digoxin the indications for the addition (or withdrawal) of other drugs need critical review, particularly those with an action on the heart and circulation. Though the mechanisms of many of the interactions with digoxin remain to be defined, appropriate dosage adjustments can be made from a knowledge of the average alterations which can be expected and measurement (when appropriate) of the plasma or serum digoxin concentration.

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Postoperative pneumonias

The changes in pulmonary function after surgery and anaesthesia range from a fall in arterial oxygen tension to bronchial and pulmonary infection and collapse of the lung. Of these, postoperative pneumonia most concerns the average surgeon and anaesthetist. The incidence of chest complications has not changed appreciably over the past 30 years,[1] suggesting that the main determinants have been largely unaffected by changes in medical and surgical practice. The problem is substantial: depending on the rigour of the diagnostic criteria, the incidence of pulmonary infections after upper abdominal surgery ranges from 5%[2] to about 70% of patients,[3] with most surveys agreeing on an incidence close to 20%.[1]

Suggestions about the aetiology of these infections have included abdominal distension due to ileus, pneumoperitoneum, inhibition of cough by postoperative pain, reflex spasm, cough reflexes depressed by opiates, lowered end-tidal point, collapse of the lung from absorption of soluble gases, use of monotonous low tidal volumes leading to loss of surfactant, increased viscosity of secretions due to atropine and dry inhaled gases, effects of anaesthetic (and atropine) and intubation with cuffed tubes on ciliary action, depression of cellular defence mechanisms, immunosuppression by anaesthesia, and contaminated anaesthetic equipment. Of these, the only factor that has been put to the test of prospective controlled trials with unequivocal results is the last. Two studies comparing the outcome in terms of postoperative chest infections when the anaesthetic was given with or without bacterial filters failed to show any difference.[4 5]

Surveys of postoperative infections highlight quite different factors as the major determinants, the most important being the site of operation: the incidence of pneumonia after operations outside the chest or upper abdomen in fit patients is negligible.[1] Next, chronic respiratory disease trebles the complication rate.[6] Obesity (above 120 kg), old age (above 70 years), and history of smoking[1] are also associated with a greater probability of postoperative pneumonia. Men have an incidence two to three times that in women,[6] though in one study no difference was found when correction was made for operative site.[1] Duration of operation is also a factor if it extends beyond two hours, as is evidence of a general lower level of fitness and a longer preoperative stay in hospital.[1]

What can be done? Three possibilities suggest themselves: improving the preoperative and postoperative management of chronic chest disease, the prophylactic use of antibiotics, and more effective control of postoperative pain.

Breathing exercises and postural drainage were shown to be effective in reducing exacerbations of chronic infection almost 30 years ago.[7] Breathing exercises have also been shown to be effective in patients having open-heart surgery if they are over 60, heavy smokers, or have a forced vital capacity less than 80% of the predicted value or a forced expiratory volume less than 75% of the forced vital capacity.[8]

Preoperative lung function tests do not seem to discriminate reliably between those patients likely to develop pneumonia and those not despite some reports to the contrary. Patients with limitation of flow below 1 litre/second at functional residual capacity accounted for over half of the pneumonias in one series of thoracic operations.[9] In another study the extent of the fall in the peak flow on the first postoperative day proved a good discriminator in a group of patients undergoing repair of hernia.[10] Unfortunately, the same was not true in patients with abdominal incisions, where the effect on peak flow of pain or reflex muscle rigidity or both presumably swamped any effect.

Nor have special postoperative routines much contribution to make. Postoperative physiotherapy, often accompanied by intermittent positive-pressure breathing, is popular in the United States. Treatment with an incentive spirometer is probably better as well as vastly cheaper.[11] Neither, however,

seems to make much difference to the overall incidence of chest complications.

Prophylactic antibiotics, too, have been generally viewed with reserve. Several reports have shown no overall benefit,[12–14] but another study, in which the appropriate antibiotics were given in therapeutically effective regimens, showed a reduction in the frequency of infections.[15] No benefit was found from routine bronchodilator treatment.

Improving the relief of pain has proved equally disappointing as an approach to preventing chest infections. Additional morphine[15] was of no benefit, and systemic analgesia with procaine, while effective in helping patients to clear sputum, had only a marginal influence on vital capacity.[16] Mid-axillary nerve blocks of the 6th to 11th intercostal nerves were no more effective.[17] One early report suggested that epidural opiates do not restore pulmonary mechanics to anything like normal either,[18] suggesting that reflex muscle spasm is as important as the pain itself. Even so, effective relief of pain has yet to be shown to be worthless in terms of actual complications rather than changes in pulmonary function.

There remains the observation in 1976 that the respiratory stimulant doxapram reduced the incidence of cough and expectoration of purulent sputum without any major effect on analgesia.[19] More recently doxapram was, however, found not to have any effect in patients with preoperative symptoms having thoracotomies who were given prophylactic antibiotics,[20] a finding in keeping with another study which found a beneficial effect from doxapram only in patients not given antibiotics.[21]

What conclusions can be reached? Prophylactic treatment of any kind seems scarcely justifiable for all patients, since some 80% will suffer no complications; but either doxapram or prophylactic antibiotics may reasonably be prescribed for patients at high risk.

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Dog bites man

Writing about dogs is apt to stir passions, but statistics at least give a dispassionate starting point. Every year in the United States a million dogs bite the hands that feed them and doubtless shatter the illusion of trust and friendship. But is it the dog's fault? The highly strung, untrained, bored dog may turn on the taunting child; the one goes to the condemned cell and the other to the accident and emergency department. How should the wound be treated?

Animal teeth are far from clean and sharp and so create a contused and contaminated wound, in which bacteria may multiply and scar tissue may form. The prevention of wound sepsis has both surgical and medical aspects. Careful cleaning, irrigation, trimming of wound margins, elimination of dead space during closure, and avoiding overtension of sutures are all important factors. Two cardinal sins to be avoided are shaving eyebrows and failing to match the vermilion of the lips. Use of fine suture materials, removed early and replaced by surface closures, will reduce the chance of skin marking or sepsis. Only in extensive wounds or difficult cases is delayed primary suture usually required.

The medical aspect of management includes prophylaxis against tetanus and, where appropriate, rabies. The controversial issue, however, is the prevention or management of wound sepsis. The dog's mouth acts as host to a wide range of pathogens, including *Pseudomonas* spp, *Staphylococcus aureus*, *Streptococcus viridans*, and *Pasteurella multocida*. A greater risk of sepsis is to be found in patients aged over 50, wounds over 24 hours old, puncture wounds, injuries of the hand, and the presence of pre-existing illness. Among the reported complications of wound sepsis are abscess formation, osteomyelitis,[1] and disseminated intravascular coagulation.

Prevention of infection is obviously the ideal. Callaham[2] favours the use of prophylactic antibiotics, especially in the case of bites on the hands. The choice of antibiotic lies between the penicillinase-resistant broad-spectrum penicillins and the equivalent cephalosporins with an early parenteral first dose as the ideal.[3] Callaham recommends erythromycin or tetracycline as an alternative for those significantly allergic to the penicillin group, but co-trimoxazole might be considered as a better alternative with the added advantage of being active against other Gram-negative organisms. Elenbaas *et al*,[4] in contrast, recently completed a prospective, double-blind, placebo-controlled study on the use of prophylactic oxacillin in dog-bite wounds and concluded that prophylactic antibiotics were of no value in the care of dog-bite injuries treated within 24 hours of accident. (Oxacillin is not much used in Britain.) If nothing