

Heroin overdose: the case for take-home naloxone

Home based supplies of naloxone would save lives

Non-fatal overdose is an occupational risk of heroin misuse¹ and fatal overdose is a common cause of premature death in heroin users.^{2,4} One of the major contributors to a fatal outcome is the inadequacy of heroin users' responses to the overdoses of their peers. They may delay calling an ambulance for fear of the police arriving, and their efforts to revive comatose users are often ineffective. The distribution of naloxone to opiate users was first mooted in 1992⁵ as an intervention that would be life saving in such situations.⁶ With a rising toll of deaths from heroin overdose it is time to take the suggestion seriously.

Interviews with 320 heroin users in Sydney found that two thirds had had a drug overdose, a third within the past year, and that 80% had been present at the overdose of another user.⁷ In Australia the incidence of deaths from heroin overdose has increased over the past decade while deaths from other drug related causes have fallen. In the United Kingdom a sharp increase in the numbers of deaths among opiate users has recently been reported from Glasgow.⁸

Naloxone has a long established use in emergency resuscitation of patients with opiate overdose.⁹ Such a tried and tested product might be suitable for distribution to opiate misusers so that they could give themselves the drug after inadvertent overdose or have others give it to them.

An obvious target group for naloxone would be opiate misusers at high risk of overdose, such as those leaving the emergency department against medical advice after resuscitation with naloxone. The short duration of action of naloxone puts such people at high risk of re-entering overdose. Patients could be given a dose of naloxone for self administration in the event of re-emergence of overdose in the next few hours. Another group at high risk is those re-entering the community after loss of opiate tolerance, either on release from prison or after discharge from a treatment programme.

More controversial would be the distribution of naloxone to all opiate users receiving treatment, as a precaution against unexpected overdose. Even more controversial would be distribution to all opiate users through needle and syringe exchanges. All opiate users are at risk of overdose—not only those who are dependent or undergoing treatment. Indeed, a heroin user who is not undergoing treatment seems to be at even greater risk of fatal and non-fatal overdose.

What concerns are raised by these proposals? *Martindale* concludes that adverse effects tend not to be a problem with naloxone at therapeutic doses.¹⁰ Nausea and vomiting have occurred, with seizures reported infrequently. Individual reports of hypertension, pulmonary oedema, and cardiac arrhythmias have generally been in patients with pre-existing heart disease undergoing cardiac surgery,¹⁰ and the role of naloxone in two reported cases of pulmonary oedema in healthy young men^{11,12} has since been questioned.¹³ The National Poisons Information Service in London reported that it had never been informed of a suspected adverse reaction to naloxone despite being contacted by about 800 cases of opioid poisoning each year.¹⁴

The potential for abuse of naloxone is negligible: it has virtually no agonist effects and is strongly antagonist to heroin and methadone. Removal of the deterrent effect of overdose might perhaps increase the frequency and intensity of opiate intoxication, although this seems unlikely given heroin users' dislike of the withdrawal symptoms produced by naloxone. Education about such dangers would need to accompany the introduction of naloxone and is already necessary to prevent post-resuscitation overdose as the short acting effect of naloxone wears off (thus leaving the heroin user at potentially

even greater risk if further opiates have been used in the interim).¹⁵ A black market in naloxone might develop if opiate misusers wanted to protect themselves from overdoses: in such a case, however, the drug would be used for its intended purpose, and the black market would simply circumvent inequalities in access to the drug.

If naloxone were to be provided to opiate misusers for emergency resuscitation it would need some modification. The onset of many overdoses is too sudden to allow time for the victim to open an ampoule, draw up the contents, and inject himself or herself. The drug might be better provided in a disposable preloaded syringe, though such a form of delivery would increase its cost. Attention would also need to be paid to the shelf life of a product which would be kept for emergencies—though even reduced potency naloxone may still be life saving.

Further issues are raised by the possibility of naloxone being administered by third parties, such as friends or family members, or its use to resuscitate a person who had not been prescribed the drug. Lifesaving applications may include administration of home based emergency naloxone to a child who has inadvertently taken the parent's prescribed supply of opiate, as has been reported.¹⁶ Is such behaviour to be discouraged, or should drug users be educated in the use of naloxone as part of training in cardiopulmonary resuscitation? We may even wish to reconsider its legal status so that it could be sold over the counter by community pharmacists to a wider population of drug misusers—in the same way as needles and syringes to drug injectors or insulin to people with diabetes.

The distribution of naloxone to opiate misusers should be seriously considered for trial and evaluation. While the problem of heroin misuse grows worldwide, the problem of deaths from accidental overdose¹⁷ is a problem we can address today. We have the opportunity to gather great potential health gains from tools already in our hands.

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Veterinary and industrial high pressure injection injuries

Need swift diagnosis and decompression

Injuries to the hands caused by industrial high pressure injections have been reported since the 1930s. Rees first described the condition in 1937, the injury seen arising from a diesel engine injector system.¹ Only in the late 1950s, however, did the widespread use of high pressure paint sprays and hydraulic systems increase the incidence of these types of injury. Veterinary high pressure injection injuries have received less attention, although many pose similar problems to those caused by industrial high pressure equipment.

When a high pressure injection injury occurs the kinetic energy absorbed by the tissues is substantial and the toxic material is often driven from fingertip to palm: 45% of patients seen over a five year period at our centre required a decompression that extended proximal to the carpal tunnel at the wrist. Injuries in which an irritant material (such as oil based paint) is injected have a particularly poor prognosis even with prompt exploration and debridement. Amputation of the finger is often required in these cases.²

The most common veterinary injuries involve chicken vaccine, in which the dose of inoculant is small (0.5 ml). Larger animals require larger doses (2 ml for pigs), and injuries involving such volumes can be difficult to manage. Animal vaccines often contain an oil base which prevents their rapid absorption into the surrounding soft tissues after inoculation and thus allows for a greater antibody response. When injected into a confined space, however—for example, a tendon sheath or pulp space—the inoculant may not be readily absorbed. An overwhelming inflammatory reaction to the chemicals may also occur and result in the formation of an abscess. The chemicals may also cause acute vasoconstriction of the surrounding vessels. Together, these factors can cause ischaemia and chemical necrosis. If the hand is accidentally inoculated it is easy to see how a local overwhelming inflammatory response may cause necrosis distally. The key to managing these injuries is swift diagnosis and decompression,^{3,4} but delays remain common. Fortunately, workers using high pressure systems are now much more aware of the hazards of injection injury than in the past and may present to an accident and emergency department with literature relating to the injected material.

The diagnosis is usually evident in veterinary cases, but diagnostic problems may arise in industrial injuries when the patient does not appreciate that an injection has occurred. If the pressure from a leaking hydraulic system is high enough, intact skin can be penetrated even without direct contact between hand and hose. The injected part usually becomes swollen and inflamed within hours. A pinhole injury to a finger or hand that may exude fluid will give a clue to the cause of injury. A careful history will usually reveal the diagnosis in these cases.

Urgent exploration is required in all industrial cases, with the exploration extended as widely as necessary. The doctor usually has no measure of the volume of material injected in industrial cases, though that information is available in veteri-

nary inoculation injuries. Because of the small volume injected, injuries caused by injection of chicken vaccine sometimes resolve satisfactorily without exploration and are simply treated with anti-inflammatory drugs or corticosteroids.⁵ If this option is considered the patient will require close observation in hospital and will need swift local decompression if swelling and inflammation extend. Alternatively, immediate local decompression may be preferred, with removal of necrotic fat and some of the mineral oil. The wound should be loosely sutured to permit discharge of serum and oil into the dressings. The hand must be elevated on a volar slab in the position of function (metacarpophalangeal joint flexion and interphalangeal joint extension). Physiotherapy should be started early.

Clinical studies are not extensive, but our review of industrial injection injuries suggests that prompt diagnosis and early decompression offer the best prospects of digit survival. Experience of injuries caused by the high pressure injection of vaccines for larger animals is even more limited, but our experience suggests that these cases should be managed in a similar way to industrial injuries involving an oil based material. A 2 ml dose of vaccine injected into the finger at high pressure may spread widely, so early extensive decompression and debridement is required, with postoperative management similar to that for more local debridement.

Amputation, however, may still be necessary in some cases. In a recent case swift exploration and debridement failed to control the damage to a farm worker's non-dominant thumb caused by injection of 2 ml of oil based parvovirus vaccine. In the following months the patient suffered repeated episodes of inflammation that were not controlled by further debridement. No organism was implicated, and the inflammation was thought to be a response to the mineral oil. Amputation at the carpometacarpal joint was required several months after the injury to control the pain and recurrent inflammation.

Those who have experience of injuries caused by high pressure injection of animal inoculants are encouraged to share their knowledge of the treatment and outcome of their cases with the Veterinary Medicines Directorate (Woodham Lane, New Haw, Addlestone, Surrey KT15 3NB), which is interested in gaining a broader knowledge of these problems.

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