infusion ended, an event better supervised during the normal working day.

We do not agree that all patients with methadone overdose should be admitted empirically for 72 hours or that pulse oximetry should be performed continuously for this time. This would result in unnecessarily protracted admissions and inappropriate use of monitoring equipment. Pulse oximetry will not detect hypoventilation in a patient being given supplemental oxygen.⁵ After an initial bolus, the early introduction of a naloxone infusion titrated to the clinical response is appropriate management; this can be stopped after 12-24 hours with the patient kept under close clinical scrutiny for several hours thereafter, particular attention being paid to the conscious level and respiratory rate and depth. Any deterioration in these variables necessitates resumption of the naloxone infusion with an initial bolus as required.

In summary, in this case flumazenil was inappropriately given and the use of naloxone can best be described as too little, with the infusion being given too late and stopped too soon, apparently without adequate clinical supervision. The clinical toxicology results are interesting, but only in relation to the postmortem discussion. The lessons in this case are not those advanced by the authors.

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- 1 Hendra TJ, Gerrish SP, Forrest ARW. Fatal methadone overdose. *BMJ* 1996;313:481-2. (24 August.)
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Patient may have injected methadone while in hospital

EDITOR,—The case of fatal methadone overdose reported by T J Hendra and colleagues relied for its diagnosis on the ability of hot chocolate to release a large load of methadone from the patient's gut, where it had been stored for some hours.¹ Such an event is possible, but the authors do not convincingly show it to have been the cause of death.

An alternative suggestion for the role of the hot chocolate is that the patient used the request for it to distract a nurse while obtaining a needle and syringe. He could then have injected a dose of methadone intravenously before retiring to bed. This would explain the high serum concentration and the absence of methadone in his gut as well as the timing of his death. Although the patient was in hospital at the time, it is not unknown for inpatients to obtain supplies of illicit drugs. In addition, any injection site would be likely to be overlooked in a patient with multiple venepuncture sites from his time in the intensive care unit.

The authors' conclusion that patients presenting with methadone overdose need to be carefully monitored is justified, but the availability of the means to inject drugs must also be considered.

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Close observation in intensive care unit is required when naloxone infusion ends

EDITOR,—T J Hendra and colleagues report the death of a young man from methadone toxicity.¹ This case provides an important lesson that the authors have missed. The patient, who had a potentially fatal serum methadone concentration, was discharged from an intensive care unit to a general medical ward while receiving treatment with naloxone by intravenous infusion. The infusion stopped at 3.30 am, and 30 minutes later he was sleeping, but no report of his neurological status is given, and he may have been comatose at that time. The authors report no further assessment of the patient until he was found dead 2 hours 55 minutes later.

Naloxone's elimination half life may be as short as 30 minutes, and recurrence of coma after treatment is stopped is well recognised. This is especially likely when long acting opioids are involved. Patients requiring a naloxone infusion should be managed in an intensive care unit and closely observed for recurrence of toxicity after the infusion stops. The likely sequence of events in this case is that the naloxone infusion ended while the patient was in a darkened general medical ward in the middle of the night and he then lapsed into a coma induced by methadone, had an unwitnessed respiratory arrest, and died.

The shortfall in resources for intensive care in Britain is well known internationally.² If the crisis has reached such proportions that simple lifesaving measures such as naloxone infusions cannot be managed in intensive care units then explicit instructions must be given to ward nursing staff for close observation and formal neurological assessment of patients when naloxone infusions end. This is particularly so if the infusion is to stop in the middle of the night, when casual observation of deterioration is least likely. If these measures are not taken this tragic incident will be repeated. In the hospital where I work all deaths in hospital of patients who have been treated in the intensive care unit are reviewed at a monthly meeting attended by the intensive care specialists and a representative of the hospital's quality assurance programme. Had this death occurred in my hospital it would have been classified as preventable, and the management of the patient after the naloxone infusion finished would have been considered substandard.

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- 1 Hendra TJ, Gerrish SP, Forrest ARW. Fatal methadone overdose. *BMJ* 1996;313:481-2. (24 August.)
- 2 Ryan DW. Providing intensive care. *BMJ* 1996;312:654.

Authors' reply

EDITOR,—We agree with Emyr W Benbow and colleagues' suggestion that tissue redistribution may partly explain the postmortem increase in blood methadone concentration seen in our patient. In another recent case one of us (ARWF) found that a postmortem blood sample contained 71 µg methadone/l, whereas a sample obtained shortly before death contained 38 µg/l. One potential mechanism for the possible increase in blood methadone concentrations associated with food intake is that food increases mesenteric and portal blood flow, causing release of methadone from the liver. Whatever the explanation, the implication of Benbow and colleagues' letter is that, as we proposed, methadone overdose requires prolonged monitoring in hospital.

We accept N Nichol and colleagues' point about the use of flumazenil but do not agree with

their comments about naloxone in this patient. The initial doses of naloxone were small but sufficient to produce the desired effect; the infusion was titrated against the clinical response, with the dose given being sufficiently small to make the late occurrence of further problems unexpected and indicative of another mechanism. We agree that pulse oximetry will not detect hypoventilation in the absence of hypoxia but believe that it has a place in the inpatient management of this problem.

The point by Aidan J Byrne about surreptitious use of drugs on the ward is well made, particularly when a patient's condition unexpectedly deteriorates, though in this instance no syringes or other paraphernalia of drug misuse were found in the patient's possession after his death.

Simon Finfer's statement that all patients requiring a naloxone infusion should be managed in an intensive care unit may not be sustainable in many hospitals owing to competing clinical demands and limited resources. In retrospect, stopping the naloxone infusion in the middle of the night without monitoring the patient by pulse oximetry was not optimal management—which was the point of our report.

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Methadone treatment

Methadone treatment is not the only option

EDITOR,—The recent editorial and three papers about methadone raise many points of interest and controversy.¹⁻⁴ The editorial's message—that methadone works, and so we should get on and use it—conceals not only the issue of deaths in drug users² but also several other issues: drug users in prison, social inequalities and poverty relating to drug users, the spread of HIV from drug users to the heterosexual population, the fact that drug users are a national pool of infection with hepatitis B and C viruses, and many other issues that decades of experience in North America, Australia, and the rest of Europe have shown do not disappear with methadone treatment. More worrying still, the problems that politicians have recently experienced over comparatively uncontroversial drug issues make one wonder what has happened to politics and politicians in the past 20 years that makes it so much less possible than it was in the 1960s to consider radical solutions to these issues.

The arguments about the efficiency of methadone in the well resourced American system are well rehearsed; in contrast, the various European systems have a shorter history and have developed along the more comprehensive harm minimisation approach. The contrast between Europe and North America was evident at the recent AIDS conference in Vancouver, where it became apparent that the United States still has major problems in implementing strategies such as needle exchange that have been accepted in Europe for 10 years.

Although methadone is undoubtedly the pharmacological mainstay, it is not a panacea. Other options tried have been injectable methadone, injectable heroin, and shorter acting drugs such as buprenorphine. Our experience with dihydrocodeine over 15 years has been that this is a safe alternative for the many drug users who do not wish to give up the use of a short acting drug.⁵ Unlike buprenorphine, dihydrocodeine is