radiation exposure from other sources was taken into account by comparison of the incidence of childhood leukaemia in the same regions before and after the accident at Chernobyl. Since background radiation is fairly constant in different parts of Finland and was fairly constant over the period covered by our study, its effect was taken into account in the analysis. The radiation dose from nuclear bomb testing has been monitored since the 1960s and changed little during the study period. To bias the results, change in exposure from other sources would have to be correlated with fallout from Chernobyl (both temporally and geographically).

Radiation from other sources can of course be regarded as a source of measurement error. This, however, depends on the validity of the measurement of exposure. In our study only the dose rate from radionuclides resulting from fallout from Chernobyl was assessed. This was achieved by subtracting the dose rate from nuclear bomb testing (known from previous surveys) from the measurements.⁵ The dose rate from naturally occurring radioisotopes was also excluded.

The power of a study depends on the magnitude of the expected effect. In Finland the increase in the number of cases of childhood leukaemia diagnosed corresponding to the mean exposure of 0.4 mSv was less than one extra case a year. We agree that the power of our study was limited. As a result we could exclude only an effect larger than 40% per mSv (or, in terms of numbers of cases, eight or more extra cases a year).

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Surgical removal of third molars

Third molars may cause severe problems in middle age

EDITOR,—Jonathan P Shepherd and Mark Brickley suggest that the prophylactic removal of third molars should be abandoned.¹ In my clinical experience some patients carry their asymptomatic unerupted third molars with them to the grave, as

suggested by Shepherd and Brickley, while others present with acute surgical and medical problems at any age up to that event. Unpublished data of the British United Provident Association (BUPA) show that a significant number of patients present in middle age and beyond with acute problems arising from their third molars; at this time not only their bone but also their cardiovascular system is brittle. Their reduced powers of recovery are such that what is an unpleasant experience in the late teens and early 20s can become a major surgical problem with hazards of mandibular fracture, nerve damage, and anaesthetic and medical complications.

Few surgeons will disagree with the statement that the prophylactic removal of third molars should be abandoned, but prophylaxis requires definition. Take, for example, a patient who presents with an acute or chronic peritonitis arising from a non-functional impacted third molar and becomes asymptomatic after antibiotic treatment. Should the tooth be removed before reinfection develops? The patient may be referred to hospital and refuse surgery with local anaesthesia. Should other impacted but asymptomatic third molars be removed under the same general anaesthesia? There is little difference in cost unless admission is required later for their surgical removal, again under general anaesthesia. Social convenience and recuperative powers are usually never better than in a young adult.

Shepherd and Brickley are ideally suited to set up a long term study into the morbidity produced by symptomatic third molars presenting in middle age and later. Postponing the surgical and medical morbidity of impacted teeth until then may be a high price to pay for short term savings and reduced waiting lists.

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- 1 Shepherd JP, Brickley M. Surgical removal of third molars. *BMJ* 1994;309:620-1. (10 September.)

National audit figures awaited

EDITOR,—In making the unequivocal statement that "the prophylactic removal of third molars should be abandoned,"¹ Jonathan P Shepherd and Mark Brickley, who refer to an American consensus conference of 15 years ago,² ignore the statement in the report on that conference that "no consensus was reached on the subject of removal of asymptomatic impacted teeth with no evidence of pathologic conditions."

The authors do not state how many asymptomatic third molars are not removed. Such data are not available. This is one reason for the current national audit of third molar activity being conducted jointly by the British Association of Oral and Maxillofacial Surgeons and the Faculty of Dental Surgeons of the Royal College of Surgeons of England, funded by the Department of Health. Being an episode based study, this audit will give information on both active and conservative management of third molars in the primary, secondary, and private sectors in Britain.

The fact that only about a third of people requiring surgical removal of teeth in hospital five years ago were treated as day cases reflects the availability of facilities for day surgery then as much as the judgment of clinicians. The targets for day surgery now demanded will probably already have redressed the balance. Again, the national audit will give this information.

Although it may be true that 90% of patients on waiting lists for oral and maxillofacial surgery in South Western region in 1991 required the removal of third molars, this by no means represents the inpatient waiting lists for the specialty as a whole. There is a substantial movement towards

day surgery and ambulatory surgery for these patients.

The British Association of Oral and Maxillofacial Surgeons and the Faculty of Dental Surgery, again through their joint audit working group, have written pilot clinical guidelines for virtually all aspects of oral and maxillofacial surgery, including the management of unerupted teeth. These are shortly to be issued to all consultants and higher trainees in the specialty for field testing. Definitive guidelines will then be issued through the appraisal process of the Clinical Outcomes Group. These will therefore be based on wide experience as well as critical appraisal of available research and audit data by expert groups. We may then be in a position to determine whether prophylactic removal of third molars should be abandoned.

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- 2 National Institutes of Health. Consensus development conference for removal of third molars. *Journal of Oral Surgery* 1980;38:235-6.

Most referred patients have symptoms

EDITOR,—Jonathan P Shepherd and Mark Brickley's editorial gives the impression that large numbers of impacted third molars are unnecessarily removed for prophylactic reasons.¹ This is not confirmed by an audit recently carried out in Trent region. Fifteen consultants in oral and maxillofacial surgery examined in detail 275 patients referred to hospital departments for surgical removal of third molars.

Most of the patients had been referred by dental practitioners, and 194 of the referral letters described symptoms or disease. According to the letters, 86 patients had suffered pain, 67 pericoronitis, and 12 caries in either the wisdom tooth or the lower second molar. Other reasons for referral included the dental practitioner's failure to complete the surgical removal of the tooth (four patients).

Only 38 patients had no complaint or symptom when seen. One hundred and thirty seven patients complained of pain, and 32 had an ache or soreness in the region of the wisdom tooth. Eighteen had noted a swelling in the past, and 15 complained of food packing or a bad taste related to the impaction. Seventy four patients had suffered symptoms on the opposite side, and 92 had received treatment before referral, or whom 69 had been prescribed antibiotics.

In only 17 patients was the decision made to leave the impacted third molars in place. The examining consultants considered that 199 patients had definite pathological reasons for removal of the teeth: 124 had suffered more than one episode of pericoronitis, 32 had caries, 24 had suffered a single episode of pericoronitis, 10 had periodontal disease, five had retained roots (including the four in whom surgical procedures had failed), and four had cysts related to the impacted teeth.

It is accepted that in the population at large a relatively small number of wisdom teeth need to be removed, but in hospital practice most patients referred with impacted third molars are already suffering symptoms and have pathological lesions related to the impacted teeth. If these patients are not treated more severe problems may present later.

The assessment of which impacted third molars should be removed can be made only by fully trained surgeons, whether in hospital or general practice, and the "potential for mistaken diagnoses

and unnecessary surgery" is no greater than that in any other branch of surgery.

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Authors' reply

EDITOR,—Although no consensus was reached concerning prophylactic removal of third molars at the National Institutes of Health Conference in 1979, the decision and cost-benefit analyses published since have concluded that this is not an appropriate strategy.¹ Longitudinal studies show that the prevalence of disease associated with third molars peaks at ages 18-25¹ and that impacted third molars that are free of disease in middle aged people can be safely left in situ because disease rarely develops and is usually minor when it does.² A substantial number of impacted third molars erupt, given the chance.³ Malpositioned third molars are often valued by restorative dentists in the construction of bridges, dentures, and overdentures for older people.

Assessments by oral surgeons¹ and potential patients⁴ of health states (utilities) resulting from surgical intervention and non-intervention, when subjected to formal decision analysis, have shown that the best treatment strategy in relation to teeth that are free of disease is non-intervention. Dentists in teaching hospitals feel the same way about their own third molars.⁵ Theoretically, given accurate prediction about the development of virtually any disease, prophylactic surgical excision is best carried out when someone is young and fit. Unfortunately, in practice and given current knowledge, this prediction cannot be made for third molars, even when teeth are impacted.¹

"Free of disease" is a much better term than "asymptomatic" since follicular cysts and periodontal disease are often asymptomatic.

Clinical guidelines should be explicit about the circumstances in which removal of third molars in the absence of local disease may be justified—for example, in surgery for jaw deformity or when there is a risk of endocarditis. Evidence currently available, however, supports the view that prophylactic removal (of teeth that are free of disease) should be carried out only in exceptional, well defined circumstances. The same applies to exceptions to the general guidance that third molars should be removed on a day case or outpatient basis.

The findings of the audit in Trent reported by P G McAndrew are similar to those of the audit in Bristol cited in our editorial. In Trent consultants found that disease justifying surgical removal was absent in 76 of 275 patients, but only 17 patients were not scheduled for surgery. Russell Hopkins draws attention to important, unresolved questions. We welcomed the national third molar survey when it was initiated and look forward to seeing the results.

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Each case needs careful thought

EDITOR,—Jonathan P Shepherd and Mark Brickley's editorial looks at the arguments for abandoning the prophylactic removal of impacted or unerupted third molars but does not explain the historical reasons why this has been traditional practice.¹ For these we must go back to the days before penicillin. Sulphonamides were not particularly effective in treating serious odontogenic infections. Consequently, cellulitis spreading into the tissues from pericoronitis around impacted lower third molars and massive, dangerous abscesses involving the adjacent tissue spaces were common and their treatment far from satisfactory. If an impacted tooth had been affected by several episodes of pericoronitis the timing of its removal was crucial. Even then, osteomyelitis spreading from an infected socket was a distinct risk. These were the cogent reasons why, at that time, patients were advised to have their impacted but not infected third molars removed. All such problems have declined dramatically in the intervening years but have not entirely disappeared.

A further consideration was that surgery becomes increasingly difficult with advancing age. Before the mid-20s a tooth, once disimpacted, is easily dislodged from the socket. After this age a greater effort is required to disrupt the attachment. From middle age onwards the bone of the jaw becomes progressively harder and more brittle so that in elderly people the greater part of the socket may have to be removed before the tooth will move without a fracture. Until relatively recently most people were edentulous by their old age, and unerupted teeth emerged and became infected under their dentures. With the increasing hazards of anaesthetics and surgery with age the earlier removal, even of buried teeth, was a sensible policy, and for some patients it still is.

As Shepherd and Brickley point out, times have changed and the morbidity associated with removal of third molars now usually outweighs any advantage of prophylactic surgery. Nevertheless, mesio-angular and horizontal teeth can still lead to caries low down on the neck of the second molar, where it can affect the pulp before becoming clinically detectable.

Treatment habits are ripe for further change but not as a matter of policy, nor should prophylactic surgery be totally abandoned. Each case necessitates careful thought and discussion with the patient, who should be well informed—not least because our patients will grow older and the full consequences of some of our decisions are still to come.

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Early mortality after dental operations

What constitutes a dental operation?

EDITOR,—Valerie Seagroatt and Michael Goldacre propose that an almost doubled standardised mortality ratio during the year after dental operations may be explained by the fact that they studied patients receiving inpatient rather than outpatient treatment, who by definition would have a greater risk of postoperative complications.¹ The explanation may, however, be far simpler and may lie in the authors' ambiguous use of the term "dental operations." If the term means, as most people would understand it without further explanation, dentoalveolar surgery then their results are surprising. If, however, the term refers

to the full range of dental, oral, and maxillofacial surgery then such a high mortality ratio could be more easily explained: an appreciable proportion of patients admitted for oral and maxillofacial surgery will be suffering from oral, perioral, and salivary gland malignancy, which in itself carries a considerable risk of death.

It is unfortunate that Seagroatt and Goldacre do not give examples of specific dental operations, as they do with other operations, given that without further clarification their statistics are alarming—perhaps unnecessarily.

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1 Seagroatt V, Goldacre M. Measures of early postoperative mortality: beyond hospital fatality rates. *BMJ* 1994;309:361-6. (6 August.)

Authors' reply

EDITOR,—The dental operations were those recorded as codes 251 and 252—"simple dental extraction" and "surgical extraction of tooth"—in the third revision of the Office of Population Censuses and Surveys' classification of surgical operations (as we specified in table I in our paper).¹ As we also specified, we excluded patients for whom a diagnosis of cancer had been recorded at admission. We therefore think that our results are unlikely to have been influenced by an appreciable proportion of patients having been admitted for oral and maxillofacial conditions that themselves carry a considerable risk of death.

Our aim was to quantify and attempt to interpret any short term mortality after operation by identifying, in particular, whether operations were followed by clustering of deaths shortly afterwards. We did not find a significant short term clustering of deaths after the dental operations. We found that the standardised mortality ratio for this group of patients was generally higher than the population average throughout the year.

We doubt that this is attributable in any way to the operations. We think that it is much more likely to be an effect of selection—that is, that the population that underwent dental operations was (in aggregate) slightly less healthy than the general population. One possibility, as we speculated, is that this may reflect the kind of patients who undergo these operations on an inpatient rather than an ambulatory basis. Another is that, more generally, some patients who require dental operations may be less healthy than average. If our explanation is correct—that the increased standardised mortality ratio throughout the post operative year in this group of patients is attributable to the characteristics of the patients rather than to the operations they undergo—the findings are not alarming in respect of the risk of dental surgery.

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1 Office of Population Censuses and Surveys. *Classification of surgical operations, 3rd revision*. London: OPCS, 1975.

Future of preventive dentistry

EDITOR,—Aubrey Sheiham presents an interesting picture of dentistry in Britain today, but his view that we could do with fewer dentists and less treatment is one sided.¹ At present, the demand for dental services is still higher than the supply in