	55%
Sheffield	Diploma in Dental Therapy and Dental Hygiene	3 years (27 months)	Unknown			

Note: “Unknown” indicates that these schools did not respond to requests for curricular information.

The General Dental Council has established a detailed set of competencies and learning objectives for the training of the dental hygienist-therapists that constitute a curriculum development guide and establish “the knowledge, skills, and attitudes which a professional complementary to dentistry must have on first registration.”⁵⁸ Domains of instruction are listed as “oral disease, plaque related dental disease, diseases of the periodontium, dental caries, oral pathology and microbiology, gerontology, child dental health, dental public health, oral surgery, oral medicine, introduction to clinical work, restorative dentistry, dental implants (principles), paediatric dentistry, orthodontics, preventive dentistry, comprehensive oral care, dental radiography, pain and anxiety control, and complementary and alternative medicine.”

Learning objectives are more revealing than course names as they detail the biomedical, socio-behavioral, and clinical expectations of training. Within the learning objectives are indications of curriculum requirements including:

- Biomedical sciences: anatomy, physiology, biochemistry, pharmacology, pathology, periodontal disease and caries, oral pathology and microbiology, gerontology, child oral health
- Social and behavioral sciences: information technology, communications, patient management, sociology, and psychology, team functions and dental care systems, law and ethics, dental public health, epidemiology
- Clinical sciences: sterilization and infection control, patient health assessment, dental therapeutics, management of medical emergencies, dental materials, oral surgery, oral medicine, periodontal care, clinical dental hygiene and clinical dental therapy, restorative dentistry, implant dentistry, pediatric dentistry, orthodontics, preventive dentistry, comprehensive care, dental radiology, pain and anxiety control, and restorative dentistry.

To emphasize a focus on caring for the underserved, the guide specifies “managing patients from different social and ethnic backgrounds” and being “familiar with the social and psychological issues relevant to the care of patients” among its learning objectives.

A three-month pilot course for dental hygiene-therapy students at Cardiff University tested their ability to learn to diagnose and treatment plan children and adults for

caries and periodontal disease and to refer appropriately for conditions beyond their competencies. It was designed to ensure that patients can be regularly screened by these providers at times between the required triennial examinations by a dentist. According to the University of Portsmouth’s Sara Holmes, results were sufficiently positive to continue and expand the program.

Training in The Netherlands

The Dutch “hygienist”—a dually trained dental hygienist-therapist—has a scope of practice that addresses the prevention and treatment of primary caries. Tasks include “prevention (primary, secondary, tertiary), screening and monitoring, and basic dental care.”^{59 60} This prevention definition encompasses everything from limiting disease occurrence to repairing teeth affected by caries. In The Netherlands, dental hygienist-therapists can practice independently or be employed by dentists but must provide care under the order of a dentist.

Length of training of the dental hygienist-therapist (Dutch “hygienist”) is longer than other comparable countries and programs. Since 1994, training must be four years post high school in order to meet the Dutch Ministry of Education’s determination that all “higher vocational schemes be four years.” Until 2002, training had been governed by the Ministry of Health under which it had expanded 15 years ago from two to three years in order to accommodate the extent and content of curriculum and provide sufficient clinical experience. Key informant, Joseph van den Heuvel, former chief dental officer in the Ministry of Health, stated his opinion that the current four-year length is “probably a bit too much considering the greater costs incurred by both students and educational institutions, the high number of drop-outs from the educational course, and the meaningful development of the ‘prevention assistant’ who can perform preventative tasks but is educated on a lower level.”

The required curriculum is competency based as is the regulation of health professionals in The Netherlands. While health professionals are licensed, Dr. van den Heuvel reports that there are no legal limits on services that any person—with or without formal training—can provide if a patient/customer is willing. Thus, dental professionals of all types can expand their practice beyond their formal training scope, albeit with risk of liability and sanction.

The four “dental hygiene” schools share a common curriculum with only minor differences. The current curriculum, begun in 2002, so overlapped the curriculum for dentist training that it challenged the difference in professions. As a result, dentist training was expanded in 2007 from five to six years post high school and re-envisioned as preparing the “oral physician,” who incorporates greater specialty-level care, care of complex and special needs patients, expanded administrative responsibilities, and increased skills in primary health supervision with referral to physicians as needed. With these changes, the numbers of dental students and oral surgeons are being markedly reduced and the numbers of dental hygienist-therapists expanded.

Comparisons across Midlevel Training by Program Length and Content

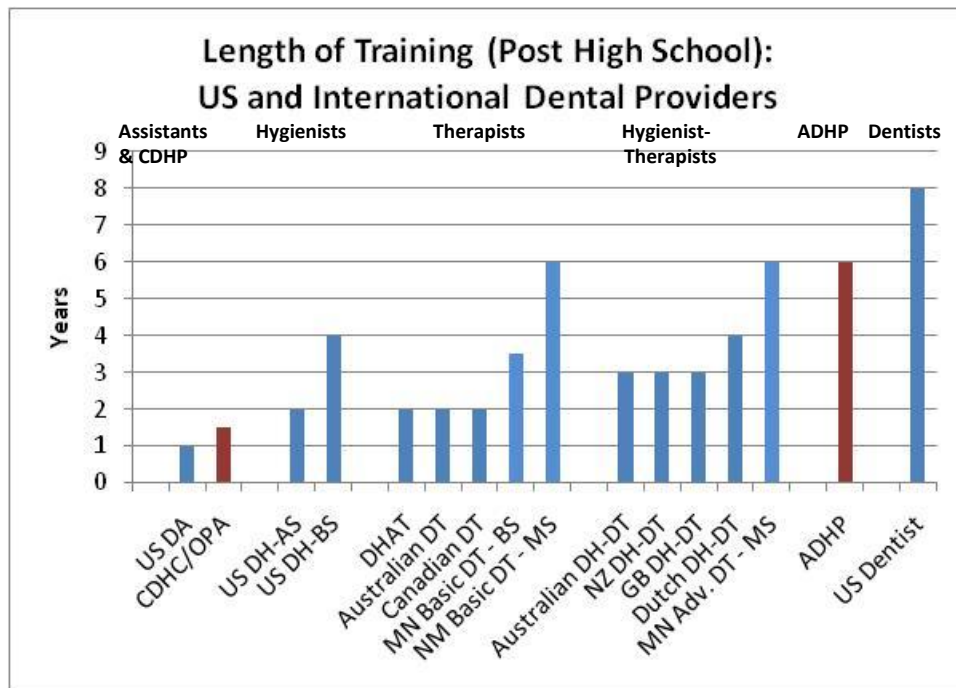
The summary chart below shows length of training for various types of current (blue) and proposed (red) dental providers. Length of training reflects differences in scope, autonomy, and placement of these various providers.

The chart demonstrates that associate degree dental hygienists (the most common training of U.S. dental hygienists) and international dental therapists in the advanced countries studied are typically trained in two years. The combined dental hygiene-therapy curriculum is commonly taught in three years. Outliers to this general rule are (1) the Dutch dental hygienist-therapist at four years, (2) the Advanced Dental Hygiene Practitioner at six years, and (3) the new Minnesota Dental Therapists at four and six years.

The Dutch dental hygienist-therapist functions with the same scope as the three-year trained Australian, New Zealand, and British dental hygienist-therapist but requires the fourth year to satisfy Ministry of Education mandates for granting degrees. It also reflects the Dutch intent to expand the role of therapists while focusing the dentist on advanced restorative care and managing the care of patients with complex medical conditions.

The proposed MN advanced dental hygiene practitioner will require six years of training—despite having the same clinical capacities as the three year dental hygienist-therapist—because this provider is envisioned to have additional capabilities in program management, research, and advocacy.

The new Minnesota basic dental therapist program is still in development and requires 40 months of training (including at least one year of college as a prerequisite for the bachelors program and four years of college as a prerequisite for the masters program) despite having a similar scope of practice as the international dental therapist. The new Minnesota advanced dental therapist requires six years of training—despite having a similar scope of practice as the three-year international combined dental hygienist-therapist.



Minnesota's Proposed Curricula Compared to International Experience

A close examination of the planned MN curricula suggests that the extensive educational requirements reflect a different philosophy of dental therapy than the philosophy that supports the DHAT and other international therapy programs:

- MN's curricula for preparing both the Basic and Advanced Dental Therapist are classically academic. The approaches taken by DENTEX in Alaska and international therapy programs are primarily experiential.
 - MN's curricula mirror the education of dentists and empower clinicians to evaluate and manage complex patients but not complex care. The DENTEX curriculum in Alaska mirrors the program used to train community health aides which empowers lay health workers to provide basic health counseling, screening, and treatments in culturally appropriate ways. (chart next page)
 - The MN curricula are trainee focused by being substantially grounded in extensive basic science, biomedical science, liberal arts, and theory-based dentistry that provides a substantial undergraduate education (especially when coupled with the required prerequisite college education). In contrast, the DHAT and other dental therapy program curricula are more population focused, being rooted in the pragmatism of ensuring clinical competency to meet the needs of targeted underserved populations.
 - The MN program is accessible only to those who are admitted to collegiate programs. In contrast, the DHAT and other dental therapy programs (particularly those that are very focused on care of indigenous populations like the DHAT program in Alaska, First Nations program in Canada, and Curtin University of Technology program in Australia) are readily accessible to non-traditional students whose cultural affiliation with the population to be served is given high value. MN's approach relies on legal restrictions on practice location to ensure that its dental therapists will care for the underserved while these other dental therapy programs focus on the characteristics and motivations of the trainees that they enroll.
- The MN advanced dental therapist, which is analogous in scope to the combined dental hygienist-therapist, gains dual certification by first completing a four-year dental hygiene program and then gaining dental therapy skills in two years. These two additional years are not analogous to training in DHAT and other dental therapy programs because they anticipate prior extensive biomedical and clinical knowledge.
 - The much longer MN program, with its extensive basic science, biomedical science, and liberal arts education, does not provide any more clinical time or experience than do the DHAT and other dental therapy programs (see chart on the following page).
 - As with health professional training programs, MN will determine its graduates' ability to provide care through certifying examination(s) and licensure. In contrast, the DHAT's ability to provide care is determined in the field by the supervising dentist upon demonstration of clinical competency.

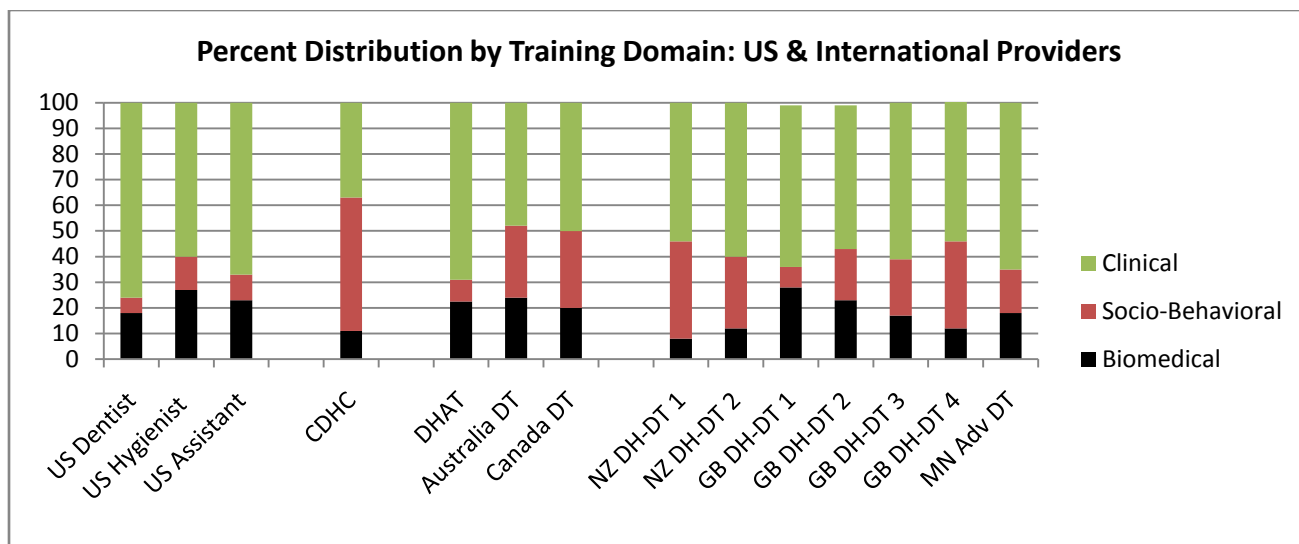
The international dental hygiene-therapist programs, including the British, Dutch, New Zealand, and all but one Australian program, are a hybrid between the Minnesota collegiate approach and the dental therapy-only pragmatic approach. Their three-year curricula, designed to incorporate both dental hygiene and dental therapy, reflect what one informant called "the growing professionalism" of dental therapy, governments' interest in engaging therapists in care for both underserved adults and children, and the deployment of dental therapists in both private and public settings.

	MN Basic Dental Therapist		DHAT
Year 1	General biology Chemistry Biochemistry Anatomy/physiology Psychology Statistics Composition Liberal arts (3 courses)	Year 1	
		Winter	Basic science in clinical medicine Principles of patient management Professional role development Technical skills Field Project (clinical)
		Spring	Basic clinical skills Behavioral medicine Principles of patient management 2 Professional role development 2 Technical skills 2
Year 2	Microbiology Physiology Head/neck anatomy Clinical application 1 Oral anatomy Oral radiology Oral histology/embryology Patient relations Cariology/nutrition Liberal arts (2 courses) Periodontology Pediatric dentistry Pharmacology Local anesthesia/pain control Radiology II Pathology Dental materials Operative	Summer	Field Project (Clinical)
		Fall	Behavioral medicine 2 Professional role development 3 Technical skills 3 Field Project (clinical)
Year 3	DPH/service learning Clinical application 2 Ethics and law Operative 2, 3 Preventive peds clinic Liberal arts (1 course) Technical writing Research methods Pediatric clinic Radiography clinic Comprehensive clinic Auxiliary utilization Practice management Operative clinic Team building Outreach experience	Year 2	Clinical Training
Year 4	Pediatric clinic Oral radiology clinic Comprehensive clinic Outreach experience Operative clinic Liberal arts (1 course)		

Distribution of Therapist Training across Biomedical, Clinical, and Socio-Behavioral Domains

The graph below compares the relative contribution of biomedical, social and behavioral, and clinical training across different provider types. Training varies

considerably both between and within different provider types. In general, all programs except the CDHC focus one-half to three-quarters time on preclinical and clinical instruction, dividing the remaining time variably between biomedical and socio-behavioral studies. Because programs vary in length, the amount of time committed to these three domains also varies considerable (see charts below).



	Percent Training			Time in Years		
	Biomedical	Socio-Behavioral	Clinical	Biomedical	Socio-Behavioral	Clinical
U.S. Dentist	18%	6%	76%	0.72	0.24	3.04
U.S. Hygienist	27%	13%	60%	0.54	0.26	1.20
U.S. Assistant	23%	10%	67%	0.23	0.10	0.67
CDHC	11%	52%	37%	0.17	0.78	0.56
Dental Therapist						
DHAT	23%	9%	69%	0.45	0.17	1.38
Australia DT	24%	28%	48%	0.48	0.56	0.96
Canada DT	20%	30%	50%	0.40	0.60	1.00
Dental Hygienist-Therapist						
NZ DH-DT 1	8%	38%	54%	0.24	1.14	1.62
NZ DH-DT 2	12%	28%	60%	0.36	0.84	1.80
GB DH-DT 1	28%	8%	63%	0.84	0.24	1.89
GB DH-DT 2	23%	20%	56%	0.69	0.60	1.68
GB DH-DT 3	17%	22%	61%	0.51	0.66	1.83
GB DH-DT 4	12	34	55	0.36	1.02	1.65

Policy Issues Relevant to Instituting Dental Therapists in the U.S.

With the newly established dental therapists in Alaska and Minnesota, “midlevel” dental providers are now authorized to deliver some dental treatment services that were previously offered in the U.S. only by dentists. Despite 88 years of practical dental therapy experience in New Zealand, longstanding and widespread adoption across the globe, and earlier successful experiments by American dental academics, these new U.S. programs are once again challenging the notion that a person with fewer years of training than a dentist can deliver a limited but comparable set of basic dental services as a dentist.

To some, the midlevel concept calls into question the very definition and responsibilities of the dentist, while to others it promotes the further advancement of the dentist as the highest level oral healthcare provider and dental care system manager. To some, institutionalization of the dental therapist in the U.S. is analogous to the successful implementation of dental hygienist, while to others it is qualitatively different. When the policy argument regarding the need for therapists is framed as an issue of access to care for the underserved, the discussion is further layered with concerns about “two-tiered care,” with the implication that care provided by dental therapists is “second-tier” despite substantial evidence supporting the safety, public acceptance, and quality of therapists’ care.

Critical policy decisions about dental therapist training, including its length and content, depend upon related decisions regarding:

- Scope of practice: what services are authorized and how they relate to other providers
- Supervision: how the dental therapist relates to the dentist
- Deployment: where and for whom dental therapists can provide services

- Accreditation of programs: by whom (whether ADA CODA or, as with medical mid-levels, separate accrediting bodies) and to what standards
- Certification of graduates: whether through program completion, skill demonstration, or standardized examination
- Licensure: by what state agency (the traditional dental board or a quasi-independent or independent regulatory agency) and with what regulatory latitude.

From the perspective of professional development and future dental workforce, further policy issues relate to developing careers ladders both within and between echelons of dental providers.* Future policy decisions regarding the training of dental therapists will be made within the contexts of these multiple concerns.

* For example, the California Dental Association has advocated for a “revised dental assisting structure... to create a meaningful dental assisting career ladder” beginning in 2010 (see http://www.cda.org/advocacy & the law/new_dental_assisting_duties_and_standards_in_2010) and the ADA considers the OPA a step on a career ladder for dental assistants. Pathways from assisting to hygiene and hygiene to dentistry are already well established.

Goal Setting

Educators responsible for training dental therapists will develop curricula designed to meet specific learning objectives. These learning objectives will be developed to meet specific program goals. For this reason, it will be critical for legislative, regulatory, and program-level policymakers to be clear about the goals of developing dental therapists in the U.S. With such clarity, these policymakers can look to ample U.S. and international examples of training from which to develop American approaches.

As in other countries, **the primary goal of instituting dental therapists in the U.S. is to expand the availability of basic dental reparative services to socially disadvantaged subpopulations** that have little access to dental care and suffer disproportionately from untreated dental disease. Access for these subpopulations is widely recognized to be hampered by the geographic distribution of dentists, paucity of dentists who participate actively in governmental insurance programs, and lack of dental coverage for many poor and working-poor adults.

Aggravating this lack of access for immigrant, migrant, native, minority, and poor populations is a cultural, social, and linguistic disconnect between many dentists and subpopulations with greatest needs. For this reason, **a second goal of training dental therapists is to engage caregivers whose social background, knowledge of underserved populations, cultural experience, and language match those of targeted populations.** The need for oral healthcare providers who can readily relate to underserved populations is evident in the ADA's proposal for a new member of the dental team, the community dental health coordinator; in the emergence of the Alaska dental health aide therapist from the Native American Community Health Aide Program; and in the Pipeline, Profession, and Practice Program that seeks to increase recruitment of underserved minorities to dental schools.*

* According to the ADA, the community dental health coordinator "will come from the [underserved] community in which they will serve. Because they come from this community, the CDHC understands the culture, language, and barriers to care. (Source: American Dental Association. Dental Team Careers: Community Dental Health Coordinator, Frequently Asked Questions: How will

A third goal of instituting dental therapy is to establish a career ladder for underrepresented minorities who can advance to become dually trained as dental hygienists and/or dentists while remaining committed to providing care to underserved populations.

A fourth goal is to improve cost-effectiveness in educating providers of basic care and purchasing dental care. Midlevel training in advanced countries has typically been two years post high school for dental therapists and three years for combined dental hygienist-therapists. Associated training costs are far lower than for training general dentists in eight years or pediatric dentists in ten or more years.† Since therapists provide a more limited range of services and have a more limited education than dentists, their salaries (like those of dental hygienists) would be lower than salaries for dentists with their greater education, scope of service, and ability to manage complexity. If these lower salaries are reflected in lower billing charges for comparable services, cost savings can accrue to payers, including patients, insurers, and government.

A fifth goal is to strengthen the dental "safety net." When surveyed in 2004, 36% of rural and urban federally funded health centers were recruiting for dentists, with 310 current vacancies for dentists reported.⁶¹ Urban areas were experiencing 20% vacancies of greater than six months, while rural areas were experiencing 50% long-term vacancies.^{lxviii} If midlevel dental therapists were practicing in these safety net sites, performing roles analogous to roles that nurse practitioners, physician assistants, or certified nurse midwives provide for physicians, much of this vacancy rate could be addressed. Data from the same survey

the CDHC help the underserved? Available at www.ada.org/public/careers/team/cdhc.asp). Alaska dental health aide therapists (DHAT) also are high school graduates who, with limited training, provide dental services to their own underserved communities. The Pipeline, Profession, and Practice Program instituted in 2001 seeks in part, to "implement programs to increase recruitment and retention of underrepresented minority and low-income students" in order "to help increase access to dental care for underserved populations." (see http://www.dentalpipeline.org/au_aboutus.html).

† In the Forsyth Experiment, a Boston-based demonstration of training dental hygienist-therapists in the 1970s, the incremental cost of educating a dental hygienist to perform dental therapy services was 22 times less than the cost of training a dentist (Lobene RR. The Forsyth Experiment: An Alternative System for Dental Care. Harvard University Press, 1979, Cambridge MA).

reveals that midlevel medical providers were nearly double (1.8 times) the number of physicians in federally funded health centers. Vacancies also are reported for other federal delivery programs including the Indian Health Service.* Overall the dental safety net is estimated to have the capacity to serve only seven to eight million of the estimated 82 million low-income people in the U.S. with an expansion potential without dental therapists of serving only 2.5 million more people.⁶²

A sixth goal is to maximize the role of dentist as the most expert dental care provider capable of managing patients with the most complex treatment and management needs. Ensuring the availability of supplemental mid-level dental providers to deliver basic services within their competencies holds potential to free the dentist from routine care and allows more time for care that requires the unique knowledge and skills acquired through four or more years of dental education and would offset declines in the dentist-to-population ratio.

Implications of Goals for Training Dental Therapists

Adherence to the previously enumerated goals helps shape training decisions regarding:

- Trainee recruitment,
- Curricula,
- Length of training,
- Supervision and placement,
- Cost,
- Training experiences,
- Care for underserved populations,
- Program accreditation, and
- Trainee certification.

Trainee Recruitment

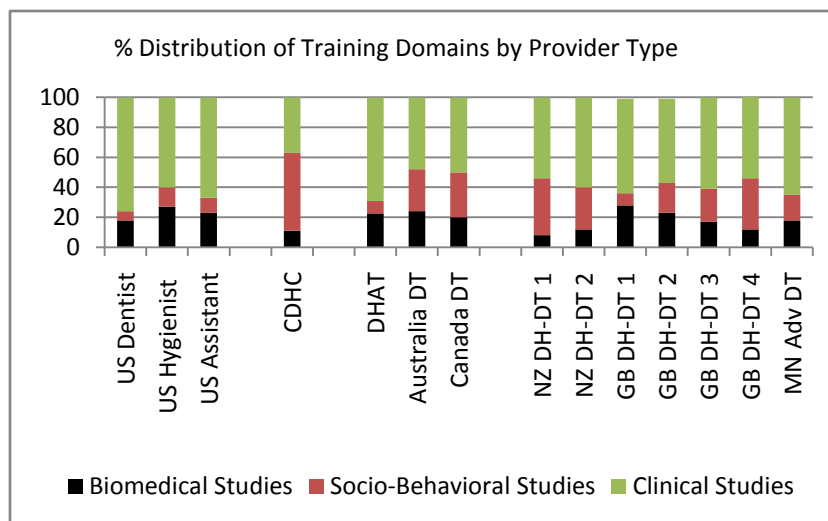
The two dental therapy programs in the U.S. have approached qualification for training in very different

* Approximately one in six dentist positions is unfilled. This statistic is calculated by number of positions posted at <http://www.dentist.ihc.gov/Positions/vacancies.cfm> divided by the number of filled spots from <http://jada.ada.org/cgi/content/full/132/11/1512-b> plus open positions.

ways despite sharing the common goal of increasing care for the underserved. The Alaska DHAT program requires only high school graduation and satisfactory completion of a single six-week, web-based course in human anatomy and physiology. Preference is given to Alaskan Natives as the program serves Alaskan Natives, and funding is encouraged from the sponsoring Tribes. In contrast, the new Minnesota programs require completion of up to four years of college-level education and satisfactory completion of up to 10 courses in the sciences and in English composition, or prior attainment of a bachelor degree in dental hygiene. Tuition is the student's responsibility with financial aid possible. Since MN trainees must first be admitted to college, the pool of potential candidates from the minority low-income communities to be served by graduates is markedly constrained.[†] Tuition requirements and physical dislocation expenses may act as further barriers to enrollment of targeted students unless aid is provided to offset these costs.

The Canadian, British, Australian, New Zealand, and Dutch programs analyzed for this review—like all other international dental therapy and combined dental hygiene-therapy programs—accept students directly from the equivalent of high school. The Canadian program, located within the First Nations University of Canada, recruits from Aboriginal populations and provides first-year “bridging” opportunities for students who need assistance in preparing for its various college-level programs.

[†] Only 20% of all Black students and 16% of all Hispanic students leave high school ready for college. Among college freshmen 11% are Black and 7% Hispanic (Source: Greene JP, Forster G. Public high school graduation and college readiness rates in the United States. 2003, Manhattan Institute for Policy Research at http://www.manhattan-institute.org/html/ewp_03.htm) compared to 13% of U.S. population that is Black and 15% that is Hispanic (Source: U.S. Census Bureau Quick Facts at <http://quickfacts.census.gov/qfd/states/00000.html>). Of those who enter college, 40% of Black and 43% of Hispanic students graduate within six years of entry. (Source: http://www.diverseeducation.com/artman/publish/article_12666.shtml). 89% of dental hygiene students in the U.S. are non-Hispanic white and the majority graduate from associate rather than bachelor degree programs as required for MN Advanced Dental Therapist admission. (Source: ADHA Dental Hygiene Education Facts, May 2009).

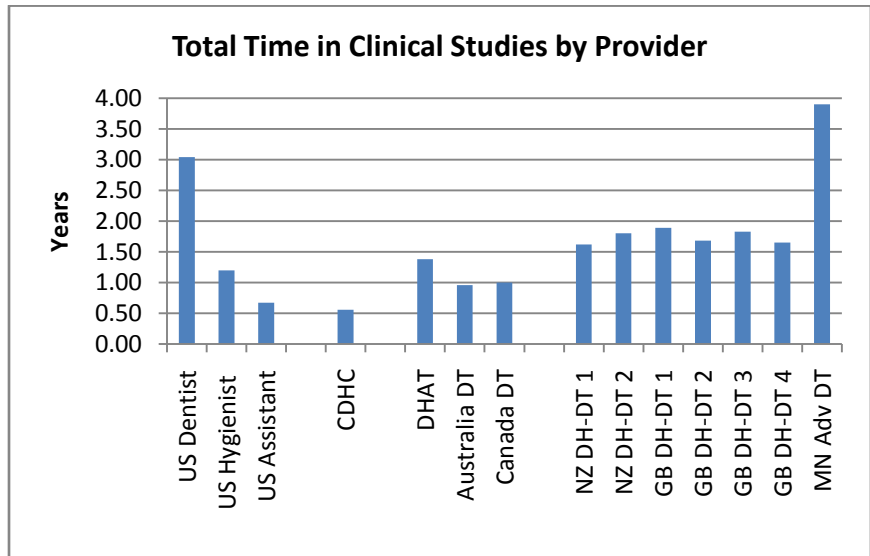
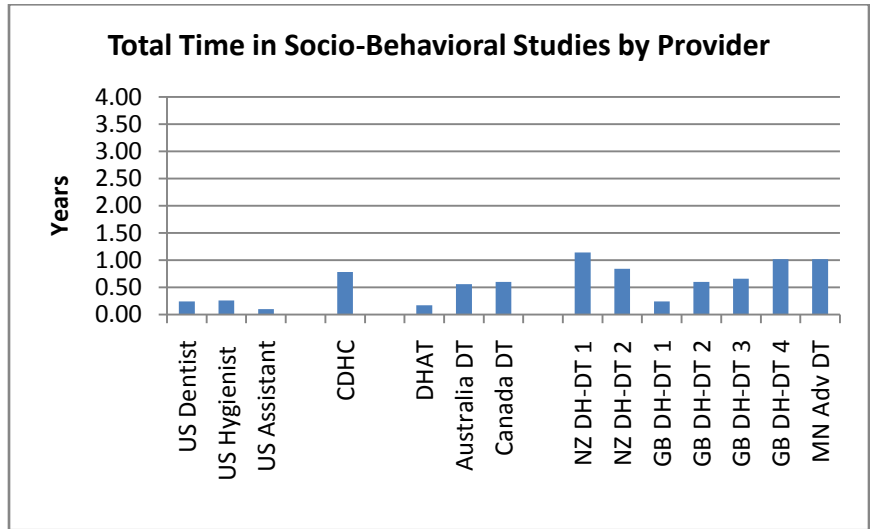
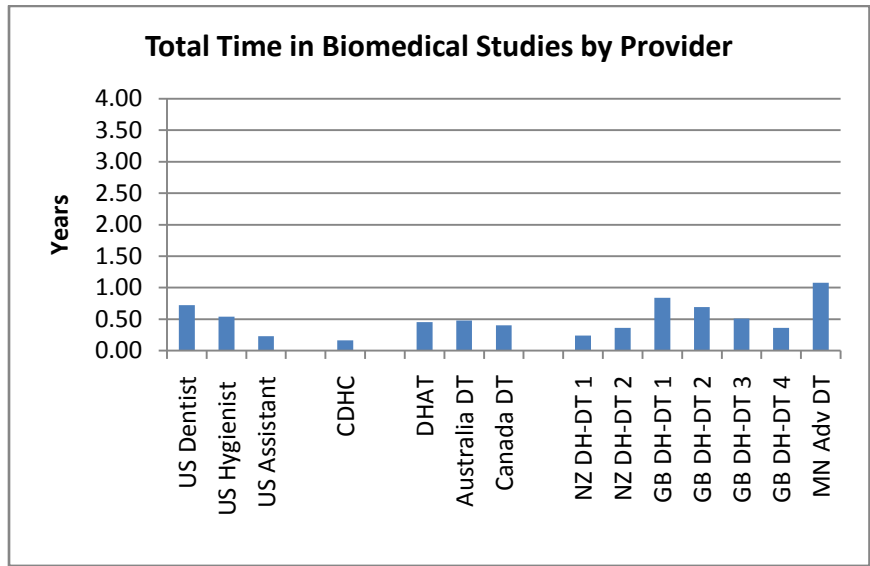


Curricula

Training of all dental personnel—whether conventional U.S., unconventional U.S., proposed U.S., or conventional international—involves instruction in three domains: biomedical, socio-behavioral, and clinical. The relative contribution of each, however, reflects the particular roles and responsibilities of the provider type as well as the particular program’s philosophy. The figures above summarize the distribution of training in programs for which sufficient information is available to make approximate comparisons. It demonstrates that all programs— except that of the community dental health coordinator, which provides only a very limited set of clinical services— commit primary emphasis to clinical training, typically half or more, with the remaining time split variously between biomedical and socio-behavioral studies.

Biomedical studies: As a percentage of curricula, biomedical studies range widely across different types of providers (from 8% to 28%), with the various dental

therapy programs showing greater constancy than the combined dental hygienist-therapist programs. Regarding total time in the curriculum (see figures on the next page for which time is calculated by multiplying the domain percentage by the program length for each programs that provided sufficient detail), U.S. dentists, British dental hygienist-therapists, and the MN advanced therapists have the greatest exposure to biomedical sciences while the CDHC, Auckland combined hygienist-therapist (“NZ DH-DT1”), and Portsmouth combined hygienist-therapist program in Great Britain (“GB DH-DT4”) have the least. Programs that matriculate directly from high school typically require initial coursework in biology and chemistry. Common to all dental training programs— extending from the CDHC to the dentist—are courses in anatomy, physiology, pharmacology, and pathology, including blood-borne infectious disease. The extent and depth of biomedical content, however, varies considerably. Dentists experience the most intensive and advanced biomedical training, albeit with 3.7 fold variation (from 478 to 1,780 clock hours) among CODA-approved schools of dentistry.⁶³



Social and Behavioral studies: Among different provider types, social and behavioral studies vary more widely than for either of the other two domains, from 6% of the curriculum for dentists to 38% for one of the New Zealand combined hygienist-therapist programs and 52% for the CDHC. In total time of study, the international combined dental hygienist-therapist programs tend to commit the greatest number of clock hours, while the conventional U.S. provider programs commit the least. With the exception of the DHAT program (whose students are inherently attuned to the target population), programs that prioritize understanding of underserved populations have the strongest social and behavioral curricula, whether calculated by percentage or by time. The Canadian program notes that its students “become familiar with Aboriginal culture and values, and in their second year, have an opportunity to work and live in First Nations and Inuit communities for an eight-week period.”⁶⁴ Similarly, the New Zealand combined program in Auckland (“NZ DH-DT 1” in the figure) has a particularly strong emphasis on native Maori populations, both through a required course on “Maori health, education, and development” and a series of elective courses for students “who seek careers with a Maori development perspective.” Coursework in this domain typically emphasizes professionalism, law, ethics, health behavior, and health promotion including communications. For the more advanced programs, including dentistry, this domain typically extends also to research and informational sciences. Among U.S. dental schools, this domain varies more than the other two. Within this domain, the most variability is coursework in community and public health practice.⁶⁴

The importance of social and behavioral studies for dental therapists was highlighted in a report by Dean Patrick Lloyd of the University of Minnesota School of Dentistry who noted that “our [future dental therapy] graduates must be well prepared to manage and care for patients from diverse backgrounds, including, especially, recent immigrants from non-English speaking countries.”⁵⁵ The need for such preparation could be extended to U.S. dental students as recent graduates report lesser preparedness to serve underserved and vulnerable populations. The American Dental Education Association reports that one-in-five graduating U.S. dental students reports being unprepared to care for rural populations, one-in-six for adapting treatment plans to low-income populations, one-in-nine to care for

children, and one-in-10 to provide care to a diverse society.³²

Clinical studies: The percentage of curriculum devoted to clinical training also varies across programs, but less so than variations in biomedical or socio-behavioral studies. All programs except for the CDHC commit one-half to three-quarters of their curricula to clinical training. With regard to total time, the international standard of time to train clinical skills is about one full year for the dental therapist and roughly one and a half to two years for the combined dental hygienist-therapist. Even CDHC training commits more than a third of its curriculum to preparation for delivery of clinical care that is limited to visual inspection, dental radiography, coronal polishing, and placement of temporary restorations. Within CODA-approved dental schools, time committed to clinical training varies considerably, from 1,729 to 6,227 clock hours, a 3.6 fold difference.⁶⁴

Most critical to the acceptance of dental therapists is the question of their preparation to deliver clinical reparative dental services that, in the U.S., have been provided until recently only by dentists. While delivery of reparative services remains controversial, delivery of hygiene services by non-dentists has been accepted since the founding of the first U.S. dental hygiene school in 1949,⁶⁵ with 76% of general dentists now employing dental hygienists.⁷ The critical element that differentiates acceptance of dental hygienists from acceptance of dental therapists is that therapists are authorized to perform irreversible procedures including cutting and extraction of teeth. This irreversibility raises concerns about the dental therapists’ capacity to make clinical decisions inherent in performing reparative procedures safely and accurately. While dental therapy initially limited care to the primary dentition (which is itself, in a sense, reversible or expendable), its purview expanded to permanent teeth once clinical concerns about safety, quality, and acceptance were resolved. Today, typical dental therapy programs teach repair of primary and permanent teeth and vary with regard to extraction of permanent teeth.

As in the training of dentists, dental therapy programs first have students perform restorative procedures on manikins and later on patients in closely supervised clinical experiences. The range of operative procedures taught to dental therapists is very limited compared to those taught to dentists. Included are intra-coronal

restorations (fillings) with amalgam and composite materials, placement of stainless steel crowns on primary teeth, and pulpotomies, typically for primary teeth only. Key informants emphasized that the preclinical and clinical curricular content that prepares dental therapy students to perform these limited procedures is greater than the comparable training that prepares dentists to perform the same procedures. The greater range of clinical procedures learned by dental students enhances their overall clinical proficiency while the greater time committed to practicing a more limited range of services enhances dental therapists' clinical proficiency. The intensity of dental therapist training in a subset of dental procedures ensures that dental therapists with two years of training develop clinical competency to deliver the limited set of procedures that they perform.

Dental therapist programs are typically located in technical colleges while combined dental hygiene-therapy programs tend to be collocated in schools of dentistry where dentists and dental therapists train alongside one another to a single standard of care. Dean Lloyd of the University of Minnesota suggests that such collocated training to a single standard of care will promote public trust and respect for the dental therapy profession while increasing the acceptance of dental therapists by dentists.⁵⁵

The capacity of non-dentists to learn clinical procedures is also reflected in the experience of training U.S. EFDAs. EFDAs in some states can perform each of the steps involved in placing a filling except cutting the tooth. This established practice has direct relevance to the question of whether a non-dentist can successfully and adequately perform clinical procedures. The most expansive EFDA policies, like those in Washington State, authorize administration of local anesthesia, isolation of the operative field, placement of matrices (that shape the filling), carving of the filling to a shape that provides normal function and bite, and finishing the filling material. An EFDA with this broad authority is essentially equivalent to the dental therapist minus the authority to cut the tooth. EFDAs, however, often are trained to perform these procedures in short continuing education courses and on-the-job experiences as well as in formal training programs. A wide range of clinical procedures are currently being learned in a variety of settings, including those that do not provide for rigorous didactic preparation and practice on manikins.

Length of Training

Program length may significantly influence which high school graduates elect dental therapy training and how well they are prepared for their limited scope of services. Training must be short enough to reduce barriers to entry, retention, and graduation, yet long enough to ensure adequate acquisition of essential competencies.

Looking across programs, the length of post high school training is typically:

- 1 year or less for dental assistants
- 1½ years for the proposed community dental health coordinator and oral preventive assistant
- 2 years for dental therapists
- 2 years for the majority of U.S. dental hygienists
- 3 years for combined dental hygienist-therapists
- 4 years for baccalaureate-level U.S. dental hygienists (whose scope of practice is the same as two-year trained dental hygienists)
- 6 years for the proposed Advanced Dental Hygiene Practitioner
- 8 years for general dentists
- 10 years for pediatric dentists
- 10-16 years for other dental specialists (with the combined DDS-MD Oral Surgery programs being the longest).

The observation that first-year curricula of both dental therapists and dental hygienists contain many common elements suggests that first-year training could be combined for these two programs. Following the first year, dental therapists and dental hygienists could each pursue a second year of focused study leading to qualification in one of these disciplines. Once trained as either a dental hygienist or dental therapist, a graduate could pursue a third year to obtain the alternate credential. This approach would result in the same outcome as the typical international three-year combined dental hygienist-therapist, but would allow the option of stopping after two years to function as either a dental hygienist or dental therapist and, perhaps, renewing additional training after a hiatus from formal education. For those who are interested in the advanced roles proposed for the advanced dental hygiene practitioner, including administrative, research, and advocacy functions, a fourth year of liberal arts studies leading to a bachelors degree would qualify them for admission to the two-year ADHP masters degree program.

This “career ladder” approach could be further expanded to include entry-level training as the proposed oral preventive assistant, which could lead sequentially to training as a dental assistant and EFDA. Dental therapy programs could offer credit toward, or advanced standing in, dental hygiene and dental therapy for candidates who are already certified as dental assistants or EFDAs.

Critical to these considerations is the maintenance of a true “entry-level” option for dental assistants of one year, dental therapists or hygienists of two years, or combined dental hygienist-therapist of three years. In order to meet the articulated goals of dental therapy training, educators and policymakers will need to guard against “degree creep” that leads to overtraining relative to authorized functions. An example of such overtraining among dental midlevels is the Dutch program, which now requires four years of study for the combined dental hygienist-therapist in order to satisfy Dutch Ministry of Education requirements for degree granting. Similarly, the long training period planned in Minnesota in order to grant bachelors and masters degrees rather than certificates or lesser diplomas is inconsistent with training standards in other comparable countries.

The most thoroughly studied training of associate-degree level dental hygienists to perform dental therapy procedures, the 1970s “Forsyth Experiment” in Boston,⁴⁴ reported that one year of additional training was sufficient to produce practitioners whose restorative care was indistinguishable in quality from that provided by dentists. The techniques that The Forsyth Institute employed to teach restorative care are now common to dentist education and include preclinical technique courses (wherein each procedure is analyzed for specific sub-tasks and practiced), simulated clinical care on manikins, and closely supervised patient care. Unlike dentist education—in which a thorough investigation of each procedure’s history and evolution, philosophical justification, mechanical justification, and evidence base may be presented (depending on the school)—training of dental hygienists as dental therapists in the Forsyth program focused on “need-to-know” information that allowed the trainee to perform each procedure to the same level as the dentist. This approach reduced the length of training while ensuring adequacy of clinical preparation.

Supervision and Deployment

Inherent to the issue of supervision are concerns regarding safety, patient acceptance, and referral for higher level care as needed. Arguing in favor of “direct supervision,” in which the dentist is required to be physically on site with the dental therapist, are the assumptions that (1) patients are not accepting of care delivered by midlevels without the dentist’s presence, (2) the therapist cannot manage medical emergencies should they arise, and (3) the therapist may require direct and immediate assistance when facing a clinical problem of unanticipated complexity. None of these concerns is supported by U.S. or international experience. Forty six states allow dental hygienists to perform dental prophylaxis services without a dentist’s presence in safety net settings, and 30 allow dental hygienists to place sealants without a dentist’s presence, thereby demonstrating professionals’ and policymakers’ convictions that all three concerns are moot, at least with regard to these services.*

With regard to restorative services, additional considerations involve the routine use of local anesthetics and high-speed handpieces as well as patient exposure to a variety of dental materials, some of which are caustic or abrasive. Yet no country that has established dental therapy requires a dentist’s presence and no evidence of greater safety risk to patients compared to care delivered by dentists was found in the literature review or reported by key informants. While dentists are better prepared by their extensive education to manage medically compromised patients who are at greater risk of presenting an emergent medical problem, such patients are not within the domain of dental therapists. Rather, dental therapists are trained to screen and refer out patients with conditions that would likely result in greater inter-operative risk, thereby minimizing the likelihood of a medical emergency. They also are trained in management of medical emergencies.

* As of August 2008, the American Dental Hygienists’ Association reported that all but four states (AL, GA, IN, MS) allowed dental hygienists to function without direct supervision in community-based safety-net settings. Sixteen states have laxer supervision standards for safety-net vs. private office settings. Twelve states do not require the prior authorization of a dentist before hygiene services are delivered by a hygienist (CA, CT, CO, ME, MI, MO, NE, NV, NM, OR, WA, WI).

Dentists, like dental therapists, occasionally confront clinical dental problems for which they are unable to provide immediate definitive care. Like dentists, dental therapists are trained to recognize such conditions, temporize them when they occur, and refer such patients to a higher-level provider. For this reason, it is critical that dental therapists have in place formal, standing affiliation agreements with collaborating dentists to whom they can readily refer. Such arrangements would parallel that of midlevel medical providers with physicians. These arrangements are typically governed by explicit guidelines and protocols that are reinforced through training that emphasizes development of sound clinical judgment.

“Indirect supervision,” in which the dentist is physically accessible to, but not physically present with, the dental hygienist or dental therapist is similarly not needed when care is delivered by these providers. Rather, requiring either direct or indirect supervision of dental therapists runs contrary to the goal of increasing access to underserved populations who may not be located near dentists or who are served by programs that have large numbers of dentist vacancies.

The term “general supervision” describes a range of more liberal arrangements in which the dental hygienist or dental therapist works collaboratively with a dentist who maintains responsibility for the patient’s care. This may take the form of “prescriptive authority,” in which the dentist prescribes treatments for the dental therapist to deliver, or of a collaborative arrangement that may not require a prior examination and treatment plan by the dentist. Like direct and indirect arrangements, general supervision arrangements that require a dentist’s direct involvement in basic restorative care by limiting the therapist’s authority to determine treatment need, run contrary to the goal of increasing access to primary dental care with its inherent characteristic of providing a “first point of contact.”

Historically, the original New Zealand dental therapist worked within school-based care systems in which “public health dentists” were responsible for diagnosis and treatment planning as well advanced care. The Alaska iteration of the dental therapist, the DHAT, functions with greater independence but in close affiliation with a “supervising dentist” who is often the same person responsible for certifying the dental therapist’s competencies. Teledentistry technologies

have markedly increased the accessibility of remote DHATs to their supervising dentists. Through access to visual and auditory communication, the dentist is able to provide real-time consultation. Advances in “virtual touch” technologies will further empower remotely located dentists to collaborate with dental therapists as needed and will further reduce the need to physically transfer the patient to the dentist’s location.

These technologies coupled with empirical evidence of dental therapists’ capacity to function quasi-independently will further reduce inherent trade-offs between supervision and deployment to underserved areas, allowing dental therapists to increasingly function in remote areas and in locations and at times when dentists are not readily physically available.

With the additional advent of “evidence-based practice” and “dental health systems research,” issues of supervision, coordination, and referral can be evaluated and refined. These studies can investigate various configurations of dentist-led teams and determine empirically how to best ensure quality care.

In addition to dentists providing a “virtual” presence in remote sites, Indian Health Service-affiliated dentists will likely continue to travel to areas served by dental therapists for periods of one to two weeks per year. As therapists increasingly manage basic care, these dentists will shift their services away from emergency care and toward complex care for which frontier patients currently need to travel great distances.

Cost

Cost considerations are inherently linked to the goal of increasing access. These include the costs of education, deployment (including supervision considerations), and salaries as well as billing rates when services are provided by dental therapists. Services provided by dental therapists can be lower cost than comparable services when provided by dentists if each of these elements is addressed.

The high cost of dentist education is frequently cited as both a barrier to entry and a barrier to graduates’ election to care for the underserved. To the extent that student debt governs these decisions, keeping the cost of dental therapy education down will be critical to recruitment and to maintaining dental therapy graduates in underserved areas.

The high cost of dental care is frequently cited as a barrier to care seeking by modest- and low-income populations. For deployment of dental therapists to meaningfully address this cost barrier, the cost to the patient must be lower than the cost of comparable services delivered by dentists whether by addressing student debt, regulating charges (e.g. through Medicaid programs), or through market forces.

As one goal of dental therapy training is to engage students from underserved populations, the cost of training may need to be offset to some degree by governments that have the greatest interest in deploying these potentially lower-cost providers. It will be in the public's interest, therefore, to keep the cost of training low in part by ensuring that programs are no lengthier than they need to be.

Training Experiences

As the primary role of the dental therapist is to deliver a limited set of basic dental services, training can be most efficient while retaining effectiveness by focusing on the delivery of “need-to-know” information and development of key clinical skills. Such a focus does not require either a broad biomedical understanding or a rich liberal arts education. It does, however, call for extensive guided preclinical and clinical experiential training. Offering a substantial portion of clinical training in sites that most emulate sites where the dental therapist will be deployed will further ensure comfort and competency.

Similar approaches are now in place for education of dentists who are increasingly trained in community settings in addition to intramural scholastic dental clinics. The 15-school *Pipeline, Profession & Practice: Community-Based Dental Education Program* was effective in increasing community-based education of dentists (from an average of 10 to 50 days of training between 2002 and 2007).⁶⁶ Many of the newest dental schools are explicitly focusing on community-based education and service to the underserved as primary elements of their missions.

Care for Underserved Populations

Recruitment, training content, and training experiences need to be aligned with the goal of increasing care for the underserved. “Degree creep,” increasing “professionalism” of midlevel providers,^{*} and long training periods all decrease the likelihood that dental therapists will focus their care on the underserved.

The limited scope of practice inherent in dental therapy is sufficient to provide a basic level of care that can stabilize a damaged dentition and contribute to prevention of new disease. It is not sufficient to rehabilitate dentitions that require repair with crowns, bridges, and various forms of dentures, root canal treatments, periodontal treatments, or any but the most basic surgical treatments. Even if dental therapists are well positioned within programs and settings that care for those who are currently underserved, care that dental therapists deliver will need to be closely aligned with more advanced care provided by dentists. Envisioned is an expansion of the current dentist-led “dental team,” both in terms of membership to include new types of providers, and in terms of geographic distribution to include greater out-stationing of dental hygienists and dental therapists. The concept of the dentist-led “dental team” is already inclusive of the general dentist, dental assistant, dental hygienist, and office manager/patient care coordinator⁶⁷ with close coordination with specialist dentists and physicians. Without exception, actions taken by states to increase the geographic availability of dental hygienists have established precedent for dental therapists to practice within some form of team concept with a supervising or collaborating dentist. Similarly, the new Alaska and Minnesota dental therapist in the U.S. and established dental therapists in the countries studied all function in coordination with a dentist-lead system of care.

^{*} Increasing professionalism is inherent within all professions as experience is gained, specialization emerges, and a drive for recognition develops. This emergence is evident internationally within dental therapy, for example, in The Netherlands where the expanding roles for therapists led to refinements in dentist education that focus more intensely on advanced care and an additional year of dentist training (from 5 years post high school to 6 years). It is also evident in Australia where therapists are now beginning to move toward specialization and expanding care for children with special healthcare needs. Dental therapists have their own professional organizations in each of the countries studied, all of which have as part of their purpose the advancement of the profession.

However, if advanced care continues to be unavailable to substantial numbers of poor and low-income people despite efforts to establish meaningful dental teams, there is potential for dental therapists to try to use their limited range of services to tackle clinical problems that could be better addressed through a dentist's more expansive scope of services. In particular, teeth that could be retained through restorative, endodontic, or periodontal care would more likely be extracted and large fillings would be placed where crowns are indicated. Pressure to provide proper care to adults could further drive reconsideration of dental therapist's scope, muddle their role, and significantly challenge their training programs.

Both incentives and requirements have been suggested to ensure that policies intended to increase access to basic care accomplish that goal. For example, in the U.S., the loosening of dental hygienist supervision requirements in one-third of states indicates public policymakers' interest in encouraging deployment to underserved areas by reducing barriers to preventive services. Similarly the ADA's interest in empowering a community health worker with a very limited set of clinical skills reflects an understanding that some dental procedures can be offered by minimally trained individuals if incentivized or required to care for people in need of entry-level care. Incentives may be established by funders of training programs. For example, the federal Title VII Health Professions Training Program prioritizes its awards to programs that advance the goals of improving the geographic distribution of health professionals, expanding access to health care in underserved areas, and increasing minority representation in the health professions.⁶⁸

Requirements—including legislated restrictions on the settings in which dental hygienists and dental therapists can practice and restriction of DHAT deployment to care exclusively of Alaskan Natives—reflect efforts to ensure that resources developed for the underserved are delivered to the underserved. Alternatively, these limitations may reflect mainstream dentistry's desire to ensure that dental therapy is not integrated into conventional private practice. Additional requirements may be imposed on individual therapists, hygienists, or dentists rather than on groups of providers, for example, through loan repayment or licensure linked to practice in underserved areas. Policymakers will need to consider whether greater improvements in access to care may

arise from imposing restrictions that target underserved populations or from instituting incentives and free-market approaches that create professional and business opportunities to expand care through the deployment of dental therapists.

Certification and Accreditation

Dental therapy training programs in the U.S. currently do not fall under any national certification or accreditation program. An accreditation agency for dental therapy will need to be identified by the U.S. Department of Education. The designated entity will need to develop definitive standards. Standards, in turn, will effectively shape program curricula and course content and will influence length of training. A period of time will be required before an agency is identified and standards are established. For example, four years elapsed between the establishment of the first dental hygiene program and its oversight by an accrediting body.

The current DHAT program is governed by the Community Health Aide Program Certification Board. Conventional U.S. dental provider training programs, including those in dentistry, dental hygiene, dental assisting, and dental laboratory technology, are accredited by the ADA's Council on Dental Accreditation (CODA). Training in Minnesota is being delivered in institutions that currently feature CODA-approved training programs for dentists and dental hygienists. No determination has yet been made regarding selection by the U.S. Department of Education of an accrediting body for dental therapy training, although CODA is the likely designee. Looking to medicine, however, physicians' assistant and nurse practitioner programs are accredited by different agencies than are allopathic and osteopathic physicians.*

* Physician assistant programs are accredited by the Accreditation Review Commission on Education for the Physician Assistant (ARC-PA); Nurse practitioners by the Commission on Collegiate Nursing Education; allopathic physicians by the AMA-AAMC Liaison Committee on Medical Education; and osteopathic physicians by the American Osteopathic Association Bureau of Professional Education. The ARC-PA Commission is described on its website as "an independent accrediting body authorized to accredit qualified PA educational programs leading to the professional credential, Physician Assistant (PA). It determines whether a program meets established standards for function, structure and performance [but] does not accredit the sponsoring institution. The accreditation process is designed to encourage sound educational practices and innovation by programs and to

Arrangements for accreditation and oversight vary in process and complexity by country but consistently provide for external oversight and training to a set of competencies. The Dutch define the scope of services in detailed regulation, share a joint curriculum among their four “dental hygiene” (combined dental hygiene-therapy) programs, and oversee their training programs through the Ministry of Education. The Australians, New Zealanders, and British accredit dental training programs through their respective Dental Councils (governmental agencies) which detail the scope of practice and training standards. The Canadians oversee their First Nation training program through the Inuit Health Branch of Health Canada, a federal agency.

Various approaches have been used to certify the preparation of healthcare providers to deliver services to the public. These include graduation, examination, competency assessment, performance evaluation, or a combination of these. The DHAT program requires that its graduates practice under supervision of their mentor dentist until the supervising dentist certifies the therapist’s competencies. A distinctly different approach is in place for dentists and dental hygienists who must

stimulate continuous self-study and improvement. The American Academy of Family Physicians, the American Academy of Pediatrics, the American Academy of Physician Assistants, the American College of Physicians, the American College of Surgeons, the American Medical Association, and the Physician Assistant Education Association all cooperate with the Commission to establish, maintain, and promote appropriate standards of quality for entry level education of physician assistants (PAs) and to provide recognition for educational programs that meet the minimum requirements outlined in [its] Standards. These Standards are to be used for the development, evaluation, and self-analysis of physician assistant programs.” ARC-PA is a member of the Association of Specialized and Professional Accreditors (ASPA). (see www.arc-pa.org).

The Commission on Collegiate Nursing Education is “intended to accomplish at least five general purposes: (1) To hold nursing education programs accountable to the community of interest -- the nursing profession, consumers, employers, higher education, students and their families -- and to one another by ensuring that these programs have mission statements, goals, and outcomes that are appropriate for programs preparing individuals to enter the field of nursing. (2) To evaluate the success of a nursing education program in achieving its mission, goals, and outcomes. (3) To assess the extent to which a nursing education program meets accreditation standards. (4) To inform the public of the purposes and values of accreditation and to identify nursing education programs that meet accreditation standards. (5) To foster continuing improvement in nursing education programs -- and thereby in professional practice. (see www.aaacn.nche.edu/Accreditation/mission.htm).

typically pass national board examinations and a regional or state level clinical examination in order to obtain a state license.* In the U.S., Dental assistants without expanded functions are not required to hold a diploma or degree nor are they required to be certified or licensed, although a voluntary board certification program is available to them through testing by the Dental Assisting National Board (DANB). Some states honor the DANB certification for EFDA certification while others may require specific topical examinations.

Certification across countries varies from the most liberal in The Netherlands to the seemingly most complex and detailed state-level regulation in the US. The Dutch approach grants the authority to practice a profession based on competency rather than a diploma, allowing healthcare providers to practice beyond their scope with restraint only by patient action should untoward results occur. Like the U.S., Australia grants the authority for scope of practice (both procedures and populations that can be served) and licensure to its states.

* New York State is currently an exception in its policy of requiring at least one year of additional clinical training post dental school and not requiring a clinical examination.

Criteria for Developing Dental Therapy Training Programs

This review suggests the following criteria for developing training programs that meet the five goals of institutionalizing dental therapy:

1. Recruitment

- Therapy students should be recruited from the general population with preference given to members of underserved poor and minority communities.
- Qualification for therapy training should not depend on prior acceptance to collegiate programs.
- Prerequisite coursework should not be so substantial as to create a barrier to entry but aptitude for dental therapy should be assessed and considered.

2. Curricula

- Curricula should stress social and behavioral instruction needed to prepare dental therapists to relate well to underserved populations, particularly if trainees are not exclusively recruited from such groups.
- Curricula should stress clinical skill attainment needed to provide quality basic services that have been well established to be within the purview of dental therapists.
- Curricula should not overly stress biological and biomedical sciences that are essential for care of complex conditions and patients, but should provide sufficient background in these fields to ensure safe provision of basic dental services and dental therapists' capacity to triage patients for care by more highly trained and skilled dentists.

3. Length of training

- The length of dental therapy training should be appropriate to the acquisition of competencies needed for dental therapy practice. U.S. DHAT and international experience confirms two years to be sufficient for dental therapy training with an

additional year for training as a combined dental hygienist-therapist.

- The length of dental therapy training should be competitive with other options and opportunities available to targeted students.
- The length and format of dental therapy training should support a “career ladder” for midlevel dental providers.

4. Supervision and placement

- Training should allow for quasi-independent service delivery in sites that serve high-needs underserved populations, with sufficient explicit real-time linkage to a dentist to ensure consultation and referral as needed.
- Trainees should be provided with clear guidelines and opportunities to develop sound judgment regarding their treatment capacity and criteria for referral to dentists when needed.

5. Cost

- The cost of dental therapy education should be low enough to ensure that programs are accessible to the targeted student population.
- The cost of care delivered by dental therapists should be lower than the cost for the same procedures when delivered by dentists.
- The cost of training should be efficient for the funder, including government.

6. Training experiences

- Training experiences should be focused on developing clinical competency for a defined set of clinical services rather than establishing a broad dental or liberal arts education.
- Training should involve community-based experiences, particularly in safety net facilities and programs.

7. Care for underserved populations

- Social, legal, and financial incentives and/or requirements should govern training in order to ensure that the goals are met.

8. Certification and accreditation

- Dental therapy program graduates should be certified based on a formal system of knowledge and

competency assessment, whether by graduation, examination, or performance evaluation.

- Dental therapy educational programs should be accredited by a recognized authority, perhaps, as in physician assistant and nurse practitioner programs, an independent accrediting body specific to midlevel practitioners.

As dental therapy training programs are conceived and developed, these aspects of training will need to be addressed by policymakers and educators in ways that lead directly to increased access to basic dental services by those who now face significant barriers to care. In a March 2008 Journal of the American Dental Association (ADA) editorial, A. T. Still University Provost O. T. Wendel and ADA Editor Michael Glick called upon

academic dental institutions to “establish a consistent and coordinated set of professional outcomes and degree levels [for new oral health care professionals] that will avoid the confusion that has echoed through the nursing, physician assistant, and nurse practitioner professions for decades.”⁶⁹ They call for development of a career ladder and a set of “competencies [to] form the structure for uniform scope of practice legislation that ultimately will lead to a structured system of care that gives patients access to affordable, high-quality, comprehensive oral health care.” Developing new training programs for dental therapists in the U.S. can benefit from these recommendations, from a focus on underlying goals, and from lessons learned by other countries’ experiences.

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Every effort was made to ensure that this report is objective, descriptive of existing and proposed dental workforce options, and analytic to the greatest degree possible. The author accepts responsibility for its content and is hopeful that findings reported in this work will support ongoing efforts to advance the oral health of underserved populations through creative workforce approaches.

References

All links were accessed and validated as of 10/8/09

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