Assessment of Lifestyle in Relation to Health

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Abstract
Habits relevant to health include physical activities, diet, smoking, drinking and drug consumption. Despite the fact that benefits of modifying lifestyle are increasingly demonstrated in clinical and general populations, assessment of lifestyle and therapeutic lifestyle changes is neglected in practice. In this review, associations between unhealthy lifestyle and health outcomes are presented. Particular emphasis will be placed on description and discussion of the standardized assessment instruments and behavioral methods that could be used in clinical practice to measure lifestyles.

After pioneer behavioral medicine research demonstrated how behavior can influence health and how modifying behavior can affect health outcomes [1], an increasing body of evidence links the initiation and progression of several medical disorders to lifestyle and behavior [2–4].

Recently, the need to redesign primary care practice by incorporating health behavior change and information about health-promoting behaviors has been underscored [5, 6]: half of the deaths that take place in the US can be attributed to chronic diseases that are all heavily influenced by 'largely preventable behaviors and exposures' [7].

Consequently, there is growing awareness that contemporary medicine needs to focus on lifestyle changes for primary prevention, for secondary intervention, and to empower patients’ self-management of their own health behaviors [8].

Humans naturally form ‘habits’ or ‘style’, which are recurrent and often unconscious patterns of behavior [9]. Any behavior in which control and choice are impaired is abnormal by definition and thus a source of clinical concern. Curt Richter [10] first discussed the concept of motivated behaviors: motivated (driven) behaviors develop through a combination of (a) specific physiological features, which stimulate the drive and respond to its satisfaction with (b) learning, which is the result of the influence of the environment on the responses generated by the drive. Craving drives (derived from powerful physiological impulse) combined with
conditioned learning, overwhelm an individual’s capacity to direct and modify his or her actions [11].

Behaviors relevant to health include physical activities, diet, sleeping, smoking, drinking and drug consumption [12]. Disorders of such motivated behaviors could come either from some disarrangement of the drive mechanisms or from a maladaptive life experiences that misled the learned response patterns [11]. There are several aspects that McHugh and Slavney take into account to define a disordered behavior [11]. A disordered behavior may, for example, be tied to its goals. Alcohol dependence can be seen as behaviors with disordered goals. The means to getting to a goal represent another way in which a behavior can be deviant and disordered. Examples may include the use of dangerous sedatives for sleep. The consequences of some behaviors identified them as dangerous and injurious. Examples include lung cancer from cigarette smoking, and coronary artery disease and obesity with high-fat dietary preferences [11].

As remarked by Wise [5], poor healthy behaviors may be worsened also by psychosocial variables that affect health and contribute to the prevalence of comorbid anxiety and depression in primary care populations. For example, demoralization in the primary patient, if untreated, often promotes unhealthy attitudes and behaviors such as substance abuse or lack of compliance [5]. These examples, however, constitute a small minority of the behavioral problems requiring explanation and treatment. More frequent are those behaviors that emerge in individuals who have no obvious diseases or defects [11]. Physicians, psychiatrists, psychologists should question how to interrupt these dangerous behaviors or, when that proves too difficult, protect people from their unhealthy consequences [11]. According to this need for behavior modification, a constant interplay between assessment and therapeutic strategies should be promoted. Measurement of lifestyle behaviors is thus necessary for the identification of causal associations between unhealthy lifestyle and health outcomes, description and quantification of the dose-response relationships between lifestyle and health outcomes, documentation of changes and differences in unhealthy lifestyles within and between individuals, respectively, over time, formulation of public health recommendations, the validation of intervention programs, and comparison of unhealthy lifestyles levels between populations, particularly when cultural and language differences exist.

However, despite considerable evidence for the importance of the assessment of lifestyle and therapeutic lifestyle changes in both clinical and normal populations, it still is underutilized [13–16].

Assessing Behaviors: Behavioral and Quantitative Approaches

Kanfer and Saslow [17] commented on traditional methods of data collection for behavioral analysis: the patient’s verbal report, his non-verbal behavior during an
interview and his performance on psychological tests. To evaluate behaviors in clinical practice, the authors [17] stated that, not only clinimetric and psychometric assessments are essential to do behavioral analysis: if one views behavior disorders as sets of response patterns which are learned under particular conditions and maintained by definable environmental and internal stimuli, an assessment of the patient’s behavior only based on the verbal report remains insufficient for a complete analysis and for prediction of his daily behavior. ‘…a functional approach of behavior has the advantage that it specifies the causes of a behavior in the form of explicit environmental events which can be objectively identified and which are potentially manipulable…’ [18, p. 3]. Kanfer and Saslow [17] thus suggested a series of data categories as essential in order to help the clinician in the collection and organization of information for a behavioral analysis. This list involves the analysis of the problem situation (frequency, intensity, duration, appropriateness), the circumstances where the problem appears (antecedents, consequences for the patients and the others in his environment), the motivational aspects associated with the problem (analysis of the reinforcing stimuli), the patient’s characteristic behavioral development and patient's deficits and excesses of self-controlling behaviors. To determine what resources can be used and limitations must be considered during the treatment, also a sociocultural-physical environment analysis should be done.

Standardized interviews and tests may collect behavioral samples of the patient’s reaction to a real problem situation in a relatively stressful interpersonal setting. Psychological tests can thus gather not only quantitative scores but they can also be treated as a small-scale life experience, yielding information about the patient’s interpersonal behavior and variations in his behavior as a function of the nature of the stimulus conditions [17]. In this chapter, we will examine the methods of behavioral assessment and standardized tools for those lifestyles (physical activity, dietary intake, smoking and alcohol consumption) currently declared by international guideline recommendations to be the major preventable risk [19].

Variations on traditional testing procedures should be also obtained by using role playing, discussion, and interpretation of current life events. Observations of interaction with significant others can also be used for the analysis of variations in frequency of various behaviors as a function of the person with whom the patient interacts. The patient may be asked to provide samples of his/her own behavior by using tape recorders for the recording of segments of interactions in his family, at work, or in other situations during his everyday life [17].

**Habitual Diet Intake and Health**

The role of dietary factors in the development of chronic disease is not fully acknowledged and is based mostly on indirect data [14]. However, epidemiologic evidence suggests that unhealthy dietary parameters are associated with increased risk for
obesity, type 2 diabetes, and heart disease [20–22], and a change in dietary choice seems to reverse or moderate the disease burden of some common risk factors related to coronary heart disease, diabetes, some cancers, and stroke [23]. Today, assessing diet intake and enhanced adherence to dietary guidelines are recommended [24].

**Dietary and Nutritional Assessment**

The goal of dietary and nutritional assessment should be to identify appropriate and pragmatic areas of change in dietary lifestyle [25]. A primary nutritional assessment should take no more than 5–15 min, and it should obtain the following information: relevant laboratory and anthropometric data and the patient’s current diet. Cultural and behavioral factors that are pertinent to a patient’s food choices should also be evaluated [25, 26].

Anthropometric data should include the patient’s body mass index \[\text{BMI} = \frac{\text{body weight (in kg)}}{\text{stature (height, in meters)}^2}\] and the body fat distribution (a local predominant abdominal fat increases the risk of complications such as metabolic syndrome and coronary heart disease) [22]. Recommended laboratory data should include total cholesterol, HDL, triglycerides, and LDL. Supplemental and specific lab tests may be appropriate in assessing the nutritional state in special population such as Crohn’s disease, colitis, diverticular disease, renal disease and patients who present unexplained gastrointestinal distress, anemia or unintentional weight loss [25, 26].

A complete dietary and nutritional assessment then provides for obtaining relevant information from the current diet. This will help determine which dietary lifestyle changes are reasonable for a given patient and any beneficial dietary habits that may be increased. Diet intake can be evaluated directly and indirectly [14]. Direct measures are aimed at counting the absolute amount of habitual diet intake. There are several methods used to assess dietary intake directly: dietary records, 24-hour dietary recall, food frequency, brief dietary assessment instruments, diet history, blended instruments [27]. Indirect methods to assess habitual dietary intake consist of trying to measure an indicator of the amount of habitual diet intake through, for example, biological markers [14]. The combination of different methods probably would give the most valid estimate [14]. The most common direct methods to assess habitual diet in a clinical setting are presented in this review. For more details, see Thompson and Subar [27].

**Dietary Records or Food Diary**

The dietary record method has the potential for providing quantitatively accurate information on food consumed during a recording period [26, 27]. For the dietary record approach, the respondent records the foods and beverages and the amounts consumed over one or more days. The amounts consumed may be measured using a scale or household measures (such as cups, tablespoons), or estimated using models,
pictures. Recording periods of more than 4 consecutive days are discouraged because of respondent fatigue [28, 29]. At the end of the recording period, a trained interviewer should review the records with the respondent to clarify entries and to probe for forgotten foods. Since the information should be recorded at the time of the eating occasion, the awareness of recording food may alter the dietary behaviors the tool is intended to measure [27]. This effect is a weakness when the aim is to measure unaltered dietary behavior. However, when the aim is to enhance awareness of dietary behavior and change that behavior this effect can be seen as an advantage. Recording, by itself, has been shown to be an effective weight loss technique [29]. Pilot study testing this approach found improved self-monitoring and adherence to dietary goals [30].

24-Hour Dietary Recall
A brief nutritional assessment tool commonly used in clinical setting is the 24-hour dietary recall. For the 24-hour dietary recall, the respondent is asked to remember and report all the foods and beverages consumed in the preceding 24 hours or in the preceding day. The rationale behind the utility of this instrument is that most people have little variability in dietary habits and are remarkably consistent with caloric intake and food choices. The recall typically is conducted by interview, in person or by telephone [31, 32], either computer assisted [33] or using a paper and pencil form. The 24-hour recall is probably the best-described quantitative method to assess dietary intake [14, 31]. An abbreviated assessment may be performed by obtaining only the previous evening’s intake (the evening is when the majority of calories are consumed). Because there is relatively little burden on the respondents, the 24-hour recall method is useful across a wide range of populations. In addition, interviewers can be trained to capture the detail necessary by avoiding leading questions and helping in reporting portion sizes. In contrast to other record methods, dietary recalls occur after the food has been consumed, so there is less potential for the assessment method to interfere with dietary behavior [27]. The main weakness of the 24-hour recall approach is the high rate of underreporting: factors such as obesity, gender, social desirability, restrained eating, education, literacy, perceived health status, and race/ethnicity have been shown in various studies to be related to underestimation [27, 34–36].

Food Frequency Approach
If the clinician is especially short on time, another assessment tool for diet intake is the Food Frequency Questionnaire (see online suppl. appendix), which is the quickest way to identify dietary patterns. Used in combination with the 24-hour recall, this is the best way to identify protective and detrimental components of the patient diet. The food frequency approach [27, 37] asks respondents to report their usual frequency of consumption of each food from a list of foods (100 categories) and frequency of use response categories (usually over an extended period such as last
3 months or last year) in order to collect a qualitative, descriptive and non-quantitative information about habitual food consumption [14]. Clinicians should focus on one or more key diet areas that are correlated with their patient's health concerns [38]. Food frequency assessment can also reveal what is missing in the diet. This information is equally important from a clinical point of view. The major limitation of the food frequency approach method is that it contains a substantial amount of measurement error [14, 27] and the difficulty in making the distinction between frequency and quantity [14].

Behavioral and Psychosocial Factors
Cultural and behavioral factors that are pertinent to a patient's food choices should also be evaluated. They include: work and other time constraints, weekend planning, timing of intake and regularity of meals, travel, age and number of children, who cooks, who purchases food, the health of other family members, family diet habits, exercise habits, cultural and religious practices. The number of previous attempts to lose weight should be taken into account, and a referral to a psychologist should be considered in the case of very low or very high BMI or in the case of possible eating disorders [39].

Physical Activity and Health

The medical literature clearly demonstrates beneficial effects of physical activity on a number of parameters that affect health and longevity [40, 41]. However, most data on the benefits of exercise come from observational trials [42]. There are no high-quality, long-term, randomized, controlled trials of exercise for prevention of cardiovascular disease or death. Observational studies, however, suggest that all-cause mortality is decreased in those patients who exercise regularly [42–61]. Exercise may provide unpretentious protection against breast cancer [62–65], pancreatic cancer [66], and other intestinal cancers [67]. A greater reduction in body fat is associated with diet integrated with exercise compared with diet alone [68]. Exercise in the absence of reduction in caloric intake may still result in weight loss and a reduction in body fat [69–70]. Intense exercise modestly advances short- and longer-term smoking cessation in women when combined with a cognitive-behavioral smoking cessation program [71], and improves exercise capacity and delays weight gain following smoking cessation [72]. Regular exercise has been shown to reduce stress, anxiety and depression [73, 74]. In a randomized trial, higher exercise energy expenditure was associated with greater improvement in measures of both physical and psychological quality of life [75]. While exercise is also associated with a small increased medical risk during or just after activity, the health benefits of exercise overcome that risk [76–81].

Currently, there are twelve commonly used physical activity recommendation guidelines for what is seen as the lower limit of acceptable physical activity [82].
Nevertheless, lack of physical activity remains a major health problem [43]. The problem of inactivity is related to the fact that physicians do not routinely screen patients for physical activity or provide counseling [83, 84]: only 13% of sedentary individuals reported that their physicians gave them advice about increasing physical activity [85] and 34% of patients reported being counseled about exercise at their last physician visit [86].

**Assessment of Physical Activity**

Physical activity was defined by Caspersen et al. [87] as ‘any bodily movement produced by skeletal muscles that results in energy expenditure’. Components of total energy expenditure include basal metabolic rate, which typically encompasses 50–70% of total energy expended, the thermic effect of food, which accounts for another 7–10%, and physical activity [88, 89]. This last component, physical activity, is the most variable component. Physical activity is measured in terms of the time it takes (duration), how often it occurs (frequency) and its intensity (the rate of energy expenditure – or rate at which calories are burnt) [90]. Although these components make up a physical activity profile, research has shown that the total amount of physical activity (minutes of moderate-intensity physical activity, for example) is more important for achieving health benefits than is any single component (frequency, intensity, or duration) [91, 92].

Valid and appropriate measurement of physical activity is a challenging task, because the relative contribution of each of these components can vary considerably both within and among individuals and populations. Therefore, in examining the relationship between physical activity and a disease or condition, it is important to focus on the dimension (or dimensions) of physical activity most likely to be associated with the specific outcome of interest [93]. Methods to assess physical activity can be divided into objective methods and subjective (self-rated or observer-rated) instruments [94].

**Observer Methods**

Observer-dependent methods based on biological and physiological approaches (e.g. heart rate monitoring, accelerometry and doubly labeled water) generally require some type of monitoring, and are thus harder to apply in large population studies than subjective assessments. Typically, these methods have been restricted to relatively small sample sizes and are considered ‘gold standard’ for the validation of other physical activity tools [93, 94]. Within this group we can find physiological approaches to measure energy expenditure (such as doubly labeled water, indirect calorimetry, heart rate monitors, ventilometry, cardiorespiratory fitness, calorimetry) and motion sensors. The latter method allows to get the best valid and real measure of habitual physical activity [14, 93–96].
Subjective Methods
The American College of Sports Medicine's journal devoted an entire supplement to describe more than 30 different instruments for subjective physical activity evaluation [94–97].

Physical activity tools can either ask about usual activity or ask about activity done within the past week, month, year, or even over a lifetime. This is the case of instruments such as physical activity logs and recalls. In the physical activity record, the patient is asked to report the time spent doing different types of activity during a given time period. Typically, physical activity logs provide a list of specific activities to choose from [89, 93]. There is a risk of losing important information, in particular, low-intensity activities tend to be underrepresented. In recalls, the study participant is asked to recall past activity, usually in an interview, in person or by phone [94–98]. The time frame could be anywhere between 24 h, a week, a year or a lifetime. Recall surveys may sometimes query the frequency and duration of activities performed over the past week. The disadvantage of the recall method is the time and cost of educating the interviewers, calling the study participants and coding the data.

Short time frames show two advantages over long time frames: the estimates are less vulnerable to recall bias and more practical to validate with objective tools. However, assessment over a short time period is less likely to reflect ‘usual’ behavior, as activity levels may vary with seasons or as a result of illness or time constraints. To obtain the best estimate of physical activity levels, some questionnaires include assessment over both a short and a long time period [93, 94].

An activity questionnaire can ask a study participant to assess his/her physical strain/fatigue on an ordinal scale when self-rating concurrent work load: this evaluation falls in the psychophysical rating scales sphere. The most popular psychophysical rating scale is the Borg scales [99].

Standardized questionnaires are also available for evaluating physical activity. Overall, standardized questionnaires are typically chosen for population studies because they possess the characteristics of non-reactiveness (they do not alter the behavior of the individual being surveyed), practicality (there are reasonable study costs and participant convenience), applicability (the instrument can be designed to suit the particular population in question), and accuracy (it is both reliable and valid) [93, 95, 96].

Standardized questionnaires for activity can have several formats: global close-ended multiple choice questions, single-item and comprehensive questionnaires [93].

Global close-ended multiple choice questions may ask individuals whether the person surveyed is more active compared to others of their age and sex [94].

Single-item questions ask about one’s overall level of physical activity by ranking it on a 5-point scale [94]. Example of single-item questions can be: ‘For how many hours per week, on average, do you engage in activity strenuous enough to build up
a sweat?’ [94]. Single-item questions lack the ability to capture all daily activities, but give a quick estimate of some components of physical activity.

Comprehensive standardized questionnaires provide more complete information compared to global and single-item questions. Some give an extensive list of activities and ask participants to indicate the duration and frequency of the activities in which they participate. These questionnaires are often modeled after the Minnesota Leisure Time Physical Activity Questionnaire published in 1978 [94, 100].

**Excessive Physical Activity**

Recent research has also suggested that excessive exercise can become a compulsive behavior that may affect psychological health [101]. Excessive exercise can become a compulsive behavior, where individuals feel compelled to exercise despite injuries, obligations or attempts to reduce their activity [102]. Exercise dependence is considered to reflect a craving for physical activity characterized by a multidimensional and maladaptive pattern of exercise that can lead to both clinical impairment and psychological distress [102–105]. The Exercise Dependence Questionnaire (EDQ) [106] is a 29-item inventory where responses are rated on a 7-point Likert type scale (from 1 = strongly disagree to 7 = strongly agree). The EDQ contains 8 subscales that are considered to reflect the multidimensional nature of the construct. The first subscale assesses the experience of withdrawal symptoms following a period of abstinence from exercise, positive reward to be gained from exercise, awareness of abnormal exercise behavior (defined as insight to the problem and interference with social and family). Three subscales are considered to reflect different forms of motivational regulation that sustain exercise behavior: desire to control his or her weight, social reasons for exercise, physical health reasons to exercise. The remaining subscale evaluates the belief that the behavior is rigid, stereotyped and excessive. It has been designed to examine possible relations between exercise dependence and eating disorders and to discriminate between primary and secondary exercise dependence; its clinical utility therefore seems to be significant [106].

**Alcohol, Smoking and Drug Consumption: A General Overview**

Most of the data concerning drug and alcohol consumption and smoking research draw upon epidemiological data, where the main focus of the measurement is on the level of each product consumption and health problems or psychosocial functioning. More recent investigations pay attention to the interactive effects of the combination of different substances and health [14].

Instruments included in this domain are designed for two general clinical functions: screening and case finding or treatment planning and monitoring. Screening
measures may be useful in non-specialty settings in order to alert to the need for more extensive assessment of substance-related symptoms for patients who present for difficulties other than the substance use. The treatment planning and monitoring measures are designed to help clinician optimize the intensity of the therapy and the changes produced during the treatment [107].

Inaccurate information represents the main problem in assessing substance use consumption. Patient denial is a significant barrier to identifying patients needing help especially for alcohol and drugs abuse. Denial may exist even when the patient is directly asked about use or confronted with behaviors suspicious for substance abuse [108]. The major part of the measures in this area is however self-rated. In this case, it may be helpful and necessary, in order to increase the validity of the assessment, to obtain reports from significant others or use biological measures [107].

Alcohol Consumption and Health

Alcohol consumption has increased globally in recent decades, and today is the world’s third largest risk factor for disease and disability in middle-income countries [108]. Alcohol is a causal factor for many medical diseases such as neurological and mental disorders [109], gastrointestinal diseases and cancer [110], and cardiovascular diseases [111]. Alcohol is also significantly associated with unintentional injuries (an alcohol intoxicated person can harm people by involving them in traffic accidents or by negatively affecting coworkers, relatives, friends or strangers) and intentional injuries (suicide and violence) [1]. Alcohol consumption and problems related to alcohol vary widely around the world, but the burden of disease and death remains significant in most countries [108]. The harmful use of alcohol is a particularly grave threat to men [108]. Overall, hazardous and harmful drinking patterns, such as drinking to intoxication and binge drinking, seem to be on the rise among adolescents and young adults [108, 112, 113]. Some studies suggest that moderate consumption may reduce the risk of myocardial infarction and other heart diseases, but what constitutes ‘moderate’ depends on age, sex, genetic characteristics, coexisting illnesses and other factors, and its benefit on health consequences is uncertain [114].

Assessment of Alcohol Consumption

Assessment of alcohol misuse requires a careful history that examines the quantity and frequency of alcohol consumed, its impact on functioning, psychological and physiologic effects of alcohol consumption and cessation [115].

The spectrum of alcohol use extends from abstinence and low-risk use (the most common patterns of alcohol use) to risky use, problem drinking, harmful use or alcohol abuse, and the less common but more severe alcoholism and alcohol dependence.
Consumption and the severity of consequences increase according to the drinking habit: men who drink more than 4 standard drinks a day (or more than 14 per week) and women who drink more than 3 a day (or more than 7 per week) are at increased risk for alcohol-related problems [121].

The US Preventive Services Task Force recommends screening for alcohol misuse in all adult patients [114, 122]. In the clinical setting, the prevalence of unhealthy use of alcohol is 7–20% or more among outpatients, 30–40% among patients in emergency departments, and 50% among patients with trauma [115–116]. US Department of Health and Human Services Recommendations [123] suggest to clinicians to routinely consider the possibility of unhealthy alcohol use in patients with hypertension, depression, insomnia, abnormal liver enzyme levels, heartburn, anemia, thrombocytopenia, injury, or problems in social life or at work [113]. The assessment for alcohol consumption should be a part of a routine examination with particular attention before prescribing a medication that interacts with alcohol, or situations that require attention, coordination, or skill (e.g. driving). Special vigilance should be paid to patients who have a family history of alcoholism, who smoke cigarettes (comorbidity is common), who have anxiety or personality disorders (particularly antisocial and histrionic personality) [124, 125].

**Standardized Tools for Alcohol Consumption**

Several validated questionnaires have been developed to identify alcohol misuse [107, 115]. Questionnaires can be completed by the patient prior to the visit with clinician review at the visit, or questions can be posed at the time of the office encounter [115]. The most important screening and case finding tools in primary care (non-specialty settings) are [107, 126]: the Alcohol Use Disorder Identification Test (AUDIT; see online suppl. appendix) [127], the CAGE questionnaire (see online suppl. appendix) [128], TWEAK test [129] and the Michigan Alcohol Screening Test (MAST) [130]. The AUDIT is the tool preferred for evaluation by the National Institute on Alcohol Abuse and Alcoholism clinician’s guide, and its psychometrics characteristics are better overall [107, 114, 131, 132]. CAGE and TWEAK are both extremely brief but are mainly focused on detecting alcohol-related use and dependence diagnoses [107]. In particular, TWEAK was specifically designed to detect women with alcohol use disorders, and it showed to be less specific in screening clinically significant alcohol use disorders in men [107]. The MAST is the longest screening tool for alcohol abuse and dependence [133, 134], and for this reason it is primarily used as a research tool rather than in clinical practice. The most commonly used standardized tools for alcohol consumption in clinical settings are described below: the AUDIT and the CAGE [107, 115].

**Alcohol Use Disorder Identification Test**

The AUDIT comes both in a clinical interview and self-report format consisting of ten questions [107, 127, 132]. Originally developed as a screening instrument for use
in primary setting to detect hazardous or harmful alcohol consumption, it is now used in a range of clinical and non-clinical settings. The 10-item core self-report or clinician-administered tool covers three different aspects of drinking: quantity and frequency, indicators of dependence and adverse consequences suggesting harmful use [107, 127, 132]. A positive score on the AUDIT (an optical cutoff score of 8 is accepted for identifying individuals with alcohol problems) alerts clinician to further investigation [107, 132]. The full 10-item AUDIT has also been validated in shortened 3- or 4-item versions [132]. High face validity (that limits its utility for patients who are motivated to deny their problems related to alcohol abuse) and some gender bias (cutoff score of 8 showed to be too high for detecting alcohol problems in women) represent the major limitations of this instrument [107].

**CAGE Questionnaire**
The CAGE [128], where each of the letters in the acronym refers to one of the 4 questions concerning the lifetime history of clinically significant alcohol problems, can be administered in a self-report or clinician interview format. Because of its brevity (it takes 1 min to be administered and scored) is one of the most widely used methods to screen for alcohol use disorder [107]. One or two positive responses to any CAGE questions suggest the need for closer assessment [135–137] for alcohol-related disorder. However, the CAGE criteria have been criticized for being insufficiently sensitive for detecting alcohol consumption in populations who have not yet developed the social and psychological stigmata of severe alcohol use disorders and do not distinguish between current and past alcohol use [107, 138].

**Single Question Screening**
In order to detect alcohol consumption, one-item questions may be nearly as effective as longer questionnaires, while questionnaires are more effective for detecting alcohol abuse or dependence than general questions [115, 139, 140]. Single-question tools may facilitate screening in situations where time is limited. Open questions may facilitate the assessment (‘Do you sometimes drink beer, wine, or other alcoholic beverages?’) and then further evaluating only those patients who acknowledge any use. A positive response should be followed by a screening test. In appropriate cases, standardized interviews can determine whether an alcohol use disorder is present, and its severity. A strategy for screening proposed by the National Institute on Alcohol Abuse and Alcoholism is published [114].

**Laboratory Tests**
Laboratory tests (e.g. levels of glutamyltransferase and carbohydrate-deficient transferring) are not more sensitive than screening questionnaires in the outpatient setting for detecting heavy or problem drinking and do not provide incremental value over questionnaires [117, 141]. While laboratory testing is not indicated for general screening for alcohol abuse, it may have a role in providing motivational feedback,
monitoring behavioral change, and it can greatly enhance the validity of patients’ self-reports [107].

**Other Measures**

Other standardized interviews for treatment planning and monitoring are available to diagnose alcohol abuse and dependence, to help clinician optimize the intensity of the therapy and the changes produced during the treatment of an alcohol disorder. Clinicians may choose among Timeline Followback [142], Alcohol Dependence Scale [143], Addiction Severity Index [144], Clinical Institute Withdrawal Assessment for Alcohol [145], Alcohol Expectancy Questionnaire [146], Drinker Inventory Consequences [147] and Obsessive Compulsive Drinking Scale [148]. For further details, see Rush et al. [107].

**Smoking and Health**

Cigarette smoking is estimated to cause over five million deaths worldwide each year and over 400,000 deaths each year in the US, making it the leading preventable cause of death [7, 19, 149]. The three major causes of smoking-related mortality are atherosclerotic cardiovascular disease, lung cancer, and chronic obstructive pulmonary disease [150]. Despite the clear evidence that quitting smoking decreases the risk of lung cancer and many other cancers, heart disease, stroke, chronic lung disease, emphysema, and other respiratory illnesses, the likelihood of developing cardiovascular or chronic pulmonary disease remains high even after quitting [151].

By 2030, there will be at least another 2 billion people in the world. Even if prevalence rates fall, the absolute number of smokers will increase [152]. Cigarette smoking is widely viewed as an addiction influenced by a wide range of psychosocial and physiological factors, including (but not limited to) the pharmacologic effects of nicotine. These include the conditioning to numerous interoceptive and exteroceptive stimuli, including emotions and environmental triggers, various socioeconomic factors, personal characteristics, and social influence factors (e.g. the cultural differences with regard to acceptance of smoking) [153].

**Assessment of Smoking Consumption and Nicotine Dependence**

Despite the benefits of smoking cessation, clinicians are not adequately screening and treating patients who smoke. Only 50% of smokers seeing a primary care physician in the past year were asked about their smoking or urged to quit [154].

The Agency for Health Care Policy and Research guidelines recommend that the tobacco use status of every patient treated in a healthcare setting be assessed and documented at every visit [155]. This practice has been shown to increase the likelihood
of smoking-related discussions between patients and physicians and to increase smoking cessation rates [156–158]. A meta-analysis of trials assessing the impact of clinician tobacco counseling found that counseling was associated with a small but significant increase in overall cessation [159]. Smoking cessation clinician counseling has traditionally occurred in the setting of an outpatient office visit, but is also of benefit to hospitalized patients who smoke, particularly those admitted with acute myocardial infarction [160–162]. Despite the growing interest in the relationship between smoking and health, measures to assess smoking are still simple, hardly standardized and psychometrically not well evaluated [14]. Questions usually concern the number of cigarettes smoked in the last 24 hours, in the last 7 days and the last year. Smoking history is also collected together with the number of quitting attempts, the age at the first cigarette and the brand of the product. Today, many tobacco researchers and clinicians are interested in the concept of tobacco dependence, which is considered a hypothetical construct involved to explain smoking relapse, heavy drug use, and severe withdrawal symptoms. The extent of nicotine dependence is thus considered an alternative, even though more indirect, approach to relate smoking consumption to health. Nicotine dependence can be measured by qualitative, objective and quantitative measures [163].

Qualitative Methods
The simplest approach to measuring dependence on cigarettes is a basic qualitative approach that uses questions to find out whether the smoker has difficulty in refraining from smoking in circumstances when he or she would normally smoke or whether the smoker has made a serious attempt to stop in the past but failed [163].

Objective Methods
The concentration of nicotine or its metabolite, cotinine, in blood, urine, or saliva is often used in research as an objective index of dependence because it provides an accurate measure of the quantity of nicotine consumed, which is itself a marker of dependence. Carbon monoxide concentration of expired air is a measure of smoke intake over preceding hours; it is not as accurate an intake measure as nicotine-based measures, but it is much less expensive and gives immediate feedback to the smoker [163].

Quantitative Methods
The most commonly used tobacco dependence measures are the Fagerstrom Tolerance Questionnaire (FTQ) [164] and the Fagerstrom Test for Nicotine Dependence (FTND) [165]. The FTND assessment of physical dependence was derived from the FTQ and was intended to overcome the psychometric and validity limitations of the FTQ [164–166].

The FTND [165] was designed to provide an ordinal measure of nicotine dependence related to cigarette smoking. In its six items, the test evaluates the quantity
of cigarette consumption, the compulsion to use, and the dependence. The scale is useful as a screen but also as a severity rate for treatment planning and prognostic value. Scoring consists of yes/no items and multiple-choice items scored from 0 to 3. The total score yielded from the items range from 0 to 10. The average score in randomly selected smokers is 4–4.5, whereas in cigarette smokers seeking treatment the mean score is from 5.2 to 6.3. No specific cut points exist for the diagnosis of nicotine dependence. However, the total score of FTND can be used as a classification of the degree of severity of dependence as follows: very low (0–2); low (3–4); moderate (5); high (6–7); very high (8–10) [108]. Its brevity (it takes about 3 min to be completed) and the easy scoring make it an efficient method to obtain clinical information. The FTND can be incorporated into a general health and lifestyle screening questionnaires for clinical and community settings. Of all the items in the questionnaire, cigarettes per day and time to first cigarette of the day seem to be the most important indicators of dependence [163, 166].

The Cigarette Dependence Scale (CDS) was developed by evaluating smokers through mail and Internet to assess signs that smokers believed indicated addiction to cigarettes [167]. There are two versions of CDS: 5- and 12-item scales. The CDS is a continuous measure of dependence that appears to reflect both DSM-IV/ICD-10 as well as FTND measure. The CDS is a new instrument; therefore, only a modest amount of validity evidence supports its use. The face validity of its content, its high reliability, and the availability of brief forms should promote its clinical use when more validity data are available [166].

The Nicotine Dependence Syndrome Scale, a 19-item self-report measure, was developed as a multidimensional scale to assess nicotine dependence based on Edwards’s theory of the dependence syndrome [168]. Applying this syndromal approach to tobacco dependence, Shiffman et al. [169] developed a 23-item scale (then revised into a 30-item scale and ultimately pared to a 19-item version) aimed at addressing five different dimensions of nicotine dependence. Drive reflects craving, withdrawal, and smoking compulsions; priority reflects preference for smoking over other reinforcers; tolerance reflects reduced sensitivity to the effects of smoking; continuity reflects the regularity of smoking rate, and stereotypy reflects the invariance of smoking.

The assessment of smoking habits to be reliable and valid cannot restrict itself to asking subjects to report the amount of tobacco products smoked, type or brand and the frequency of smoking, but should also involve a measurement of the subject’s typical smoking style [14]. The Wisconsin Inventory of Smoking Dependence Motives (WISDM-70) is a 68-item measure developed to assess dependence as a motivational state [170]. In other words, this scale attempted to assess the processes that lead to dependence in the way that a physician would use blood pressure to predict end-state organ damage. The intent was to craft self-report measures that were relatively direct indicators of the motivational press to use drug in a dependent manner. This measure has 13 theoretically based subscales designed to tap different smoking
dependence motives: Affiliative attachment, Automaticity, Behavioral choice/melioration, Cognitive enhancement, Craving, Cue exposure/associative processes, Loss of control, Negative reinforcement, Positive reinforcement, Social/environmental goals, Taste/sensory properties, Tolerance, Weight control. The WISDM-68 has good psychometric properties that allow dependence to be assessed as a multidimensional motivational state. The clear theoretical basis of this measure and its length suggest that the WISDM-68 is more appropriate for theory-driven research than for clinical purposes [166].

More research on the suitability of these measures in different genders and races, and with psychiatric comorbidities is required. With more research into the construct validity of these new measures, researchers may develop a better understanding of mechanisms underlying tobacco dependence and their relation to various theoretically, societally, and clinically important criteria [166].

Illicit Drug Consumption and Health

According to several cross-sectional studies of the prevalence of alcohol/drug abuse and addiction, up to 40% of hospital admissions are related to substance abuse and its sequelae [171]. Patients who are intoxicated are more likely to be injured in traumatic accidents, and there is a significant association between having a substance use disorder and injury from physical trauma [172]. Drug abuse is more prevalent in patients who are depressed, anxious, or have any other psychiatric comorbidity (including personality disorders), and in those who smoke tobacco and who abuse alcohol. Drug use may be associated with other addictive patterns, such as gambling or sexual behaviors, that may require treatment in addition to the chemical dependence [120]. Special attention should be paid in the differential diagnosis of substance abuse in patients who are prescribed addictive drugs on a long-term basis for the treatment of a disease or a chronic pain syndrome. These patients develop physical dependence, but do not meet the behavioral criteria for drug dependence [120].

Assessment of Illicit Drug Consumption

An important advice should be taken into account in the evaluation of illicit drug consumption. In order to establish some level of comfort for the patient, it is often best to first ask about socially accepted substances, such as nicotine and caffeine (coffee, soda, energy drinks) and next about alcohol use (in particular beer, that is generally not considered to be ‘alcohol’). Then you may ask about pills and herbal preparation consumption. The issue of illicit drugs should be the last to treat. By this time, the patient should have a sense that the practitioner is asking for information in a non-judgmental manner. Marijuana, which is considered less problematic by users, widely
prevalent, and carries less social stigma, should be asked about first. Inquiries should then be made about cocaine and heroin use, as well as prescription pain medications. For each substance, patients should be asked about quantity used, the amount of money spent on a daily/weekly/monthly basis for drugs, the frequency of drug use. It may be helpful to find out where, when, and with whom drugs or alcohol are most often used. Finally, it is of importance to evaluate the route of administration (e.g. oral, intranasal) and whether the patient has ever injected drugs in the past or shared needles [120].

Standardized Tools for Illicit Drug Consumption

The CAGE questionnaire, briefly described above as a screening tool for alcohol consumption, has been modified in order to screen for drug use only, and is called the CAGE-AID questionnaire (AID = adapted to include drugs) [173]. High numbers of affirmative responses are related to higher likelihood of chemical dependence, and further investigation by the clinician is warranted [174]. The CAGE-AID is especially useful in settings where there is a high likelihood of drug or alcohol use, such as emergency departments, sexually transmitted disease clinics, and student health centers. The Drug Abuse Screening Test (DAST; see online suppl. appendix) [175] adapted from the MAST [133], is a self-report instrument (20 or 28 items) created to identify a lifetime abuse or dependence drug diagnosis across a wide range of psychoactive substances other than alcohol. DAST covers a wide range of clinical consequences related to drug misuse without being specific about a drug, e.g. diminished control over the drug and tolerance and withdrawal symptomatology. Its total score provides a lifetime measure of drug problem severity. The DAST proved to be clinically relevant in mentally ill adult and in settings in which seeking treatment for drug use was not the main declared patient’s goal [107].

Laboratory Tests

Urine, blood, breath, hair, saliva, and sweat are all types of lab tests for drug consumption. Urine testing is most widely used because it is noninvasive, simple to obtain, and yields a detectable concentration of most drugs; however, it does not measure impairment. Blood levels of drugs can provide more information about level of impairment, but must be obtained invasively, and drug metabolism may shorten the time in which a drug can be detected in the bloodstream, compared to urine sampling. The best evidence for long-term drug use is the combination of a good history and a urine toxicology screen [176].

Conclusion

Clinicians continue to be the most respected source of lifestyle modification information [15]. A number of psychological treatments have been found to be effective in
health-damaging behaviors [177]. A basic psychosomatic assumption is the consideration of patients as partners in managing disease. The partnership paradigm includes collaborative care (a patient-physician relationship in which physicians and patients make health decisions together) [178, 179] and self-management (a plan that provides patients with problem-solving skills to enhance their self-efficacy) [180, 181].

The assessments of lifestyle are underutilized despite considerable evidence of their effectiveness in both clinical and normal populations [8]. Methods for assessing lifestyles were presented in this review. To evaluate behaviors in clinical practice via interview, not only clinimetric and psychometric assessment is essential. Behavioral analysis should also include functional analysis of behavior. Several validated developmental and behavioral instruments that are easily and briefly administered are available. Questionnaires are typically chosen for population studies because they possess the characteristics of non-reactiveness (they do not alter the behavior of the individual being surveyed), practicality (there are reasonable study costs and participant convenience), applicability (the instrument can be designed to suit the particular population in question), and accuracy (it is both reliable and valid). However, currently methods to assess diet intake, physical activity, alcohol, smoking and other illicit drugs suffer from serious methodological defects such as underreporting and overreporting and the influence of cultural and social ideas in the definition of what it is considered acceptable consumption [14]. Assessment of the patient’s behavior only based on the verbal report remains insufficient for a complete analysis and for prediction of his/her daily behavior; implementation of tools for assessing lifestyle has therefore been recommended [90].

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