Clinical Practice Guidelines:
Toxicology and toxinology/Alcohol – ethanol

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Alcohol – ethanol

April, 2023

Alcohol is a commonly abused substance in Australia. It is responsible for approximately 3500 deaths each year and is second in the list of preventable causes of drug related deaths and hospitalisation in Australia, after tobacco.[1] Excessive alcohol consumption can have both immediate and cumulative clinical consequences.

Alcohol is a central nervous system (CNS) depressant that can start to affect the brain within minutes of consumption.[2] Following consumption, it takes approximately 30–45 minutes for the blood alcohol concentration (BAC) to reach its peak. It then takes approximately one hour for the body to metabolize the alcohol, at the rate of approximately 10 g (one standard drink) per hour. When more than one standard drink is consumed, the BAC continues to rise, however, the rate of metabolism remains constant.[2]

Initial physiological effects of an increase in BAC include a sense of wellbeing, relaxation and loss of inhibitions. However, as alcohol consumption increases and the BAC rises, the effects can be less pleasant, and the patient may display signs of alcohol toxicity.

The **immediate clinical consequences** of excessive alcohol consumption are alcohol intoxication and alcohol poisoning. In addition to the direct clinical effects related to alcohol toxicity, patients can sustain physical injuries indirectly related to intoxication, for example, loss of balance and physical coordination, leading to a fall from which injuries can occur. Intoxication can also cause acute behavioural disturbances and aggression, resulting in the patient being involved in a physical altercation causing injuries to self and others.

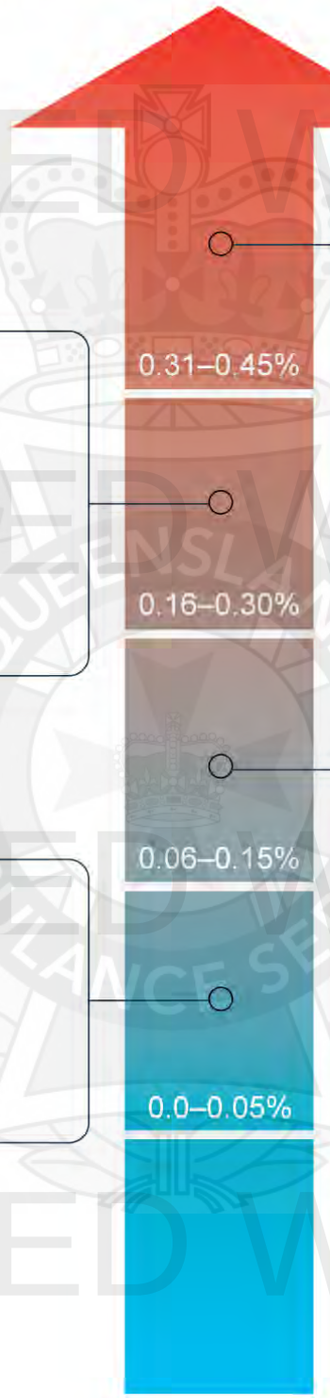
The immediate effects of alcohol consumption can vary significantly between individuals, depending on a range of factors including:[3]

- type and volume of alcoholic drink consumed
- time frame in which the alcohol is consumed
- age, gender, body size and composition
- the individual's experience consuming alcohol
- genetics
- the rate at which the individual can metabolise the alcohol.

The **cumulative clinical consequences** of alcohol consumption can be profoundly debilitating and may result in a range of chronic medical conditions that can cause premature death. These include:[1]

- chronic liver disease
- pancreatitis
- cardiovascular disease
- cancer of the oral cavity, pharynx, larynx, oesophagus, liver, colorectum and breast
- nutritional deficiencies
- wernickie's encephalopathy
- diabetes
- nutritional deficiencies

As Blood Alcohol Concentration (BAC) increases, so does the degree of intoxication and the level of impairment



ALCOHOL POISONING (BAC 0.31–0.45%)

- severe difficulty speaking
- severe dizziness
- loss of consciousness
- severe respiratory depression (respiratory rate < 8 breaths per minute)
- loss of gag reflex
- bradycardia
- seizures
- hypothermia
- hypoglycaemia
- pale and clammy skin
- cyanosis

SEVERE Intoxication (BAC 0.16–0.3%)

- significant impairment of speech
- severe ataxia
- significant impairment of attention and reaction time
- loss of memory
- Impairment of judgement and decision-making capacity
- vomiting
- potential loss of consciousness

MODERATE Intoxication / Impairment (BAC 0.06–0.15%)

- ataxia or loss of balance and physical co-ordination
- increased impairment in cognitive functioning, memory and judgement
- confusion
- mood variations including an increased risk of aggressive behaviour and/or acute behavioural disturbances in some individuals
- loss of fine motor skills
- slurring of speech
- drowsiness
- sleepiness
- dizziness
- dehydration

MILD Intoxication / Impairment (BAC 0.01–0.05%)

- feelings of wellbeing, relaxation and a sense of confidence
- an urge to speak
- reddening of the skin and flushing of the face
- mild speech impairment
- slight decrease in attention, memory or judgement

Risk assessment

Before considering a provisional diagnosis of alcohol intoxication (mild, moderate or severe) or alcohol poisoning, it is important to consider and where possible complete a differential diagnosis to exclude other conditions that can mask or mimic clinical signs of alcohol intoxication.

- Obtain a detailed **clinical history** from family and/or friends including information regarding the patient's past medical history and recent health issues. Be alert to the presence of any condition that may:
  - mimic a presentation of alcohol intoxication; or
  - exacerbate the physiological effects of alcohol consumption.
- Obtain **information from witnesses** who may have observed the patient during the time leading up to the request for ambulance attendance.
- Elicit information regarding the amount and type of alcohol the patient has consumed, the timeframe in which it has been consumed, and the time at which the last alcoholic beverage was consumed.
- Elicit information regarding other substances consumed such as recreational drugs and medications, both prescribed and non-prescribed.

Risk assessment

- Obtain information regarding the patient's daily history of alcohol consumption.
- Conduct a thorough **clinical assessment**.
- Note the presence of any of the clinical features of alcohol intoxication as listed above.
- Note if the patient has suffered any physical injuries.

Additional information

The immediate effects of alcohol consumption can vary significantly between individuals, depending on a range of factors including:

- ***Type of alcoholic beverage:*** Not all alcoholic beverages contain the same concentration of alcohol. The percentage of alcohol in a beverage, which is expressed as alcohol by volume (alc/vol) can vary significantly. In Australia, a 'standard drink' is required to contain 10 g (12.5 mL) of alcohol. Alcoholic beverage container labels are required to specify the number of 'standard drinks' contained therein, and the alc/vol.[1]

Additional information *(cont.)*

- ***Volume of alcohol:*** The volume of alcohol consumed is very significant when considering the immediate effects of consumption. Because alcoholic beverages vary in alcohol concentration, the amount of alcohol consumed is calculated by multiplying the volume of the beverage by the alcohol concentration.[1]

It is important to note that alcohol beverages may not necessarily reflect a 'standard drink'. A typical serving of red wine is 150 mL (1.5 standard drinks) and where beer is served by the glass, the size of the glass can differ across public drinking venues.

It may also be difficult to calculate the volume of alcohol consumed during a drinking session, especially when individuals may be sharing a container of alcohol such as a jug or a cask, and their glass may be replenished by others.

- ***Consumption timeframe:*** The time frame in which the alcohol is consumed is also relevant. Rapid consumption of numerous alcoholic beverages can result in a higher BAC, as the rate at which the alcohol is metabolised by the liver is fixed and does not increase in response to the volume of alcohol consumed.[2]
- ***Metabolism of alcohol:*** It typically takes approximately one hour to metabolize 10 g (one standard drink) of alcohol, however this varies between individuals. Factors that can influence metabolism include:[3]
  - *Age* – children and the elderly generally have a reduced ability to metabolise alcohol.
  - *Gender* – the same amount of alcohol can lead to a higher BAC in women.
  - *Body size and weight* – peoples' size and weight can have a significant impact on alcohol tolerance.
  - *General health* – individuals with liver disease or dysfunction are less able to metabolise alcohol.
  - *Genetics* – people carry different variations of the enzymes responsible for alcohol metabolism.
  - *General health:* A number of medical conditions are exacerbated by the effects of alcohol, e.g. epilepsy, hepatitis, pancreatitis.
  - *Medication and drugs:* Alcohol can interact with many prescribed pharmacological preparations and potentiate the effects of recreational drugs.

Additional information *(cont.)*

- Alcohol is a drug of dependence. Acute cessation of alcohol consumption precipitates alcohol withdrawal syndrome which is characterised by clinical features such as insomnia, restlessness and psychomotor agitation, nausea, sweating, delirium tremens, and seizures. **Alcohol withdrawal syndrome can be life-threatening.**[4]
- Complete a differential diagnosis to exclude conditions that can mimic or mask alcohol intoxication:[5]
  - other intoxications
  - electrolyte imbalance (hypo or hypernatremia, hypercalcemia)
  - hypoglycaemia
  - hypothermia
  - head injury
  - stroke
  - seizure
  - encephalitis or meningitis
  - sepsis
  - renal failure
  - encephalopathy (hepatic, HIV, Wernicke)
  - hypothyroidism