

THE STUDY OF THE VALIDITY OF PREDICTIVE ALCOHOL WITHDRAWAL SCALE (PAWS SCALE) FOR COMMUNITY HOSPITALS

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Abstract

This research is a Prospective Cohort study which aims to examine the validity of the Predictive Alcohol Withdrawal scale (PAWS scale) and to determine the appropriate score and the recommended intersection of the PAWS scale. The sample group is the people who have previously been diagnosed by the doctors against the criteria of DSM-V and WHO with alcohol dependence F10.2. They have been examined by the PAWS scale and were indications suggesting to stay at Phanom Dongrak Chalermparakiet 80th Anniversary Hospital. The results of the study reveal that the average age of the sample group was 43 years with 89.90% male. The diagnosis of alcohol addicts treated at the hospital found that the number 1 was gastrointestinal disease of 16 people (22.9%), followed by the respiratory disease of 13 people 18.60% and the other infections of 9 people (12.9%) respectively. The sensitivity of this predictive model was 98.10%. The specificity was 93.80% with the Positive Predictive Value of 98.10% and the Negative Predictive Value of 93.80%. The study also found that there were 70% of the sample group with PAWS scale of more than or equal to 4 who had severely alcohol withdrawal syndrome. Therefore, the appropriate intersection score using ROC, QROC and logistic regression predicted probability was more than or equal to 4.

Keywords: Predictive Alcohol Withdrawal scale (PAWS scale), Alcohol Withdrawal Scale (AWS), Clinical Institute Withdrawal Assessment For Alcohol- Revised Version (CIWA-ArScore), Alcohol Withdrawal Syndrome, Alcohol Dependence

Introduction

In 2018, the global situation of alcohol and health showed that 43% of the global population, or approximately 2.3 billion people, is alcoholic (World Health Organization, 2018). About 3 million of population aged 15-49 years have died of disease and drinking-related injuries every year.

In Thailand, among the population aged 15 years and above (or a total of 55.9 million people

(Assanangkornchai, 2019), the 25-44 age group had the highest drinking rate of 36.0%. The survey of mental health problems also found that 2.7 million Thai people aged 18 years and above had alcohol used disorder, with 1.8 million people who were alcohol abuse and 900,000 people who were alcohol dependence (Office of the Health Promotion Foundation, 2017). According to the facts, there

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should be an effective tool to assess alcohol withdrawal syndrome in order to treat it seriously.

The Clinical Institute Withdrawal Assessment for Alcohol (CIWA-Ar score) (Sullivan *et al.*, 1989) is a tool which has been widely used. However, most of the research was conducted in severity level of mild to moderate patients where the severely deprived group was less detected or not detected. The patients will be detected only when they begin to have symptoms and the possible risks were not included in the assessment. Therefore, the author chose to study the validity of a new type of Prediction of Alcohol Withdrawal Scale called PAWS scale.

The Prediction of Alcohol Withdrawal Scale (PAWS scale) (Maldonado *et al.*, 2014) was initiated by psychiatrist Dr. Jose R. Maldonado at Stanford University, USA during 2014-2015. He studied the validity of the tools and finally applied the risks and vital sign in the assessment of alcoholism which was able to better assess the alcohol withdrawal syndrome and also in severe cases. However, the study data was only available to patients who could speak English. Therefore, this research focused on the gap opportunity of extending previous research with Thai context by translating and adding appropriate information to apply and used PAWS scale in the medical history taking point. The treatment was planned according to the standards of the Department of Mental Health, Ministry of Public Health. The gold standard was used as a psychiatrist in the diagnosis of alcohol withdrawal syndrome, together with the use of AWS and CIWA-Ar scores.

The objectives of this study are to examine the validity of PAWS scale, also the appropriate score and the recommended intersection of it. The expected outcomes are to use PAWS scale as a prediction of alcohol withdrawal syndrome in the community hospitals. Moreover, PAWS scale can be used to plan the treatment for alcoholic patients and for further research use.

Concepts and Related Theories About Alcohol Withdrawal

Alcohol Dependence diagnosis was performed by using the criteria of ICD-10 (International Classification of Diseases and Related Health Problems) and DSM V (Diagnostic and Statistical Manual of Mental Disorder 5). Inappropriate alcoholism can lead to clinically significant disorders or distress, showing symptoms such as drug resistance and being more or less intoxicated for a longer period of time, etc. In other word, alcohol withdrawal is a condition where there is a change in the physiology or symptoms will occur after reducing the amount of drinking. The

neurotransmitter receptor systems in the brain of the patients with chronic alcohol dependence are likely to adjust such as a decrease in inhibitory neuropathy and an increase nervous system stimulation when the patient abruptly stops drinking alcohol. Moreover, brain systems have to work harder, especially the sympathetic autonomic nervous system causing alcohol deficiency syndrome when stop drinking.

There are many factors associated with severe alcohol withdrawal syndrome such as the people with age over 30 years, have drunk high amounts of alcohol at a time (>150 g per day) for over 5 years, have ever had a severe alcohol deficiency (Delirium Tremens; DTs) and also had seizures due to lack of alcohol, etc.

Causes and Pathophysiology of Alcohol Withdrawal

When a person starts drinking alcohol, the action of GABA-A receptors is stimulated and also inhibit the action of NMDA receptors. In contrast, the inhibitory function of the GABA-A receptor decreases and the excitatory function of the NMDA receptor increases when the person drink for a period of time leading to alcohol tolerancesuch as 1) Metabolic tolerance which increases the rate of ethanol in the liver allowing people drink more to get the same effect, 2) Cellular tolerance which decreases neurons and GABA mediated inhibition causing risk of seizures after alcohol withdrawal and 3) Behavioral tolerance which causes a person to drink alcohol before doing activities, causing adrenergic hyperactivity when immediately stop drinking. It also leads to irritability, agitation, aggression, trembling hands, convulsions.

Severity Levels of Alcohol Withdrawal

1) Mild alcohol withdrawal occurs from 6 h to 36 h after the last drink. The symptoms include trembling hands, irritability, slight anxiety, pain, dizziness, sweating, palpitations, loss of appetite, high blood pressure, nausea, vomiting, insomnia, etc.

2) Moderate alcohol withdrawal occurs 24-27 h after the last drink, causing rapid pulse, high blood pressure, restlessness, shaking hands, tremors, sweating, loss of appetite, nausea, vomiting and diarrhea.

3) Severe alcohol withdrawal occurs 48-96 h after the last drink, causing confusion of date, time and place (Delirium Tremens) with extreme restlessness, trembling hands, shivering, decreased concentration, rapid pulse, fever, hallucinations, delusional hearing, and paranoia.

Phanom Dong Rak Chalermparakiet 80th Anniversary Hospital has adopted the guidelines

from the Department of Mental Health, Ministry of Public Health for the care of alcohol withdrawal patients and to perform alcohol withdrawal risk assessment.

Step 1, The patients with ASSIST score ≥ 27 or with physical accident or general patients who had drunk regularly in the past 3 months were assessed by answering the questions from CAGE tool which includes CUT DOWN (Have you ever felt that you should cut down on your alcohol drinking?), ANNOYED (Has someone annoyed you by warning or blame you on alcohol drinking?), GUILTY (Have you ever felt bad or guilty about your alcohol drinking?) and EYE-OPENER (Have you had to drink alcohol in the morning to get rid of your hangover?). For step 2, when criteria 1 is not met, risk factors for severe alcohol withdrawal from history of continuous drinking were concerned in order to provide advice and first aid if there is high chance of occurring alcohol withdrawal syndrome.

Alcohol Withdrawal Monitoring

If there was a risk of alcohol withdrawal, the alcohol withdrawal assessment should be performed by using the Alcohol Withdrawal Scale (AWS) or Clinical Institute Withdrawal Assessment for Alcohol-Revised Version (CIWA-Ar) and also monitor according to Guidelines for alcohol withdrawal to provide outpatient treatment (With mild to moderate alcohol withdrawal symptoms, CIWA-Ar ≤ 14 points or AWS ≤ 9 points) or inpatient treatment (Onset or expected to have moderate to severe alcohol withdrawal, CIWA-Ar ≥ 15 points or AWS ≥ 10 points). If the patient does not accept the treatment, we should provide short consultation, alcohol withdrawal symptoms, and motivates appropriate services.

Though the severity assessment of alcohol withdrawal symptoms with the AWS or CIWA-Ar can help to monitor withdrawal symptoms and provide appropriate treatment by adopting initial assessment and periodic assessment, the assessment score may be incorrect in cases of complications. Therefore, the results should not base on the assessment score alone. Clinical decisions and other observations should also be taken as some symptoms may lead to other complications.

Diagnosis of Alcohol Withdrawal

The criteria for alcohol withdrawal include (A) Stopping or using less alcohol after prolonged use of large amounts, (B) Have more than two symptoms including autonomic hyperactivity, increased hand tremor, insomnia, nausea or vomiting, transient visual, tactile, or auditory hallucinations or illusions, psychomotor agitation, anxiety and grand mal seizures which occurs within an hour or a few days after

criterion A, (C) The symptoms in criterion B cause discomfort such as losing job, occupation, or other important work, and (D) These symptoms are not caused by any other physical or psychiatric disorder.

Treatment of Alcohol Addiction with Alcohol Withdrawal

1) Evaluation for Diagnosis

1.1 Screening Evaluation: Use an assessment form to screen the problems raised from drinking alcohol by using Alcohol Use Disorder Identification Test (AUDIT) or CAGE to screen for nonalcohol-related cases and interview the patients with alcohol-related problem.

1.2 Diagnosis: Based on DSM-IV, DSM-V system and provide disease code according to the criteria ICD-10 of the (World Health Organization, 2018).

2) Preparation for Receiving Treatment

This includes history taking, assessing the patient's condition and evaluating sources of supported information for patients and relatives about the disease, symptoms, effects, physician guidelines and treatment participation.

3) Treatment of Alcohol Deficiency

3.1 Assessment of severity of alcohol withdrawal: use the Alcohol Withdrawal Scale (AWS) or Clinical Institute Withdrawal Assessment for Alcohol, Revised (CIWA-Ar).

3.2 Treatment for alcohol withdrawal: focus on providing sedative, relief physical symptoms, vitamin and mineral supplements, and environmental management.

Literature Reviews

From both national and international literature reviews, Predictive Alcohol Withdrawal scale or PAWS scale (Maldonado *et al.*, 2015), developed by American psychiatrist Maldonado at Stanford University in 2014, was highly reliable in assessing patients with severe alcohol withdrawal syndrome. The PAWS scale can predict alcohol withdrawal with sensitivity of 93.10% and have specificity of 99.50%. The research was studied with a small sample group in 2014 and a large sample in 2015 with consistent results and intersection score of greater than or equal to 4. The concept of "Kindling Process" (Ballenger and Post, 1978) describes the process of alcohol withdrawal as a result of repeated exposure to the same stimulant from alcohol, making it easier to imbalance the neurotransmitters in the brain. If the patients have ever had alcohol withdrawal, the risk of future alcohol withdrawal will be more severe.

Materials and Methods

To conduct the research, the sample group is the people who have previously been diagnosed by the doctors against the criteria of DSM-V and WHO with alcohol dependence F10.2. They have been examined by the PAWS scale with or without alcohol withdrawal syndrome and there were indications suggesting to stay at Phanom Dongrak Chalermprakit 80th Anniversary Hospital, a community hospital with a size of 30 beds. The study was conducted from 1 January 2020 to 30 June 2020 by assessing a total of 5 times before hospital stay, 3 days during the stay and before going home. The required sample size is 70 people As shown in Figure 1.

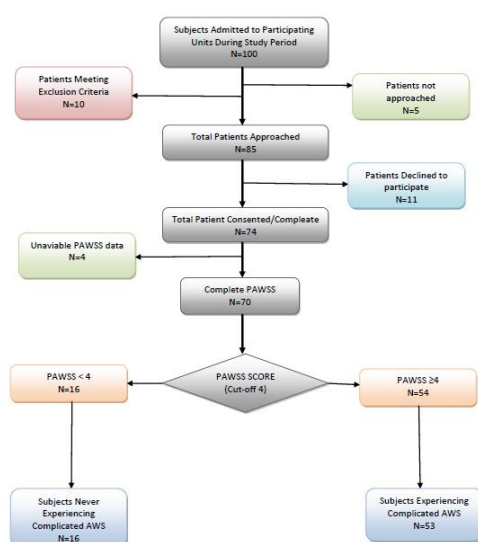


Figure 1. Flow chart of patient recruitment

Research Tools

1) Personal Information Questionnaire is a tool created by the author. It has both closed-ended style of questions to choose from and open-ended to fill in the blank including age, sex, status, education level, occupation, disease, history of drug and substance taking.

2) Predictive Alcohol Withdrawal Severity score in Rural hospital (Rural PAWS score) is a prediction model which was developed by the author based on the reviews of literature from both national and international researches. After collecting the data, a Rural PAWS score was conducted composing of 5 parts with 14 questions including Part 1: preliminary criteria, Part 2: Information from patient history taking (10 items), Part 3: Data from physical examination (3 items), Part 4: Data from laboratory (1 item). The hospital

pays expenses for this research. If the score is greater than or equal to 5, patients will be at high risk of developing severe alcohol withdrawal syndrome.

Validation of Research Instruments

1) Content Validity

The appropriateness of all research tools was monitored by the supervisors, covering the use of language and improvement to suit the sample group. Afterwards, the research tools were also confirmed again by 5 qualified experts in mental health and psychiatric. Finally, the Content Validity Index (CVI) was calculated showing the value of 0.95.

2) Reliability

The author did experiment by asking the questionnaire to 20 non-sample patients in the hospital and analyzed the reliability of the instruments in the prediction of alcohol withdrawal severity by adopting the Cronbach's Alpha coefficient formula. The reliable value was 0.85.

Data Collection

1) The sample group was patients who were admitted to the emergency accident building or outpatient building. During the data collection period, the author assessed the characteristics of the patients from history taking, physical examination, and specific sample selection according to the specified qualifications. The data of 70 people were collected due to the proportionate of population and sample.

2) Prior to collecting data, the author met the sample group to inform about right protection in which any information obtained from this research is confidential and anonymous and ask for the voluntary to participate in the research.

3) When the sample group accepted to participate, they had 30 min to answer the 2 parts of the questionnaire.

4) After collecting the information, the author checked the completeness of the 70 questionnaires and analyzed the data by statistical methods to summarize the research results.

Statistical Analysis

In the analysis part, the research used the SPSS program to analyze the obtained data. General information is presented in the form of mean, standard deviation and percentage. Data from the PAWS scale were used to find the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). Moreover, the analysis of Receiver-Operating Characteristic (ROC) was considered in conjunction with QROC and reconfirmed the intersection with logistic regression.

Result and Discussion

Part 1: The Analysis of General Data

According to the Table 1, among the sample size of 70 people, the average age was 43 years accounted for 20% of which 4 people or 35.70% obtained less than 4 scores. There were 9 people who obtained more than 4, representing 64.3%. The difference of the two groups was statistically significant at P value <0.05 and 89.90% were male whose 22.60% got less than 4 scores and 77.40% got more than 4 scores.

Part 2: Primary Diagnosis of Alcohol Addicts Treated at the Hospital

The results of the primary diagnosis of alcohol addicts treated at the hospital showed that the first place was the gastrointestinal disease including cirrhosis, pancreatitis, gastroenteritis, gastrointestinal bleeding and abdominal pain, accounted for 16 persons or 22.9%. The second place was respiratory disease namely pneumonia and COPD exacerbation, accounted for 13 people or 18.60%. The third place was other infections including cellulitis, infected wound, accounted for 9 people or 12.9%.

Part 3: The Analysis of the Validity and Reliability of the Research

The results of the analysis of the validity and reliability of the research showed that the sensitivity of the questionnaires was 98.10% (95% CI 88.10, 99.10) and the specificity was 93.80% (95% CI 90.02, 97.10). A positive predictive value was 98.10% (95% CI 88.10, 99.10) and a negative predictive value 93.80% (95% CI 90.02, 97.10). The analysis also showed that 70% of the patients in the sample group who got PAWS score more than or equal to 4 had alcohol withdrawal syndrome.

Part 4: The Analysis of the Appropriate Intersection Using ROC and QROC

In Table 2, the results of appropriate intersection of the alcohol diagnosis using ROC and QROC found that the optimum intersection score was more than or equal to 4. The sensitivity was 98.10%. (95% CI 88.10,99.10) and the specificity was 93.80% (95% CI 90.02,97.10). Both values of sensitivity and specificity were corresponding with Kappa coefficient at 91.20% (95% CI 85.50, .96.10). Moreover, the results of the intersection analysis were confirmed by logistic regression predicted probability which also equal to 4 scores.

Conclusions and Discussion

In conclusion, this research is a Prospective Cohort study which aims to examine the validity of the PAWS scale of the mentioned sample group. The sample group consisted of 70 people with the average age of 43 years which are the common age in the development of alcoholism (Hawkerand and Oxford,1998). Among them, 64.3% obtained more than 4 who were mostly male, related to the research of (Maldonado, 2015) suggested males has highest likelihood to develop alcoholism.

The first primary diagnosed diseases of alcohol addicts were the gastrointestinal disease, followed by the respiratory disease namely pneumonia and COPD exacerbation and other infections, related to the study in the US (Maldonado, 2014; 2015) which respiratory and gastrointestinal were also the main diseases of alcoholism.

The sensitivity of the questionnaires was 98.10% and the specificity was 93.80% with a positive predictive value of 98.10% and a negative

Table 1. General data of the sample group

Demographic variables	Patient groups			Statistical significance between PAWSS groups
	Total (N = 70)	Negative PAWSS (<4): (N = 16)	Positive PAWSS (≥4): (N = 54)	
Age, average (SD)	43 (20.3%)	4 (35.70%)	9 (64.30%)	P=0.001
Gender (% male)	89.90%	22.60%	77.40%	

Table 2. The analysis of the appropriate intersection using ROC and QROC

Cutoff	Sensitivity	Specificity	Quality of specificity k (0, 0)	Quality of efficiency k (0.5, 0)	Kappa coefficient quality of sensitivity k (1, 0) Weighted
≥1	1.000	0.00	0.150	0.100	1.00
≥2	0.981	0.5	0.319	0.600	0.970
≥3	0.981	0.75	0.634	0.700	0.954
≥4	0.981	0.938	0.912	0.912	0.912
≥5	0.852	0.937	0.934	0.823	0.743
≥6	0.259	0.937	0.922	0.650	0.604
≥7	0.185	1.00	1.00	0.564	0.465
≥8	0.111	1.00	1.00	0.124	0.230

predictive value of 93.80%, similar to the previous study showing the sensitivity of 93.10% and specificity of 99.50% (Maldonado, 2014; 2015). Moreover, 70% of the patients in the sample group who received score more than or equal to 4 had alcohol withdrawal syndrome. The appropriate intersection score using ROC and QROC was also confirmed by logistic regression predicted probability with the result of more than or equal to 4 As shown in Figure 2.

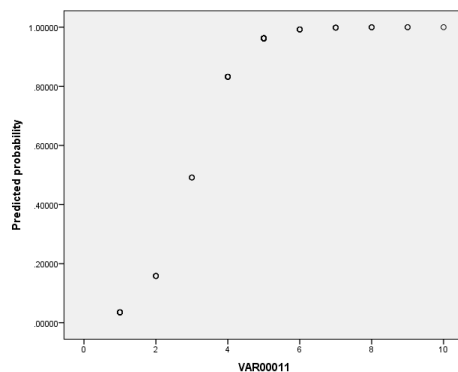


Figure 2. The result of the appropriate intersection by the logistic regression predicted probability is more than or equal to 4

This research has contributed to the benefits of predicting the severity of alcohol withdrawal syndrome in clinical use because of its accuracy and early detection. For the future study, the sample size should be larger and the pre-symptomatic (prophylaxis) care guidelines should be studied because this PAWS scale can also predict severe alcohol withdrawal.

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