The Clinical Opiate Withdrawal Scale (COWS)

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Abstract—The clinical opiate withdrawal scale (COWS) is a clinician-administered, pen and paper instrument that rates eleven common opiate withdrawal signs or symptoms. The summed score of the eleven items can be used to assess a patient's level of opiate withdrawal and to make inferences about their level of physical dependence on opioids. With increasing use of opioids for treatment of pain and the availability of sublingual buprenorphine in the United States for treatment of opioid dependence, clinical assessment of opiate withdrawal intensity has received renewed interest. Buprenorphine, a partial opiate agonist at the mu receptor, can precipitate opiate withdrawal in patients with a high level of opioid dependence who are not experiencing opioid withdrawal. Since development of the first opiate withdrawal scale in the mid-1930s, many different opioid withdrawal scales have been used in clinical and research settings. This article reviews the history of opiate withdrawal scales and the context of their initial use. A template version of the COWS that can be copied and used clinically is appended. PDF formatted versions of the COWS are also available from the websites of the American Society of Addiction Medicine, the California Society of Addiction Medicine, the UCLA Integrated Substance Abuse Programs, and AlcoholMD.com.

Keywords—buprenorphine induction, chronic pain, Himmelsbach scale, history of opiate withdrawal scales, measurement of opioid withdrawal signs and symptoms

Assessment of opioid[1] withdrawal usually employs some combination of observable behaviors (e.g., yawning, restlessness, rhinorrhea), physiological measures (e.g., pulse rate, blood pressure, or pupil size), and patients' subjective rating of opiate withdrawal symptoms. Observable behaviors (more conventionally called "signs" in medical parlance) are generally considered more valid than addicts' self-report of symptoms. The enhanced validity, however, can be illusionary, as all the usually observed behaviors with the exception of piloerrection (gooseflesh skin) can be feigned. Some clinicians have proposed incorporating physiological measures (e.g., heart rate, temperature, instrument-measured hand tremor, trapezius electromyogram) in an effort to increase the sensitivity and validity of opiate withdrawal measurement.

Opioid withdrawal intensity is a function of: (1) the severity of physical dependence on opioids, and (2) the relative occupancy of the mu opiate receptor at a point in time. To show spontaneous opioid withdrawal, a patient must be physically dependent (a neuroadaption process) and have a relative abstinence of opioids occupying the mu opiate receptors.

Some medications (for example, opioid antagonists such as naloxone, naltrexone, nalmefene and partial opioid agonists such as buprenorphine) can precipitate opioid withdrawal in a patient who is physically dependent on opioids. They do so by displacing the full agonist (e.g., heroin, morphine, methadone) from the mu opiate receptor with a substance with higher affinity for the receptor than the full

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TABLE 1
Himmelsbach's Point System for Measuring Opioid Abstinence Syndrome Intensity by the Day or Hour (Himmelsbach 1941)

	By Day (D)		By Hour (H)	
Sign or Symptom	**Points**	**Limit**	**Points**	**Limit**
Yawning	1	1	1	1
Lacrimation	1	1	1	1
Rhinorrhea	1	1	1	1
Perspiration	1	1	1	1
Mydriasis	3	3	3	3
Tremor	3	3	3	3
Gooseflesh	3	3	3	3
Anorexia (40% decrease in caloric intake)	3	3	—	—
Restlessness	5	5	5	5
Emesis (each spell)	5	—	5	5
Fever (for each 0.1° C. rise over mean addiction level)	1	—	1	10
Hyperpnea (for each resp./min rise over mean addiction level)	1	—	1	10
Rise in a.m. systolic B.P. (for each 2 mm. Hg over mean addiction level)	1	1.5	1	10
Weight loss (a.m.) (for each lb. from last day of addiction)	1	—	—	—

Total abstinence syndrome intensity score per day or per hour is the sum of the points scored in the (D) or (H) columns, respectively, with due attention to the limits.

agonist, but with no (antagonist) or less (partial agonist) intrinsic opiate activity.

MEASUREMENT OF OPIATE WITHDRAWAL SEVERITY

Opiate withdrawal scales have been developed to compare the efficacy of treatments for withdrawal, to assess the degree of physical dependence before methadone induction, and to assess physiological patients' readiness for buprenorphine induction. Most often they have been used in a research context; however, with the increasing use of best-practice and standardized protocols to guide treatment, their use in clinical practice is likely to increase.

Since one use of opiate withdrawal scales is for induction of patients on methadone or buprenorphine, an instrument should discriminate clearly between symptoms of opiate toxicity and opiate withdrawal. Confusion of opiate toxicity with opiate withdrawal can have disastrous clinical results. Fatal methadone overdoses have apparently been the result of such confusion by patients or clinicians. Nausea, for example, can result from opiate withdrawal or be caused by opiate intoxication.

The following section traces the history of some of the more well-known opiate withdrawal rating scales and describes the context in which they were developed.

The Himmelsbach Scale

The first rating scale to assess the severity of opiate withdrawal was developed at the Federal Addiction Research Center in Lexington, Kentucky. Lawrence Kolb and C. K. Himmelsbach described the scale at the ninety-third annual meeting of the American Psychiatric Association in 1937. Their paper was subsequently published in the *Journal of Clinical Psychiatry* (Kolb & Himmelsbach 1938). Several years later, Himmelsbach published a more detailed description of the instrument in the *Annals of Internal Medicine* (Himmelsbach 1941), and the scale became commonly cited as the Himmelsbach scale. Most opiate withdrawal scales are modeled to some extent on this scale. However, some of the rating criteria in the Himmelsbach scale, such as weight-loss and caloric intake, require observation over a 24-hour period and are not applicable to symptomatic assessment at any single point in time (see Table 1).

In the late 1960s other investigators at the Addiction Research Center developed instruments that focused on the subjective effects of opiate withdrawal. First was the Opiate Withdrawal Subjective Experience Scale (OPW),[2] which consisted of items culled from a 550-item, true-false questionnaire developed at the Addiction Research Center Inventory (the Addiction Research Center in Lexington, Kentucky was part of a federal prison operated by the U.S. Department of Public Health). Items were selected which discriminated subjects who reported that they were or were not experiencing opiate withdrawal (Haertzen & Meketon 1968). Later refinements included the Strong Opiate Withdrawal Scale (SOW) for measuring withdrawal from high levels of physical dependence and the Weak Opiate Withdrawal Scale (WOW) for measuring less intense withdrawal symptoms (Haertzen, Meketon & Hooks 1970).

TABLE 2
The Subjective Opiate Withdrawal Scale (Handelsman et al. 1987)

	Score				
	0	1	2	3	4
Item	Not at All	A Little	Moderately	Quite a Bit	Extremely
1. I feel anxious					
2. I feel like yawning					
3. I'm perspiring					
4. My eyes are tearing					
5. My nose is running					
6. I have goose flesh					
7. I am shaking					
8. I have hot flashes					
9. I have cold flashes					
10. My bones and muscles ache					
11. I feel restless					
12. I feel nauseous					
13. I feel like vomiting					
14. My muscles twitch					
15. I have cramps in my stomach					
16. I feel like shooting up now					

Patients are asked to score each item on how they feel at the time they are completing the rating sheet. The scale score is the total of all item scores.

With the advent of methadone maintenance treatment in the early 1970s, clinicians needed a practical and reliable method for determining whether patients were physically dependent on opiates. Opiate use history alone was not sufficient, since addicts sometimes exaggerate or minimize the severity of their drug problem. To devise more objective diagnostic tests for assessing level of physical dependence, protocols were developed and widely disseminated using the short-acting, opiate antagonist naloxone (Blachly 1973a, b; Blachly & Vandam 1972). In patients who are physically dependent on opiates, intravenous or intramuscular administration of naloxone precipitates acute opiate withdrawal. As a diagnostic procedure, this became known as the "naloxone challenge."

Some naloxone protocols focused on nonambiguous signs of opiate withdrawal such as gooseflesh. Although not experienced by all addicts undergoing precipitated withdrawal, when present gooseflesh is considered a very reliable sign since it cannot be feigned (Blachly 1973a). Richard Wang and colleagues at the Veterans Administration Drug Treatment Center in Milwaukee used a list of 10 items adapted from the Himmelsbach scale to measure signs and symptoms before and after an intramuscular injection of 0.8 mg naloxone (Wang et al. 1974). The items included the usual signs of opiate withdrawal except mydriasis, and added such symptoms as "feeling of change in temperature," "stomach pain," and "muscle aching."

The Opiate Withdrawal Scale (OWS)

In England, a group of investigators studying the role of conditional withdrawal in precipitating relapse to opiates developed the Opiate Withdrawal Scale (OWS), a 32-item inventory of opiate withdrawal signs and symptoms from medical literature (Bradley, et al. 1987). Patients rated the intensity of each sign or symptom occurring during the previous 24 hours on a four-point scale—nil (0), mild (1), moderate (2), and severe (3)—yielding a total score ranging from 0 to 96. The investigators used principal component analysis to assess the contribution of each item to the overall score. They also compared scores on the OWS to an unspecified observer-rated scale completed by nurses and found that where withdrawal distress was fairly low, the observer-rated scale was fairly insensitive, but when distress was marked, the two scales were well correlated.

Subjective Opiate Withdrawal Scale (SOWS)

Noting that the Himmelsbach scale had only been validated in patients with high levels of physical dependence, clinical investigators at the Veterans Administration Medical Center in the Bronx and the Department of Psychiatry at the Mount Sinai School of Medicine in New York examined the validity and interrater reliability of two new opiate withdrawal scales: the Subjective Opiate Withdrawal Scale (SOWS) and the Objective Opiate Withdrawal Scale (OOWS, described below). The purpose of the new withdrawal scales was to provide researchers with more sensitive and validated instruments that could be used in measuring clinical effectiveness of medications used for treatment of opiate withdrawal. The scales were validated by comparing patients' scores before and two days after beginning methadone. Opiate abusers scale scores were also examined before and after being challenged with either placebo or 0.4 mg of naloxone.

TABLE 3
The Objective Opiate Withdrawal Scale (Handelsman et al. 1987)

Item	Score One Point for Each Item if:
1. Yawning (Frequency = # of yawns per observation period)	One or more
2. Rhinorrhea (Frequency = # of sniffs per observation period)	Three or more
3. Piloerection (Gooseflesh—observe patient's arm)	Present
4. Perspiration	Present
5. Lacrimation	Present
6. Mydriasis	Present
7. Tremors (hands)	Present
8. Hot and cold flashes (Shivering or huddling for warmth)	Present
9. Restlessness	Present
10. Vomiting	Present
11. Muscle Twitches	Present
12. Abdominal cramps (Holding stomach)	Present
13. Anxiety (Range: mild to severe) *Mild:* observable manifestations—foot shaking, fidgeting, finger tapping *Moderate to severe*: agitation, unable to sit, trembling, panicky; complains of difficulty in breathing, choking sensations, palpitations.	Present

TABLE 4
The Short Opiate Withdrawal Scale (Gossop 1990)

Item	0 None	1 Mild	2 Moderate	3 Severe
Feeling sick				
Stomach cramps				
Muscle spasms/twitching				
Feelings of coldness				
Heart pounding				
Muscular tension				
Aches and pains				
Yawning				
Runny eyes				
Insomnia/problems sleeping				

Patients were asked to put a check in the column if they had suffered from any of the following conditions within the past 24 hours.

On the Subjective Opiate Withdrawal Scale (SOWS), patients rate each of 16 items on a five-point scale, yielding a total score ranging from zero to 64. Table 2 shows a version of the instrument constructed from the description (Handelsman et al. 1987).

Objective Opiate Withdrawal Scale (OOWS)

The Objective Opiate Withdrawal Scale (OOWS) is a 13-item scale on which each sign is rated as absent or present during a time period during which the patient is observed (see Table 3). Subsequent investigators have referred to the OOWS but do not necessarily include the same items (as an example see Turkington & Drummond 1989).

Short Opiate Withdrawal Scale (SOWS)

One of the investigators involved in development of the 32-item OWS published a shortened version (Gossop 1990; see Table 4). Some items were eliminated because they had low loading on factor analysis or because they were unclear to addicts (e.g., "feelings of unreality"). Ultimately the scale was winnowed to 10 items. In a sample of 68 opiate addicts studied during withdrawal from

TABLE 5
The Subjective Opiate Withdrawal Questionnaire (Loimer, Linzmayer & Grunberger 1991)

1. I feel very good	I feel very bad
2. My conecntration is poor	My concentration is good
3. I cannot think clearly	I can think clearly
4. I have a good appetite	I have a poor appetite
5. My thoughts revolve around drugs	Drugs do not preoccupy me
6. I am optimistic	I feel pessimistic
7. I feel active	I feel apathetic
8. I have feelings of anxiety	I have no feelings of anxiety
9. I am indifferent	I take an interest in my environment
10. I sleep very well	I sleep very badly
11. I feel restless	I am at peace with myself
12. My mood is changeable	My mood scarcely changes
13. I am depressed	I am in good humor
14. I am tired and weak	I am lively and awake
15. I have severe withdrawal symptoms	I have no severe withdrawal symptoms
16. I am irritable and grumpy	Nothing upsets me
17. I have no pain	I have severe pain
18. Sex interests me greatly	Sex does not interest me
19. I have severe diarrhea	I am severely constipated
20. I am sweating heavily	I am not sweating

Each of the 20 items was rated on a 100 mm. line anchored on one end by the items on column 1 and on the other end by the items in column 2. The total score was the sum of analogue scores for all 20 items.

methadone, the 32-item scale and the 10-item scale showed a 0.97 correlation (Gossop 1990).

The Subjective Opiate Withdrawal Questionnaire (SOWQ)

Investigators at the University of Vienna studying rapid opiate detoxification devised the Subjective Opiate Withdrawal Questionnaire (SOWQ), a dichotomous, 20-item survey to assess patients' symptoms before and after detoxification (Loimer, Linzmayer & Grunberger 1991). The SOWQ was not based on the Himmelsbach scale and included such domains as mood, which were not assessed in other scales (see Table 5).

The Clinical Opiate Withdrawal Scale

The Clinical Opiate Withdrawal Scale (COWS) was first published in a training manual for buprenorphine treatment (Wesson et al. 1999; see Appendix 1). The items included have been validated in other assessment instruments. The rating system for each item takes into account that some signs and symptoms may occur along a continuum. For example, stomach cramping may be subjective at low levels of intensity but become a sign at higher levels (e.g., vomiting or diarrhea).

The COWS format and item rating system were modeled after the Clinical Institute Withdrawal Assessment of Alcohol Scale revised (CIWA-Ar; Sullivan et al. 1989). The instrument can be completed in about two minutes while talking with a patient and observing for opioid withdrawal signs. It can be serially administered to track changes in the severity of opiate withdrawal symptoms over time or in response to treatment.

The score for each item reflects the severity of the sign or symptom, and the total scores are grouped as "mild (5 to 12 points)," "moderate (13 to 24)," "moderately severe (25 to 36), and "severe (more than 36).

Use of the COWS in Buprenorphine Induction

Buprenorphine is a partial opiate agonist that can precipitate opiate withdrawal if administered to a physically-dependent patient. Buprenorphine is a partial opiate agonist. Unlike full opiate agonists, such as heroin, methadone, or morphine, whose opiate effects continue to increase as the dose increases, buprenorphine has a ceiling effect, beyond which additional buprenorphine has no additional opiate effects (including respiratory depression). Since, however, buprenorphine has a higher affinity for the mu opiate receptor than do full opiate agonists, it can displace them from the receptor. If the opiate effects of buprenorphine are not as great as the full opiate agonist displaced, opiate withdrawal will be precipitated.

Clinical guidelines for buprenorphine induction generally mention that a patient thought to be physically dependent on opioids should be in mild to moderate withdrawal or that some number of hours should have occurred since last use of an opioid such as heroin or methadone

before giving the first dose of buprenorphine. Using time as a criterion for the first dose of buprenorphine is problematic because patients are not always truthful in reporting their last use and the rate of opioid metabolism varies considerably from patient to patient. A safer approach is to wait until the patient is experiencing moderate to severe opiate withdrawal. Clinical experience with the COWS suggests that buprenorphine is unlikely to precipitate withdrawal in subjects who are physically dependent on opioids with withdrawal ratings of 25 or greater. Some patients with mild or moderate ratings will not have opiate withdrawal symptoms precipitated. These are possibly patients with a lower level of physical dependence. The validity of the COWS in predicting precipitated withdrawal at the low end of the scale needs additional study.

CONCLUSION

The COWS is an easy to administer clinical tool to assess opiate withdrawal signs and symptoms. In patients who are physically dependent on opioids, the total score is a good index of patients' opiate withdrawal intensity. The scale can be applied to patients in a variety of office, clinic and hospital settings, and used with patients undergoing treatment for opioid addiction as well as patients with chronic pain who may be physically dependent on opioids.

NOTES

1. An *opioid* is any drug or medication (either naturally occurring or synthetic) with morphine-like effects. An *opiate* is a drug or medication that is derived from the opium poppy. Opiate is also used to refer to mu and other endogenous opiate receptors.

2. The designation of this scale by its acronym began a tradition for naming opioid withdrawal scales. The acronyms can be confusing as they are not always unique; see the two different SOWS below.

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APPENDIX 1
Clinical Opiate Withdrawal Scale

For each item, circle the number that best describes the patient's signs or symptom. Rate on just the apparent relationship to opiate withdrawal. For example, if heart rate is increased because the patient was jogging just prior to assessment, the increase pulse rate would not add to the score.

Patient's Name:_____ Date and Time ____/____/____:_____

Reason for this assessment:_____

Resting Pulse Rate: _____beats/minute *Measured after patient is sitting or lying for one minute* 0 pulse rate 80 or below 1 pulse rate 81-100 2 pulse rate 101-120 4 pulse rate greater than 120	**GI Upset**: *over last 1/2 hour* 0 no GI symptoms 1 stomach cramps 2 nausea or loose stool 3 vomiting or diarrhea 5 multiple episodes of diarrhea or vomiting
Sweating: *over past 1/2 hour not accounted for by room temperature or patient activity.* 0 no report of chills or flushing 1 subjective report of chills or flushing 2 flushed or observable moistness on face 3 beads of sweat on brow or face 4 sweat streaming off face	**Tremor** *observation of outstretched hands* 0 no tremor 1 tremor can be felt, but not observed 2 slight tremor observable 4 gross tremor or muscle twitching
Restlessness *Observation during assessment* 0 able to sit still 1 reports difficulty sitting still, but is able to do so 3 frequent shifting or extraneous movements of legs/arms 5 unable to sit still for more than a few seconds	**Yawning** *Observation during assessment* 0 no yawning 1 yawning once or twice during assessment 2 yawning three or more times during assessment 4 yawning several times/minute
Pupil size 0 pupils pinned or normal size for room light 1 pupils possibly larger than normal for room light 2 pupils moderately dilated 5 pupils so dilated that only the rim of the iris is visible	**Anxiety or Irritability** 0 none 1 patient reports increasing irritability or anxiousness 2 patient obviously irritable or anxious 4 patient so irritable or anxious that participation in the assessment is difficult
Bone or Joint aches *If patient was having pain previously, only the additional component attributed to opiates withdrawal is scored* 0 not present 1 mild diffuse discomfort 2 patient reports severe diffuse aching of joints/muscles 4 patient is rubbing joints or muscles and is unable to sit still because of discomfort	**Gooseflesh skin** 0 skin is smooth 3 piloerrection of skin can be felt or hairs standing up on arms 5 prominent piloerrection
Runny nose or tearing *Not accounted for by cold symptoms or allergies* 0 not present 1 nasal stuffiness or unusually moist eyes 2 nose running or tearing 4 nose constantly running or tears streaming down cheeks	Total Score _____ The total score is the sum of all 11 items Initials of person completing assessment: _____

Score: 5-12 = mild; 13-24 = moderate; 25-36 = moderately severe; more than 36 = severe withdrawal

This version may be copied and used clinically.