GETTING TO OUTCOMES®

OPERATIONS GUIDE FOR

U.S. AIR FORCE COMMUNITY ACTION TEAMS

Content Area Module for Air Force Sleep Health Promotion

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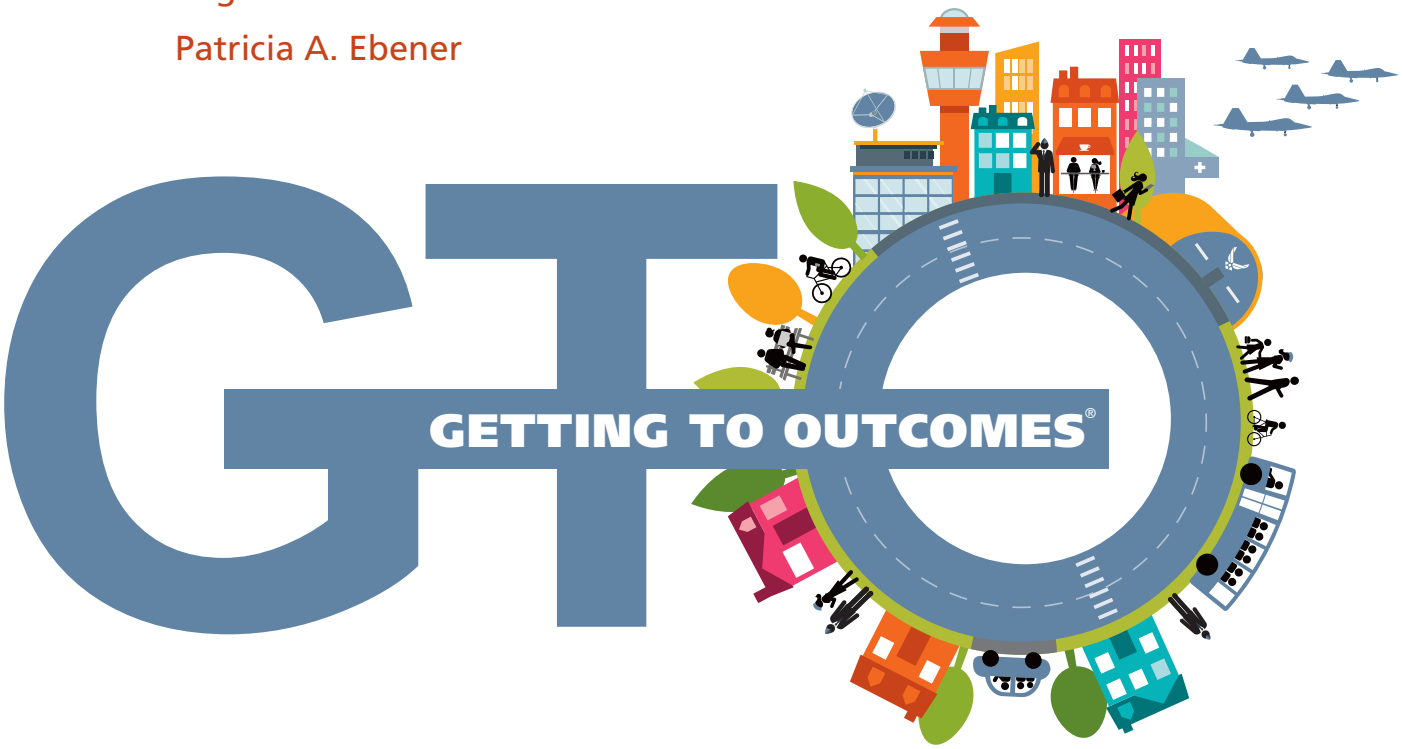

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Preface

Sleep is a vital health behavior. Service members, including Airmen, are at high risk for insufficient sleep, poor sleep quality, daytime fatigue, and sleep disorders, including insomnia and sleep apnea. When Airmen do not get the sleep they need, their bodies, brains, and behavior suffer, compromising readiness. Military culture has tended to undermine the importance of sleep; however, there is increasing awareness that sleep is an operational imperative, not something to be sacrificed.

This content area module (CAM) for Air Force sleep health promotion is a companion volume to the *Getting To Outcomes® Operations Guide for U.S. Air Force Community Action Teams*. It includes guidance and resources for Community Action Teams (CATs) that have an interest in sleep health promotion initiatives and their evaluation. This CAM was requested by the U.S. Air Force Office of Resilience, based on findings in the most recent Community Feedback Tool. This CAM is intended to be used with the GTO Operations Guide for planning a sleep health promotion initiative as part of a Community Action Plan (CAP).

Getting To Outcomes® (GTO) is a user-oriented ten-step process for comprehensive planning, implementation, and evaluation of programs and community initiatives. It is designed to help organizations run programs well and get desired outcomes. It was developed to bridge the gap between the research evidence of effectiveness, established by program developers, and the often-ineffective implementation of the same programs outside a research setting.

The GTO Operations Guide for Community Action Teams and four companion CAMs are designed for the U.S. Air Force CATs to aid each installation in developing its CAP for integrated resilience and violence prevention, as directed in Air Force Instruction 90-5001. The documents contain tools that will help installations' Community Support Coordinators, Community Action Team Chairs, Violence Prevention Integrators, CATs, and the Community Support Program Managers at the major command level complete each GTO step. GTO is part of an Air Force initiative to increase the effectiveness of plans while enabling each installation to address its unique needs.

The research reported here was commissioned by the U.S. Air Force Integrated Resilience Office under the Deputy Chief of Staff for Manpower, Personnel and Services, Headquarters U.S. Air Force, and conducted within the Manpower, Personnel, and Training Program of RAND Project AIR FORCE as part of a fiscal year 2019 project, "Getting to Outcomes for Integrated Violence Prevention and Resilience in the Military: Phase Two."

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Abbreviations

AETC	Air Force Education and Training Command
AETCI	Air Education and Training Command Instruction
AF	Air Force
AFB	Air Force Base
AFI	U.S. Air Force Instruction
BRFSS	Behavioral Risk Factor Surveillance System
CAB	Community Action Board
CAM	content area module
CAP	Community Action Plan
CAT	Community Action Team
CBT-I	cognitive behavioral therapy for insomnia
CDC	Centers for Disease Control and Prevention
CFT	Community Feedback Tool
COSC	Combat and Operational Stress Control
CQI	continuous quality improvement
CSC	Community Support Coordinator
CSPM	Community Support Program Manager
DoD	U.S. Department of Defense
DoDI	Department of Defense Instruction
GTO	Getting To Outcomes
HRBS	Health Related Behaviors Survey
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
ISI	Insomnia Severity Index
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OSA	obstructive sleep apnea
P^4	program, policy, practice, or process
PDHA	Post Deployment Health Assessment
PDHRA	Post Deployment Health Re-Assessment
PROMIS	Patient-Reported Outcomes Measurement Information System
PSQI	Pittsburgh Sleep Quality Index

PTSD	posttraumatic stress disorder
SHUT-I	Sleep Healthy Using the Internet
SMART	specific, measurable, achievable, realistic, and time-based
SRI	sleep-related impairment
TBI	traumatic brain injury
TIB	time in bed
TST	total sleep time
USAF	U.S. Air Force
VPI	Violence Prevention Integrator
WASO	wakefulness after sleep onset

Introduction and Overview

BACKGROUND ON GETTING TO OUTCOMES AND CONTENT AREA MODULES

This Content Area Module (CAM) for Air Force Sleep Health Promotion is a companion volume to the *Getting To Outcomes® (GTO) Operations Guide for U.S. Air Force Community Action Teams*. It includes guidance and resources for Community Action Teams (CATs) that have an interest in sleep health promotion.

The main volume of the GTO Operations Guide provides tools and resources for using GTO to plan, evaluate, and improve any integrated resilience and violence prevention program, policy, practice, or process—what we call *P*^{4}—that a CAT is interested in including in its Community Action Plan (CAP). The GTO guide leads CATs through the ten steps of GTO, shown in Figure I-1, and provides supplemental information and resources to support implementation of integrated resilience and violence prevention P^4. The GTO guide is a sequence of overviews, tools, and additional resources for each GTO step.

GTO is currently being incorporated into U.S. Air Force (USAF) guidance and instructions for completing CAPs. The GTO guide does not go into depth about how to apply GTO to any specific substantive area. CAMs, such as this one, that accompany the GTO guide provide significantly more depth in four domains: sleep health promotion, suicide prevention, sexual harassment prevention, and workplace stress prevention and reduction. This CAM is intended to be used with the GTO guide for planning a sleep health promotion initiative as part of a CAP.

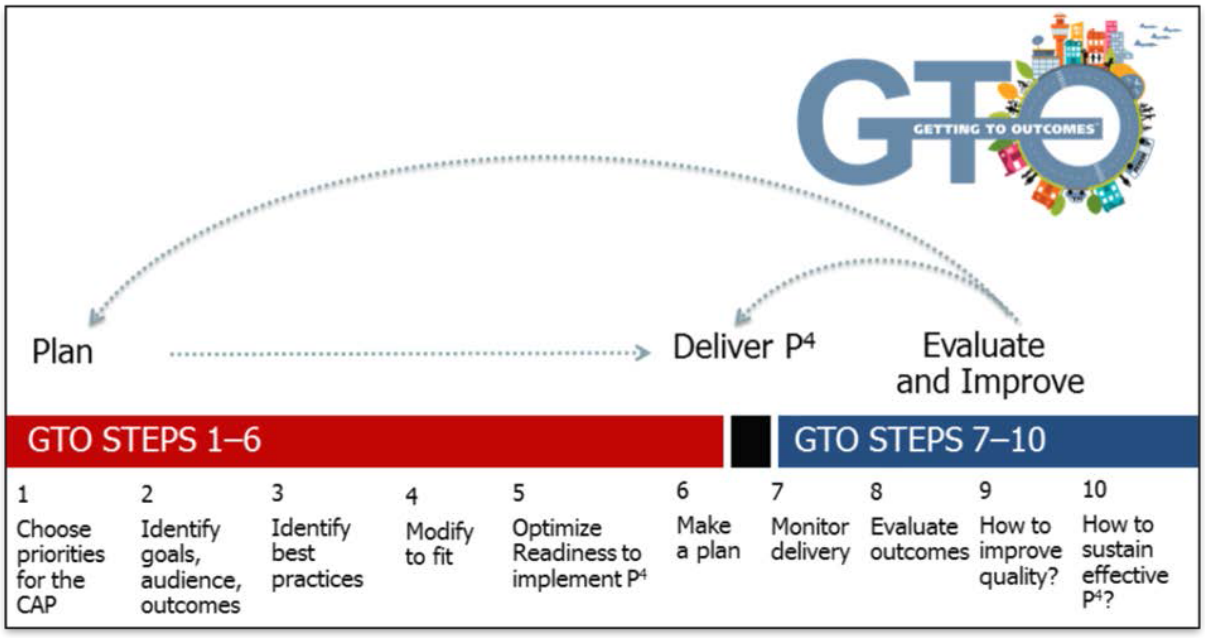


Figure I-1. The Ten Steps of Getting To Outcomes

This CAM provides examples of completed GTO tools for sleep health promotion. The examples of completed GTO tools presented here relate to a hypothetical scenario at a fictional Air Force installation, Townville Air Force Base (AFB). The example tools follow the Townville AFB CAT's work using GTO to consider multiple sleep health–related problems,

select best-practice P^4 for consideration, and plan and prepare to evaluate its final selection. In this hypothetical example, we have selected a real sleep health program, CBT-I Coach, which has been tested in service member populations and as an app-based program and is appropriate as a P^4, given its scalability and relatively low resource intensity. Notably, there are many similar app-based or internet-based sleep programs available (e.g., Sleep Healthy Using the Internet [SHUT-I], Sleepio, and many others), many of which have empirical support (see Shin, Kim, and Grigsby-Toussaint, 2017, for a recent review). As with all CAMs, the selection of this program is not an endorsement of any particular program over another. Rather, this CAM provides an example that satisfies specific criteria that are appropriate for a sleep health promotion program and serves the purpose of having a specific example to carry through each of the GTO steps. The scenario involves the preparation of the installation's 2019–2020 CAP. Together with its CAT, Townville AFB's Community Support Coordinator (CSC) and Violence Prevention Integrator (VPI) completed the CAP for Integrated Resilience and Violence Prevention using the GTO framework. They received training and support from their major command (MAJCOM) Community Support Program Manager (CSPM). Throughout the process, they updated the installation's Community Action Board (CAB) and incorporated its feedback. The examples of completed GTO tools for CBT-I Coach, included in this CAM, are provided to illustrate the instructions included in each chapter of the GTO Operations Guide. Although the characters, CAT, and AFB are fictional, the remaining details are as realistic as possible. That is, the information about existing data sources, sleep health promotion and intervention P^4, and the evidence supporting them are correct to the best of our knowledge.

BACKGROUND ON SLEEP HEALTH

Sleep health is an operational imperative. We spend roughly one-third of our lives asleep—if we are lucky enough to get the 7–8 hours of sleep per night recommended by the Centers for Disease Control and Prevention (McKnight-Eily et al., 2009). However, service members are not sleeping enough, and this is affecting their readiness, their well-being, and their physical health.

Sleep loss affects performance and operational effectiveness. After being awake for 24 hours, a person experiences about the same level of impairment as someone with a blood alcohol content above the legal limit for driving (Dawson and Reid, 1997).

- Sleep deprivation and fatigue impair cognition, attention, reaction time, and moral reasoning, all of which are critically important for operational effectiveness (Wesensten and Balkin, 2013).
- Between 12 and 25 percent of the most-severe aviation accidents are attributed to fatigue.
- Multiple nights of restricted sleep are linked with reductions in physical strength and endurance and slower recovery from athletic injury (Reilly and Piercy, 1994).

Sleep loss affects mental health and increases suicide risk. Service members with sleep problems are at increased risk of developing depression, anxiety, alcohol use problems, and posttraumatic stress disorder (PTSD) and are at increased risk for suicide (McLay, Klam, and Volkert, 2010; Wright et al., 2011).

Sleep loss affects physical health. Insufficient sleep and poor-quality sleep are linked with health problems that include obesity, diabetes, and heart disease. Service members with poor sleep are more likely to miss work days, more likely to have higher health care utilization, and less likely to deploy (Seelig et al., 2016).

Service members are at high risk for insufficient sleep and other sleep-related problems.

- Roughly 50 percent of Airmen reported getting "less sleep than they need" in the 2015 RAND Health Related Behaviors Survey (https://www.rand.org/nsrd/projects/hrbs.html; Meadows et al., 2018).
- In 2012, a RAND report found that 31 percent of service members were getting five hours or less of sleep, which is considered "extreme short sleep duration" (Troxel et al., 2015).

But healthy sleep is more than just the amount of sleep you get—quality also matters! Unfortunately, service members are also at elevated risk for poor sleep quality and daytime fatigue, both of which can have significant consequences for service member readiness, health, and well-being. For instance, 48.6 percent of service members reported clinically significant poor sleep quality (Troxel et al., 2015).

Service members engage in a number of strategies to manage sleep problems and daytime fatigue, including taking sleep medications and stimulants, which can also compromise readiness because of the known side effects of these medications. For instance:

- 18.4 percent of service members surveyed in the RAND study took medicine during the prior month to help them fall asleep (Troxel et al., 2015).
- 7.5 percent of Airmen in the 2015 Health Related Behaviors Survey (HRBS) (Meadows et al., 2018) reported using sleep medications "every day" or "almost every day," and approximately 20 percent reported using energy drinks either daily or weekly.

Beyond these specific sleep symptoms and sleep-related behaviors, service members are also at risk for several **sleep disorders**, including insomnia, obstructive sleep apnea, and nightmares. Each of these disorders, their prevalence rates, and their impacts on service members are described in detail in Appendix A.

In summary, service members are at high risk of having short sleep duration, poor sleep quality, and problems with daytime fatigue, as well as increased risk for certain sleep disorders. As we will discuss below, these sleep problems and disorders can have a direct effect on USAF readiness, as well as indirect effects, given that Airmen often engage in strategies to manage sleep problems and fatigue (e.g., taking sleep medications, consuming large doses of caffeine) that may also compromise readiness.

RISK AND PROTECTIVE FACTORS FOR SLEEP PROBLEMS

This section describes individual and organizational factors related to sleep. These are summarized in Table I-1.

Individual-Level Factors

Demographics. Prior research has identified a number of demographic characteristics associated with increased risk for sleep problems, including gender, age, and race/ethnicity (Taylor et al., 2005; Young et al., 1993):

- **Gender** is associated with sleep disturbances, but the direction of association depends on the nature of the sleep disturbance (e.g., Capaldi, Guerrero, and Killgore, 2011; Mysliwiec et al., 2013a).
- **Race/ethnicity.** Non-Hispanic black or African American service members reported shorter sleep duration and more difficulty initiating and maintaining sleep than white service members (e.g., Gellis et al., 2010; Meadows et al., 2018).

- **Higher education** is related to greater sleep satisfaction among service members (Meadows et al., 2018).
- **Marital status.** Married people have lower rates of poor sleep quality and short sleep duration than unmarried, divorced, and separated people (Troxel et al., 2007).

Health behaviors. Poor health behaviors are associated with higher rates of sleep problems (Seelig et al., 2010; Swinkels et al., 2013; Toblin et al., 2012), whereas practicing healthy sleep behaviors (i.e., "good sleep hygiene") may be a protective factor.

- **Alcohol use.** Among 41,000 Operation Enduring Freedom and Operation Iraqi Freedom (OEF and OIF) active-duty service members, problems with drinking alcohol were correlated with trouble sleeping (Seelig et al., 2010).
- **Use of technology**, especially before bedtime, is also a key contributor to sleep problems, due to both the stimulating content of social media and video games and the exposure to light emitted from electronic devices, which can directly suppress the hormone melatonin, which helps to signal sleep onset (Grandner, Gallagher, and Gooneratne, 2013).
- **Excessive use of caffeine or energy drinks.** 44.8 percent of respondents from the 2010 Deployment Well Being Survey consumed at least one energy drink (e.g., Red Bull, Monster, 5-Hour Energy) per day. High usage of energy drinks was associated with mental health problems, aggressive behaviors, and fatigue in servicemembers (Toblin et al., 2012).
- **Healthy sleep behaviors.** A protective factor was practicing good *sleep hygiene*, which encompasses a set of sleep-related behaviors, including following consistent sleep-wake routines (when possible); using well-timed naps; having comfortable sleep environments in terms of light, noise, and temperature; and avoiding excessive use of alcohol or caffeine.

Mental and physical health comorbidities. Sleep problems can be both a cause and a consequence of poor mental health.

- Sleep problems are particularly common among service members with major depression, PTSD, pain, or traumatic brain injury (TBI) (Goff et al., 2007; Insana, Kolko, and Germain, 2012; Lew et al., 2010; McLay, Klam, and Volkert, 2010; Plumb, Peachey, and Zelman, 2014; Swinkels et al., 2013; Wallace et al., 2011).
- Sleep problems can also predict the onset of new mental health problems (Goff et al., 2007; Insana et al., 2012; Lew et al., 2010; McLay, Klam, and Volkert, 2010; Plumb, Peachey, and Zelman, 2014; Swinkels et al., 2013; Wallace et al., 2011).

ORGANIZATIONAL FACTORS

Below, we provide some examples of organizational factors, including service branch, occupational categories, and military cultural factors, that are associated with sleep problems.

Service branch

- The HRBS report (Meadows et al., 2018) found that Airmen were significantly more likely to get sufficient sleep (7–8 hours) when compared with personnel in the Army, Navy, or Marines.
- However, rates of insufficient sleep and daytime fatigue were high across all service branches, including the Air Force (AF).

Occupational categories

- Service members deployed in support and sustainment units (e.g., medics) and as electronic equipment repair specialists are at higher risk for sleep problems (Armed

Forces Health Surveillance Center, 2010; Brundage, Wertheimer, and Clark, 2010; Seelig et al., 2010).
- Service members with occupations that require shiftwork are also at risk for sleep disturbances (Caldwell and Gilreath, 2001; de Souza Palmeira, Lucia, and Marqueze, 2016; Shattuck and Matsangas, 2017).
- Occupational stressors, including high operational tempo environments and unpredictable, hostile, or threatening conditions, can also increase risk for sleep disturbance.
- In contrast, operational schedules that are more closely aligned with circadian rhythms are important protective factors to promote better sleep and reduce errors and accidents.

Military culture/attitudes from leadership. Military cultural attitudes and beliefs about sleep might serve as risk factors for poor sleep in this population, as well as critical barriers to the implementation and enforcement of healthy sleep practices (Brown, Caldwell, and Chandler, 2013; Kennedy, 2009; Miller and Shattuck, 2005; Mysliwiec et al., 2013b). In contrast, strong leadership that recognizes the critical role of sleep for operational effectiveness is a key protective factor.
- "The operational community treats the need for sleep as a resource to be rationed in the best times, and as a sign of weakness in the worst" (Brown, Caldwell, and Chandler, 2013).
- Lower levels of assistance or encouragement from unit members and leaders and limited exposure to sleep management training in theater are associated with poor sleep quality (Miller, Shattuck, and Matsangas, 2011).

Unit- and deployment-specific risk factors
- A greater number of deployments, a greater length of deployment, greater combat exposure while deployed, and deployment to Iraq or Afghanistan versus other locations are additional factors associated with an increased risk of poor sleep quality and short sleep duration postdeployment (Luxton et al., 2011; McLay, Klam, and Volkert, 2010; Plumb, Peachey, and Zelman, 2014; Seelig et al., 2010; Swinkels et al., 2013; Wright et al., 2011).

Sleep-related habitability/environmental factors. Noise, inadequate temperature and airflow, and inappropriate lighting and light pollution have each been associated with sleep loss and circadian misalignment. In contrast, environments that are cool, dark, quiet, and perceived as private and safe can promote sleep health.

Table I-1 summarizes research on which factors, at the individual and organizational levels, are associated with either greater risk for sleep problems or protection from them. In some cases (such as gender), factors are labeled "depends;" gender can be a risk or protective factor, depending on the type of sleep disturbance. Risk or protective factors that are considered modifiable and viable targets of P^4 strategies are indicated by bold text.

Table I-1. Individual and Organizational Risk and Protective Factors for Sleep Problems

Level of Impact	Factor	Increases Risk	Provides Protection
Individual	Gender	(depends on the sleep symptom)	
	Race/ethnicity (non-Hispanic blacks compared with non-Hispanic whites)	X	
	Married		X
	Increased age	X	
	Higher levels of education		X
	Poor health behaviors or poor sleep hygiene (e.g., use of energy drinks)	X	
	Co-occurring mental or physical health problems	X	
Organizational	Air Force (compared with the Army, Navy, and Marine Corps)		X
	Occupational characteristics (e.g., shiftwork)	X	
	Junior enlisted personnel	X	
	More-frequent or longer deployments	X	
	Combat exposure	X	
	Unit support or leadership support		X
	Occupational stressors	X	
	Cultural attitudes that undermine sleep (e.g., “sleep is for the weak”)	X	
	Sleep environment and habitability		X

SLEEP HEALTH PROMOTION P^4

Promoting healthy sleep and preventing sleep problems may enhance Airmen’s resilience, health, and readiness. In choosing the right P^4, it is important to consider the following:

1. Which risk factors are contributing to sleep disturbances, and which protective factors may promote sleep health?
2. What types of sleep disturbances are most common at your installation?

Ultimately, choosing the right P^4 should be based on a balance of fit, within both the military in general and USAF specifically; evidence to support that the P^4 works; and scalability to address the needs of the installation.

Based on our review and a consensus of military sleep experts, there are no established and evidence-based sleep health promotion P^4 specifically tested in USAF or the military more generally; however, there are several promising practices to promote sleep health. These promising practices are based on scientifically supported principles, show positive effects in related areas (e.g., treatment of insomnia), or are supported by credible experts. Selections for sleep interventions should focus on these promising practices and should be evaluated using the GTO process to determine whether they are achieving the desired impact and whether adaptations for the military and nonclinical populations are needed.

Sources of Promising Practices

There are a number of valuable resources for identifying promising practices for sleep health promotion that stem from existing U.S. Department of Defense– (DoD-) and USAF-specific sleep-related policies, as well as guidance on the state of the science for promoting sleep health from experts in the field, including working group members from the RAND sleep working group, the American Academy of Sleep Medicine, the Centers for Disease Control and Prevention, the National Sleep Foundation, the Center for Deployment Psychology, the U.S. Department of Veterans Affairs, the National Institutes of Health, and the Institute of Medicine.

Before discussing the promising P^4, we note that a comprehensive review of DoD- and USAF-specific policies is provided in Appendix B. Despite the presence of these codified policies, which are built around sound scientific principles and clinical recommendations, there has not been systematic evaluation of these codified policies, largely because it is difficult to carry out evaluations and enforce these policies in the face of mission priorities.

For example, in one study of Army officers, 80 percent reported not receiving sleep management briefings during deployments (Miller, Shattuck, and Matsangas, 2011). The majority of the officers (74 percent) reported that their unit never or rarely encouraged or monitored naps, and most (67 percent) reported that their unit never or rarely designated dark or quiet areas for rest. Given the inherent qualities of deployments, as well as other operational and training environments that make sleep difficult, the policies outlined in Appendix B include

- encouraging somewhat regular sleep schedules and allowing sufficient times for rest and sleep
- designating dark areas for rest
- encouraging naps
- providing designated time off for rest, as well as other fatigue countermeasures and interventions to minimize circadian disruption caused by shiftwork or jet lag (e.g., use of caffeine, light therapy) (Wesensten and Balkin, 2013).

We highlight examples of promising practices that reflect evidence-based interventions that could be tailored to promote sleep health and prevent the onset of chronic sleep disturbances, as well as specific types of administration that may be most promising in terms of scalability.

Key components of best practices for sleep health P^4:

1. **Awareness that sleep is an operational imperative.** A key goal of Healthy People 2020, a federal initiative to improve the health of the nation, is to "increase public knowledge of how adequate sleep and treatment of sleep disorders improve health, productivity, wellness, quality of life, and safety on roads and in the workplace" (Healthy People 2020, 2018). Such expanded awareness and education campaigns should ideally occur within training and operational contexts, as well as in USAF medical settings, and should be targeted at both line leaders and their subordinates. Furthermore, there is a need for **ongoing sleep education and awareness campaigns in both operational and medical settings and at every stage of command** (Hsu et al., 2018). In addition to providing basic education about sleep needs and consequences of sleep loss, these awareness campaigns should be tailored to the target population and, for the USAF, should include a focus on fatigue countermeasures and strategies to mitigate circadian rhythm disruption caused by shiftwork or jet lag. In addition, awareness campaigns should highlight existing USAF policies (see Appendix B) related to sleep and should focus on implementation and enforcement of policies related to sleep plans, required rest periods, and counterfatigue measures.
2. **Creating a sleep health–promoting culture.** This can include changing "policies, institutional structures, or the social and physical environment in an effort to reduce risk characteristics and increase protective factors that affect the entire community" (Basile et al., 2016). The most-promising strategies to influence cultural change and to ensure that the P^4 is successfully implemented are high-level advocacy, clear and enforceable policies that support or demand the change, education (initial and ongoing) of the entire force, and communication of a clear message.
3. **Education on healthy sleep behaviors.** Existing sleep health promotion programs that have been targeted toward adolescents and college student samples (as reviewed in (Cassoff et al., 2013) incorporate principles of sleep hygiene (e.g., practices that help or hurt sleep, such as excessive caffeine use or light exposure prior to bedtime), as well as stimulus control, which, simply stated, suggests that the bed should be used for sleep (and sex) alone, as opposed to other activities (e.g., technology use, watching TV). Evidence from these programs suggests that although they are successful at enhancing education about sleep, they have only modest effects at changing sleep- related behavior (Cain, Gradisar, and Moseley, 2011; Cortesi et al., 2004; De Sousa, Araujo, and De Azevedo, 2007; Kira et al., 2014; Moseley and Gradisar, 2009; Tan et al., 2012; Wing et al., 2015). Therefore, they should be used in conjunction with a systematic behavioral program. Although these programs are primarily targeted toward college student populations, there is considerable overlap in terms of age and other risk factors associated with sleep disturbance in college students and younger Airmen.
4. **Promoting healthy sleep environments in operational environments.** It may be particularly important in military settings to augment sleep hygiene instructions with other practical solutions, such as sending sleep kits containing an eye mask or earplugs and other supplies to service members in deployed settings or other environments in which environmental disruptions may be a primary cause of sleep disturbances (Troxel et al., 2015).
5. **Changing sleep-related behaviors and cognitions.** Cognitive behavioral therapy for insomnia (CBT-I) comprises multiple cognitive and behavioral techniques that target maladaptive thoughts and behaviors about sleep. CBT-I has been shown to be a highly effective treatment for insomnia and other sleep-related symptoms (Mitchell et al., 2012) in both civilian and military samples. In 2005, the National Institutes of Health recommended CBT-I as a highly efficacious treatment for insomnia, and CBT-I is recommended as the frontline treatment for insomnia by the American College of Physicians. The Center for Integrated Healthcare has also endorsed CBT-I as an

empirically supported treatment for insomnia within military and veteran populations (Center for Integrated Healthcare, 2009). Additional information on CBT-I is included in Appendix C.

Table I-2 provides a summary of the main types of promising practices that address identified risk factors for sleep disturbances and some of the most prevalent sleep symptoms in the USAF and military more generally, including insufficient sleep duration, insomnia, and poor sleep quality.

Table I-2. Summary of Promising Practices to Promote Sleep Health

Strategy	Approach
Awareness and cultural change	• Address cultural resistance to sleep health • Message sleep as an operational imperative • Leadership serves as role models to support sleep health and sleep needs • Adequate opportunities for sleep are provided, as dictated by policy and operational demands
Education	• Practice good sleep hygiene (keep consistent sleep-wake schedules; avoid caffeine and alcohol; remove technology [e.g., cell phones, video games, and TV] from the bedroom; keep the sleeping environment comfortable)
Promoting healthy sleep environments	• Optimize sleep environments (e.g., cold, dark, quiet, private, safe) when possible • Provide sleep kits, containing eye masks and ear plugs, in deployed environments to offset some of the environmental contributors to sleep disturbance
Cognitive-behavioral strategies	• Multicomponent intervention designed for the treatment of insomnia • Generally includes sleep restriction, stimulus control, and cognitive restructuring of beliefs related to sleep • Various modalities available: individual, in-person; group; online; app-based; video; phone

OVERVIEW OF CAM CONTENT

Drawing on the risk and protective factors for sleep problems reviewed above and expert recommendations on promising practices for sleep health promotion, this CAM provides an example of a GTO process for sleep health promotion, focusing on those aspects that are particularly modifiable with the use of a P^4. It contains a chapter for each GTO step that you will be using to develop your CAP for a sleep health promotion P^4. Each chapter contains

- ✓ an overview of the GTO step, as carried out by the fictional Townville AFB CAT, described above
- ✓ tips and resources specific to sleep health promotion
- ✓ an example of completed tools for each GTO step.

This sleep health promotion CAM is a companion volume to the GTO guide, which contains more-detailed instructions for how to complete each step, additional tips and resources for each step, and blank tools. For example, the GTO guide contains guidance for selecting an evaluation design, identifying outcome measures, and reporting evaluation results.

Chapter One

GTO Step 1—Problems and Resources Assessment for a Sleep Health Promotion P^4

What is GTO Step 1?

The Community Action Team (CAT) at Townville AFB identified sleep health as an increasing problem, based on the Community Feedback Tool and focus groups.

The team begins at Getting To Outcomes (GTO) Step 1: an assessment of its community and target population to identify relevant problems, gaps, and resources. First, it gathers information on the problems and needs in its community by reviewing some data sources (included in Tip 1-1). Lt Col Jones, a CAT member, volunteers to complete the *Data Catalog Tool* and readily identifies several sources of U.S. Department of Defense (DoD) data that can help the CAT understand the scope of the problem. Lt Col Jones also works with local preventive medicine and epidemiology experts to identify other data sources.

Townville AFB is a high operational tempo base where many Airmen do shiftwork, often with irregular and unpredictable schedules and high work demands, and are regularly deployed. These occupational characteristics and stressors put these personnel at high risk for sleep problems. Furthermore, there has been increasing concern that sleep problems may be contributing to occupational errors and accidents or "near misses." As Lt Col Jones documents in the Data Catalog Tool below, based on data reported from the Community Feedback Tool, she learns that 51 percent of Airmen report "sleeping problems" (including sleeping too little, sleeping too much, or nightmares), and 50 percent report feeling tired frequently. These findings are noted in the Data Catalog Tool to help identify the ideal P^4 to address each of these critical sleep problems.

Identifying your installation's risk and protective factors

Some data sources exist that can help you identify risk or protective factors and the types of sleep disturbances on which to focus your sleep health promotion plans. Note the following pros and cons of data sources.

Pros

- The data source assesses the prevalence of sleeping problems and feeling tired.
- All Active Duty, National Guard, and Air Force Reserve personnel are eligible and invited to participate in this survey.
- Data are available for each installation.

Cons

- The survey has a low response rate.

Tip 1-1. Links to existing data sources to help you identify needs in your community

Local Data Sources	Content	Reporting Period	Resources for More Information
Community Feedback Tool (CFT)	USAF community needs assessment covering • self-rated health, resilience, and attitudes toward military service • problems, needs, and resources used • attributes of military resources • feedback from spouses of Airmen • the three most commonly experienced types of problems on your installation • items related to sleep (feeling tired, "sleeping problems," and "enough time for sleep, healthy diet, or exercise").	• Installation report every 2 years; your installation's most recent survey report was provided to your MAJCOM's CSPM and VPI in May 2018.	• Your MAJCOM's CSPM and VPI
Behavioral Risk Factor Surveillance System (BRFSS)	• State-based, random-digit-dialing telephone survey of noninstitutionalized adults aged 18 years residing with landline telephones in all 50 states, the District of Columbia, and U.S. territories • Information on military service, perceived insufficient rest or sleep, sociodemographic characteristics, and health-related behaviors • In 2016, a sleep disorders state module was added to 11 states assessing insomnia, daytime sleepiness, and snoring/sleep apnea risk.	• Annual	• Chapman et al., 2015 • Centers for Disease Control and Prevention, 2017

NOTE: You are encouraged to consider other local quantitative data, such as aggregate data from the Periodic Health Assessment, and qualitative data, such as CAT or Community Action Board (CAB) member expertise or Airman input.

Data Catalog Tool

Completed by: Lt Col Jones **Date:** 1 MAY 2018

Risk Factors or Problem Areas and other gaps, e.g. resilience factors to be increased	Sources of Data	Existing or New Data	Person Responsible/ Date Due
1. **Sleeping problems:** 51% of Airmen reported sleeping problems, including sleeping too much, sleeping too little, or nightmares	Community Feedback Tool, Townville AFB–specific data	Existing	Community Support Coordinator Month 1
2. **Daytime fatigue:** 50% of Airmen reported feeling frequently tired	Community Feedback Tool, Townville AFB-specific data	Existing	Community Support Coordinator Month 1
3. **Sleep disorders diagnoses:** 25% of Airmen have an ICD-10 diagnosis of insomnia	Defense Manpower Data Center automated health data	Existing	Community Support Coordinator Month 1

NOTE: ICD-10 = International Statistical Classification of Diseases and Related Health Problems, 10th revision.

Next, the Townville CAT reviews existing Air Force resources that can potentially address the identified problems in the Data Catalog Tool. Through formal and informal sources, the members identify one P^4 that targets the sleep-related behaviors and problems noted in the Data Catalog Tool: the afterdeployment.org sleep resource site. They document this P^4 in the *Community Resources Assessment Tool*. Maj Green, a CAT member, uses this information to complete the Community Resources Assessment Tool.

Community Resources Assessment Tool

Completed by: Maj Green **Date:** 1 MAY 2018

	Resource 1	Resource 2	Resource 3
Name of resource and its services/ activities	Afterdeployment.org sleep resource site, which includes video stories, sleep assessments, a sleep library, and links to additional resources		
Location (Installation or Community)	Virtual		
Target population served	Service members		
Hours of operation	24/7		
Who uses it?	Because this is a virtual resource, it is accessed on an ad hoc basis, and utilization data for Townville AFB are not available		
Community risk factors addressed	Sleep behaviors and sleep problems		
Protective and resilience factors being promoted	Healthy sleep behaviors		
Any outcomes/evidence of effectiveness produced by the resource?	None		
What's working?	Difficult to know, given that the use of the resource by Townville AFB personnel is unknown		

The Townville CAT is satisfied that there are policies in place that are consistent with expert recommendations concerning what constitutes sufficient sleep (7–8 hours) and policies concerning shiftwork and crew rest schedules.

However, the existence of such policies does not always ensure healthy sleep among Airmen. The review of existing P^4 in the Community Resources Assessment Tool highlighted a significant lack of existing programs available to promote healthy sleep behaviors and unknown effects of existing resources. Moreover, cultural attitudes that tend to undermine sleep are pervasive and often perpetuated by leadership, which has a trickle-down effect on junior officers and enlisted Airmen, which can serve as a barrier to sleep health promotion. On the other hand, given that junior enlisted Airmen are more likely than officers to have certain sleep problems, it is important to deliver sleep health education to all levels of command.

The Townville CAT concludes that ongoing training to inform members of existing Air Force sleep health policies and enforcement of such policies is necessary to promote enhanced recognition by leadership of the importance of sleep for operational effectiveness and to change cultural attitudes that have traditionally undermined sleep. The CAT also notes key gaps in sleep health education that should be addressed among junior enlisted Airmen and officers and should engage the local public health activity. Consistent with the goals of Healthy People 2020, the CAT identifies the following priorities:

1. sleeping problems, particularly the percentage of Airmen failing to achieve adequate sleep (7–8 hours)

2. daytime fatigue among Airmen and its impacts on performance.

Having identified its priorities, the Townville CAT is ready to consider its goals and desired outcomes in GTO Step 2.

The CAT uses the *Triaging Among Problems Tool* (below) to identify priority areas. Using the Triaging Among Problems Tool, the team discusses and identifies the key problem areas to be addressed, existing resources and capacities, mandated priorities, and target population.

Triaging Among Problems Tool		
Triaging Process Questions	**Problems to be addressed:** **(1)**	**(2)**
1. List problems to be addressed.	**Sleeping problems:** 51% of Airmen reported sleeping problems, including sleeping too much, sleeping too little, or nightmares.	**Daytime fatigue:** 50% of Airmen reported feeling tired frequently.
2. List capacities needed to address the problem	• Trainers with expertise in creation of sleep plans, behavioral treatments of sleep problems, staff, curriculum, policy documents, leadership time • Programs focused on promotion of healthy sleep behaviors	A targeted strategy to ensure that available P^4 are relevant to the needs of enlisted service members
3. Is this problem currently being addressed elsewhere (at the installation or neighboring community)?	No	No
4. Is this a problem that we lack the resources (time and budget) to confront?	No	No
5. Is this a problem that we cannot change or whose change we cannot measure?	No	No
6. Is this a problem that we choose not to address at this time?	No	No
7. Is this a problem that our installation must address to comply with AF CAB or MAJCOM priorities?	Yes	Yes
Highlight the remaining problems with associated capacities and the mandated priorities. These are your priority problems.	Need training to help senior line leaders develop sleep plans Ensure that the program addresses gaps that lead to differences in sleep problems by pay grade	Ensure that the program addresses gaps that lead to differences in daytime fatigue by pay grade
9. Specify your target population, including their characteristics and the approximate number for which you have resources, e.g. all Airmen or a more targeted group?	All Airmen	All Airmen

Chapter Two

GTO Step 2—Goals and Desired Outcomes for a Sleep Health Promotion P⁴

What is GTO Step 2?

As reviewed in Step 1, the Townville CAT has decided to focus on improving sleep health (i.e., increasing sleep duration and quality) by providing sleep health promotion training at all levels of Airmen. The team has limited resources to collect new data, so, before it defines its outcomes in the *SMART Desired Outcomes Tool*, it reviews existing surveys that assess sleep health. To determine realistic goals, it considers what the baseline is in terms of percentage of Airmen achieving desired goals for sleep duration and fatigue and what would be an achievable goal following a one-year implementation strategy, based on a review of the existing literature. For example, some sleep promotion interventions focused on habitual short sleepers show that 50 percent of participants who received a brief sleep health promotion program increased their sleep duration, by 21 minutes on average. Although this may seem like a small increase in sleep duration, when considered cumulatively, such increases could have a big impact on operational effectiveness. Based on a predetermined goal for the desired outcome, Capt Adams, a CAT member, agrees to lead the effort by reviewing Townville's results in its CFT report, including the report's pros and cons.

The **Community Feedback Tool** is a survey assessing indicators of self-reported health and resilience, preparedness to handle family matters in the event of a deployment, and attitudes toward military service or employment. The survey includes items related to sleep problems and daytime fatigue.

Pros

- Survey data can be examined at the squadron level and stratified by other areas of interest.

Cons

- The survey only reports on the proportion of Airmen who obtained 5 or more hours of sleep per night. However, guidelines indicate that adults should obtain 7–8 hours of sleep per night. Therefore, knowing the number who obtained 5 or more hours of sleep **does not** provide meaningful insight into the proportion that may have sleep problems. It is therefore determined that this tool **does not contain meaningful data** to use for monitoring purposes.

Based on Capt Adam's review of data sources that would allow the CAT to avoid costly collection of new data, the CAT selects three measures from the Community Feedback Tool

to assess its goals using the SMART Desired Outcomes Tool, which helps with setting targets that are specific, measurable, achievable, realistic, and time-based (SMART). Using the information from the Community Feedback Tool about current sleep issues at Townville AFB, Capt Adams is able to identify clear and agreed-upon goals. Of note, not all goals could be measured using existing Community Feedback Tool data, and Capt Adams also considers other data sources that could be used to assess progress toward these goals. Therefore, Capt Adams also considers other assessments for measuring goals, with a focus on brief but validated assessments.

With these goals identified, the CAT is also able to begin the process of completing the *Community Action Plan Overview Tool*. By formalizing its goals, the team is also better equipped to begin outreach to installation leadership to share its vision. The team establishes measurable goals by reviewing the literature on similar sleep health promotion programs to determine SMART goals. Lt Col Jones, the CAT chair, schedules short meetings with key installation leaders to share the team's goals to improve sleep health at Townville AFB. These meetings will be used to obtain feedback about the goals and direction of the initiative, get buy-in for the team's plans, and learn more about any similar P4 with which the team will want to coordinate.

The next step will be to move forward with selection of the best P^4 to achieve the goal of promoting sleep health among service members.

SMART Desired Outcomes Tool

Completed by: Capt Adams **Date:** 20 MAY 2018

	Goal:	**SMART Desired Outcome Statement**
	Improve positive sleep hygiene and sleep behaviors among service members	Within 6 months of program implementation, 70% of service members report good sleep hygiene, as assessed by the Sleep Hygiene Index.
	SMART Checklist	
Specific	Sleep hygiene and sleep behaviors can be measured with a specific instrument, such as the Sleep Hygiene Index (Mastin, Bryson, and Corwyn, 2006)	
Measurable	70% of service members report good sleep hygiene	
Achievable	Appears likely if a P^4 is identified that can be widely disseminated across the installation	
Realistic	It is realistic that a P^4 focused on sleep hygiene and stimulus control would promote these outcomes	
Time-based	Within 6 months of program implementation	
	Goal:	**SMART Desired Outcome Statement**
	Decrease sleep problems among service members	Within one year of program implementation, 70% of Airmen have ISI scores <=14 or show a reduction of 6 or more points on the ISI.
	SMART Checklist	
Specific	Difference in ratings of sleep problems before and after participation in the selected P^4, which can be measured with existing instruments, such as the Insomnia Severity Index (ISI)	
Measurable	Post-treatment ISI scores will be <=14, which indicates subthreshold or no clinically significant insomnia, or a reduction in ISI of 6 or more points, to indicate significant improvement	

SMART Desired Outcomes Tool—Continued		
	Goal:	**SMART Desired Outcome Statement**
Achievable	It may be challenging to make a widespread impact on sleep quality and other outcomes, given cultural attitudes toward sleep in the military; however, other sleep health promotion programs have demonstrated significant improvements in sleep quality and reductions in insomnia	
Realistic	Measure aligns with identified installation needs	
Time-based	Within one year of program implementation	
	Goal:	**SMART Desired Outcome Statement**
	Decrease daytime fatigue among service members	Within one year of program implementation, achieve a statistically significant reduction, corresponding to a large effect size, in the proportion of service members reporting feeling tired during the day.
	SMART Checklist	
Specific	Difference in ratings of daytime fatigue before and after participation in the selected P^4, which can be measured with existing instruments	
Measurable	Tests of statistical significance and calculation of effect sizes can be performed for relevant scores on the fatigue measure	
Achievable	It may be challenging to make a widespread impact on sleep quality and other outcomes, given cultural attitudes toward sleep in the military; however, previous studies have demonstrated significant reductions in fatigue following internet-based sleep health promotion	
Realistic	Measure aligns with identified installation needs	
Time-based	Within one year of program implementation, achieve statistically significant reduction, corresponding to a large effect size, in the proportion of service members reporting feeling tired during the day	

Community Action Plan Overview Tool

Vision for your installation's CAP: Sleep health is a priority for all service members, as evidenced by healthy sleep hygiene and sleep behaviors, as well as good sleep quality and sleep that is consistent with national guidelines.

Completed by: Capt Adams **Date:** 20 MAY 2018

What challenges is your Community Action Plan addressing? (Summarize GTO Step 1)	What are the goals for your Community Action Plan? (From GTO Step 2)	What are your Desired Outcomes? (From GTO Step 2)	What P⁴ are you using to achieve these desired outcomes? (Finalized by GTO Step 6)	How will you assess the quality of your P⁴? *PROCESS EVAL* (from GTO Step 6)	How will you assess the outcomes of your P⁴? OUTCOME *EVAL* (from GTO Step 6)	How will you track whether your goals have been addressed? (see GTO Step 6)
1. 51% of Airmen reported sleeping problems, including sleeping too much, sleeping too little, or nightmares.	Promote positive sleep hygiene and sleep behaviors among service members	Within 6 months of program implementation, 70% of service members report good sleep hygiene, as assessed by the Sleep Hygiene Index.	CBT-I Coach	Survey measures of utilization, accessibility and satisfaction	Pre- and post-measures of sleep hygiene, sleep quality, total sleep time (TST),	Measures of fatigue and sleep problems on the next Community Feedback Tool
2. 51% of Airmen reported sleeping problems, including sleeping too much, sleeping too little, or nightmares.	Decrease sleep problems among service members	Within one year of program implementation, 70% of Airmen have ISI scores <=14 or show a reduction of 6 or more points on the ISI.	CBT-I Coach	As above	As above	As above
3. Inadequate sleep and poor sleep quality are leading to daytime fatigue, as 50% of Airmen reported feeling tired frequently.	Decrease daytime fatigue among service members	Within one year of program implementation, achieve a statistically significant reduction, corresponding to a large effect size, in the proportion of service members reporting feeling tired during the day.	CBT-I Coach	As above	As above	As above

Chapter Three

GTO Step 3—Promising Practices in Sleep Health Promotion P4

What is GTO Step 3?

In GTO Step 3, the CAT plans to consider:

1. the best available research evidence
2. practitioner expertise and other available resources.

Maj Green volunteers to lead the effort and begins by searching for a list of evidence-based practices for sleep health promotion maintained by the government, DoD, or a nonprofit agency. She determines that existing databases do not have a P4 that would be good to use and turns to the academic literature for guidance. She identifies evidence in scientific articles and other reports by

1. searching for review articles in Google Scholar using the search terms "review" AND ("sleep problems" OR "insomnia") AND "prevention"
2. searching for evaluation studies in Google Scholar using the search terms ("evaluation" or "intervention" or "program" or "treatment") AND ("sleep problems" OR "insomnia") AND "prevention"
3. Searching the *gray literature* (literature published outside of a commercial publisher) using internet search tools to find government or business reports.

Maj Green finds few rigorous assessments of sleep-related prevention P4 in real-world settings. Maj Green records what she finds in the *P4 Evidence Synthesis Tool*.

Next, Maj Green turns to promising practices. These might be considered promising because they could have a substantial evidence base supporting their efficacy but (1) have primarily been used as clinical interventions rather than prevention or sleep health promotion strategies or (2) have not been tested as prevention strategies in military populations.

Given the desire to find a way to widely disseminate the selected P4 on Townville AFB, Maj Green decides that an app-based program that delivers CBT-I would best serve the base's needs, based on the following reasons:

- A recent systematic review and meta-analysis of CBT-I in non–sleep-disordered populations found that it had a medium-sized effect on sleep quality, suggesting its effectiveness as a sleep promotion program (Murawski et al., 2018).
- Several app-based programs (e.g., SHUT-I, Sleepio, CBT-I Coach) exist that include key components that have been identified as promising practices, including a focus on cognitive-behavioral strategies to improve sleep and sleep hygiene education.

- App-based programs are scalable and accessible for Airmen at Townville AFB because all of the Airmen own mobile phones.
- An app could be easily prescribed by clinicians if Airmen report sleep difficulties or fatigue problems during regular medical visits.

After working through GTO Step 3, Maj Green decides that a mobile application called CBT-I Coach (Kuhn et al., 2014) is the approach the team will use because the app targets both needs identified by the CAT in GTO Step 1, addresses the team's goals and desired outcomes, has a strong evidence base, is currently commercially available (she learns that SHUT-I is only available for clinical trials), and is free to download.

Next, the team will move on to Step 4 to make sure that CBT-I Coach fits well with the culture and needs of Townville AFB and then to Step 5 to ensure that the organization has the P^4 readiness to carry it out well.

P[4] Evidence Synthesis Tool

Completed by: __Maj Green___ **Date:** ____1 JUNE 2018____

Section 1: Summary of Best Available Evidence			
What sources did you explore to find the best available evidence?	**Did you review this source? (Yes/No)**	**What P[4] did it suggest using?**	**What is the evidence for those P[4]?**
1. Online registries	Yes: Clearinghouse for Military Family Readiness	None; most practices were focused more on general wellness or adolescent populations	N/A
2. Systematic evidence review papers or reports	Yes: Murawski et al., 2018	CBT-I	Evidence for improved sleep quality in non–sleep-disordered populations
3. Research journal articles	Yes: Cassoff et al., 2013 Karlin et al., 2013	School-based sleep promotion programs (with components such as cognitive and behavioral strategies and sleep education) CBT-I	School-based sleep promotion programs may improve sleep knowledge but have little success in promoting behavioral change CBT-I has resulted in significant improvements in sleep, depression, and quality of life in a large implementation study in a veteran population
4. Other reports not in research journals (e.g., evaluation report from program developer, practitioners, subject experts)	Yes; nothing additional found	N/A	N/A

Complete the next section for each P[4] you listed above and continue to consider.

Evidence Synthesis Tool—Continued

P⁴ being considered: CBT-I Coach

Section 2: Assessment of Evidence-Based Approach for a Specific P⁴		
P⁴ features and how they relate to our needs, behaviors, or desired outcomes	**Does the P⁴ have these features? (Yes/No)**	**What would we need to change to make the P⁴ fit our needs?**
1. Has evidence of effectiveness.	Yes	Studies have shown that clinicians believe that online CBT-I programs, including CBT-I Coach, improve patient outcomes for patients receiving CBT-I, and an experimental study demonstrated that it is feasible and acceptable to patients. However, it has not been evaluated as a stand-alone tool, nor as a prevention or health-promotion tool (only as an adjunct to CBT-I). Therefore, modifications may be needed to determine certain situations (e.g., severity of the sleep problem) in which additional support from a clinician or medical provider is needed.
2. Focuses clearly on at least one of our identified goals and desired outcomes.	Yes	CBT-I Coach focuses on sleep hygiene and sleep behaviors and stimulus control (Goal 1), which were identified as a significant sleep-related need at this installation that could ultimately lead to better sleep outcomes (e.g., sleep duration and quality) (Goal 2).
3. Addresses the risk or protective or resilience factors related to sleep problems (see Introduction).	Yes	No changes needed.
4. Provides necessary activities and materials.	Yes	No modifications are necessary. Although CBT-I Coach was not designed for the Air Force, it focuses on the core sleep hygiene recommendations and stimulus control recommendations that are known to affect sleep across populations. Service members may need to think creatively about how they can adapt the recommendation for purposes of their military career (e.g., in situations in which they have less control over their sleep environment), but the tool is designed to be broadly applicable in providing educational resources to users.
5. Employs teaching methods to actively involve participants.	Yes	No changes needed.
6. Employs activities, instructional methods, and behavioral messages appropriate to our target population.	Yes	No changes needed.

Sleep CAM Tip 3-1. Examples of sleep health promotion P[4]

P[4] Type	Target Population	Description	Outcomes	Level of Evidence	Sample References
CBT for insomnia (CBT-I)	Individuals experiencing sleep problems	CBT-I uses cognitive and behavioral strategies to address sleep problems. CBT-I is typically an intervention targeting those with established sleep problems or sleep disorders. Multiple modalities are available (e.g., in-person, group, app-based, etc.).	CBT-I has positive effects on objective and subjective sleep outcomes in sleep-disordered populations (e.g., those with insomnia), as well as on self-reported sleep in non–sleep-disordered populations.	High	Murawski et al., 2018 Trauer et al., 2015 Okajima, Komada, and Inoue, 2011
Sleep hygiene strategies	Sleep-disordered and non–sleep-disordered populations	Sleep hygiene refers to behavioral and environmental strategies that have the potential to improve sleep (e.g., avoid caffeine and alcohol before bed, reduce bedroom noise).	Though there is some evidence that these individual strategies are associated with sleep, there are few rigorous studies testing the effectiveness of the recommendations, nor is there substantial evidence that sleep hygiene education alone would be effective on a population level.	Low	Irish et al., 2015 Montgomery and Dennis, 2004 Yang et al., 2012

P[4] Type	Target Population	Description	Outcomes	Level of Evidence	Sample References
Sleep health education programs	Adolescents and college students	Programs generally incorporate sleep hygiene recommendations and education regarding stimulus control. Examples of specific programs include Sleep Treatment and Education Program for Students (STEPS); Improving Adolescent Well-Being: Day and Night (IAWB); Australian Centre for Education in Sleep (ACES); and Food, Emotions, Routine, Restrict, Environment, and Timing (FERRET).	Though these programs are effective in improving sleep-related knowledge, they are generally less effective in producing behavioral changes.	Low to moderate, depending on outcome	Cassoff et al., 2013 Brown, Buboltz, and Soper, 2006 Moseley and Gradisar, 2009 Kira et al., 2014 Tan et al., 2012

P[4] Type	Target Population	Description	Outcomes	Level of Evidence	Sample References
Mindfulness-based interventions	Sleep-disordered populations	There are a number of mindfulness-based interventions that have been tested for sleep, such as mindfulness awareness practices (MAP); mindfulness-based therapy for insomnia (MBT-I), which integrates behavioral and mindfulness principles; mindfulness-based cognitive therapy; and mindfulness-based stress reduction, a structured psychoeducational intervention.	These interventions have been shown to improve subjective sleep outcomes, though the magnitude of change can be modest, and it is unclear whether there is a significant effect on objective sleep outcomes.	Moderate	Ong and Sholtes, 2010 Black et al., 2015 Winbush, Gross, and Kreitzer, 2007 Larouche et al., 2015

P[4] Type	Target Population	Description	Outcomes	Level of Evidence	Sample References
Complementary and alternative medicine	Sleep-disordered populations	Complementary and alternative medicine refers to a range of activities, including acupuncture and yoga.	Though these interventions often have a component of mindfulness or relaxation—elements that are present in other P[4] options listed in this table—there is limited research regarding the effectiveness of complementary and alternative medicine for sleep. Some research has suggested that yoga, acupressure, and tai chi may be effective for insomnia, but there are few rigorous studies available, and military- and veteran-specific studies often focus on sleep problems comorbid with other conditions (e.g., PTSD, chronic pain).	Low	Stoller et al., 2012 Staples, Hamilton, and Uddo, 2013 Sarris and Byrne, 2011

Chapter Four

GTO Step 4—Assessing Fit for a Sleep Health Promotion P^4

What is GTO Step 4?

During GTO Step 4, the Townville AFB CAT reviews materials for CBT-I Coach (e.g., Koffel and Farrell-Carnahan, 2014; Kuhn et al., 2014) to assess its fit. If the fit is promising, the CAT would like all service members at Townville to use CBT-I Coach. Therefore, the fit must be considered for service members with dramatically different roles, pay grades, duty hours, and tasks.

Given the diversity of Airman needs and unit cultures, the CAT is drawn to the broad applicability of CBT-I Coach. As a mobile app, CBT-I Coach is easily accessible, can be used on a service member's own schedule, and focuses on concrete and practical recommendations. Other advantages include the fact that CBT-I focuses on a range of sleep issues, including poor sleep quality and insufficient sleep duration, and can be delivered across a variety of modalities. However, service members and units must sometimes be creative in the ways that they are able to apply specific recommendations to themselves, especially in circumstances in which they may have less control over such factors as duty hours or sleep environment.

In order to assess fit, it is critical to acknowledge other circumstances that can support the implementation of CBT-I. Namely, high-level advocacy, education (initial and ongoing) of the entire force about the importance of a sleep health promotion P4, and communication of a clear message by leaders about its utility are needed to ensure the success of a sleep health promotion P^4.

The CAT's process in evaluating the fit of CBT-I Coach for Townville AFB is documented in the *P^4 Fit Assessment Tool* and the *Culturally Appropriate P^4 Checklist Tool* by Mr. Turner. During a series of brainstorming sessions, the team considered risk and protective factors and specific occupational stressors and circumstances that might influence the implementation and overall fit of the program. For instance, the team discussed how to adapt sleep scheduling instructions for Airmen who regularly work nights and how to incorporate circadian principles (e.g., importance of light exposure), particularly when traveling across time zones, into the sleep education component. Furthermore, as the team brainstormed options, it considered issues such as accessibility (e.g., whether all Airmen would have access to mobile devices), disseminability (e.g., the pros and cons of in-person versus app-based delivery methods), and appropriateness for a broad range of Airmen, based on demographics, rank, occupation, and location. The brainstorming sessions were used to complete the Step 4 tools, which increased the team's confidence that CBT-I Coach would be a good fit for Townville.

The Townville AFB CAT is now ready to move forward to Step 5 of the GTO process. In this step, it will examine current P^4 readiness to assess whether it can implement CBT-I Coach well.

P4 Fit Assessment Tool

Completed by: Mr. Turner **Date:** 1 JULY 2018 **P4 Being Considered:** CBT-I Coach

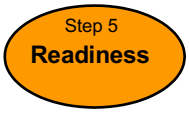
Fit with the target population's . . .	Considerations	Fits? (Yes/No)	What adaptations can be made to increase the fit?
1. Needs	P4 must provide service members with evidence-based education and recommendations about sleep hygiene and stimulus control strategies in a way that can be easily disseminated to a large group of individuals with diverse responsibilities and demands.	Yes	None needed. The CBT-I Coach recommendations are designed to be broadly applicable and based on the best scientific evidence regarding sleep health. The app has a "Create New Sleep Habits" section that gives users the opportunity to tailor the way that these recommendations can be adapted to their own circumstances (Kuhn et al., 2014).
2. Gender, age, race/ethnicity distribution	P4 must be accessible to Air Force members with diverse • occupations and work roles • genders • races/ethnicities • ages • languages.	Yes	None needed.
3. Other aspects of the target population (e.g., education level, work schedules)	P4 must readily available to all service members	Some work needed	CBT-I Coach is a mobile app developed for smartphones and other mobile devices (e.g., tablets). Although most service members have access to smartphones or other mobile devices, some consideration must be paid to those who do not have access. For example, some adaptation of materials to a workbook or paper and pencil worksheets may be necessary for the small number of individuals who cannot access the app.
Fit with the community's . . .			
4. Cultural norms and values	Military cultural attitudes and beliefs can be a barrier to enforcing healthy sleep practices	Some work needed	The CBT-I intervention relies in part on cognitive therapy strategies to address maladaptive beliefs about sleep (Kuhn et al., 2014). Though CBT-I Coach includes "tools to facilitate cognitive restructuring" (Kuhn et al., 2014, p. 600), it may be challenging for users who do not have experience with cognitive therapy to use these tools on their own (e.g., without the assistance of a therapist). Without a clear mechanism for addressing sleep-related beliefs, a focus on stimulus control and sleep hygiene alone may be less effective.
5. Environment in which the installation is located	Some service members located in deployed and operational settings may have less control over their environment or duty schedule	Yes	The sleep hygiene and stimulus control tools in CBT-I Coach are designed to help users develop plans that are tailored to their unique circumstances.

Fit with the community's . . .	Considerations	Fits? (Yes/No)	What adaptations can be made to increase the fit?
6. Other aspects of the community	P^4 must be usable for individuals of mixed ranks and roles	Yes	As noted, because CBT-I Coach includes tools that allow users to create tailored sleep hygiene and stimulus control plans, it is applicable to individuals from a range of backgrounds.
Fit with your installation's . . .			
7. Mission, core values, Wingman culture	CBT-I Coach fits well with the Air Force conceptualization of enhancing resilience.	Yes	Because CBT-I Coach was not designed specifically for Air Force service members or service members in general, it could be helpful to develop a communication plan for the dissemination of CBT-I Coach that explicitly connects the importance of sleep and sleep health to Airman resilience.
8. Resilience and violence prevention priorities	Poor sleep and fatigue are risk factors for certain negative outcomes, and being rested and alert are important for resilience.	Yes	None needed
9. Leadership support	Installation leadership supports the importance of sleep health, but individual unit leaders may be less familiar with the importance of sleep for resilience and performance.	Some work needed	Though CBT-I Coach is used at the individual level, having unit leaders who are supportive of sleep health and sleep promotion is **critical** to encourage uptake of the app. It may be helpful to consider ways that unit leaders can be educated on the importance of sleep and how CBT-I Coach could be a tool that will ultimately improve readiness in their unit.
10. Context/setting (e.g. Wingman Day)/other programs in place	Varies significantly across service members	Some work needed	Adaptations may be needed based on occupational characteristics, such as shiftwork, deployment, or in cases where sleep habitability is lacking.
11. Other aspects of the installation (e.g. space to convene)	None	Yes	None needed

Culturally Appropriate P[4] Checklist Tool

Completed by: Mr. Turner **Date:** 1 JULY 2018 **P[4] Being Considered:** CBT-I Coach

	Yes/No	What, if any, adaptations are needed?
Air Force relevance Have you verified the relevance of the materials you plan to use (i.e., applicable, understandable, specific)?	Yes	None needed. CBT-I Coach has specific tools that are designed to help individual users create plans for integrating sleep hygiene and stimulus control recommendations in a way that is tailored to their specific circumstances.
Informed review Have the materials been reviewed by members of the community or knowledgeable others (e.g., CAB/Community Action Team members)?	Yes	The CAT and CAB reviewed materials for appropriateness and feasibility.
Cultural sensitivity throughout Is the P[4] culturally sensitive throughout and not just in certain sections?	Yes	Adaptions may be needed to note explicitly when operational demands take precedence and to note safety concerns associated with sleep restriction in an operational or training setting.
Social infrastructure considerations Does the P[4] take into account language, environment, values, and socioeconomic status of the Airman community in its materials and services? What about civilians and families?	Yes	Though CBT-I Coach does not explicitly address these topics, the tools are designed to be adaptable to an individual's circumstances.
Cultural competence training Have the intended P[4] facilitators received specialized training in cultural competence?	N/A	CBT-I Coach is a mobile app, and, therefore, there are no "facilitators" per se. However, as described above, there may be value in providing basic education about sleep promotion and the role of CBT-I Coach to unit leaders to improve the uptake of the app. If this education is instituted, it would likely focus in part on the way that military culture may lead to poor sleep behaviors.



Chapter Five

GTO Step 5—Readiness to Implement a Sleep Health Promotion P⁴

What is GTO Step 5?

In GTO Step 5, the Townville AFB CAT considers whether it has the P⁴ readiness necessary to deliver CBT-I Coach without modification. To make this determination, it systematically considers the following types of readiness:

- **Strong leadership** that values the importance of sleep and that will serve as a champion for the sleep health promotion program is crucial for the program's success. Having a champion at the top of the command is critical for the success of the sleep health promotion program, in order to change military cultural attitudes that have undermined the importance of sleep.
- **Motivation** is the degree to which the CAT collectively has the needed incentives or commitment to carry out USAF CAB-mandated local, resilience, and violence prevention P⁴, especially given competing priorities.
- **P⁴-specific capacities** are the things needed to make a specific P⁴ happen. For example, an organization may need a specific helping agency to be on board in order to leverage the skills of its staff. An organization should also engage installation health clinics and primary care providers to facilitate access to CBT-I and expertise available to deliver it.
- **General capacity** is the overall knowledge, skills, and functioning of the CAT. This includes things such as supportive norms, positive climate, and the efficiency with which the CAT operates. This could be supplemented by education programs to emphasize that CBT-I is the ideal first treatment option before considering pharmacological sedatives.

The *Readiness to Implement P⁴ Tool* (below) helped to organize this task and provides a record of the final determination of the team on each component.

The CAT has determined that CBT-I Coach fills an important need on the installation because there are currently no existing, systematic efforts to promote sleep health. The relative simplicity of CBT-I Coach as a P⁴ will help to make a pilot implementation effort more feasible. The team makes decisions regarding how to design the pilot based on a review of the existing literature concerning similar online sleep health promotion programs. The CAT has already garnered installation leadership buy-in and will work to provide education and gain buy-in from unit leaders in preparation for implementation. Because CBT-I Coach is a mobile app, many aspects of implementation readiness are not a significant concern—for example, facilitators are not needed to implement the P⁴. In addition, because CBT-I Coach is free, costs will be kept relatively low and

will largely comprise personnel time. If CBT-I Coach is implemented on a wider scale, availability of technology may present a concern, though all service members on the base currently have smartphones.

After completing GTO Step 5, the CAT feels even more confident in its readiness to conduct a pilot of CBT-I Coach sessions at Townville AFB. The process of completing the Readiness to Implement P^4 Tool provided a structure that has allowed the team to set aside issues that have been addressed and focus its efforts on the few remaining readiness gaps.

Readiness to Implement P^4 Tool

Completed by: Capt Adams **Date:** 10 JULY 2018 **P^4 being considered:** CBT-I Coach

Subcomponent of Readiness	Questions	Responses	OK?	Importance	Plan to Increase Readiness
Relative Advantage (can skip if considering a P^4 you have already been implementing)	Is this P^4 better than our current P^4, or does our current P^4 remain the most advantageous?	Currently, there are no Air Force–wide or installation-wide approaches to promoting sleep health. Therefore, implementing CBT-I Coach will fill an important gap.	☒Yes ☐ No	☒ Not at all ☐ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.
Simplicity	How simple is this P^4 to implement?	Because CBT-I Coach is a mobile app, it is easy to implement. However, it will first require the development of a communication strategy to ensure that all service members on the installation are aware of the app and download it. Messaging to leadership may also increase the uptake and/or use of CBT-I Coach at the service member level.	☐Yes ☒ No	☐ Not at all ☒ Somewhat ☐ Very	Who will work on this plan? The CAT chair will work with installation leadership to develop a messaging strategy, as installation leadership is already supportive of this initiative. The chair will also work with installation leadership to develop a strategy for promoting buy-in among unit leaders. By when will it be accomplished? October 2018
Ability to Pilot (can skip if considering a P^4 you have already been implementing)	How able are we to try out this P^4?	We will pilot with a small group of service members (~5) who volunteer to participate in program testing. The pilot is useful to check whether there are any bugs in the program and to determine feasibility and	☒Yes ☐ No	☐ Not at all ☐ Somewhat ☒ Very	Who will work on this plan? The CAT chair will work to identify a group of volunteers who will pilot the app. By when will it be accomplished? December 2018

Readiness to Implement P⁴ Tool—Continued					
Subcomponent of Readiness	**Questions**	**Responses**	**OK?**	**Importance**	**Plan to Increase Readiness**
Observability	How easily can we see the results of this P⁴ soon?	The team reviews guidance on evaluation methods found in the GTO guide. We can measure sleep-related habits before use of CBT-I Coach and after some specified period of use (e.g., 4 weeks), to determine whether behavior change has occurred. We can also measure sleep outcomes (e.g., quality, duration) before and after use to see whether these metrics improve. We will also include a follow-up measure (4 weeks after the initial implementation phase) to determine whether behavior change continues to occur/and or whether changes are sustained.	☒Yes ☐ No	☐ Not at all ☐ Somewhat ☒ Very	Who will work on this plan? Lt Col Jones By when will it be accomplished? Within 8 weeks of the final pilot participant enrolling We will first measure the effects of the P⁴ on the group of individuals who participate in the pilot. Existing measures of sleep and sleep hygiene can be used.
Priority	How important is this P⁴ compared with other things we do?	Very important. Sleep is critical not only for day-to-day performance, but also for longer-term physical health, mental health, well-being, and readiness. This is a low-burden way to target sleep in a large population of individuals over a short period of time.	☒Yes ☐ No	☐ Not at all ☐ Somewhat ☒ Very	Who will work on this plan? By when will it be accomplished? None needed.

Readiness to Implement P⁴ Tool—Continued					
Subcomponent of Readiness	**Questions**	**Responses**	**OK?**	**Importance**	**Plan to Increase Readiness**
Champion	Is there a well-connected person who supports this P⁴?	Installation leadership are supportive of this effort.	☒Yes ☐ No	☐ Not at all ☐ Somewhat ☒ Very	Who will work on this plan? By when will it be accomplished? None needed.
Supportive Climate	Do we have the necessary policies and procedures to enable the P⁴?	There may be work that needs to be done to help unit leaders understand how this P⁴ is consistent with policy and to obtain their buy-in to increase uptake.	☐Yes ☒ No	☐ Not at all ☒ Somewhat ☐ Very	Who will work on this plan? Lt Col Jones will convene a meeting of unit leaders to brief them on CBT-I Coach and discuss any policy implications that need to be addressed. By when will it be accomplished? October 2018
	How committed is our CAB leadership to the P⁴?	CAB leaders are very supportive.	☒Yes ☐ No	☐ Not at all ☒ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.

Readiness to Implement P⁴ Tool—Continued					
Subcomponent of Readiness	**Questions**	**Responses**	**OK?**	**Importance**	**Plan to Increase Readiness**
Inter-organizational Relationships	What relationships are needed between us and other organizations (e.g. Healing Abuse Working for Change) to do this P⁴?	Connect with Combat and Operational Stress Control (COSC) personnel to promote the dissemination and utilization of CBT-I Coach across the installation. Connect with Air Force Education and Training Command (AETC) personnel to assist with dissemination to service members	☒Yes ☐ No	☐ Not at all ☒ Somewhat ☐ Very	Who will work on this plan? Lt Col Jones By when will it be accomplished? November 2018
Intra-organizational Relationships	What relationships are needed within our Community Action Team to do this P⁴?	Connections with COSC, health care facilities, and primary care communities who can support the implementation of CBT-I Coach.	☐Yes ☒ No	☐ Not at all ☒ Somewhat ☐ Very	Who will work on this plan? The CAT will partner with these stakeholders to assist in implementation efforts. By when will it be accomplished? November 2018
P⁴-specific Knowledge & Skills	Do we have the number of P⁴ implementers recommended for the P⁴?	Because this is a mobile app, direct facilitation and implementation are not required beyond efforts to promote the use of the app.	☒Yes ☐ No	☐ Not at all ☐ Somewhat ☒ Very	Who will work on this plan? By when will it be accomplished? None needed.
	Do our P⁴ implementers meet the following P⁴ qualifications [*this subsection may only be relevant for certain P⁴ that require special qualifications*]:				
	Education level?	Because this is a mobile app, direct facilitation and implementation are not required beyond efforts to promote the use of the app.	☒Yes ☐ No	☒ Not at all ☐ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.

Readiness to Implement P⁴ Tool—Continued					
Subcomponent of Readiness	**Questions**	**Responses**	**OK?**	**Importance**	**Plan to Increase Readiness**
	Years of experience?	Because this is a mobile app, direct facilitation and implementation are not required beyond efforts to promote the use of the app.	☒Yes ☐ No	☒ Not at all ☐ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.
	Communication skills?	Because this is a mobile app, direct facilitation and implementation are not required beyond efforts to promote the use of the app.	☒Yes ☐ No	☒ Not at all ☐ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.
	Necessary training or experience for working with the group targeted by this P⁴?	Because this is a mobile app, direct facilitation and implementation are not required beyond efforts to promote the use of the app.	☒Yes ☐ No	☒ Not at all ☐ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.
	Comfort enough with the topic to effectively deliver the P⁴ with fidelity?	Because this is a mobile app, direct facilitation and implementation are not required beyond efforts to promote the use of the app.	☒Yes ☐No	☒ Not at all ☐ Somewhat ☐ Very	Who will work on this plan? By when will it be accomplished? None needed.

Readiness to Implement P⁴ Tool—Continued				
Fiscal and Resource Capacities	**Considerations**	**Costs**	**OK?**	**Plan to Increase Needed Resources**
Printed materials (including curriculum and recruiting fliers): Do we have access to the materials needed to deliver the P⁴?	The CBT-I Coach app is free. The potential exception will be if it is determined that some version of CBT-I Coach needs to be developed for service members who do not have access to a smartphone or other device; in this case, a paper version (e.g., a workbook) may need to be developed and printed. It is difficult to estimate these costs at this time; the pilot test will focus on individuals who have access to these devices. It may be worth printing fliers to recruit participants for the pilot and to increase uptake once full dissemination of CBT-I Coach takes place.	$200	☐Yes ☒ No	Who will work on this plan? Maj Green By when will it be accomplished? Develop and disseminate flyers by December 2018 If a workbook version is needed, timeline and costs are to be determined, but this is not needed for the pilot.
Transportation, if needed	N/A	N/A	☒Yes ☐ No	Who will work on this plan? By when will it be accomplished? None needed
P⁴ implementers: Received sufficient training specific to the P⁴?	Because CBT-I Coach is an app, there are not “implementers” in the traditional sense who will need to be trained to deliver the P⁴. That said, it will be important for unit leaders to be aware of the importance and features of CBT-I Coach so that they can encourage Airmen to download and use the app. This is consistent with work identified in the “Supportive Climate” section above.	N/A	☐Yes ☒ No	Who will work on this plan? Lt Col Jones By when will it be accomplished? October 2018

Readiness to Implement P⁴ Tool—Continued				
Fiscal and Resource Capacities	**Considerations**	**Costs**	**OK?**	**Plan to Increase Needed Resources**
Number of volunteers: • costs to recruit, • train	N/A	N/A	☒Yes ☐ No	Who will work on this plan? By when will it be accomplished? None needed
Equipment: Do we have needed access to a computer or special computer programs to implement the P⁴? Does the P⁴ require a projector or other equipment?	CBT-I Coach requires access to a smartphone or other tablet device, but service members will be using their own devices.	N/A	☒Yes ☐ No	Who will work on this plan? By when will it be accomplished? None needed
Amount of space, if needed, e.g. rental	N/A	$0	☒Yes ☐ No	None needed.
Evaluation materials and efforts, e.g. surveys, data entry	Project evaluator for 50 hours	$2,500	☒Yes ☐ No	Financial resources are available; need to identify an individual who can analyze data for the pilot study.
Other: Facilitator and support person salary	N/A	N/A	☒Yes ☐ No	None needed.
Other: Personnel time	Approximately 100 service members will be recruited to participate in the pilot test. Over the 4-week period, we expect service members to spend approximately 2 hours per week using the app. For 100 service members, 8 hours of effort over the pilot study phase will yield a cost of 800 person hours. This "dosing schedule" is based on an 8-session estimate. Note that this cost only reflects personnel time.	$32,000 (note that this funding is not needed to implement the P⁴, but reflects personnel time)	☒Yes ☐ No	The CBT-I Coach pilot will be conducted with 100 individuals. Presumably, individuals who agree to participate will see the value of CBT-I Coach and will be willing to invest the person hours. The CAT is confident that it will find 100 individuals to invest in this way.

Readiness to Implement P⁴ Tool—Continued				
Fiscal and Resource Capacities	**Considerations**	**Costs**	**OK?**	**Plan to Increase Needed Resources**
Total cost		$34,700		

Chapter Six

GTO Step 6—Planning to Implement and Evaluate a Sleep Health Promotion P⁴

What is GTO Step 6?

Having completed GTO Steps 1–5, the CAT is now ready to develop the operations of its selected P⁴. In this step, the team relies on the *P⁴ Work Plan Tool* to create a detailed plan for running the program. While the team was able to use many of the prompts in the P⁴ Work Plan Tool, it also needed to customize the tool with tasks that were specific to the CBT-I Coach P⁴.

It is also important that leaders convey the importance of adherence to the implementation plan. Periodic monitoring and assessment must be included in this process to determine whether and when you are getting off track. Plans to pair this messaging with implementation on a regular basis will ensure the success of the process.

Using this tool in GTO Step 6 left the team feeling assured that no key program tasks had been left out. The process of identifying tasks and then assigning a responsible team member improved the efficiency with which the CAT completed preparation tasks. Lt Col Key, the CAT chair, particularly appreciated the opportunity to match the skills, expertise, and interests of group members to implementation tasks. As shown in the P⁴ Work Plan Tool, planning for specific components of implementation was largely overseen by the group member who would ultimately be responsible for the task when the P⁴ rolls out.

P⁴ Work Plan Tool

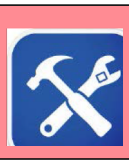
Completed by: CAT **Date:** 23 JULY 2018 **P⁴:** CBT-I Coach

Tasks: Administrative	When Will It Be Done? (Time Frame)	Who Is Responsible?	Date Done
Prepare budget (see P⁴ Budget Tool)	July 2018	Maj Green	23 July 2018
Acquire curriculum and materials, including evaluation materials	August 2018	Maj Green	
Set preferred implementation dates	August 2018	Maj Green	
Tasks: Policies and Procedures	**When Will It Be Done? (Time Frame)**	**Who Is Responsible?**	**Date Done**
Obtain required permissions and draft necessary taskers	August 2018	Lt Col Jones	
Tasks: Preparation	**When Will It Be Done? (Time Frame)**	**Who Is Responsible?**	**Date Done**
Provide information to unit leaders to increase P⁴ buy-in on installation	November 2018	Lt Col Jones	
Conduct outreach to develop installation community support	November 2018	Lt Col Jones	
Meet with COSC and AETC personnel to ensure situational awareness	November 2018	Lt Col Jones	
Develop recruitment materials for the pilot test	Early December 2018	Maj Green	
Notify installation community and recruit participants	December 2018–January 2019	Lt Col Jones	
Tasks: Implementation	**When Will It Be Done? (Time Frame)**	**Who Is Responsible?**	**Date Done**
Administer pre-pilot measures for pilot participants	December 2018–January 2019	CAT	
Pilot participants use CBT-I Coach for 4 weeks	December–February 2019	N/A	
Administer post-pilot measures for pilot participants	January–March 2019	CAT	
Administer 4-week follow-up measures for pilot participants	February–April 2019	CAT	

P⁴ Work Plan Tool—Continued			
Tasks: Evaluation			
Program online survey for completion of pre-pilot, post-pilot, and follow-up measures (sleep and sleep hygiene), as well as satisfaction and utilization measures	December 2018	Capt Adams	
Recruit evaluator for pilot test	October 2018	Lt Col Jones	
Collect data	Before pilot, 4 weeks after pilot begins, and at 4-week follow-up	Automated	
Enter and analyze data	1 month following all pilot sessions and within 1 month of receipt of all 3-month follow-up data	Evaluator	
Review process evaluation data from relevant data collection tools and complete GTO Step 7 summary tool	1 month following receipt of pilot study post-test data	Evaluator	
Review outcome evaluation data (including pre- and post-survey data) and complete GTO Step 8 summary tool	- Sleep and sleep behavior outcomes can be evaluated after the initial 4-week implementation phase and at 4-week follow-up	Evaluator	
Present results and decide which changes are needed to improve the performance and outcomes, using GTO Step 9 CQI process and tools. Adjust goals and outcomes and reassess fit and P^4 readiness in light of implementation; update P^4 Work Plan Tool with lessons learned from implementation	Following receipt of follow-up outcome data	Evaluator and CAT	
Finalize documentation, inventory any supplies, and begin planning next round or next steps	August 2019	CAT	

In the *P⁴ Budget Tool*, the CAT outlines its expected costs. Most CBT-I Coach pilot test costs are tied up in personnel time—largely, the hours that service members spend using CBT-I Coach, but also the cost of an evaluator for the pilot. Currently, the CAT is not obligated to produce these dollars from its own budget. The CAT expects that commanders will permit the effort as mission relevant and cover it with the general budget. That said, CAT members are also sensitive to the fact that prevention programs must be worth their costs. Ultimately, the CAT will be expected to provide a recommendation to the Air Force about whether *all* CBT-I Coach costs, including the largely invisible personnel costs, are offset by the benefits produced by the trainings. In an effort to consider and prepare themselves for this analysis, they include personnel time in the P⁴ Budget Tool.

The remaining costs for the pilot study of CBT-I Coach sum to only $200 and are well within the budget allocated to the CAT.



P[4] Budget Tool

Completed by: Maj Green **Date:** 23 JULY 2018 **P[4]:** CBT-I Coach

Item by Category	Calculation	Cost Estimate
Personnel	% effort or hours	
Project evaluator (e.g., public health nurse)	$50 for 50 hours	$2,500
Work group time	Approximately 100 service members will be recruited to participate in the pilot test. Over the 4-week period, we expect service members to spend approximately 2 hours per week using the app. For 100 service members, 8 hours of effort over the pilot study phase will yield a cost of 800 person hours.	$32,000
	Personnel Subtotal	**$34,500**
Materials, equipment, and supplies		
Recruitment materials	$200	$200
	Materials, Equipment, and Supplies Subtotal	**$200**
Other (e.g., travel, transportation)		
	Other Subtotal	**$0**
Total cost	**Sum of non-personnel category subtotals**	**$200**

During GTO Step 6, the CAT develops a process evaluation plan. After the pilot study of CBT-I Coach is complete, the team wants to know whether it implemented the program according to plan, and how well. To do so, it decides to track use of the app by participants and its own record of adhering to the work plan. It understands that no P^4, no matter how successful, will continue at Townville AFB if service members resist its messaging. Therefore, it decides to assess whether program participants enjoyed the program and internalized the underlying philosophy, using surveys delivered after the pilot test is complete. The completed *Process Evaluation Planner Tool* is below. Below that tool, more guidance is presented on the details of process evaluation methods that could be used in an evaluation of CBT-I Coach.

The CAT plans to use the results of the process evaluation to decide whether it needs to make any changes or improvements after the pilot (e.g., improve recruitment and pre-program messaging because attendance was weak) or changes to the work plan before rolling out CBT-I Coach to the entire installation. The team documents its decisions in the Process Evaluation Planner Tool.

Process Evaluation Planner Tool

Completed by: Community Action Team_ **Date:** 23 JULY 2018 **P⁴:** CBT-I Coach

Process Evaluation Areas	Considerations	Evaluation Methods and Data Collection Tools	Anticipated Schedule for Data Collection and Analysis	Person(s) Responsible
1. The characteristics of participants compared with those of the target population	Pay grade, career group, gender, race, ethnicity	Pretest survey before using CBT-I Coach	Collection: immediately before first session Analysis: After all pilot sessions	Evaluator
2. The participants' utilization compared with the program plan	Percentage of planned participants who enrolled, percentage of planned participants who used CBT-I Coach	Participants will be asked to complete a daily diary with three short questions: How many times did you use CBT-I Coach today? Which features of CBT-I Coach did you use today? In total, how many minutes did you spend using CBT-I Coach today?	Collection: End of each day during 4-week pilot period Analysis: After all pilot sessions	Evaluator
3. Level of delivery the P⁴ achieved (or exposure to the P⁴), and inclusion of all planned components	Which elements of CBT-I Coach did participants use most often? How often did pilot participants use CBT-I coach over the course of the 4-week pilot? How many hours in total were spent using CBT-I Coach? What was the duration of use among those who used CBT-I Coach (e.g. attrition or dropout)?	Data will be taken from the daily diary described above. Analyses will compare characteristics (e.g., demographics, initial sleep data) of those who finished CBT-I Coach versus those who did not start it at all and those who did not complete it. In addition, data on bedtimes and wake-up times obtained from the sleep diaries will be used to determine adherence to the prescribed sleep schedule.	Collection: End of each day during 4-week pilot period Analysis: After all pilot sessions	Evaluator
4. Satisfaction of the participants	Satisfaction questions on post-pilot survey	The post-pilot evaluation survey will include questions about satisfaction with the app (e.g., content, user-friendliness) and the extent to which they incorporated strategies into daily life	Collection: End of 4-week pilot Analysis: After all pilot sessions	Evaluator

Process Evaluation Areas	Considerations	Evaluation Methods and Data Collection Tools	Anticipated Schedule for Data Collection and Analysis	Person(s) Responsible
5. Staff's (including volunteers') perception of the implementation	Time it will take for staff to recruit participants. Staff time needed to track individuals who drop out or do not fully adhere to CBT-I Coach	Interviews with staff to understand challenges with recruitment, implementation, and extent of dropout	Collection: End of each week of the 4-week pilot	Evaluator
6. Adherence of implementation to the GTO Step 6 Work Plan	Recruitment and retention plan, implementation planning tasks, and evaluation planning tasks	Examine GTO step 6 Work Plan Tool to determine whether the person in charge of each task accomplished it as planned.	Analysis: At team meeting of the CAT	Evaluator
7. Other	Participant report of facilitators and barriers to using CBT-I Coach	Open-ended questions on post-pilot evaluation survey	Collection: End of 4-week pilot Analysis: After all pilot sessions	Evaluator

Sleep Health CAM Tip 6-1. Sample process evaluation measures for CBT-I Coach

Measure	**Description**
Participant engagement with CBT-I Coach	Participant report of • frequency of using CBT-I coach (weekly) • features of CBT-I Coach used • number of minutes spent using CBT-I coach (weekly)
Career-related factors associated with CBT-I Coach engagement	Analysis of whether certain participant characteristics (e.g., pay grade, career group) were associated with use of CBT-I Coach, using measures listed above
Participant satisfaction	1) Proportion of participants indicating they were satisfied/very satisfied with • content of CBT-I Coach educational modules (e.g., sleep hygiene, stimulus control) • CBT-I Coach exercises (e.g., "Creating New Sleep Habits" checklists) • user-friendliness of the app 2) Extent to which participants indicated that they incorporated strategies from CBTI-I Coach into their daily lives
Understanding of factors that contribute to service member use (or lack of use) of CBT-I Coach and implementation of sleep hygiene and stimulus control strategies	Open-ended questions to be asked on post-pilot evaluation survey, assessing the following: • What factors contributed to your use of CBT-I Coach (e.g., app is easy to access throughout the day)? • What factors made it difficult to use CBT-I Coach (e.g., app was hard to navigate, technology did not work well)? • Did the "Creating New Sleep Habits" feature help you to think of ways the recommendations could be incorporated into your daily life? Why or why not? • What obstacles did you experience in trying to incorporate the recommendations into your daily life (e.g., was difficult to fit the recommendations into the demands of my military job; don't think sleep is an important issue or concern for me)? • In what ways could the app be modified to increase the chances that you will use the recommendations in your daily life?

The CAT sees the process evaluation as an important first step in evaluating the usefulness of CBT-I Coach at Townville AFB. However, ultimately, it wants to know whether the app leads to downstream improvements in sleep behaviors and in sleep outcomes, such as sleep duration and quality. To answer these questions, the team also plans an outcome evaluation.

To evaluate CBT-I Coach's longer-term outcomes after the pilot is evaluated and implementation is scaled up, the CAT plans to rely primarily on existing data collected in the Community Feedback Tool, which is completed every two years (see the *P[4] Outcome Evaluation Planner Tool*). This survey includes an item that assesses whether Airmen experience sleeping problems (too little, too much, nightmares, etc.) and an item assessing whether personnel are frequently tired. Use of this data will permit a *pre-post* design that will allow a comparison of sleep problems and fatigue at Townville AFB before and after CBT-I Coach is implemented. The team will partner with the external evaluator and the DoD Office of People Analytics to request descriptive data from the survey for Airmen who served the majority of the previous year at Townville AFB.

Analysis of the Community Feedback Tool data will allow the CAT to determine whether the climate at Townville AFB is changing. This will be a good match to the program if and when CBT-I Coach is promoted for the entire installation. However, during the pilot phase, only a small number of service members will use the app. The team believes it is unlikely that having only 100 individuals use the app will produce a large-enough cultural shift to show up in the climate of the entire installation. It decides to add another component to its outcome evaluation plan that will allow it to assess the impact of CBT-I Coach specifically on the 100 service members who attend the sessions.

For this second evaluation component, the workgroup plans to collect its own data using brief questionnaires. Before the first session, it will ask participants to complete three measures. The first is a 13-item measure of sleep hygiene called the Sleep Hygiene Index (Mastin, Bryson, and Corwyn, 2006), which assesses sleep behaviors and environmental factors. Respondents are asked to rate how true each item is, with items such as "I go to bed at different times from day to day," "I use alcohol, tobacco, or caffeine within 4 hours of going to bed or after going to bed," and "I sleep on an uncomfortable bed (for example, poor mattress or pillow, too much or not enough blankets)." The second measure is the Insomnia Severity Index (ISI), a well-validated seven-item measure assessing insomnia symptoms that has been used extensively in insomnia treatment studies. The ISI is included in the CBT-I Coach app, making it relatively easy to collect the data. The team carefully considered the trade-offs between the burden to participants and the importance of using well-validated assessments and determined that these instruments were the most appropriate, as they are relatively short and well validated. These two measures will be completed by pilot participants prior to using CBT-I Coach to assess baseline sleep behaviors, environment, and quality and will also be completed after four weeks of using CBT-I Coach. In addition, participants will be asked to complete the Consensus Sleep Diary (Carney et al., 2012) for a seven-day period prior to beginning the pilot program, and again for a seven-day period at the end of the pilot. All three measures will also be completed at a four-week follow-up assessment. By comparing the pre- and post-measures, the CAT will be able to see whether there were any immediate changes in sleep behaviors, duration, and quality after use of CBT-I.

Because the effects of CBT-I Coach may take some time to be observed, the CAT will also examine responses at the four-week follow-up time point to determine whether there have been further effects and whether any gains made at the second assessment have been maintained.

The CAT decides to coordinate with the evaluator to ensure that its outcome evaluation meets the ethical standards of DoD and has received all regulatory approvals. Capt Williams agrees to serve as the liaison between the team and the evaluator. Once all the necessary data have been collected, the evaluator will complete the analyses and help the CAT understand whether CBT-I Coach achieved the desired outcomes outlined in the SMART Desired Outcomes Tool. She will also provide a summary of any observed changes in sleep and sleep behaviors before and after piloting CBT-I Coach among service members who participated in the pilot program.

The completed P^4 Outcome Evaluation Planner Tool is below. Below that tool, more guidance is presented on the details of outcome evaluation measures that could be used in an evaluation of CBT-I Coach or other P^4 that target sleep health, beyond the Community Feedback Tool items that were previously identified. The GTO Operations Guide provides guidance on evaluation methods.

P[4] Outcome Evaluation Planner Tool

Completed by: _Community Action Team_ **Date:** _30 JULY 2018_ **P[4]:** _CBT-I Coach_

Desired Outcome	Evaluation Design	Scale Name/Questions	Source of Scale/Questions	Items to Include
Improved sleep hygiene (including sleep behaviors and environmental factors)	☐ Pre-/post- with comparison group ☒ Pre-/post- ☐ Post- only	13-item Sleep Hygiene Index	Mastin, Bryson, and Corwyn, 2006	All 13 items
Improved sleep quality	☐ Pre-/post- with comparison group ☒ Pre-/post- ☐ Post- only	7-item Insomnia Severity Index	Bastien, Vallieres, and Morin, 2001	All 7 items
Improved total sleep time, time in bed, sleep latency, wakefulness after sleep onset, and efficiency	☐ Pre-/post- with comparison group ☒ Pre-/post- ☐ Post- only	Consensus Sleep Diary, completed over a 7-day monitoring period	Carney et al., 2012	All items
Within one year of program implementation, promote significant improvement in sleep problems among service members	☐ Pre-/post- with comparison group ☒ Pre-/post- ☐ Post- only	Item included on the Community Feedback Tool	Community Feedback Tool	Sleep item
Within one year of program implementation, achieve significant reduction in proportion of service members reporting feeling tired during the day	☐ Pre-/post- with comparison group ☒ Pre-/post- ☐ Post- only	Item included on the Community Feedback Tool	Community Feedback Tool	Sleep item

Sleep Health CAM Tip 6-2. Sample outcome measures

Sample Measure	Description	Reference(s)
Sleep hygiene and sleep behaviors		
Sleep Hygiene Index	Participants rate 13 items related to sleep behaviors and environmental factors	Mastin, Bryson, and Corwyn, 2006
Fred Hutchinson Cancer Research Center Caffeine Questionnaire	This 13-item questionnaire asks participants to report their frequency and amount of caffeine consumption	Fred Hutchinson Cancer Research Center, 2004
Sleep Hygiene Awareness and Practice Scale	Participants complete 13 items assessing awareness and knowledge of sleep hygiene	Lacks and Rotert, 1986
Sleep Hygiene Self-Test	Participants complete 30 items assessing activities that influence sleep quality and quantity, as well as level of sleep hygiene	Blake and Gomez, 1998
Sleep and sleep quality		
Sleep diary	Participants complete a daily diary indicating information such as the time at which they went to bed, the time at which they tried to go to sleep, how long it took to fall asleep, the number of awakenings during the night, the time at which they woke up, and the amount of time spent in bed after waking. There are many sleep diary options; CBT-I Coach uses the Consensus Sleep Diary.	Carney et al., 2012
Pittsburgh Sleep Quality Index (PSQI)	Participants rate 19 items in seven domains, including subjective sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction	Buysse et al., 1989
Insomnia Severity Index	Participants rate seven items assessing areas such as difficulties with sleep onset and maintenance, satisfaction with sleep, and interference with daily functioning	Bastien, Vallieres, and Morin, 2001
Objective assessments of sleep	Several validated, noninvasive devices are available, such as actigraphs to objectively monitor sleep-wake patterns, including sleep duration and sleep efficiency. These are more costly than self-reports but provide useful objective assessments that may facilitate program evaluation.	

Sample Measure	Description	Reference(s)
Sleep and sleep quality		
Epworth Sleepiness Scale	Participants complete eight items assessing the likelihood of falling asleep during different situations	Johns, 1992
Karolinska Sleepiness Scale	Single-item measure assessing subjective sleepiness	Kaida et al., 2006
Patient-Reported Outcomes Measurement Information System (PROMIS) sleep disturbance and sleep-related impairment (SRI) item banks	Participants complete items assessing factors such as quality of sleep, satisfaction with sleep, and difficulty falling and staying asleep. The sleep disturbance item bank has 27 items, and the SRI item bank has 16 items. Short forms are available, with 4, 6, and 8 items.	Pilkonis et al., 2011; Buysse, Yu, et al., 2010; Choi et al., 2010; Yu and Berger, 2011

Chapter Seven

GTO Step 7—Process Evaluation for a Sleep Health Promotion P⁴

What is GTO Step 7?

By the end of summer, the Townville CAT had completed the planning process for implementing and evaluating CBT-I Coach. Over the next six months, the team was focused on promoting CBT-I Coach in the community, recruiting 100 service members to participate in the pilot, and, finally, implementing the CBT-I Coach pilot. In late April 2019, the team was ready to see and interpret the results of its process evaluation. The *Process Evaluation Results Summary Tool* was completed by the external evaluator, who had access to the questionnaire data and post-P⁴ surveys and had attended debriefing sessions with the CAT.

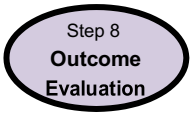
The Townville AFB CAT gleaned several insights from the process evaluation that will help it contextualize the outcome evaluation and plan for the future. It was satisfied with the amount of engagement with CBT-I Coach, though it is considering adaptations that could be made to the app to further promote engagement and ensure that the content is tailored to the military setting. For example, the educational modules and interactive checklists could more explicitly address some of the common issues faced by service members (e.g., attempting to improve sleep habits in circumstances in which service members have little control over their duty hours). The CAT is also considering ways to improve the messaging associated with a full CBT-I Coach rollout to increase engagement across the installation, including more-targeted information about the features of the app and how it may apply to service members. Because the pay grade and career groups of pilot participants were somewhat different from those of participants on the installation, the CAT is also considering ways to do more-targeted outreach to less-well-represented groups (e.g., those in maintenance and logistics careers). It is also careful to interpret the findings of the pilot in this context because what is learned from the pilot may not generalize to other career groups.

Process Evaluation Results Summary Tool

Completed by: _External Evaluator_ **Date:** 30 APRIL 2019 **P4:** CBT-I Coach

Process Evaluation Questions	Process Evaluation Data and Results		
What were the characteristics of P4 participants compared with those of the target population?	Characteristic	CBT-I Coach Participants	Townville AFB
	Pay grade		
	E1–E4	63%	60%
	E5–E6	12%	17%
	E7–E9	1%	3%
	O1–O3	20%	17%
	O4+	4%	3%
	Career group		
	Operations	35%	30%
	Maintenance and logistics	5%	20%
	Support	25%	30%
	Medical	27%	10%
	Other	8%	10%
	Gender		
	Men	67%	80%
	Women	33%	20%
	Race		
	White	75%	72%
	Black/African American	18%	15%
	Asian	2%	4%
	Other	5%	9%
	Ethnicity		
	Hispanic or Latino	18%	14%
	Not Hispanic or Latino	82%	86%
What was the participants' P4 utilization compared with the P4 plan?	On average, participants accessed CBT-I Coach 4 times per week, for a total of 70 minutes per week. The elements used most frequently included Create New Sleep Habits (80%), the Sleep Diary (64%), and the relaxation exercises (40%).		
What level of delivery did the P4 achieve, and did all planned components get delivered?	According to the feedback provided by participants in the post-pilot questionnaire, most found it easy to access the app regularly and found the app user-friendly to navigate, though some said that they would have used it more often if they had received reminder notifications on their devices. Though the educational elements were helpful, the checklists were described as a helpful tool to think of ways they could incorporate the recommendations into day-to-day life. Challenges to adopting the recommendations included feeling like their job duties did not allow much flexibility, feeling like they did not have a sleep problem to begin with, and feeling like they had limited control over their sleep environment.		

Process Evaluation Results Summary Tool—Continued	
Process Evaluation Questions	**Process Evaluation Data and Results**
How satisfied were the participants?	Of the participants • 83% were satisfied or very satisfied with the content of the educational modules • 76% were satisfied or very satisfied with the exercises • 94% were satisfied or very satisfied with the user-friendliness of the app
What was the staff's (including volunteers) perception of the P^4?	N/A
How closely did the P^4 implementation follow the GTO Step 6 Work Plan?	All target dates were met. There were some initial challenges recruiting 100 participants through outreach efforts (e.g., fliers), but working with unit leadership helped to improve recruitment efforts so that the target sample was achieved.
Other	



Chapter Eight

GTO Step 8—Outcome Evaluation for a Sleep Health Promotion P⁴

What is GTO Step 8?

For the pilot evaluation of CBT-I Coach, the CAT does not expect the impact to be so large that it would be observable in the rate of sleep problems measured for the entire installation. Thus, during the planning phase, the team decided not to include Community Feedback Tool measures as outcomes in the pilot evaluation. Instead, it used three measures to assess sleep and sleep behaviors in participants at three time points: (1) before beginning to use CBT-I Coach, (2) after four weeks of using CBT-I Coach, and (3) four weeks after the second follow-up. The CAT expects that use of CBT-I Coach will result in improved sleep hygiene and sleep-related behaviors, which will, in turn, result in improved sleep health.

The *P⁴ Outcome Evaluation Results Summary Tool* illustrates the summary data and interpretation that the CAT received from the external evaluator. Results demonstrated that there was some improvement in sleep hygiene after use of CBT-I, as well as improved sleep efficiency (proportion of time in bed that is spent asleep). However, there was little impact observed on TST (a measure of sleep duration) or overall sleep quality.

The results of the CAT's evaluation suggest that, at least in the short term, CBT-I Coach may be effective in producing changes in sleep hygiene and sleep-related behaviors (e.g., getting up for the day instead of spending time awake in bed). Scores on the PSQI and Consensus Sleep Diary suggest that sleep quality and sleep duration are a concern within the sample; however, it may be that more time is needed to observe the effect of CBT-I Coach on these outcomes or that more intensive use of CBT-I Coach and its activities is needed to produce change in these types of outcomes.

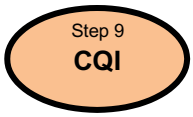
Using information from the outcome evaluation and process evaluation, the CAT believes that it has learned quite a bit from the pilot test of CBT-I Coach and is ready to move forward with improvements. In Step 9, it will use these lessons learned to brainstorm ways to improve the P⁴.

P4 Outcome Evaluation Results Summary Tool

Completed by: External Evaluator **Date:** 15 MAY 2019 **P4:** CBT-I Coach

Metric/Item/ Scale/ Other data Name	Pre-P4 Score	Post-P4 Score	Percentage Change [(post- minus pre-) divided by pre-]	Interpretation
Improved sleep hygiene measured by the Sleep Hygiene Index	Mean = 36.2 Comparison: Not planned	Mean = 30.2 Comparison: Not planned	16.6% (decrease)	Scores on the Sleep Hygiene Index range from 13 to 65. Some studies have used a cutoff of >26 to represent poor sleep hygiene (Kaur and Singh, 2017). Pre-test scores indicated that, on average, participants had poor sleep hygiene. After four weeks of using CBT-I Coach, participants' scores improved substantially, though scores were still in the "poor sleep hygiene" range. It does appear that gains were maintained four weeks later. This suggests that CBT-I Coach may promote better sleep habits.
Insomnia symptoms, as measured by the Insomnia Severity Index	Mean = 18.2	Mean = 15.4	15% (decrease) 0% (no change)	Scores above 14 indicate clinically significant poor sleep quality. Initial scores suggest that, on average, pilot participants experience poor sleep. However, after 4 weeks of using CBT-I Coach, average scores were still above 14. This suggests that it may be more challenging to create change on factors such as insomnia symptoms with just 4 weeks of use of CBT-I Coach.

P⁴ Outcome Evaluation Results Summary Tool—Continued				
Metric/Item/ Scale/ Other data Name	**Pre-P⁴ Score**	**Post-P⁴ Score**	**Percentage Change [(post- minus pre-) divided by pre-]**	**Interpretation**
Improved TST, time in bed (TIB), sleep latency, wakefulness after sleep onset (WASO), and efficiency measured by the Consensus Sleep Diary	Mean TST = 5.7 hours Mean TIB = 6.9 hours Mean sleep latency: 13 minutes Mean WASO = 4 minutes Mean sleep efficiency = 82.6%	Mean TST = 5.8 hours Mean TIB = 6.5 hours Mean sleep latency: 13 minutes Mean WASO = 7 minutes Mean sleep efficiency = 89.2%	TST: 1.6% (increase) TIB: 5.8% (decrease) Sleep latency: 0% (no change) WASO: 75% (increase) Mean sleep efficiency: 8.0% (increase)	At baseline, on average, participants were not receiving the recommended 7–8 hours of sleep. Though sleep latency and WASO were not very high, participants were spending 1.2 hours in bed awake each day (for example, lying in bed awake in the morning before getting up). After 4 weeks, there was little change in TST or sleep latency. Though WASO appeared to increase substantially, it was only a difference of 3 minutes, which should not be overinterpreted. However, time in bed decreased and sleep efficiency increased, suggesting that participants may be spending less time lingering in bed awake, instead waiting until they are sleepy to get in bed and then getting up shortly after waking. At the second follow-up, these metrics remained largely similar.
	Comparison: Not planned	Comparison: Not planned		



Chapter Nine

GTO Step 9—Continuous Quality Improvement for a Sleep Health Promotion P^4

In GTO Step 9, the CAT uses the *CQI Review Tool* to summarize the results of its efforts to date and organize its plan for the future. The outcome evaluation showed that CBT-I Coach had a moderate impact on sleep-related behaviors but did not have much impact on sleep duration or quality.

The results of the process evaluation help the CAT make sense of the failure to achieve the desired outcome. Though participants regularly engaged with the CBT-I Coach, it may be that more-regular use of the tools would have improved the translation of the educational and interactive components to day-to-day life. For example, participants noted that reminder notifications might increase their engagement with the app. There were also suggestions that aspects of the content might be better tailored to the military setting. Finally, though participants engaged with the elements of the app most relevant to the issues seen on installation (e.g., the interactive checklists), they may have benefited from using some of the less-utilized elements of the app. Therefore, providing more-specific guidance about how to use the app may have improved engagement and resulted in better outcomes. The team also keeps in mind that any effects on sleep or sleep quality may require more time and more-consistent engagement with CBT-I Coach to observe and that four weeks may not have been adequate follow-up time.

CQI Review Tool

Completed by: Maj Green _ **Date:** 1 JUNE 2019 **P[4]:** CBT-I Coach

1. Priorities for Action			
Targeted Need	**Desired Outcome**	**Outcome Evaluation Result (Check one box and explain)**	**Action Needed? (Yes/No & explain)**
Method of disseminating education and tools related to sleep hygiene and stimulus control	Improved sleep-related behaviors, sleep quality, and other sleep outcomes (e.g., duration, efficiency)	Progress on desired outcome: ☐ Exceeded ☒ Reached ☐ Missed **Explain:** Improvements in sleep hygiene and sleep behaviors were observed, though there was less observed impact on other sleep-related outcomes.	Yes **Explain:** We will find ways to tailor the content for a military population, develop a guide highlighting key aspects of CBT-I Coach, and build in reminder notifications.

2. Process Evaluation

Dates and Participation Targets

P[4] dates:

January 2019–April 2019

A. Total target population: 100

Target population characteristics:

Pay grade
- E1–E4: 60%
- E5–E6: 20%
- O1–O3: 17%
- O4+: 3%

Career group
- Operations: 30%
- Maintenance and logistics: 20%
- Support: 30%
- Medical: 10%
- Other: 10%

2. Process Evaluation—Continued

Dates and Participation Targets

Gender
- Men: 67%
- Women: 33%

Race
- White: 72%
- Black/African American: 15%
- Asian: 4%
- Other: 9%

Ethnicity
- Hispanic or Latino: 14%
- Not Hispanic or Latino: 86%

P^4 Adherence/Delivery

B. Total P^4 participants who attended at least one session: N/A, as CBT-I is a mobile app; 100 participants engaged in the pilot

C. Total who attended every session: N/A

What level of P^4 adherence did you achieve (offer activities according to P^4 requirements), and what evidence do you have to document this level of adherence?

Because CBT-I Coach is a mobile app, fidelity to the CBT-I model is not a significant concern. However, fidelity/adherence to the prescribed sleep schedule can be monitored using the sleep diary data on the app. In addition, surveys can be used to monitor amount of time spent on the app and frequency of use. Our evaluation results suggest that the aspects of the app that were used most often by participants included Create New Sleep Habits, Sleep Diary, and relaxation exercises.

Process Evaluation Results	Divide the Total at D by the Total at A	Divide the Total at D by the Total at B
D. Total participants in evaluation: 100	% of target: 100% (D ÷ A × 100)	% of actual: 100% (D ÷ B × 100)

Evaluation participants (check all that apply): ☒ Facilitators or staff

☒ Participants (all) ☐ Participants (some) ☐ Others _____

How well does the evaluation represent the population served? (check one):

☐ Not at all well ☒ Somewhat well ☐ Very well

3. Planning P4 Improvements		
Step-by-Step Review	**Response**	**Changes for the Next Time?**
Were the problems identified the right problems to be addressing with our P4? (GTO Step 1) Are there other problems that should be addressed? Have the problems changed? Should we 'stay the course' with the current P4?	Yes	No
Do we need to change goals and desired outcomes or potential participants? (GTO Step 2) Target different conditions or behaviors? Reset benchmarks up or down?	Yes	The target goals are still reasonable; however, we should consider the timeline over which change in certain outcomes (e.g., sleep quality, sleep duration) should be expected to be observed.
Should we consider another P4? (GTO Step 3) Or are there other improvements we need to make?	Not yet	No
Does the P4 still philosophically and logistically fit our installation, community, and participants? (GTO Step 4) If not, why not? What adaptations could be made? Were any adaptions made? How did that go?	Somewhat	Our evaluation suggests that there may be ways to better incorporate aspects of the military experience into CBT-I Coach—for example, recommendations on how to navigate situations in which a service member has little control of his or her sleep environment or duty hours.
Do we have the readiness (willingness and capacities) to do the P4 well? (GTO Step 5) Has there been a shift in resources? Are new staff capacities needed?	Yes	No
How well did we plan? (GTO Step 6) Any suggestions for improvement? Anything missing?	Well	No
How well did we implement the P4? (GTO Step 7) Did we implement the P4 with adherence—i.e., were the core components delivered? What are the main conclusions from the process evaluation?	Well	• Develop materials to highlight the various features of CBT-I Coach and how they may be helpful to service members • Find ways to build in notification reminders to increase regular engagement with CBT-I Coach • Develop more-tailored content for military populations
How effectively did the P4 help us reach our desired outcomes? (GTO Step 8) What are the main conclusions from the outcomes evaluation?	Somewhat	• Explore whether a longer follow-up period and greater engagement with CBT-I Coach will affect those outcomes that did not change in the pilot

Chapter Ten

GTO Step 10—Sustainability Review for a Sleep Health Promotion P⁴

What is GTO Step 10?

In May 2019, the Townville CAT meets to review its efforts to date and begin planning for the next year. The CAT determined that the P⁴ may be effective in improving sleep hygiene and sleep-related behaviors, which was an important goal of the P⁴, based on the needs identified on this installation. Any modifications that the team chooses to make are likely to make the P⁴ even more effective and potentially produce greater change for the other target outcomes (e.g., sleep quality, sleep duration). Therefore, after some modification, CBT-I Coach will be expanded and promoted for the entire installation. The CAT is considering whether a follow-up evaluation may be appropriate to determine whether these outcomes are met before scaling the dissemination to the full installation.

If the CAT decides to conduct a second evaluation, the iterative process built into GTO makes it very easy to cycle back to Step 1 and begin the process anew. During this second cycle, the time investment will be lower because many decisions can remain in place. For example, the P⁴ selection process evaluation can remain unchanged; however, the team may revise the expected outcomes, as they may have been overly ambitious in the first pilot. The team may also choose to conduct a second pilot to address shortcomings identified in the first, including extending the follow-up period, as it may take longer for behavioral changes to occur. For now, the team records its decisionmaking process in the *Sustainability Review Tool*.

The team also records a plan for ongoing program implementation and evaluation, emphasizing the importance of sleep health for the operational effectiveness and health of personnel at Townville AFB, to ensure that the P⁴ continues even during changes in leadership.

GTO Step 10 Sustainability Review Tool: Current Status

Completed by: Community Action Team **Date:** 1 JUNE 2019 **P4:** CBT-I Coach

	Questions (use your GTO tools as you address these questions)	Answers	Next Steps (Explain or enter "N/A")
What we have done in the past	**Does the need for the P4 continue?** Has the need for the P4 changed or remained the same? Are there any new concerns?	Yes. Sleep behaviors and sleep continue to be an issue on the installation, and the pilot reached only a small subset of individuals at the installation.	N/A
	Are our results good enough to continue doing the P4? Look at your results and determine the P4's impact on the participants.	Yes	The CAT is working to make adjustments to the P4 and its dissemination to potentially improve the effectiveness. We are deciding whether a second pilot study should be held to examine the effectiveness of an updated version before scaling the P4 installation-wide.
	What particular result can we use to justify the P4? Any goal or desired outcome that you achieved may be a good "result" to share with stakeholders to justify the P4. Look at the Goals and CQI tools to see what desired outcomes were reached or exceeded. Highlight any dramatic improvement from your data.	Participants were satisfied with CBT-I Coach, and there was evidence that it is associated with improvements in sleep behaviors and sleep hygiene. The implementation of the P4 is low-cost with leadership buy-in.	Consider conducting a second pilot study with the updated version of CBT-I Coach.
	What should we change about the way we do the P4? Using evaluation data and the CQI tool from GTO Step 9, think about the process—recruitment, enrollment, attendance, logistics, etc.—and consider whether one or more of these activities could be strengthened or changed to be a better fit for your site and staff.	Develop educational materials to be part of the dissemination plan to ensure that service members understand the purpose and features of CBT-I Coach, which may maximize the benefit they obtain from its use.	Develop educational materials to be part of the dissemination plan.

Questions (use your GTO tools as you address these questions)	Answers	Next Steps (Explain or enter "N/A")
Who knows the P^4 and supports keeping it going here? Consider which individuals at the installation are champions of this P^4—i.e., influential people who really like the P^4—and are enthusiastic about it, including leadership. Should somebody else be brought on? Who is going to take the lead?	The CAT is still in place to support a second pilot study, if applicable, and the broader dissemination and implementation of CBT-I Coach.	Capt Adams transfers all materials to the shared, secure site and provides links to all CAT members and other stakeholders (e.g., installation leadership) in order to ensure sustainability for subsequent commands.

Sustainability Review Tool: Future Work

Completed by: Community Action Team **Date:** 5 JUNE 2019 **P4:** CBT-I Coach

	Sustainability Questions	Answers	Next Steps
What we will do in the future	**Where will the GTO tools, the P4 evaluation, and the P4 manual and materials be kept?** Decide who will have access to them and consider how this is the same or different from other P4 materials at your installation. Where do you currently keep them?	The GTO tools and evaluation reports will be stored on the CAT's secure, shared website.	Capt Adams will transfer all materials to the shared, secure site and provide links to all CAT members and other stakeholders (e.g., installation leadership).
	Who will be in charge of making the P4 happen? Also, think about who is trained to be the facilitator, how that decision was made, and what supervision would be necessary.	The CAT retains oversight of the second pilot study	Capt Adams and Maj Green will review and update GTO Steps 1–3 before the next CAT planning meeting.
	Who else is in favor of and needs to be involved in keeping the P4 going? Think about the Wing Commander, the Community Action Team, the CAB, and the community of Airmen. Should a new champion be added?	CAT and installation leadership	Installation leadership will be briefed on the results of the pilot study and plans for next steps.
	Who will do the evaluation and pre-/post-surveys, track attendance, and monitor adherence? When (how often) and to whom will the results be reported? Think about who could lead these activities (1 person or more—staff or an outside group). Think about how to organize the results and who needs to see them.	The CAT will maintain the division of responsibilities used in preparation and implementation of the pilot program.	The CAT will need to determine whether it's feasible to retain the independent evaluator to continue examining the results of the P4.
	How much funding, if any, do we need for running the P4? Are there resources other than funds that are needed to run the P4 well (e.g., for recruitment, good attendance, supplies)?	Budget for recruitment and advertising costs is sufficient. We will need leadership support for continued personnel time. We will also need to determine whether it's financially feasible to retain the evaluator for ongoing data analysis needs.	The CAT will continue outreach to installation and unit leadership to garner support for personnel time and will explore budgetary implications of retaining the evaluator.

Sustainability Review Tool: Future Work

Completed by: Community Action Team **Date:** 5 JUNE 2019 **P4:** CBT-I Coach

Sustainability Questions	Answers	Next Steps
When will we run the P4 again? And when will we revise the Step 6 Work Plan? Consider the different times of year or days and times of the week and what worked best in the past. Think about lead time needed to look back at the Work Plan and revise it if needed.	If a second pilot test is implemented, it will need to take place after revisions have been made to CBT-I Coach content and the dissemination plan. This will likely be possible in fall 2019. Otherwise, consider full implementation at this time.	Complete revisions to CBT-I Coach to prepare for the next implementation.
How can we keep staff trained in the P4? The more staff are trained, the more likely you will be able to continue the P4. Look back at the P4 materials and what is required of facilitators. Consider who could be trained and who would be responsible for doing the training.	N/A	N/A

Summary

Using this CAM, you have followed the example of a fictional CAT using GTO to develop its CAP around sleep health promotion. The tools and instructions helped the CAT assess the installation's problems related to Airman sleep hygiene and sleep promotion, set goals and desired outcomes to address these problems, identify the best sleep promotion P^4 possible, ensure that those P^4 were a good fit, and ensure that it had the capacity to run them well. It used GTO Step 6 to develop detailed implementation and evaluation plans. After completing Step 6, it was ready to start implementing a pilot test of CBT-I Coach, the P^4 it selected, and collecting process and outcome evaluation data. Completing the remaining steps included summarizing and reporting evaluation results and using those results to carry out continuous quality improvement in Step 9. Step 10 is a summary of what had been done and what needed to be done in the future to sustain effective programs.

This CAM for sleep health promotion is available for download without charge in the Related Products section at www.rand.org/t/TL311. At the same site, the GTO Operations Guide for CATs is available for download without charge, and the tools for each GTO step have been assembled in a fillable-form Word document.

APPENDIX A

Descriptions of Sleep Disorders and Their Impacts in Service Member Samples

Beyond specific sleep symptoms and sleep-related behaviors, prior research has identified several sleep disorders, including insomnia, obstructive sleep apnea, and nightmares, that are prevalent in military populations.

Insomnia is characterized by a persistent sleep complaint (lasting one month or longer), with associated daytime impairment. Insomnia is the most prevalent sleep disorder in the general U.S. population, affecting between 9 and 12 percent of Americans (National Institutes of Health, 2005; Ohayon, 1997). However, estimates are considerably higher (up to 20–40 percent) in primary care medical settings (Arroll et al., 2012; Shochat et al., 1999; Simon et al., 1997). Among active-duty personnel, **insomnia is one of the most-frequent reasons for mental health referrals and the most common complaint reported by service members post-deployment** (Collen et al., 2012; McLay, Klam, and Volkert, 2010; Mysliwiec et al., 2013a; Mysliwiec et al., 2013b; Seelig et al., 2010).

DoD medical surveillance data collected between 2000 and 2009 document a marked increase in new diagnoses of insomnia across all services (Armed Forces Health Surveillance Center, 2010). In fact, the diagnostic rates of insomnia increased 19-fold over the nine-year surveillance period. Mysliwiec et al., 2013a, reported that 24 percent of OEF/OIF service members referred for sleep studies received a diagnosis of insomnia.

Consistent with civilian samples, evidence from military populations also shows an even higher prevalence of insomnia in comorbid medical or psychiatric populations. In particular, mild traumatic brain injury (mTBI), chronic pain, anxiety, depression, and PTSD have been common diagnoses among service members returning from OEF/OIF/Operation New Dawn operations and are commonly comorbid with insomnia (Lew et al., 2010). Furthermore, the presence of insomnia can exacerbate symptoms of these comorbid conditions and can lead to poorer treatment outcomes (Ouellet, Savard, and Morin, 2004; Schoenfeld, Deviva, and Manber, 2012).

Obstructive sleep apnea (OSA) is characterized by the collapsing of the upper airway during sleep, which leads to nocturnal symptoms of gasping for air or loud snoring and daytime sleepiness. OSA has a reported prevalence of between 2 and 7 percent in civilian samples (Punjabi, 2008). Prevalence data on OSA are somewhat inconsistent, depending on how the condition is measured (e.g., with gold-standard in-laboratory polysomnographic monitoring or a self-report screening instrument), the population being studied, and the specific criteria used to define the presence or absence of symptoms. There is also a critical shortage of prevalence data on OSA rates among active-duty U.S. service members. The existing studies of OSA prevalence among service member populations are either from non-U.S. samples (e.g., 2.9 percent of British soldiers reported symptoms consistent with OSA in Okpala, Walker, and Hosni, 2011) or from reports of population incidence rates among service members hospitalized for sleep-related disorders. For example, medical surveillance data collected between 2004 and 2015 demonstrate a sharp increase in OSA cases among active-duty service members.

Among military samples referred to sleep centers, OSA prevalence rates range from 51.2 to 76.8 percent among those referred for diagnostic sleep screening (Capaldi, Guerrero, and Killgore, 2011; Mysliwiec et al., 2013a; Mysliwiec et al., 2013b). A recent study of 725 OEF/OIF service members referred to medical care for sleep disturbances found an OSA prevalence rate of 51.2 percent (27.2 percent mild, 24.0 percent moderate to severe; Mysliwiec et al., 2013b). A follow-up study (Mysliwiec et al., 2013a) found that 62.7 percent of active-duty service members

referred for sleep testing within 18 months of their most recent deployment were diagnosed with OSA.

Nightmares. Combat-exposed service members may be particularly vulnerable to experiencing nightmares, which can severely compromise sleep quality and duration and can also impair daytime functioning. In fact, frequent, distressing dreams are one of the cardinal symptoms of PTSD, which affects approximately 15 percent of post-deployed service members (Ramchand et al., 2010). For example, one sample of 201 OEF/OIF veterans identified by primary care providers as needing behavioral health assessments revealed a nightmare prevalence rate of nearly 51 percent (31.8 percent severe, 18.9 percent moderate; Gellis et al., 2010).

The presence of insomnia predicted future suicidal ideation one month later, even after controlling for baseline suicidal ideation, depression, and hopelessness. Furthermore, retrospective examinations of Veterans Health Administration medical records of 381 veterans who died by suicide show that veterans with reported poor sleep during their most recent visit to the Veterans Health Administration in the year prior to their death died approximately 100 days sooner than those who did not report sleep problems (Pigeon et al., 2012). PTSD, depression, and TBI are common disorders associated with sleep problems, but longitudinal evidence further shows that sleep problems can predict the onset of new mental health conditions (Gehrman et al., 2013; Hoge et al., 2008; McLay, Klam, and Volkert, 2010; van Liempt et al., 2013; Wallace et al., 2011; Wright et al., 2011). Furthermore, even with successful treatment for a co-occurring mental health condition (e.g., depression), sleep problems can predict poor treatment response or relapse (Manber et al., 2008; Troxel et al., 2012).

Collectively, these findings suggest that sleep problems are an independent predictor of poor mental health and increased risk of suicide among military and civilian populations, not merely a correlate of co-existing mental health conditions.

In addition to these negative mental health sequelae, sleep problems can also increase risk for physical health problems, such as obesity and heart disease (Knutson, 2010; Troxel et al., 2010). For example, short sleep duration, nightmares, and sleep disorders (e.g., OSA and insomnia) are common correlates of diagnosed health conditions (e.g., cardiovascular disease, asthma, poor health), self-reported poor health, obesity, hypertension, pain symptoms, and respiratory and chest symptoms (Brundage, Wertheimer, and Clark, 2010; Engel et al., 2000; Mysliwiec et al., 2013b; Seelig et al., 2010) in military samples. There is also longitudinal evidence demonstrating that service members who self-reported trouble sleeping, short sleep duration (five or fewer hours), and OSA were more likely than those without sleep problems to self-report the onset of diabetes three and six years later (Boyko et al., 2013).

Sleep problems can also have immediate and lasting effects on cognitive functioning and performance. For instance, findings from the military's research laboratories have demonstrated the significant effects of sleep deprivation and fatigue on cognition, attention, reaction time, and moral reasoning, all of which are critically important for operational effectiveness (Wesensten et al., 2013). These consequences are most alarming for those in "high-risk" occupations, such as air traffic controllers and pilots, which require high levels of sustained attention and have small margins of error. Experimental work has also shown that the cognitive and performance effects of sleep deprivation are similar to impairment seen with blood alcohol levels above the legal limit (Dawson and Reid, 1997). In fact, after being awake for 24 hours, an individual experiences impairment similar to someone with a blood alcohol level higher than 0.80—the level at which states legally determine that one is too intoxicated to operate a motor vehicle. It is important to note that sleep-deprived individuals are notoriously inaccurate when it comes to determining their own level of impairment from lack of sleep (Dorrian et al., 2003). The combination of impairment and poor insight can be particularly toxic,

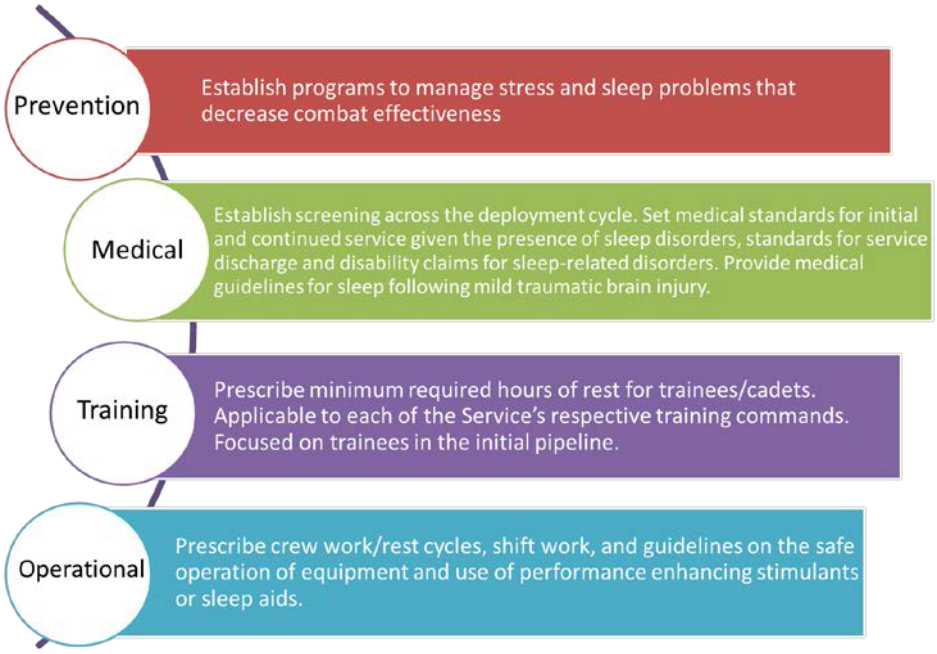
leading to lapses in awareness with potentially catastrophic consequences, particularly in high-risk occupations.

APPENDIX B

Description of U.S. Department of Defense and Air Force–Specific Sleep Policies

This summary draws from the RAND military sleep report (Troxel et al., 2015), which included a comprehensive review of all sleep-related policies, interviews with military experts representing clinical and operational training contexts, and a working group of military and civilian sleep experts that was conducted in 2013–2014. This summary describes current USAF policies and programs under four domains: prevention, medical, training, and operational (see Figure B-1).

Figure B-1. Categories of Military Sleep Policies and Programs



SOURCE: Troxel et al., 2015.

The sleep-related policies in the USAF context are typically formal instructions or directives that dictate how sleep-related behaviors and sleep disorders among Airmen are identified and treated. Policies can also serve as guidelines on and, in some cases, requirements for sleep duration and work/rest cycles. *Sleep programs* are defined as efforts and actions to address sleep problems or to promote healthy sleep. Sleep programs may be the translation of a policy, but a program's existence or implementation may not necessarily be dictated or mandated by a policy.

U.S. Department of Defense Prevention Policies and Programs

Most DoD and service-specific sleep-related "prevention" strategies fall under the categories of resilience training, education and messaging, and practical strategies (e.g., providing sleep kits). Among the most well-known of these programs is the DoD-issued instruction (U.S. Department of Defense Instruction [DoDI] 6490.05, 2008) to establish and maintain COSC programs in each of the military branches. Specifically, each branch must train and employ COSC personnel who are able to determine whether individuals are sleep-deprived or suffering

from other sleep problems that significantly decrease their combat effectiveness or place anyone at added risk of harm. In such cases, COSC personnel have the discretion and authority to intervene and bring such individuals to mental health care providers for evaluation and treatment. In addition to training and employing COSC personnel, the service branches are responsible for educating leaders and service members on combat and operational stress reactions, which may include instructions on the impact of sleep management on readiness.

Several other DoD publications identify sleep as an important factor in the context of stress resilience for military personnel. These resources are not necessarily formal policies, but they include information for service members in the form of "how-to" suggestions or tips for the best ways to manage sleep and/or stress in the post-deployment period. For instance, the U.S. Army's *Guide to Coping with Deployment and Combat Stress* (U.S. Army, 2011) advises sleeping at least seven to eight hours in each 24-hour period to prevent combat stress and describes poor sleep as a warning sign for suicide and one to be aware of when service members use the "battle buddy" method of accountability.[1]

USAF Prevention Policies and Programs

Each military service has at least one program or campaign to promote resiliency among its service members; within USAF, this program falls under the Integrated Resilience Directorate. Within these resilience initiatives, healthy sleep is identified as an important component of resilience; however, according to the RAND sleep working group members, these guidelines fall short of providing evidence-based strategies to promote sleep health (Troxel et al., 2015).

One of the most concerted and systematic efforts to promote sleep health as a critical component of resilience is the Army's Performance Triad initiative. Specifically, the model highlights nutrition, exercise, and sleep as critical factors that influence the resilience and readiness of service members. By identifying sleep as a major component of healthy living, the Army has made a major step toward advocating for good sleep habits in the military. However, the effects of this research and program on Army policies and health outcomes are limited, so the efficacy of such programs for improving sleep has yet to be demonstrated.

U.S. Department of Defense Medical Policies and Programs

There are a number of DoD policies related to sleep that are used to set medical standards and qualifications for initial military service. In addition, policies exist to facilitate referral to a medical evaluation board and to identify which sleep-related disorders impact service eligibility or medical care options for sleep disorders for service members (DoDI 6130.03, *Medical Standards for Appointment, Enlistment, or Induction into the Military Services*, 2018).

In addition to medical standards, medical policies include screening for sleep disorders, mostly through self-reported assessments, such as the Post Deployment Health Assessment (PDHA) and the Post Deployment Health Re-Assessment (PDHRA) programs through DoDI 6490.03, *Deployment Health*, 2006. These tools screen for physical and mental health problems, including PTSD and "troubled sleep." Notably, these mandated screenings include a very limited assessment of sleep, primarily in the context of other mental health conditions.

[1] The *battle buddy method* is commonly used in military training and operations. It involves pairing two service members in the same unit, often bunkmates, who are then responsible for each other's conduct and well-being. This method encourages teamwork and motivates service members to maintain high standards in many areas, including sleep hygiene.

USAF Medical Policies and Programs

Air Force medical policies typically provide general guidance on sleep-related behaviors to enhance resilience and operational performance through a suggested seven or eight hours of sleep every 24 hours, if the mission permits (U.S. Air Force Instruction [AFI] 44-153, 2014; AFI 44-172, 2015).

USAF Training Policies and Programs

The Air Education and Training Command Instruction (AETCI) requires eight hours of uninterrupted sleep for students in the training environment. AETCI 11-202, Vol. 3, 2010, also requires a 12-hour non-duty period before the assumption of duty. In addition, this policy identifies what qualifies as suitable sleeping provisions (i.e., crew bunks or other major command–defined rest facilities, privacy, and noise levels).

Another relevant policy is AETCI 36-2205, Vol. 11, 2012, which prescribes training schedule standards for survival, evasion, resistance, and escape students and states that the operational schedule for students must last no longer than 16 hours per day, except during operational evasion and resistance training. Other USAF publications for trainees or cadets, such as U.S. Air Force Academy Instruction 36-3536, *Allocation of Cadet Time*, 2017, do not include any guidance on sleep, but that instruction's subordinate publication, U.S. Air Force Academy Instruction 36-3518, *Intercollegiate Athletic Programs*, 2012, allows cadets who return late from an academy-sponsored trip seven and a half hours before they are required to take part in "mandatory activities."

USAF Operational Policies and Programs

Most Air Force policies are related to operational flight standards for pilots and aircrews (AFI 11-2 series; AFI 11-401; AFI 16-1202; U.S. Air Force Manual (AFMAN) 31-201, Vol. 3; AFI 11-2AE, Vol. 3; U.S. Air Force Tactics, Techniques, and Procedures (ATTP) 3-42.2; AFI 21-201; AFI 21-202, Vol. 1; AFI 48-149; AFI 91-202; AFI 91-203; AFI 91-204; and AFI 91-207).

Air Force policies prescribe crew rest; fatigue management, including sleeping provisions; and flight duty limitations. The guidances given for crew rest in AFI 11-202, Vol. 3, 2010, and the 11-2 series publications that follow all indicate at least ten continuous hours of rest, including an opportunity for at least eight hours of uninterrupted sleep during the 12 hours immediately prior to duty. It also provides guidance on when exceptions to the policy can be made and how to mitigate fatigue during extended operations.

The Air Force also has Counter-Fatigue Management Program policies to minimize conflict with crew circadian rhythms and provide opportunities for eight hours of sleep in each 24-hour period (AFI 11-2B-1, Vol. 1, 2011). The policies advise that the appropriate management of sleep/rest cycles should be the primary counterfatigue management effort. Secondary efforts include scheduling procedures aimed at managing those cycles, strategic napping techniques, and proper diet and exercise (AFI 11-2C-130, Vol. 3, 2012) and are based on scientifically sound principles.

There is also published guidance for flight surgeons to issue flight medications as a way to optimize alertness during planned missions and facilitate sleep during the alert portion of one's circadian rhythm (AFI 48-149, 2014).

Finally, there are a number of Air Force policies related to safety that state, for instance, that unit commanders must establish and enforce duty hour limits for operators of motor vehicles (AFI 91-202, AFI 91-203, AFI 91-204, AFI 91-207) to allow sufficient opportunity for rest periods. There are also a number of safety programs in place to reduce safety mishaps by requiring periods of rest for sufficient sleep duration (such as Air Mobility Command's Operational Risk Assessment and Management system). In addition to broader Air Force policies, each combatant command or theater of operations may have its own policies related to sleep, crew rest, or shift work.[2]

Summary of Sleep-Related Policies and Programs

Despite the presence of codified policies and programs that are built around sound scientific principles and clinical recommendations on adequate sleep duration and counterfatigue measures, there has not been systematic evaluation of the implementation and enforcement of these policies. Therefore, their existence does not constitute an evidence-based P^4, without evaluation of their implementation and efficacy. Evaluation efforts may be impeded by low enforcement of policies and programs. For example, in one study of Army officers, 80 percent reported not receiving sleep management briefings during deployments (Miller, Shattuck, and Matsangas, 2011). The majority of the officers (74 percent) reported that their unit never or rarely encouraged or monitored naps, and most (67 percent) reported that their unit never or rarely designated dark or quiet areas for rest. Given the inherent qualities of deployments (as well as other operational and training environments that make sleep difficult), encouraging somewhat regular sleep schedules, designating dark areas for rest, encouraging naps, providing designated time off for rest, and promoting other counterfatigue measures and interventions to minimize circadian disruption caused by shiftwork or jet lag (e.g., use of caffeine, light therapy) may help support sleep health among service members (Wesensten and Balkin, 2013).

[2] One such example is Pacific Air Forces Instruction (PACAFI) 24-101, *PACAF Combat Mobility Flights*. This policy prescribes standards for personnel utilization for shift work. It states that work schedules for deployed aerial port operations are based on individuals working 12-hour shifts. After completion of a continuous-duty period, commanders and supervisors will ensure that personnel are provided a rest period of sufficient duration to allow a minimum of eight hours of uninterrupted sleep.

APPENDIX C

Background on Cognitive Behavioral Therapy for Insomnia

The principles of CBT-I are directly applicable to prevention-level strategies because CBT-I principles are based on a theoretical rationale that acute sleep disturbances may arise for a number of reasons (e.g., stress, life transitions, illness) and are fairly ubiquitous, in that most people suffer from acute sleep disturbances on occasion. However, according to the widely accepted Spielman model of insomnia, perpetuating factors that cause some people to develop chronic sleep disturbances following acute episodes of poor sleep are maladaptive thoughts and behaviors about sleep (Spielman, Caruso, and Glovinsky, 1987).

A review of the literature on CBT-I applications within military populations demonstrates that CBT-I reduces insomnia symptoms and core PTSD and depressive symptoms, with moderate to large effect sizes (Talbot et al., 2014; Margolies, 2011; Gellis and Gehrman, 2011; Koffel and Farrell-Carnahan, 2014; Perlman et al., 2008). Despite the strong empirical support for CBT-I, dissemination of CBT-I has proved challenging, which has limited the scalability of the intervention. To enhance dissemination, several studies tested different treatment modalities of CBT-I, including group settings (Perlman et al., 2008; Koffel and Farrell-Carnahan, 2014) and various telemedicine strategies. These studies also showed positive results for reducing insomnia symptoms and may be particularly useful for inclusion as a P^4 to prevent chronic sleep problems.

A significant challenge in treatment delivery is overcoming barriers to dissemination. Service members are often hard to reach because of their training, deployment, and relocation schedules. Additionally, the small number of qualified behavioral health specialists limits the availability of CBT-I (Siebern and Manber, 2011). Technologies that enable patients to obtain treatment without coming face to face with providers can dramatically improve dissemination. Several mental health–related smartphone and internet applications have become available in recent years, and the existing evidence concerning their efficacy is promising (Arnedt et al., 2014). For instance, CBT-I Coach is a program that was designed for people who are engaged in CBT-I with a health provider or who have experienced symptoms of insomnia and would like to improve their sleep habits. The app guides users through the process of learning about sleep, developing positive sleep routines, and improving their sleep environments and provides a structured program that teaches strategies proven to improve sleep and help alleviate symptoms of insomnia, based on cognitive-behavioral principles. Although CBT-I Coach was designed to augment in-person therapy, as a prevention strategy, it may be useful as a stand-alone P^4 for individuals who do not meet clinical criteria for a sleep disorder, and it may be useful for identifying individuals who could benefit further from in-person treatment. Other modalities, including use of two-way video functions of smartphones to conduct video chat therapy sessions between service members and providers, are also being tested (Luxton et al., 2012). The Center for Deployment Psychology also has an online CBT-I program (Brim, 2013), but, to our knowledge, the efficacy of this program has not been systematically evaluated.

Because the U.S. population uses smartphones extensively, these devices offer a highly accessible platform for delivering tools to aid in treatment to service members and veterans. Smartphone applications also provide easy ways to deliver tools to patients, which may complement treatments and improve adherence and outcomes. The highly customizable nature of these applications allows software developers to create a wide range of tools that may be useful to clinicians and patients. In particular, the ability to provide *individualized feedback* based on an individual's sleep diaries or other wearable electronic devices that track sleep—e.g., actigraphs—may enhance compliance and motivation to achieve personalized goals within the program (Levenson et al., 2016).

APPENDIX D

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