

Antibiotic prophylaxis for minor dermatological surgery in primary care

Is usually unnecessary with good preoperative preparation



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Surgical procedures that disrupt the integrity of the skin predispose the patient to postoperative surgical site infection. Infection occurs after surgery in 1.5–20% of cases, and in Europe the associated costs are around €20bn (£17bn; \$25bn) each year.¹ An increasing amount of minor dermatological surgery is being carried out in primary and secondary healthcare settings. Antibiotic prophylaxis is widely used in such procedures, but how effective is it?

Good quality trials investigating the use of antibiotic prophylaxis in minor surgery are lacking. The linked randomised controlled trial by Heal and colleagues assessed the effect of a single prophylactic application of topical chloramphenicol on the incidence of wound infections after clean minor dermatological surgery.² The trial investigated 973 patients treated in primary care in north Queensland, Australia. The authors found a statistically significant reduction in infection in the treatment group compared with the control group (6.6% (95% confidence interval 4.9 to 8.8) *v* 11% (7.9 to 15.1)). The result was not clinically significant, however, because the absolute reduction of infection of 4.4% fell short of the authors predetermined reduction for clinical significance of 5%.

Most minor dermatological surgery in primary and secondary care is classified as “clean” (see table). Most surgical site infections are caused by contamination of an incision with micro-organisms from the patient’s own body during surgery. The decision to use prophylaxis depends on the patient’s risk of infection (increased as a result of age, obesity, smoking, immunosuppression, malnutrition, renal failure, and underlying illness such as diabetes), the consequences of infection, and the risk of harm from the antibiotics. Concerns also remain about the indiscriminate use of antibiotics and the emergence of antibiotic resistance, such as that reported from the use of topical neomycin and mupirocin.

Topical antibiotics have been widely used on wounds that are left to heal by primary closure or secondary intention without much supporting evidence. A randomised controlled trial of prophylactic topical bacitracin on minor surgical wounds found no significant reduction in surgical site infection, although the incidence of contact allergy was higher in the treatment group.³ Other prospective studies of prophylactic topical antibiotic used in clean surgery have shown only a modest reduction in surgical site infection.⁴

Using the correct hand washing technique for at least two minutes before performing surgery significantly reduces the bacterial count.⁵ Good preoperative antisepsis is probably more a function of the method rather than the agent used (although the National Institute for Health and Clinical Excellence (NICE) recommends povidone-iodine or chlorhexidine⁶). Removal of gross contamination and meticulous cleansing of the incision site reduce surgical site infection. Medical staff who sweat profusely are more likely to contaminate the surgical site than staff who do not.⁷ This may be relevant to the study from Queensland.

Rates of surgical site infection reported by practitioners experienced in dermatological surgery in specialist primary care settings, such as cancer clinics and dermatology clinics, are low.^{4,8} However, controversial results from the MiSTIC (minor surgery in the community) study in the United Kingdom reported that the quality of minor surgery carried out by general practitioners was “not as high” as that carried out in hospital (by hospital doctors).⁹ If substantiated, these findings may influence the rate of surgical site infection.

What constitutes a surgical site infection? Visual scales of infection are not always reliable. In studies with multiple investigators, interobserver differences may be high. The study by Heal and colleagues used the presence of erythema as one measure of infection. However, postoperative erythema is common and may not reflect the presence of infection. Even when the erythema represents local infection antibiotics may not be necessary. In one study of surgical site infections only 2% were classified as superficial suppuration, and only 10% of these needed antibiotics.⁸ Moreover, topical antimicrobials such as iodine or silver may be more appropriate for local wound infection. They act at multiple sites within the infecting organism, the risk of resistance is low, and they are tolerated well by patients.

Concerns have been raised about patients undergoing minor dermatological surgery who have prosthetic

Cleanliness status of different types of surgery

| Type of surgery | Definition |
|------------------------|--|
| I: clean | Non-contaminated skin, sterile technique |
| II: clean-contaminated | Wounds in oral cavity, respiratory tract, axilla, or perineum |
| III: contaminated | Trauma, acute wound, presence of non-purulent inflammation, or major breaks in aseptic technique |
| IV: dirty or infected | Foreign body contamination or devitalised tissue |

orthopaedic implants that may become infected, or those at risk of developing infective endocarditis. Recommendations from the Mayo clinic¹⁰—based on guidelines from the American Heart Association, American Dental Association, and the American Academy of Orthopaedic Surgeons—no longer recommend antibiotic prophylaxis in clean dermatological surgery that does not involve the oral mucosa or infected skin. Recent guidelines from NICE and the Scottish Intercollegiate Guidelines Network on surgical site infections (although not specifically mentioning minor dermatological surgery) also state that clean minor surgical procedures do not warrant antibiotic prophylaxis.^{6 11}

Infections have been reported in 1-5% of cases after clean surgery.¹² The consequences of such infection are usually minor so antibiotic prophylaxis in these patients is not normally deemed necessary. Clean dermatological surgical procedures where antibiotic prophylaxis may be needed are those involving the oral mucosa or sites considered to be “dirty,” including the axilla, groin, external genitalia, and lower limbs.¹⁰

In clean minor surgery meticulous preoperative preparation and aseptic technique by appropriately trained practitioners with access to appropriate facilities will prevent most surgical site infections without antibiotic prophylaxis.

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Indoor radon and deaths from lung cancer

Universal coverage of basic anti-radon measures is key

In the linked study, Gray and colleagues assess the contribution of indoor radon to deaths from lung cancer in the United Kingdom, and the cost effectiveness of policies to control radon.¹

Radon-222 is a chemically inert gas produced from radium, which is formed during the radioactive decay of uranium. Radon gas emits α irradiation, and exposure is defined in terms of activity concentration or level (becquerels per cubic metre of air, Bq/m³). Radon produced by the decay of uranium in the ground seeps upwards and enters buildings through cracks or holes in the foundations. In some cases, building materials or tap water can also be contaminated. The radon concentration of a dwelling depends on the amount of uranium and radium in the underlying soil, the degree of emanation of radon from the soil, how easily it enters a building, and whether it is removed from indoor air. When radon is inhaled, short lived radon progeny may deposit on the bronchial epithelium exposing epithelial cells to α irradiation.

The link between lung cancer and inhaled radon was first shown in underground miners exposed to high concentrations of radon.² These miners were mostly smokers who were also exposed to arsenic, silica dust, and diesel exhaust fumes, however, which raised concerns about the applicability of the findings to the general population. The pooled analysis of miner cohorts confirmed that inhaled radon does not increase the risk of other cancers.³

A pooled analysis of 13 European case-control studies showed that the risk of lung cancer increases in a linear fashion with exposure to radon.⁴ Furthermore, the relative effect of radon is similar for smokers and non-smokers, both sexes, and all age groups—the risk of cancer relates to a person’s exposure to radon and their baseline risk as a result of other factors. Smokers already have a higher baseline risk of lung cancer, so exposure to radon increases this risk further. The analysis was important because it eliminated confounding by various dimensions of smoking exposure.

Gray and colleagues show that most lung cancers caused by radon occur at moderate or low concentrations of radon, and that the most cost-effective policy is to apply basic anti-radon measures in all new dwellings. Although the study is not the first of its kind,^{5 6} it is the most extensive and detailed evaluation to date.

The authors propose that basic anti-radon measures in all dwellings would be a more cost effective way to reduce the effect of exposure to radon than current two step policies based on measuring radon and taking action only when radon concentrations exceed the action level. The results show that the best option would be a comprehensive strategy at the population level, similar to that promoted by Sir Geoffrey Rose for physiological risk factors to prevent cardiovascular disease. He suggested that such a strategy is necessary where risk is widely diffused throughout the whole population. A population

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Alastair Gray, lead author of the linked research paper, talks about its findings in a *BMJ* podcast at <http://podcasts.bmj.com/bmj/>

strategy aims to reduce the population mean by targeting the entire population, regardless of risk level, rather than just the small group with the highest risk.⁷ Applying basic measures in all new homes is also consistent with the ALARA (as low as reasonably achievable) principle in radiation protection—exposure should be reduced even below the reference or action levels (usually 200-400 Bq/m³ for radon) whenever possible.

Gray and colleagues' findings suggest that radon policies need to be scrutinised, and that the priority should be to apply basic measures universally rather than to take action only when high radon levels have been identified by measurement. However, cost effectiveness is context specific. Concentrations of radon are relatively low in the UK, and the proportion of lung cancers that can be attributed to radon is lower than in many other European countries. Policies for preventing lung cancer caused by radon should be tailored to the local or national distribution of radon concentrations in dwellings, as Gray and colleagues' results show. For example, in areas where a large proportion of homes have high radon concentrations, measuring radon and taking action if the action level is exceeded may still be cost effective.

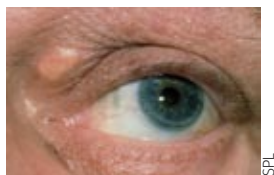
The joint effect of radon and smoking is also important.

Because 85% of radon induced cancers occur in people who smoke, the deleterious effects of indoor radon on health could largely be avoided by eliminating smoking. This is reflected in the finding that reducing indoor concentrations of radon may not be cost effective for people who have never smoked. The analysis did not take into account the fact that people who live in apartments are more likely to smoke than those who live in detached single-family houses—a matter that deserves further scrutiny.

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Statins and familial hypercholesterolaemia

LDL cholesterol should be lowered by at least 50% from baseline



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In the linked study, Versmissen and colleagues report the outcome of treatment with statins for primary prevention of coronary heart disease in a large cohort of patients with heterozygous familial hypercholesterolaemia.¹ This autosomal dominant monogenic disorder affects about one in 500 people and is the most common genetic cause of premature coronary disease. It results in the accumulation of low density lipoprotein (LDL) from birth, the approximate doubling of usual LDL cholesterol concentrations, and the subsequent development of tendon xanthomata and atheroma. Before effective treatment with statins became available, mortality from coronary disease was increased nearly 100-fold in adults aged 20-39, and about fourfold in those aged 40-59.²

The findings from Versmissen and colleagues' study add to the evidence base for treating familial hypercholesterolaemia. Because it is unethical to withhold treatment from patients at such high coronary risk, no randomised placebo controlled trials of statins have assessed clinical outcomes in this group, and so this study is particularly useful. Clinical management has relied on extrapolating the results of randomised trials of statins conducted in patients with polygenic hypercholesterolaemia³ and trials in heterozygous familial hypercholesterolaemia using the surrogate outcomes carotid intima medial thickness and coronary angiographic changes,^{4,5} together with a few prospective observational studies.⁶

The authors used the delay in starting statin treatment after these drugs were licensed to compare the risk of

coronary disease in treated and untreated patients. They found a significant (relative risk 0.24, 95% confidence interval 0.18 to 0.30) reduction in the risk of coronary heart disease with statin treatment, and that the risk of myocardial infarction approached that of the general population in patients over 55 (hazard ratio of 1.44, 0.80 to 2.60). Furthermore, 85% of patients were prescribed a statin at a dose that would not have reduced LDL cholesterol concentrations by more than 50%,⁷ as is recommended by evidence based guidelines from the National Institute for Health and Clinical Excellence (NICE).⁸ The authors suggest that lower doses of statins than currently advised may be used for primary prevention of coronary disease in these patients.

What results might have been expected? Most patients were prescribed simvastatin at a mean dose of 33 mg daily, which resulted in an apparent 44% lowering in LDL cholesterol. However, a meta-analysis of short term trials of simvastatin 80 mg—the maximum licensed dose—reported a mean reduction of only 42%.⁷ The dose-response curve in familial hypercholesterolaemia is similar to that in unaffected people,⁹ which suggests that the dose used in this study may have been underestimated, possibly as a result of up-titration of treatment during the 8.5 year follow-up or a switch to more potent statins.

How consistent are these findings with previous reports? One registry study reported the outcome in 2582 heterozygous patients followed from 1980 to 2006.⁶ Primary prevention resulted in a 48% reduction in LDL cholesterol after 1991 when statins were

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prescribed routinely, although it was still 1.7 times higher in patients aged 20-59 compared with the general population. Importantly, mortality from coronary disease was reduced by only 25% in 800 patients with established coronary disease, largely because it was reduced by only 8% in men.

How should clinicians respond to these findings? Caution is needed in drawing conclusions about the effectiveness of different treatments from observational studies. We know conclusively from randomised trials of statins that larger reductions in LDL cholesterol are more effective in lowering coronary risk.³ Furthermore, in familial hypercholesterolaemia a mean 50% reduction in LDL cholesterol over two years significantly reduces carotid intima medial thickness.⁴ Although statin monotherapy seems to be sufficient for primary prevention in most young heterozygous adults, clinically adequate lowering of LDL cholesterol often cannot be achieved with low potency statins.⁷ A high potency statin—such as atorvastatin 40 mg or rosuvastatin 20 mg daily—can usually achieve this and is usually needed if untreated LDL cholesterol concentrations are high.

Furthermore, the spectrum of mutations differs between the Netherlands and the United Kingdom, with mutations that cause greater increases in LDL cholesterol and early onset coronary disease being more prevalent in the UK than in the Netherlands.¹⁰ Adherence to the NICE guidance of lowering LDL cholesterol by at least 50%, with a high potency statin and lifestyle modification, is therefore the best strategy.⁸

The authors argue that aggressive treatment with statins in childhood, as advocated by the American Academy of Pediatrics,¹¹ may not be necessary. Nevertheless, drug treatment will almost certainly be needed from the late teens, and earlier treatment should be based on individualised risk stratification.⁸ For secondary prevention, and very high risk primary prevention, combined treatment with a high potency statin and the intestinal cholesterol absorption inhibitor, ezetimibe, lowers LDL cholesterol by roughly an extra 22%,^{8 12} although no evidence to

support this strategy is available from clinical trials.

What can we conclude? Statins are highly effective for the primary prevention of coronary heart disease in heterozygous familial hypercholesterolaemia, but current evidence indicates that LDL cholesterol should be lowered by at least 50% from baseline with a high potency statin.

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Surgical safety checklists

Improve collaborative teamwork, minimise surprises, and reduce harm to patients

Surgical deaths and complications are a global public health problem. The World Health Organization estimates that each year half a million deaths related to surgery could be prevented.^{1 2} In England and Wales, the National Patient Safety Agency's national reporting and learning system recorded 129 419 surgery related events in 2007.³ In the United States, the state of Minnesota (with less than 2% of the US population) reported 21 surgeries in the wrong site during one year (October 2007 to October 2008).⁴ The real situation is probably even worse though, because most safety incidents are not reported.⁵

In June 2008, WHO launched the Safe Surgery Saves Lives campaign.² This included a "surgical safety

checklist" (www.who.int/patientsafety/safesurgery/en/) to ensure that the entire operating theatre team has a common understanding of the patient and the surgical procedure, and that evidence based interventions such as antibiotic prophylaxis or deep vein thrombosis prophylaxis are reliably given.² The 19 item checklist is completed in three stages—before induction of anaesthesia (sign in), just before skin incision (time out), and before the patient leaves the operating theatre (sign out). Items on the checklist must be verbally confirmed with the patient and other team members. The WHO Safe Surgery Saves Lives Study Group has published a study of 3733 patients before and 3955 patients after implementation of the checklist.^{6 7} After implementation, deaths

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were reduced by 47% (from 1.5% to 0.8%, $P=0.003$) and in-hospital complications by 36% (from 11% to 7.0%, $P<0.001$). Improvement was seen across the eight study hospitals, which were based in high, middle, and low income countries. The authors of the study make it clear that the mechanism for the observed improvements in outcome is unclear and is almost certainly multifactorial. They also admit that part of the improvement might result from the Hawthorne effect—an improvement in performance as a result of the subjects' knowledge of being observed. However, the study produced what seem to be robust results across a range of settings. On the basis of these results, the National Patient Safety Agency has issued an alert mandating that an adapted version of the WHO checklist is completed for every patient undergoing a surgical procedure in England and Wales, with full implementation by February 2010.⁸ How hospitals will be assessed to ensure that they use the checklist by this date is not mentioned.

Several factors need to be taken into account in the attempt to translate the WHO study's impressive findings into practice. Firstly, mandatory use of the checklist may not deliver the same impressive results as the voluntary WHO study. Some clinicians will think the checklist implies that their practice is unsafe. They will cite their own results and lack of catastrophes to support their resistance. In addition, certain aspects of care may be delegated to others; for example, a junior doctor who rarely attends operating lists may be blamed if prophylaxis for deep vein thrombosis is not given.

Secondly, in addition to using the checklist, team introductions, briefings, and debriefings were also used in the WHO study, but the exact process and adherence were not described. Briefings and debriefings at the beginning and end of the theatre list are considered good practice by the National Patient Safety Agency in the supporting information to its alert. Safety briefings enable members of the team to introduce themselves to each other and the list of patients, their order, and potential problems—such as the need for special equipment and patient positioning—to be discussed. Such briefings may have contributed to the success of the intervention in the WHO study as a whole. Without proper introductions, team members may work together all day without knowing each other's names. It is much harder to speak up, ask a question, or voice a concern in the absence of a modest degree of familiarity. Despite initial scepticism from doctors, briefings are popular with nurses and other theatre staff. Briefings improve team communication and reduce errors and unexpected delays.⁹ Poor team work was associated with an increase in complications and deaths (odds ratio 4.82, 95% confidence interval 1.30 to 17.87) in an observational study of 293 surgical procedures in four US hospitals.¹⁰ In another single centre US study, surgeons reported an 82% reduction in unexpected delays after the introduction of briefings.¹¹

Thirdly, the WHO study took place in only a few of the operating theatres in each study hospital and was led by people with an interest in making the checklist work. For successful implementation along the lines of the National Patient Safety Agency alert, a similar

method should be considered. This would enable problems to be resolved by enthusiastic teams before they spread to other areas. The checklist may require changes to existing procedures to avoid duplicating paperwork. Enhancements to the checklist are encouraged but removal of items is not. Long checklists are less likely to be completed so care should be taken in adding new items.

Briefings and checklists should take minutes and not cause delays. In theory, any team member can lead the briefings and safety checks. In our experience the operating surgeon is best suited to lead the safety briefing at the start of the list. We have also found that a circulating nurse or anaesthetic assistant is the best person to ensure that the WHO checklist is completed for each patient. Completion of the checklist must not become a passive tick box exercise—all team members must actively take part, and staff will need training as team members change.

None of these problems of implementation is insurmountable. Surgical teams, anaesthesia teams, and theatre teams all have different hierarchies and cultures, but if this initiative is to succeed, all will have to take part and accept changes to their working practices. Collection of data and feedback to individuals and teams showing improvements in practice and patient outcomes will help in the battle for hearts and minds that will be essential for the spread and sustained use of checklists.

Error is inevitable in systems that rely on human performance. Complexity of care in the operating theatre has evolved beyond the limits of individual performance. Briefings and checklists have been shown to improve collaborative teamwork, minimise surprises, and lead to a smoother, safer day in the operating theatre. Try asking your neighbour—"If we were going to operate on you, would it be a good idea to take a few minutes to ensure all the operating theatre team knows the plan and we have the correct equipment?"—the answer is predictable.

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What should clinicians do when faced with conflicting recommendations?

Find guidelines that are systematic and transparent, and make informed judgments

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Clinical practice guidelines sometimes make conflicting recommendations.¹⁻⁸ For example, a sore throat may be managed differently in North America, France, and Finland—where guidelines recommend that a diagnostic test should be performed and that treatment should be conditional on its result—than it would be in England, Scotland, the Netherlands, and Belgium—where guidelines recommend that the decision to prescribe penicillin should depend mainly on the severity of symptoms, with no testing.¹

Such disagreements occur for both valid and non-valid reasons. Valid reasons include honest differences in the many judgments that go into a recommendation—judgments about which research is relevant; the risk of bias in that research; the applicability of the research findings to the question at hand; and the relative importance of the anticipated benefits, adverse effects, and costs. Non-valid reasons include conflicts of interest, lack of awareness of relevant evidence or ignoring such evidence, failure to appraise the relevant research critically, failure to consider outcomes that are important to patients, and inappropriate valuations of outcomes.

Conflicting recommendations can be bewildering for clinicians and patients. What then should clinicians do when faced with conflicting recommendations?

Simply ignoring guidelines altogether is one solution, but this would be hazardous. Clinicians need good quality clinical practice guidelines. Busy clinicians try to provide the best care they can for their patients but find it almost impossible to keep up to date with the deluge of new information crossing their desks. Good guidelines can synthesise all the research that is relevant to practice and can help with the complex judgments needed to translate that evidence into practice.

Clinicians should be wary of recommendations that have not been developed systematically and transparently. Well informed clinical recommendations require evidence and judgments. Evidence is needed to estimate the consequences of alternative management strategies and, ideally, as a basis for judgment about how patients value those consequences. Judgments need to be made about the evidence (table 1 on [bmj.com](#)) and about the balance between the desirable and undesirable consequences of adhering to a recommendation (table 2 on [bmj.com](#)). These judgments are complex and may be difficult, and if they are made informally and non-systematically errors may occur. Such errors include oversights, introduction of extraneous information, too much weight being given to some evidence (for example, personal experience) and too little to other evidence (for example, well designed research that conflicts with personal experience), conflicting interests, heuristics, and biases. Hence, particularly when benefits and harms need to be balanced,

guidelines should quantify—in terms of relative and absolute risks—the important benefits and harms of the management options. If such summaries are missing and judgments are not made transparently, it is impossible for others to appraise the soundness of the judgments that were made.

Clinicians must therefore be able to identify guidelines that are systematically developed—that is, those that describe the methods that were used—and that provide the essential estimates of treatment effects. They can take several shortcuts when doing this, such as ignoring guidelines where a clear conflict of interest exists and prioritising guidelines that are linked to systematic reviews. Clinicians should be cautious about non-systematically developed recommendations. They should use or adapt evidence based guidelines for decisions that they make often and that are particularly important. They may also wish to appraise the primary studies themselves.

Although clinicians cannot appraise every guideline that they use, clinicians need criteria to determine whether a guideline has been developed systematically so they can make informed judgments about what to do when recommendations conflict with one another or current practice,¹¹ and why such conflicts exist. Reasons for conflicting recommendations include differences in what evidence was considered, judgments about that evidence (table 1),¹² and differences in judgments about the desirable and undesirable consequences of adhering to a recommendation (table 2).⁹

Recommendations can disagree for many reasons, but usually there are only one or two key ones. In the sore throat example, the main reason for conflict is that the North American, French, and Finnish guidelines consider the prevention of rheumatic fever important enough to prescribe antibiotics, whereas the other European guidelines consider rheumatic fever to be rare and sore throat self limiting and therefore recommend that the severity of symptoms should be balanced against the disadvantages of giving antibiotics. Australian guidelines give different recommendations for different settings according to the risk of rheumatic fever, which is still high in aboriginal communities.

Clinicians can develop the skills they need to appraise guidelines critically in several ways. These include self study, online and non-online courses, journal clubs, and workshops. These skills are an essential clinical tool. As with other clinical skills, practice is necessary and it is probably more effective and efficient to do this in a group than individually.

The bottom line is that clinicians need guidelines and use them all the time, but they should not accept recommendations uncritically. To serve their patients well, they must be able to make informed judgments about which guidelines are appropriate, and what to do when recommendations conflict with one another.