Alcohol withdrawal in the critical care unit


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Summary Managing acute alcohol withdrawal in critical care presents a unique challenge to the critical care nurse. The prominence of alcohol use within the Australian community means that many critical care admissions involve acute alcohol withdrawal, an alcohol induced illness, or indeed an unrelated admission with underlying heavy alcohol intake.

Current statistics suggest 1 in 5 Australians drink to ‘risky’ levels each month. This suggests that most critical care nurses will encounter a patient who is experiencing active withdrawal from alcohol, often without clear physiological symptomatology. Acute alcohol withdrawal delirium can be difficult to distinguish from other forms of delirium and in the absence of a comprehensive history, alcohol withdrawal and its sequelae may go untreated.

Contemporary management guidelines for alcohol withdrawal suggest a common framework of first line benzodiazepine usage, with emerging research focusing on adjunctive therapy aimed at reducing benzodiazepine doses, and therefore reducing length of stay in the critical care unit. The controversial therapy of ethanol infusion and common assessment and withdrawal scales are examined in relation to their usefulness in critical care.

Alcohol withdrawal management in critical care necessitates careful nursing assessment, including alcohol usage history, delirium management, withdrawal assessment and symptomatic relief using an evidence-based protocol.

Introduction

Seventy-two thousand Australian hospital admissions annually are directly attributed to excessive alcohol intake, and 1 in 5 Australians drink to risky levels at least once per month.1 These statistics...
suggest that most critical care nurses will routinely care for a patient acutely withdrawing from alcohol during their career, yet most of the available research on alcohol withdrawal fails to address the nursing perspective, particularly the unique problems associated with assessing and managing critically ill patients experiencing acute alcohol withdrawal.

This paper addresses the phenomena of acute alcohol withdrawal in the critical care setting. The pathophysiology of alcohol use and withdrawal is briefly described followed by an in-depth discussion on the current pharmacological management in critical care, namely benzodiazepine therapy and adjunct therapies such as Propofol, Dexmedetomidine and Haloperidol. The controversial therapy of ethanol infusion will be discussed, and finally the particular aspects of nursing management in critical care, including common assessment and withdrawal scales, and control of physiologically deleterious sequelae of acute alcohol withdrawal.

### Table 1 Stages of alcohol withdrawal.

<table>
<thead>
<tr>
<th>Stages of acute alcohol withdrawal</th>
<th>Physiological presentation</th>
</tr>
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<tbody>
<tr>
<td>Stage 1: Autonomic hyperactivity</td>
<td>Anxiety, agitation, tachycardia, diaphoresis and tremor caused by widespread catecholamine release.</td>
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<tr>
<td>Manifests within hours post-abstinence and may last for several days.</td>
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<tr>
<td>Stage 2: Hallucinations</td>
<td>Visual and tactile hallucinations, triggered by increased dopamine transmission during the withdrawal state.</td>
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<tr>
<td>Manifests within 8–48 h post-abstinence, may last up to 6 days.</td>
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<tr>
<td>Stage 3: Neuronal excitation</td>
<td>Seizure activity caused by derangement of GABA and NMDA transmitters and altered cellular calcium influx.</td>
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<tr>
<td>Manifests within 12–48 h post-abstinence.</td>
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<tr>
<td>Stage 4: Delirium tremens</td>
<td>Exaggerated sympathetic activity, confusion, psychomotor agitation, and hallucinations. Delirium can mimic alternate critical illness such as sepsis or head injury, may precipitate respiratory and cardiovascular collapse, and is considered a medical emergency.</td>
</tr>
<tr>
<td>Manifests within 2 days post-abstinence but may not appear until 4–5 days.</td>
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Adopted from: Al Sanouri et al.8

### Sequelae of alcohol withdrawal

Alcohol is a central nervous system depressant which effects neurotransmission and autonomic activity.2 The World Health Organisation International Disease Classification taxonomy describes alcoholism as a blend of harmful alcohol use leading to physical and mental damage, and further, a dependence syndrome characterised by repeated use, increased tolerance and physical phenomena of withdrawal (ICD 10.1, ICD 10.2).3

Alcohol is believed to effect the regulation of the inhibitory neurotransmitter gamma amino butyric acid (GABA). In alcoholism, neurons become less sensitive to GABA, whilst concurrently enhancing the sedative effect.4 N-Methyl-D-aspartate (NMDA) is a neurotransmitter which is blocked by alcohol, causing sedation. Withdrawal leads to an increase in autonomic excitation, a hallmark of early withdrawal symptomatology.5 The prolonged intake of alcohol leads to a type of cellular tolerance, where resistance to the neurotransmitters develops, and increasingly larger amounts of alcohol are required to achieve the same effect.6 Tolerance to alcohol is a complex process involving cognitive, psycho-social, genetic and environmental influences. It is not fully clear at which point GABA desensitisation occurs and tolerance develops. Vengilene et al.7 believe that repeated alcohol use is intrinsically tied to individual behaviour reward systems therefore creating a unique progression from controlled to compulsive alcohol use.

Alcohol withdrawal can be divided into four stages, classified by time and physiological effect.5 The withdrawal process is dynamic, and each patient’s presentation will be influenced by the timing of abstinence (Table 1). The most common presentation in critical care is the late stage,
characterized by delirium and seizure activity, possibly because patients presenting with earlier stage withdrawal are managed in an outpatient or general ward setting. Patients with later stage, life-threatening sequelae of alcohol use such as electrolyte imbalance, respiratory failure, hepatic failure and gastro-intestinal disease require admission to a critical care unit to optimize multi-organ function and manage delirium and seizures. 

Current management strategies

Treating symptoms of acute alcohol withdrawal in the critical care unit presents a unique challenge. The patient’s presentation may include autonomic hyperactivity and delirium, which may be masked by another co-morbidity or primary diagnosis. Delirium is a neurological complication, characterized by an alteration in consciousness leading to cognitive dysfunction, psychomotor agitation and perceptual disturbance such as hallucination. Alternatively, delirium tremens represents a cluster of symptoms of which delirium is one feature, and is considered the most dangerous stage of acute withdrawal, encompassing dehydration, electrolyte imbalance and cardiac arrhythmias. Treatment of delirium tremens, therefore, is not specific to the neurological aspect of the syndrome, but encompasses all body systems, and treatment goals revolve around delivering an alcohol ‘substitute’ to prevent seizures and reduce autonomic hyperactivity.

The literature reveals a general consensus that currently the most effective treatment for acute withdrawal is benzodiazepine therapy. Mayo-Smith et al. cites randomized controlled trials from the 1960s to 1970s such as Kramp and Rafaelson (1978) and Brown, Moggy and Shane (1972) that compared benzodiazepines to neuroleptics, however, quite reasonably, to date there is no published research on benzodiazepines versus placebo. Medical consensus on the use of benzodiazepines appears to derive from these early trials.

Current research has not shown greater efficacy of other therapies over benzodiazepines. Benzodiazepines are believed to be effective due to their similar pharmacodynamic action to alcohol, affecting GABA transmission and acting as a therapeutic substitute in the absence of the primary drug. Benzodiazepines effectively allow ‘weaning’ from alcohol whilst preventing seizures and delirium tremens. The European Federation of Neurological Societies (EFNS) published guidelines in 2005 for the management of alcohol withdrawal-related seizures, and found that the benzodiazepines of choice were Lorazepam and Diazepam.

Crippen suggests Midazolam is uniquely effective in the critical care setting as it allows infusion and titration responsive to the patient’s presentation. Mayo-Smith et al. completed a meta-analysis that found benzodiazepines were superior to neuroleptics such as Chlorpromazine in treating acute withdrawal, as neuroleptics were associated with prolonged delirium and higher mortality. Neuroleptics, historically known as major tranquillizers, block dopamine receptors in the central nervous system, and were believed to interrupt the reward effects of alcohol. The use of benzodiazepines can be problematic as the drug class itself is implicated in delirium. Maldonado indicates that patients administered benzodiazepines are at high risk for delirium, however he also concedes that in alcohol withdrawal they remain best practice due to their role in controlling withdrawal symptoms.

Contemporary management guidelines for alcohol withdrawal suggest a common framework of first line benzodiazepine usage. The majority of emerging research appears to center on adjunctive therapy aimed at reducing benzodiazepine doses, and therefore reducing length of stay in the critical care unit.

Adjuvant therapies

McCowan and Marik and Subramaniam et al. reported success with using Propofol where withdrawal symptoms were refractory to benzodiazepines. Subramaniam et al. used Propofol as an adjunct to benzodiazepines, and in each case commenced Propofol following intubation. The intubations were precipitated by heavy Lorazepam usage, so it remains unclear if Propofol assisted in withdrawal management or simply provided a level of sedation so as to mask clinical signs of withdrawal. These researchers concede that Propofol may be only providing an effect of general anaesthesia, with little influence on neurotransmission. To date no randomized trial of the efficacy of Propofol in this scenario has been undertaken.

It is hard to appreciate a demonstrated causal effect between Propofol and withdrawal, as the drug can be used to sedate to a point of unconsciousness, which would then prevent any comprehensive withdrawal assessment. Autonomic hyperactivity may remain evident in the form of tachycardia and diaphoresis, but if the patient is heavily sedated an alcohol withdrawal scale will be of little value.
Diminishment of the opportunity to comprehensively assess patients for alcohol withdrawal due to sedation asserts the need for clear communication across outpatient settings, general wards and critical care areas. Maintenance of a concise history of alcohol abuse and the transfer of such history across services will assist in early identification of patients in active alcohol withdrawal and enable appropriate management to be instituted.

Dexmedetomidine and Clonidine are alpha adrenergic agonists with anxiolytic and analgesic properties that reduces sympathetic outflow and have been suggested as an adjunct to managing withdrawal. Studies have found success with Dexmedetomidine as an adjunct therapy specific to acute withdrawal management, although no randomized trial has been published. A randomized trial examining general utility in critical care found the drug to have anxiolytic and sedative effects appropriate for critical care units however only case studies have assessed efficacy in withdrawal. Baddigam et al. found Dexmedetomidine infusion concurrent with benzodiazepine therapy resulted in a dampening of autonomic hyperactivity and a reduction in benzodiazepine requirements in critically ill patients. A major disadvantage of this drug class is the lack of seizure prophylaxis that is afforded by benzodiazepines. Dexmedetomidine therapy appears to have similar limitations as Propofol. These drugs do not act as alcohol substitutes and therefore do not abate the serious symptoms of withdrawal. These drugs may ameliorate some of the anxiety and agitation associated with delirium in general terms, but do not provide specific treatment.

Sodium Valproate and Carbamazepine have been used to manage withdrawal seizures for many years in non-critical care areas. A distinct reduction in seizure activity has been reported with dampening of withdrawal symptoms, and this has been supported by double blind randomized trials.

However, anticonvulsant drugs present a dilemma in critical care as the administration route is usually oral, and the sedative effect is reduced, which may be problematic in critical care units where succinct management of delirium and agitation is required to successfully institute supportive therapy such as mechanical ventilation.

Current management controversies

Di Paula et al. support this opinion, suggesting that ethanol merely avoids withdrawal during the hospital stay and allows the patient to return to drinking post discharge. However, most management of acute withdrawal appears to lack level one evidence, and it could be argued that ethanol...
replacement in the management of patients with acute alcohol withdrawal requires further research.

**Nursing management**

Nurses play a pivotal role in assessing and managing delirium in critical care. The state of delirium fluctuates and has shifting clinical manifestations. The delirious patient may be confused, agitated, lethargic, or all of these. The manifestations of delirium are described as existing on a continuum from hyper-excitation to complete lethargy.

Management, therefore, should be actively responsive to the patient’s presentation. One to two hourly assessment of sedation, neurological assessment in tandem with withdrawal assessment, and monitoring for signs of Wernicke’s encephalopathy are all an integral part of the withdrawing patient’s management.

Wernicke’s encephalopathy is characterized by altered conscious state, ataxia and ophthalmoplegia and is caused by a reversible palsy of the abducens nerve, caused by Thiamine deficiency. This often occurs in concert with Korsakoff’s syndrome, which is a permanent dysfunction of amnesia and cognitive impairment. Wernicke–Korsakoff syndrome is a well documented outcome in chronic alcoholism.

Thiamine replacement is a level one recommendation in alcohol withdrawal to prevent Wernicke–Korsakoff syndrome, and should be routinely administered with the recommended dose of 100 mg IV/IM daily.

Life-threatening electrolyte imbalance is a significant risk in acute alcohol withdrawal, and the critical care nurse should remain vigilant to the manifestation of deranged potassium, magnesium, sodium and phosphate levels. Hyponatraemia is a common presentation amongst heavy beer drinkers, possibly due to the low salt content of beer and concurrent malnutrition. Hypomagnesaemia is also common in the chronically malnourished, and may lower the seizure threshold, and potentiates risk of ventricular arrhythmias in a patient group with prolonged QT interval. Frequent serum electrolyte levels will signal deteriorating or static imbalances and allow the nurse to administer electrolyte replacement and aim to optimise cardiac, renal and cerebral function.

**Identification and assessment of acute alcohol withdrawal**

Assessment of acute alcohol withdrawal and the administration of benzodiazepines are controversial, particularly in critical care. Two most common treatment pathways are symptom triggered therapy or protocol therapy. Symptom triggered therapy may be problematic in the context of delirium or agitation. However, Lansford et al. argue that indiscriminate benzodiazepine carries the risk of paradoxical agitation and may compromise respiratory status by diminishing airway protection.

In 1997, The Working Group on Pharmacological Management of Alcohol Withdrawal for the American Medical Association cited Mayo-Smith et al. as an evidence-based guideline for management of acute alcohol withdrawal. This guideline recommended benzodiazepine agents and dosages should be individual, and driven by the use of a symptom severity scale.

Safe management of withdrawal symptoms is a focus for the critical care nurse, and may involve administering benzodiazepines in extraordinary doses. Difficulty in assessing patients either at risk of or commencing withdrawal is linked to current assessment scales used in practice. The scales in common use have been designed for conscious patients who are able to report symptoms and accept oral medication. Although this is possible in critical care, the majority of this patient group arrives in the critical care unit with an altered conscious state, already delirious, or perhaps intubated and unable to participate in any subjective assessment.

The use of a structured alcohol withdrawal scale and symptom triggered dosing is well documented outside of critical care, with very little information specific to the area. The most commonly employed scale is the Clinical Institute Withdrawal Assessment of Alcohol (CIWA-Ar) scale. Developed by Shaw et al. in 1981, the scale used a combination of objective data (tremors, vital signs, and vomiting) and subjective data (headache, hallucinations, and nausea) to score severity of withdrawal and trigger treatment. The scale could be used to assess patients as often as half-hourly but has been commonly used one to two hourly.

The scale has been revised several times since its inception, but remains a tool most appropriate to a specialist detoxification unit.

One of the greatest challenges facing critical care nurses is that this standard scale contains 7 out of 10 questions requiring cognition and a coherent response. Various critical care units have attempted to devise a scale more appropriate to intensive care environments where the patient population may be sedated and intubated, or so unwell to be in delirium tremens and/or withdrawal seizures and therefore unable to provide subjective data.
Wojtecki and Marron\textsuperscript{45} have further adapted the CIWA-Ar for critical care and emergency, relying predominantly on behaviour observation with some physiological data to trigger treatment. Phillips\textsuperscript{10} has attempted to initiate a modified severity scale and a protocol specifically for critically ill patients which incorporates objective data, and physiological measurements such as serum values and urinalysis. The protocol also promotes clinicians to examine other causes for delirium.

The pilot protocol is continuing to undergo evaluation and to date no further information on the project has been published.

Despite its reliance in part on subjective data, the CIWA-Ar scale does have an application in critical care. The scale provides a common, consistent framework for clinicians to assess and respond to withdrawal symptoms, and avoids indiscriminate benzodiazepine use. The scale may be used to guide benzodiazepine therapy, however does not necessarily exclude other data such as neurological assessment, electrolyte values, and haemodynamic monitoring, all of which may reveal withdrawal symptoms such as tachycardia, seizure activity, ECG changes and dehydration.

It is notable that many contemporary critical care texts mention alcohol withdrawal only in passing.\textsuperscript{46—48} Perhaps the widespread usage of benzodiazepines combined with opiates and anaesthetic agents to achieve sedation in critical care means alcohol withdrawal is being masked, or where the patient has a known history of alcohol abuse or dependence, an assumption is made that the common sedation regime of Morphine, Midazolam and/or Propofol will treat any symptoms of withdrawal. Patients with a history of alcohol abuse have higher morbidity and mortality rates than the general population\textsuperscript{9} and need to be identified and appropriately treated for both withdrawal and other potential side effects of withdrawal on admission to the critical care unit.\textsuperscript{6}

**Conclusion**

At present, the CIWA-Ar or a derivative of this scale combined with benzodiazepine therapy is the accepted standard for treatment of acute withdrawal in critical care, despite the tool’s limited suitability for the intensive care environment. There are a variety of adjuvant therapies with varying degrees of evidence behind them which may be guided by the preference of senior medical staff or unit protocol. However, current literature indicates the absence of evidence-based drug protocols, dosage regimes and an assessment scale to manage patients withdrawing from alcohol in critical care settings. The prominence of alcohol use within the Australian community means that many critical care admissions involve acute alcohol withdrawal, an alcohol induced illness, or indeed an unrelated admission with underlying heavy alcohol intake. This social phenomenon necessitates careful nursing assessment and validated withdrawal assessment tools and raises the need for further nursing research.

**References**


