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Authors

Melzer, Anne
Reese, Zachary
Mascarhenas, Lorraine
et al.

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Education for Tobacco Use Disorder Treatment

Current State, Evidence, and Unmet Needs

Anne C. Melzer[1,2], Zachary A. Reese[4], Lorraine Mascarhenas[3], Caitlin B. Clancy[4], Janaki Deepak[7], Hyma Gogineni[8], Yaron Gesthalter[9], and Joanna L. Hart[4,5,6,10]

[1]Center for Care Delivery and Outcomes Research, Minneapolis VA Health Care System, Minneapolis, Minnesota; [2]Division of Pulmonary, Allergy, Critical Care, and Sleep, and [3]Department of Internal Medicine, University of Minnesota Medical School, Minneapolis, Minnesota; [4]Division of Pulmonary, Allergy, and Critical Care, Department of Medicine, [5]Palliative and Advanced Illness Research Center, and [6]Department of Medical Ethics and Health Policy, University of Pennsylvania, Philadelphia, Pennsylvania; [7]Division of Pulmonary and Critical Care, Department of Medicine, University of Maryland School of Medicine, Baltimore, Maryland; [8]Department of Pharmacy, Western University of Health Sciences, Pomona, California; [9]Department of Pulmonary and Critical Care, University of California San Francisco, San Francisco, California; and [10]Department of Medicine, Corporal Michael J. Crescenz Department of Veterans Affairs Medical Center, Philadelphia, Pennsylvania

ORCID IDs: 0000-0001-6966-7848 (A.C.M.); 0000-0001-5617-741X (J.L.H.)

ABSTRACT

Background: Tobacco use is undertreated in the medical setting. One driver may be inadequate tobacco use disorder treatment (TUDT) training for clinicians in specialties treating tobacco-dependent patients.

Objective: We sought to evaluate the current state of TUDT training for diverse professionals and how these skills are assessed in credentialing exams.

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Correspondence and requests for reprints should be addressed to Anne C. Melzer, M.D., M.S., Minneapolis VA Health Care System, 1 Veterans Drive, Minneapolis, MN 55417. E-mail: acmelzer@umn.edu.

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Methods: We performed a focused review of current educational practices, evidence-based strategies, and accreditation exam contents focused on TUDT.

Results: Among medical students, participants in reviewed studies reported anywhere from 45 minutes to 3 hours of TUDT training throughout their 4-year programs, most often in the form of didactic sessions. Similarly, little TUDT training was reported at the post-graduate (residency, fellowship, continuing medical education) levels, and reported training was typically delivered as time-based (expected hours of instruction) rather than competency-based (demonstration of mastery) learning. Multiple studies evaluated effective TUDT curricula at varied stages of training. More effective curricula incorporated longitudinal sessions and active learning, such as standardized patient encounters or proctored patient visits. Knowledge of TUDT is minimally evaluated on certification exams. For example, the American Board of Internal Medicine blueprint lists TUDT as <2% of one subtopic on both the internal medicine and pulmonary exams.

Conclusion: TUDT training for most clinicians is minimal, does not assess competency, and is minimally evaluated on certification exams. Effective, evidence-based TUDT training incorporating active learning should be integrated into medical education at all levels, with attention paid to inclusion on subsequent certifying exams.

Keywords:
tobacco use cessation; health education; internship and residency; competency-based education

Tobacco use remains one of the leading causes of preventable death in the United States and worldwide (1–3). Healthcare systems and individual clinicians are uniquely positioned to mitigate the harms of tobacco through tobacco use disorder treatment (TUDT). Addressing tobacco use for hospitalized patients is mandatory for U.S. healthcare systems, and failure to do so can result in penalties (4). Although even simple interventions, such as brief advice, can double quit attempts (5), more intensive interventions are especially effective. This includes the Ask-Advise-Connect model, which combines a brief motivational intervention with practical quit support and can be particularly effective (6, 7). Many interventions rely on individual clinician competency in TUDT to be effective. However, in the absence of benchmarks in TUDT, clinicians are often underprepared to enter independent practice. Many lack the knowledge and skills to successfully implement high-quality TUDT.

Poor provision of TUDT is of particular concern in pulmonary clinics, where many disease processes are directly attributable to tobacco use and where rates of ongoing use are typically high. Despite this concentration of need, there is tremendous variability in the delivery of this care (8, 9). Among patients currently using tobacco, as few as 21% were counseled on cessation therapy, and rates of TUDT ranged from 3% to 72% (10–12). Physicians cite multiple barriers to providing smoking cessation support, including systems and policy issues, time constraints, poor reimbursement, and lack of prescription coverage (13). Clinicians also identify limited knowledge of TUDT modalities and guidelines, stigma, fatalism, and a perception that cessation is primarily the responsibility of the patient as barriers to providing clinical support for TUDT (7).

Although pulmonologists agree that TUDT education is an essential component of pulmonary training and believe they should be offering this service, many lack the requisite knowledge and skills to provide high-quality TUDT (14–16).

National organizations and funders within the United States have identified efficient, effective education during clinical training as a critical step to reducing the health impacts of tobacco (17, 18). As a first step in assessing unmet needs in TUDT education for clinicians serving patients with respiratory conditions, we completed a narrative review of *1*) current practices and evidence-based interventions for TUDT education; and *2*) current testing and credentialing requirements related to tobacco and TUDT for key clinician types.

METHODS

A multidisciplinary workgroup was convened by the American Thoracic Society (ATS) Tobacco Action Committee to address priorities and needs in TUDT education. The workgroup was composed of clinicians across the country with an interest in tobacco control and TUDT education who were members of ATS. The committee members were five pulmonary and critical care physicians, one pharmacist, one nurse, and two trainees (pulmonary fellow, internal medicine resident). Meetings were conducted virtually, and additional experts in medical education were recruited.

Literature Review

Preliminary article selection was first completed by five study team members (C.B.C., H.G., J.L.H., Z.A.R., and J.D.). Articles for inclusion were further reviewed by two other members (A.C.M. and L.M.), with disagreements resolved through consensus. Based on the objectives determined by the committee, we reviewed the literature in the two areas described below.

TUDT training. We conducted a narrative review of the medical education literature to explore the current landscape of TUDT training. We limited our review to studies published in English, in PubMed, between 1988 and 2021, which included descriptions of educational interventions as well as knowledge assessments and curricular evaluation. We focused our review on the training pipeline for physicians who care for respiratory patients (undergraduate medical students, internal medicine, family medicine, pulmonary medicine residents, fellows, and attending physicians) and the broader multidisciplinary team (nurses, physician assistants, pharmacists, and respiratory therapists).

Professional testing and curriculum requirements. We identified testing requirements for our selected clinician types, defined as: *1*) medical students; *2*) residents in internal medicine and family medicine; *3*) fellows and attending physicians in general internal medicine, pulmonary, critical care, sleep, and surgery; *4*) nurses, nurse practitioners (advanced practice nurses [APRNs]), and physician assistants; *5*) pharmacists; and *6*) respiratory therapists. We reviewed all publicly available exam content descriptions for relevant licensing exams and looked for content areas relating to tobacco or TUDT. For full listing see tables. Of note, given there are several certifying bodies and many roles for APRNs, we reviewed two primary care APRN exams from one certifying body (American Nurses Credentialing Center).

RESULTS

We identified 50 relevant studies, including 8 randomized controlled trials and 18 nonrandomized intervention studies (e.g., pre–post, postimplementation feedback), with the remainder being cross-sectional or observational studies, including systematic

reviews. Complete study details are included in Table E1 in the data supplement.

Summary of Current State and Educational Methods across the Training Pipeline

Educating clinicians about TUDT requires efficiency, given the many competing training demands and requirements. Few published studies are randomized designs. We summarize the key randomized studies in Table 1. Tested educational methods varied, including standardized patient instruction and practice, peer role-play, online modules, didactic lectures, and supervised interactions with patients. A systematic review of 13 randomized controlled trials evaluating the effectiveness of training strategies among varied health professional and post-graduate medical programs found that trainees' counseling skills increased significantly when trained in motivational interviewing or the U.S. Public Health Service Guideline approach, also called the 5A's (ask, advise, assess, assist, arrange) (19). Below, we summarize details on the current state and educational strategies by role and stage of training.

Undergraduate medical education. The most robust literature exists in undergraduate medical education.

Current quality of training. Several studies examined the inclusion of TUDT curricula in medical schools. Medical schools frequently include some educational elements about tobacco dependence (20–24). However, the instructional methods, time devoted to the topic, and content remain limited, with a focus on hours spent in didactic instruction without assessments of the targeted clinical skills that are more likely to have a direct impact on patient care (25–30). In a study of 22 medical schools in the United Kingdom, only one in three offered more than didactic training, and the quality of "practical training" was assessed to have declined from 2004 to 2015 (24). A systematic review of quantitative studies of clinical students and practitioners from January 2006 to March 2015 found 59 studies, 29 of which were focused on post-graduate stages of clinical training. The authors found that most curricula focused on time spent rather than on competency-based education and evaluative frameworks that may ensure mastery of the essential skills (31). A cross-sectional study of 1,065 third-year medical students found that 68% had $\leq$5 hours of didactic instruction, and about 40% reported no case-based discussions, standardized patient encounters, or clinical skills courses to supplement the didactics. Among those who completed any active instruction, they primarily completed one such additional instructional encounter. Students who completed more hours of instructional time and participated in more case-based discussions, standardized patient encounters, and clinical skills courses were more likely to intend to complete all of the 5A's (32).

Evaluated training formats. Several instructional formats and curricula demonstrated increases in skills and knowledge in TUDT. Among two cohorts of medical students at a single U.S. medical school who were offered a curriculum during the first year, then again during the third year, integrated with a case-based learning session and review of brief counseling, there was high retention of counseling skills learned through the fourth year of medical school (33). Another study used standardized patient instructors to provide direct feedback to third-year medical students on counseling techniques and demonstrated an improvement in counseling skills (34). A study of 2,441 students at 10 medical schools found that, when compared with 4 hours of didactic sessions alone, a web-based

Table 1. Summary of key randomized controlled trials of tobacco use disorder treatment training among clinicians and trainees

Author	Objective	Population	Intervention	Outcomes
Medical students				
Park *et al.* (2019)	To compare the effectiveness of using standardized patients vs. peer role-play in tobacco cessation counseling	113 fourth-year medical students	Students randomized into a standardized patient group or peer role-play group. After training, students' OSCE scores were used to evaluate their competency in tobacco cessation counseling skills before and after intervention compared with baseline.	Post-intervention OSCE scores increased significantly compared with baseline. However, there was no statistical difference between the groups. After intervention, students' self-confidence and smoking knowledge test scores increased significantly, regardless of the type of module.
Ockene *et al.* (2016)	To assess the effectiveness of a multimodal tobacco treatment program on students' counseling skills compared with traditional curricula	Students from 10 U.S. medical schools ($N = 2,441$)	Students were randomized and pair-matched to the MME or TE programs. The MME program included a web-based course, a role-play classroom demonstration, and a clerkship booster session during the third year that reinforced prior tobacco treatment instruction. The TE curriculum was $\leqslant 4$ h in duration throughout the 4 yr and was largely didactic based.	Although the difference was not statistically significant, MME students completed more tobacco counseling behaviors on the OSCE checklist (mean, 8.7 [standard error, 0.6] vs. mean, 8.0 [standard error, 0.6]; $P = 0.52$) than TE students. MME students were more likely to complete assist-arrange behaviors, including suggesting behavioral strategies (11.8% vs. 4.5%; $P < 0.001$) and providing information regarding a quitline (21.0% vs. 3.8%; $P < 0.001$).
Stolz *et al.* (2012)	To evaluate if a web-based tobacco abstinence training program can supplement or replace traditional training methods	140 third-year medical students	Students were provided access to a self-directed web-based learning module on smoking cessation. Afterward, they were randomly allocated to attend 1 of 4 education approaches: *1*) web-based training using the same tool; *2*) lecture; *3*) role-playing; and *4*) supervised interaction with real patients. Success of a student's respective intervention was measured with an OSCE.	Students in group 4 scored the highest, followed by group 3, 2, and then 1. Adequate counseling skills were seen more frequently in students from groups 4 and 3. Overall, role-playing and supervised interactions with real patients were equally efficient and more powerful when compared with web-based learning with or without a lecture.

Table 1. *Continued*.

Author	Objective	Population	Intervention	Outcomes
Leong *et al.* (2008)	To determine the effect of Tobacco World, a tobacco cessation training program, on undergraduate medical students' knowledge, attitudes, and self-efficacy in tobacco dependence treatment	125 third-year medical students	Students in the intervention group were assigned to a local clerkship site and received Tobacco World training, which included a 4-h tobacco cessation workshop combined with an assignment to provide smoking cessation counseling at a local clerkship site. The comparison group students were assigned to a distant clerkship site and received standard clerkship training.	Students in the intervention group demonstrated significant improvements in key measurements of knowledge, attitudes, and confidence in tobacco cessation counseling. They also reported an increased frequency of tobacco cessation counseling compared with the comparison group.
Residents				
Cornuz *et al.* (2002)	To evaluate the efficacy of an education program based on behavioral theory, active learning methods, and practice with standardized patients on internal medicine residents' counseling abilities	35 internal medicine residents; 251 smoking patients	Residents in the intervention group underwent a training program during which they learned to provide counseling that matched patients' motivation to quit smoking with practice, and they practiced these skills with standardized patients. The control group underwent a didactic session about dyslipidemia management. Patients self-reported abstinence and underwent an exhaled carbon monoxide test at 1-yr follow-up. Their willingness to quit smoking and the residents' counseling skills were also evaluated.	At 1-yr follow-up, the patients in the intervention group had a significantly higher rate of abstinence from smoking than the control group (13% vs. 5%; $P = 0.005$). In addition, smokers' willingness to quit was also higher in the intervention group (94% vs. 80%; $P = 0.007$). Residents in the intervention group were also noted to provide better counseling than those in the control group (mean score, 4.0 vs. 2.7; $P = 0.002$).
Faculty and pharmacists				
Caponnetto *et al.* (2017)	To evaluate the changes in smoking cessation outcomes after training with a state-of-change model for tobacco cessation and motivational interviewing	42 pharmacists and their patients	Pharmacist participants were randomly assigned to the intervention or control group. The control group attended a 3-h training session, and the intervention group also attended a subsequent 6-h training session. The main outcome measures were number of treated smokers, smoking reduction at Week 24, and smoking cessation rates at Week 24.	At Week 24, 12.2% of smokers quit smoking in the intervention group, compared with 1.6% from the control group. Overall, training pharmacists in the stage-of-change model for smoking cessation and motivational interviewing improved smoking reduction and cessation rates.

Table 1. *Continued*.

Author	Objective	Population	Intervention	Outcomes
Verbiest *et al.* (2013)	To evaluate the effectiveness of a low-intensity training program for GPs	49 GPs and 225 patients who smoke were evaluated before and after intervention	GPs underwent a 1-h training program that was aimed at personal and organizational barriers that routinely arise when performing smoking cessation counseling. Patients and GPs were followed before and after intervention.	Patients evaluated by GPs who participated in the training program reported being asked about smoking behavior more often than patients of untrained GPs. The trained GPs also reported that the program increased the ability and intention of providing smoking cessation care. There was no effect on the long-term quit rates of patients evaluated by trained GPs.
Reviews and meta-analyses				
Hyndman *et al.* (2019)	To systematically review the effectiveness of tobacco dependence treatment education vs. standard or no tobacco dependence education on entry-level healthcare professional trainees	28 randomized controlled trials from 16 health professional programs that included 4,343 healthcare students and 3,122 patients	Two researchers independently reviewed the articles and abstracted data regarding student knowledge, self-efficacy, and practices in tobacco cessation interventions. They also measured patient smoking cessation after intervention.	At 6 months after intervention, 78 more patients per 1,000 counseled by the entry-level students reported quitting smoking compared with control. Student tobacco cessation counseling skills improved after training with the 5A's model, motivational interviewing approach, practice with standardized patients, and active learning.
Carson *et al.* (2012)	To determine the efficacy of training healthcare professionals in smoking cessation intervention	Meta-analysis including 17 randomized controlled trials	Randomized controlled trials in which healthcare professionals were trained in smoking cessation as part of the intervention group were included. Trials were considered if they reported the smoking status of patients at 6 months after intervention.	Of the 17 included studies, 13 found no evidence of an effect on sustained smoking cessation after the respective interventions. A meta-analysis of 14 studies for point prevalence of smoking was notable for statistically significant effects in favor of the respective intervention. Healthcare professionals who received training were more likely to perform smoking cessation interventions than control subjects. This included asking patients to set a quit date, making follow-up appointments, counseling patients, distributing self-help material, and prescribing a quit date.

Definition of abbreviations: 5A's = ask, advise, assess, assist, arrange; GP = general practitioner; MME = multimodal education; OSCE = objective structured clinical examination; TE = traditional education.

course with role-play classroom demonstration was moderately more effective for both increasing counseling skills on Observed Skills in Clinical Exam testing and for completion of assist-arrange (actually linking patients with a TUDT provider) and offering pharmacotherapy (35). One study found that, when compared with web-based instruction, inclusion of either role-playing or supervised interactions with real patients to practice counseling skills was more effective in achieving minimal competency in counseling skills. Another study confirmed similar efficacy of role-playing versus standardized patient interactions (36, 37). Additional uncontrolled studies suggest a benefit for multimodal and longitudinal instruction (38–41). Notably, nearly all studies relied on intermediate outcomes (e.g., Observed Skills in Clinical Exam performance, knowledge measurements, and self-reported comfort with addressing tobacco use).

Collectively, the evidence supports longitudinal instruction throughout medical training, including core knowledge-based training with an emphasis on supervised skill-building and assessments using standardized patient encounters, group role-playing, or supervised patient encounters.

Post-graduate medical education.

Current quality of training. Little information exists on the current training practices for post-graduate trainees, including residents, fellows, and practicing physicians. Overall, there is little emphasis on TUDT for post-graduate trainees, even within pulmonary medicine and other specialties served by ATS whose clinics are populated by patients with tobacco-related diseases (14, 35). One international web-based survey (104 programs in 84 countries) found that most training programs taught some variation on brief advice or counseling, with emphasis on knowledge rather than skills (42). No information was available on current educational practices for practicing physicians and faculty.

Evaluated training formats for residents. In keeping with the level of training, educational opportunities were more typically centered on specific patient populations and disease processes (43). Most studies were small and pre–post in design, evaluating intermediate outcomes such as skill development and knowledge acquisition or retention. One randomized study of internal medicine residents ($n = 35$) provided counseling and motivational interviewing training followed by skill building with standardized patients and, by evaluating patient outcomes ($n = 251$), found that patients of the trained residents were more than twice as likely to be abstinent from tobacco (13% vs. 5%; $P = 0.005$) (44). Additional studies used varied types of active learning training models, such as small group discussions, peer role-playing with individualized tutorials, 3-hour training programs with small group discussions and role-playing with taped sample counseling sessions, or standardized patients and feedback. All formats were found to be effective for increasing evaluated outcomes, including knowledge acquisition, counseling skills, and adherence to evidence-based counseling strategies (45–49).

Evaluated training formats for practicing physicians and fellows. A number of studies pooled faculty, fellows, and recent graduates in general practice or pulmonary and critical care for intervention and assessment. Interventions were similar to those offered to residents, although with more focus on brief (<2 h) one-time interventions or online materials as opposed to longitudinal curricula (50, 51). In one small study of pulmonary fellows ($n = 12$), only 50% rated their training

curriculum as adequate. After participating in an ambulatory teaching script with a small group session, 100% rated their curriculum as adequate (52). Another small study ($n = 24$ pulmonary physicians) in Germany demonstrated that a 2-hour tobacco treatment training resulted in improved 6-month tobacco abstinence rates among patients (53). Most studies evaluated intermediate outcomes, such as self-assessed comfort with counseling and/or medications. One study evaluated the quality of available online courses on TUDTT and found that 17/24 failed to meet minimum quality standards using a peer review rubric for online learning, although the content was generally deemed appropriate (54).

Pharmacists.

Current quality of training. Little information on training activities for pharmacists was identified. However, in one study of 188 pharmacy faculty, 49.5% reported receiving no formal training for TUDT before study participation (55). Notably, information on necessary curricula was reported in several states that allow pharmacists to prescribe TUDT medications after attaining competency, although this varies considerably by state.

Evaluated training formats. When compared with strategies for training physicians, tested strategies were generally more time intensive and heavily didactic in nature. One study used a 3-day, 14.5-hour train-the-trainer curriculum, which found high acceptability and perceived effectiveness of the program (55). Two studies ($n = 493$ pharmacy students, $n = 142$ pharmacy students) evaluated 8-hour training courses, with large increases in self-rated counseling skills after training (56, 57). One study trained practicing pharmacists ($n = 42$) and compared a brief (3-h) training with a two-part training (3 h followed by 6 h), finding that 12.2% of smokers treated from the intensive training arm quit, versus 1.3% of the less-intensive arm, strongly supporting the efficacy of the more robust training program (58).

Nurses and nurse practitioners.

Current quality of training. Little information was identified as to current practices in nursing education for TUDT. No studies were identified specific to physician assistants.

Evaluated training formats. Nurses and APRNs were commonly pooled in studies (*see* data supplement for full study details). Most assessed interventions were variations of relatively brief didactic instruction (1–6 h) and were found to produce modest increases in knowledge, perceived knowledge, and positive attitudes toward providing cessation support (59–62). One study found no benefit for a longer course (6 h vs. 2 h) (63). Another study incorporated counseling practice and role-playing into the didactic training and found that nurses' counseling behaviors, including assessing patient readiness to quit and providing assistance, remained increased through 12 months of follow-up (64). This study again supports the benefit to incorporating an active learning component into training.

Respiratory therapists.

Current quality of training. Little information was identified regarding the current training practices in respiratory therapy education for TUDT. One study administered surveys to 254 program directors of respiratory therapy programs. Surveys revealed that more than half of the programs (56%) offered no teaching on the 5R's of tobacco cessation counseling (relevance, risks, rewards, roadblocks, and recognition). Furthermore, most programs (>90%) did not spend any time teaching students about the sociopolitical aspects of

TUDT, and 41% of programs did not evaluate students' competencies in TUDT counseling (65).

Evaluated training formats. Two studies evaluated training in an online format. Overall, pre- and postcourse surveys demonstrated that these training programs enhanced provider self-efficacy, confidence, and knowledge in TUDT (66, 67). One study also noted that those who underwent training were more likely to advise patients to quit and refer them to the tailored TUDT counseling or the National Network of Tobacco Cessation Quitline (67).

Accreditation and Credentialing Requirements

Throughout health professionals' initial and ongoing education and certification, there are multiple assessments of the knowledge deemed necessary to progress to the next steps in training or to independently practice in their role. The majority of assessments are knowledge-based. Recent advances in medical education are shifting to a focus on mastery of key skills. Summary findings are in Table 2.

Undergraduate medical education. Educational efforts in undergraduate and postgraduate medical education typically reflect the content of such competency exams. Therefore, inclusion of TUDT principles on these exams is likely to "yield the delivery of more evidence-based interventions, improved health, and reduction of disease and death" (68). Medical students in the United States take the three U.S. Medical Licensing Exam series to achieve licensure. TUDT and tobacco are minimally assessed in these exams. Tobacco and nicotine are mentioned as one component of four content topics assessed across the series of exams: *1*) behavioral health→abnormal processes→substance use disorders→ tobacco/nicotine use; *2*) respiratory system→abnormal processes→adverse effects of drugs on the respiratory system→ acute effects of tobacco/nicotine; *3*) pregnancy, childbirth, and the puerperium → abnormal processes→adverse effects of drugs→alcohol, tobacco, and other drugs; and *4*) multisystem processes and disorders→abnormal processes→toxins and environmental extremes→chemical→ agricultural hazards→green tobacco poisoning. There is no explicit mention of TUDT.

Fellowship training requirements. The Accreditation Council for Graduate Medical Education pulmonary fellowship training requirements only mention smoking cessation once in the pulmonary and critical care 2.0 milestones under "local quality improvement initiatives (e.g., community vaccination rate, infection rate, smoking cessation)" in patient safety and quality improvement.

American Board of Internal Medicine and American Board of Family Medicine. TUDT is minimally tested on American Board of Internal Medicine (ABIM) examinations. The ABIM pulmonary exam has tobacco use treatment and smoking cessation listed as <2% for "Occupational and Environmental Diseases." Tobacco and TUDT is not listed in the ABIM critical care blueprint, and the ABIM internal medicine exam blueprint lists smoking cessation as <2% under "Cancer Prevention."

The American Board of Family Medicine does not provide a detailed blueprint for its certification exam, although TUDT is not mentioned in the summarizing information provided. One of 16 knowledge self-assessment modules for test preparation includes "health behavior," encompassing the "impact of exercise, nutrition, obesity, sexual health, and tobacco and substance abuse of human health."

Table 2. Contents of health professional licensing and certification exams pertaining to tobacco use disorder and treatment for clinicians in varied fields and through stages of medical education

Training Level; Degree Type	Curriculum Requirements	Accreditation Exam/Fellowship Milestones	Exam/Milestone Subjects Mentioning Tobacco, Smoking, or Nicotine
Undergraduate medical education; M.D./D.O.	Per the LCME, the medical school faculty are responsible for providing "content of sufficient breadth and depth to prepare medical students for entry into any residency program and for the subsequent contemporary practice of medicine." There are no standardized recommendations about specific content. However, there are specific subjects that are denoted on the Data Collection Instrument surveys (e.g., biochemistry, gross anatomy, etc.).	USMLE	Behavioral health (9–13%) Respiratory system (9–13%) Reproductive and endocrine systems (9–13%) Multisystem processes and disorders (6–10%)
	Per the COCA, the medical school must "teach and educate students in order to ensure the development of the seven osteopathic core competencies of medical knowledge, patient care, communication, professionalism, practice-based learning, systems-based practice, and osteopathic principles and practice."	COMLEX	Clinical presentations: patient presentations related to nervous system and mental health (10–14%) Clinical presentations: community health and patient presentations related to wellness (12–14%)
ACGME; residency	Per the ACGME, the curriculum of the respective residency program must contain the following educational components: program aims "consistent with the Sponsoring Institution's mission, the needs of the community it serves, and the desired distinctive capabilities of its graduates." The program's educational aims must be made available to its applicants, residents, and faculty.	ABIM certification exam	Cancer prevention (<2%)
		ABFM certification exam	No mention of tobacco, smoking, or nicotine in the blueprint
		ABS	SCORE general surgery curriculum: no mention of tobacco, smoking, or nicotine General surgery qualifying exam: no mention of tobacco, smoking, or nicotine in the blueprint General surgery certifying exam: no mention of tobacco, smoking, or nicotine in the blueprint Vascular surgery qualifying and certifying examinations: no mention of tobacco, smoking, or nicotine in the blueprint

Table 2. *Continued*.

Training Level; Degree Type	Curriculum Requirements	Accreditation Exam/Fellowship Milestones	Exam/Milestone Subjects Mentioning Tobacco, Smoking, or Nicotine
ACGME; fellowship	The curriculum components include the same guidelines for residency, with the addition of appropriately delineated responsibilities for fellows regarding patient care, advancing roles in patient management, and graded supervision in their respective subspecialty.	Pulmonary/critical care medicine fellowship milestones 2.0	Patient safety and quality improvement
ACPE; Pharm. D.	Per the ACPE, students are expected to develop a comprehensive knowledge base required to be ready for practice and be able to recall, build on, and apply that knowledge to provide quality patient care in a variety of settings. There are no standardized recommendations regarding specific content. However, required didactic subjects are mentioned, which include biomedical, pharmaceutical, clinical, social, administrative, and behavioral sciences.	NAPLEX	No mention of tobacco, smoking, or nicotine in the blueprint
CCNE; B.S.N., M.S.N., D.N.P.	Per the CCNE, the curriculum should be developed, implemented, and adjusted to reflect the student outcomes in accordance with the program's mission and goals, prepare the students for the roles they will be carrying out upon graduation, and consider the program's community-of-interest needs.	NCLEX	Health promotion and maintenance (9%) Psychosocial integrity (9%)
ARC-PA; P.A.-C.	"The curriculum must provide instruction in the following areas of social and behavioral sciences and their application to clinical practice in: death, dying, and loss; human sexuality; normal and abnormal development across the lifespan; patient response to illness or injury; patient response to stress; substance use disorders; and violence identification and prevention."	PANCE	No mention of tobacco, smoking, or nicotine in the blueprint
ANCC; A.P.R.N.	Competency-based board certification exams with a reliable assessment of entry-level clinical knowledge and skills for an advanced-practice nurse.	ANCC certification	No mention of tobacco, smoking, or nicotine in the blueprint for family practice or adult/gerontology primary care nurse practitioner exams. Topic may be included under "age-appropriate prevention" "behavioral-motivational interviewing," or "lifestyle."

Table 2. *Continued*.

Training Level; Degree Type	Curriculum Requirements	Accreditation Exam/Fellowship Milestones	Exam/Milestone Subjects Mentioning Tobacco, Smoking, or Nicotine
CoARC; R.R.T.	"The curriculum must include content in oral and written communication skills, social/behavioral sciences, and biomedical/natural sciences as well as respiratory care. This content must be incorporated in a manner that promotes achievement of the curriculum's defined competencies." Some competencies included are as follows: assess the cardiopulmonary status of patients; create therapeutic goals for patients with cardiopulmonary disease; provide patient, family, and community education; and promote cardiopulmonary wellness, disease prevention, and disease management.	NBRC	Recall how to assess smoking history and conduct patient and family education on lifestyle changes (including smoking cessation)

Definition of abbreviations: ABIM = American Board of Internal Medicine; ABFM = American Board of Family Practice; ABS = American Board of Surgery; ACGME = Accreditation Council for Graduate Medical Education; ACPE = Accreditation Council for Pharmacy Education; ANCC = American Nurses Credentialing Center; APRN = Advanced Practice Nurse; ARC-PA = Accreditation Review Commission on Education for the Physician Assistant; B.S.N. = Bachelor of Science in Nursing; CCNE = Commission on Collegiate Nursing Education; CoARC = Commission on Accreditation for Respiratory Care; COCA = Commission on Osteopathic College Accreditation; COMLEX = Comprehensive Osteopathic Medical Licensing Exam; D.N.P. = Doctor of Nursing Practice; D.O. = Doctor of Osteopathy; LCME = Liaison Committee on Medical Education; M.D. = Medical Doctor; M.S.N. = Master of Science in Nursing; NAPLEX = North American Pharmacist Licensure Exam; NBRC = National Board for Respiratory Care; NCLEX = National Council Licensure Exam; P.A.-C. = Certified Physician Assistant; PANCE = Physician Assistant National Certifying Exam; Pharm.D. = Doctor of Pharmacy; R.R.T. = Registered Respiratory Therapist; SCORE = Surgical Council on Resident Education; USMLE = U.S. Medical Licensing Exam.

Publicly available websites were queried for the 2021 academic year. Reviewed websites included: https://www.usmle.org/step-exams/; https://www.nbome.org/assessments/comlex-usa/; https://www.abim.org/certification/exam-information/internal-medicine/exam-content; https://www.abim.org/certification/exam-information/pulmonary-disease/exam-content; https://www.theabfm.org/become-certified; https://www.absurgery.org/xfer/GS-ITE.pdf; https://files.surgicalcore.org/curriculumoutline_gs.pdf; https://www.acgme.org/globalassets/pfassets/programrequirements/140_internalmedicine_2022v4.pdf; https://www.acgme.org/globalassets/pfassets/programrequirements/149_pulmonarydisease_2022v2.pdf; https://nabp.pharmacy/programs/examinations/naplex/competency-statements-2021/; https://www.nclex.com/test-plans.page; https://www.nccpa.net/wp-content/uploads/2021/05/PACompetencies.pdf; https://coarc.com/accreditation/entry-into-practice-standards/; https://www.nbrc.org/examinations/rrt/#general-exam-info; https://www.nursingworld.org/our-certifications/adult-gerontology-primary-care-nurse-practitioner/.

Surgical training and certification. The American Board of Surgery's content description for the American Board of Surgery In-Training Examination does not mention tobacco dependence or TUDT. Similarly, the general surgery and vascular surgery certification exam content descriptions do not mention tobacco. The American Board of Otolaryngology and the American Board of Thoracic Surgery do not mention tobacco or TUDT in the content descriptions of their certifying exams.

Pharmacists, nurses, and respiratory therapists. The competency statements reporting the content of the North American Pharmacist Licensure Exam for pharmacists do not mention tobacco or TUDT. The National Council of State Boards of Nursing offers the National Council Licensure Exam for nursing certification. The National Council Licensure Exam description includes nicotine withdrawal under "Psychosocial Integrity" and smoking cessation under "High-Risk Behaviors" and "Health Promotion/Disease Prevention." The Committee on Accreditation for Respiratory Care includes relevant practical skills in the curriculum requirements aligned with the National Board for Respiratory Care board exam. These are *1*) perform clinical assessment→interviewing a patient to assess→smoking history; and *2*) conduct patient and family education→lifestyle changes→smoking cessation.

Summary of Key Skills for Tobacco Dependence Counselors

Although attaining the skills necessary for clinicians to function as independent TUDT counselors would likely benefit patients, it is unrealistic to expect all clinicians to undergo this intensity of training. Formal certification requirements include completion of an approved TUDT training course, 240 hours of practice experience over 2 years, and a knowledge exam (available at https://www.naadac.org/NCTTP). However, the training blueprint and core competencies required to become certified can serve as an example for an effective skills-based curriculum; they are broadly applicable to clinicians who treat or encounter patients with tobacco use disorder, with competencies applicable to other substance use disorders and behavioral change interventions (Table 3). The focus on skills mastery is a key part of the curriculum and ensures that participants have ample opportunity to practice TUDT skills before independence.

DISCUSSION

Effective interventions promoting tobacco treatment and smoking cessation require practitioners to help patients "overcome their ambivalence to change, and then guide them to available and appropriate … resources (69)." Although TUDT requires development of complex and multilayered competencies, we identified scalable, evidence-based strategies to improve competency across the medical education pipeline and appropriate to diverse clinician types. These practices have not been widely adopted among medical schools and post-graduate training programs. A key component of the most effective training strategies is the inclusion of active skill development and practice, such as role-playing, standardized patient encounters, or supervised patient encounters. However, even less resource-intensive didactic trainings with knowledge assessments improved intermediate outcomes, such as knowledge acquisition and self-efficacy.

The communication and behavioral counseling skills required for TUDT are fundamental to clinical training more broadly. Early educational interventions appear to hold promise for instilling durable skills among future clinicians. As such, these foundational skills should be cultivated early in training (70) as part of all undergraduate

Table 3. Selected core competencies from the NAADAC and CTTTP

Tobacco dependence knowledge and education
Describe the prevalence and patterns of tobacco use, dependence, and cessation in the country and region in which the treatment is being provided and how rates vary across different demographic, economic, and cultural subgroups
Explain the societal and environmental factors that promote and inhibit the spread of tobacco use and dependence
Explain the health consequences of tobacco use and benefits of quitting and the basic mechanisms of the more common tobacco-induced disorders
Describe how tobacco dependence develops, and be able to explain the biological, psychological, and social causes of tobacco dependence
Describe the chronic-relapsing nature of tobacco dependence, including typical relapse patterns and predisposing factors
Provide information that is gender, age, and culturally sensitive and appropriate to learning styles and abilities
Identify evidence-based treatment strategies and the pros and cons for each strategy
Counseling skills
Demonstrate effective counseling skills, such as active listening and empathy, that facilitate the treatment process
Demonstrate establishing a warm, confidential, and nonjudgmental counseling environment
Describe and demonstrate the use of evidence-based methods for brief interventions for tobacco use and dependence, as identified in current guidelines
Describe the use of models of behavior change, including motivational interviewing, cognitive therapy, and supportive counseling
Demonstrate the effective use of clinically sound strategies to enhance motivation and encourage commitment to change
Demonstrate competence in at least one of the empirically supported counseling modalities, such as individual, group, and telephone counseling
Assessment interview
Demonstrate the ability to conduct an intake assessment interview
Demonstrate the ability to gather basic medical history information and conduct a brief screening for psychiatric and substance abuse issues
Describe the existing objective measures of tobacco use, such as carbon monoxide monitoring and cotinine level
Treatment planning
In collaboration with the client, identify specific and measurable treatment objectives
Collaboratively develop a treatment plan that uses evidence-based strategies to assist the client in moving toward a quit attempt and/or continued abstinence from tobacco
Describe a plan for follow-up to address potential issues, including negative outcomes

Table 3. *Continued*.

Demonstrate the process to make referrals to other practitioners or to recommend additional care
Pharmacotherapy
Describe the benefits of combining pharmacotherapy and counseling
Provide information on correct use, efficacy, adverse events, contraindications, known side effects, and exclusions for all tobacco-dependence medications approved by national regulatory agencies
Identify information relevant to a client's current and past medical, psychiatric, and smoking history (including past treatments) that may impact pharmacotherapy decisions
Provide appropriate patient education for therapeutic choices and dosing for a wide range of patient situations
Communicate the symptoms, duration, incidence, and magnitude of nicotine withdrawal
Identify second-line medications and be able to find information about them as needed
Identify possible adverse reactions and complications related to the use of pharmacotherapy for tobacco dependence, making timely referral to medical professionals/services; demonstrate the ability to address concerns about minor and/or temporary side effects of these pharmacotherapies
Demonstrate the ability to collaborate with other healthcare providers to coordinate the appropriate use of medications, especially in the presence of medical or psychiatric comorbidities

Definition of abbreviations: CTTTP = Council for Tobacco Treatment Training Programs; NAADAC = National Association for Alcoholism and Drug Abuse Counselors.
Documents are available from: https://www.naadac.org/assets/2416/ncttp-exam-bibliography(2019).pdf, http://ctttp.org/wp-content/uploads/2018/05/2015-ShefferPayneOstroff.pdf.

curricula. If these core skills are not developed, clinicians may demonstrate adequate knowledge of the principles of TUDT but lack the self-efficacy and communication skills required to actually deliver this care (71). Given the historic variability in undergraduate training, post-graduate trainees and practicing clinicians in relevant specialties must also be assessed to ensure that their communication and TUDT skills are adequate. This provides an opportunity to deliver tailored training to fill identified gaps in TUDT knowledge and skills and also to explore strategies for implementation of TUDT into clinical workflows.

We confirmed that despite the central role tobacco plays in morbidity and mortality, it remains minimally included in training requirements and certification exams. Through more robust inclusion on exams and assessments, training programs would be incentivized to set aside adequate time and resources for teaching these skills. TUDT education is a model topic for competency-based medical education, as it develops skills in multiple domains. Furthermore, the competency-based approach from the National Association for Alcoholism and Drug Abuse Counselors that is used for TUDT education can be simplified and adjusted based on the learner role. TUDT training that integrates evidence-based curricula components would allow for assessment of patient outcomes (e.g., smoking cessation rates), which is arguably the ultimate assessment of medical education.

We propose that a broad assessment of current training practices is a critical first step to guide future efforts.

Limitations

Our review has limitations, including a narrative, nonsystematic, method, and searching only PubMed, which may have excluded articles that are not indexed. A review of all certifying exams (e.g., other medical specialties, other certifying bodies, and roles of advanced practice providers) was out of the scope of this review.

Conclusions

In summary, TUDT knowledge and skills are minimally assessed throughout clinical training across diverse clinician roles, and the current state of training is poor. However, we also identified several evidence-based, scalable, effective educational strategies that directly improved patient outcomes. Integrating these strategies into clinical training to promote the use of TUDT across high-need clinical settings is necessary to appropriately treat patients suffering unnecessarily from tobacco-related diseases.

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