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NEED FOR RADIOLOGISTS TO INTERPRET ORTHOPEDIC TOTAL JOINT RADIOGRAPHS

We believe that the methodology employed by Nayak and colleagues in their study "Interpretation by radiologists of orthopedic total joint radiographs: Is it necessary or cost-effective?" (*Can J Surg* 1996;39(5):393-6) has significant problems. There are factual errors in the initial paragraph: (1) Most private offices in Canada that have many orthopedic patient visits have the total joint radiographs interpreted by the attending radiologist. (2) It is not the policy of our institution that all radiography must be performed by the Department of Radiology, since the Division of Cardiology performs some of its own radiography. (3) It is not the policy of the Department of Radiology that all radiographs be interpreted and that

the fee for this interpretation be billed by the radiologist. On the contrary this is the policy of the London Health Sciences Centre, supported by the Public Hospitals Act.

The study described by Nayak and colleagues was not a prospective one, as indicated in the abstract of the article but was clearly a retrospective study as described in the Methods section. Regarding the methodology, the radiographs were not read by the orthopedic division independent of the clinical history but were read in conjunction with the clinical assessment of the patient. If the orthopedic division had (1) designed a prospective trial with blind reading of the radiographs without clinical information, as is the usual scenario in the radiology department, (2) indicated the probability of the radiograph changing the subsequent management and (3) indicated whether any of the radiographic findings actually changed the management plan, based on the clinical assessment only, the study would have been strengthened immeasurably.

The professional component of the radiologic examination does not consist solely of interpreting the results of a diagnostic procedure. It has 5 components¹ as follows:

(A) Providing clinical supervision, including approving, modifying or intervening (or both) in the performance of the procedure when appropriate, and quality control of all elements of the technical aspect of the procedures.

(B) Performance of any clinical procedure associated with a diagnostic procedure that is not separately billable (e.g., injections that are integral to the part of the study) and of any fluoroscopy.

(C) Post-procedural monitoring, where appropriate, including intervening, except when this constitutes a separable billable service.

(D) Interpreting the results of the diagnostic procedure.

(E) Providing premises for any aspect(s) of (A) and (D) that is (are) performed in a place other than that in which the procedure is performed.

We are not sure how to interpret the statement, "of the 240 primary total knee replacements, there was no discrepancy between the orthopedist's and radiologist's interpretations...." We are not in the practice of including in our consultation comment on whether the proposed operation is pertinent. Had the study been designed with the question: Based on the radiographic appearance only, is a total joint replacement recommended at this time?, we believe the study would have been strengthened and might have led to differences of opinion between the orthopedist and radiologist.

Naylor and colleagues recognized that there is a difference in opinion as to the suitability and timing of total joint replacement.² In this excellent review, which included one of the authors of the current article, more than 20% of the panelists reportedly were unable to agree on the appropriateness of the joint replacement classification in 30% of the scenarios included.

The individual cases cited in Nayak's article in support of their underlying hypothesis are examples of a lack of collegiality. There is no indication that any of the radiographs were reviewed by a radiologist in consultation with an orthopedic surgeon or with provision of relevant clinical findings.

With respect to economics, the authors propose that by removing the radiology consultation they would save \$23 000. The average costs in our hospital for total knee and total hip replacements are \$5473 and \$5699 respectively. If 30% of the primary cases included in this study were inappropriate, the savings would represent $(0.3 \times 240 \times \$5473 + 0.3 \times$

184 × \$5699) \$708 640.80. Another option suggested for achieving significant economic saving³ concluded that approximately \$4.3 million could be saved in Ontario if primary joint replacements were devolved from tertiary care centres to community hospitals. This is obviously a significantly larger amount of money than that which would be saved by the lack of a radiologic consultation. In addition, the practice of the authors to have frequent postoperative radiographic surveillance is not supported in the literature.^{4,5} It has been suggested often by the Department of Radiology that standing orders for postoperative follow-up are inappropriate for the clinical management of the patient. This has been countered by the orthopedic department, which considers these follow-up studies essential for research. Were this so, the fees for both the patient visit and the subsequent radiography should be billed to a research account and should not be submitted to the Ontario Hospital Insurance Plan for payment. Further savings could also be obtained if both knees or both hips were not routinely radiographed in follow-up studies. The savings in film alone would be approximately \$6000.

We respect the experience of the senior authors (C.H.R. and R.R.B.) who have subspecialty practices of adult hip and knee reconstructive surgery. The radiology department staff also practise in a tertiary and quaternary fashion. Some of the authors of this letter have practices that are largely devoted to the interpretation of orthopedic radiology and are not representative of a general radiologist's practice in Canada. The practice in our department is that, on occasion, subspecialists in other areas do report some orthopedic films. The Methods section of Nayak's article makes no comment on whether radiographs

deemed to be incorrect were interpreted by subspecialists other than orthopedic radiologists. Lastly, we believe that it is inappropriate that the references cited in the article do not appear in the peer reviewed literature but are presentations from the American Academy of Orthopaedic Surgeons annual meetings. Although the abstracts may have been peer reviewed, they do not have the same scientific merit as a peer-reviewed, published scientific paper.

Summary

We applaud the aim of Nayak and colleagues: to use our scarce economic resources as judiciously as possible. We have suggested several alternatives that would save more of our scarce health care dollars. We would be delighted to take part in a properly designed prospective randomized trial to address the issues presented in this paper.

We believe the literature would be strengthened by the publication of a collegial paper, coauthored by orthopedic and radiology departments, addressing the issue of saving health care dollars by omitting unnecessary or redundant procedures.

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A detailed review of the paper by Nayak and colleagues in the October 1996 issue (pages 393 to 396) reveals a serious lack of appropriate methodology. The study design is flawed when judged by accepted contemporary research criteria of methodology¹ for the following reasons:

The Questions

The objective stated is to “examine the necessity and cost-effectiveness of interpretation by radiologists of orthopedic radiographs obtained for patients who undergo total hip or knee replacement.” However, the appropriateness of “serial radiographs” is also addressed in the context of the paper and simply answered by expressing “strong feelings.” In addition, the au-

thors address the issue of “routine interpretation of orthopedic films by radiologists,” but these issues are not included in the objective. The choice of topic and rationale is not a focused and explicitly identified research question and is flawed to the extent that invalidates the conclusions. This paper then attempts to address 2 goals: (1) to examine the need for radiologists to interpret radiographs obtained for patients who undergo total hip and knee replacements; (2) to examine the cost-effectiveness of the interpretation of such radiographs.

Goal 1

- There was no description of the methods used in the study. The description under Methods identified what appeared to be “usual practice” in the centre. The methods used to evaluate the reports and to compare the reports and analyse the differences, were not described.

- The literature search strategy is not stated. Methods of inclusion are not defined, and yield of evidence is not outlined. A secondary reference list and bibliography are not offered. A review of the sparse literature references suggests that evidence was not evaluated.

- The steps taken in designing this study were never identified. There is nothing to indicate the existence of a study protocol or operations manual; no information is provided on how the sample size was estimated and what inclusion or exclusion criteria were used. In essence, this is simply an observational study based on a case series; and even the largest case series is nothing but a couple of hundred anecdotes strung together.

- The evaluation contains no statistical analysis. A reasonable effort should have been made to assess agreement between observers (i.e., ortho-

pedic surgeons and radiologists). The extent of the analysis was to look at raw numbers in cases of disagreement.

- Control of bias was not addressed in the design considerations. The assessment of radiologic tests can be seriously hampered by the presence of systematic bias. In this case, many factors affect interpretation, including variations in test efficacy among patients, and differences in interpretation of the tests by the orthopedic surgeons and radiologists who read them.

- There is nothing to suggest that image readers were blinded to clinical information or other test results.

- Operative findings constitute an acceptable “gold standard.” There is, however, no information about the criteria used and the avoidance of bias in a situation where the authors alone were fully aware of clinical manifestations and radiographic and operative findings.

Goal 2

This goal constitutes an economic analysis and the design and interpretation of such an economic analysis includes a number of well-recognized steps.²

To define the problem:

- What type of economic analysis is being performed?

- Are the alternatives being compared and identified? Are the alternatives appropriate and have all possible alternatives been considered?

- To specify the perspectives of the analysis.

- Are the sources of data (i.e., incidence, prevalence, safety, effectiveness) reasonable?

- Are direct, indirect and intangible costs and benefits explicitly defined and measured?

- Are the costs and charges differentiated?

- Are incremental cost-benefit or

cost-effectiveness ratios calculated?

- Are all potentially relevant uncertainties and biases identified? Are there potential impacts on the results assessed?

- Are ethical issues identified and discussed?

- Are the conclusions appropriate and reasonable?

There is nothing to suggest that any of these steps were addressed by Nayak and colleagues, and the conclusions therefore are neither appropriate nor reasonable. The discussions in this paper present only the cost fees charged by radiologists, and this is nothing but a crude estimate. That estimate, furthermore, is based on the assumption that the radiologist’s professional fee only reflects the interpretation of radiographs. This widely held misconception about the scope of radiologic services sees radiology only as a “film reading service.” Beyond the interpretation of radiographs, this fee includes the supervision of a qualified staff, whose efforts are directed toward producing a radiologic examination yielding the maximum diagnostic information at the least possible exposure to radiation, and an increasing responsibility for the radiologist to consult on optimal pathways for imaging examinations. Such advice will seek to achieve a diagnosis or affect a treatment in a manner that is safe in minimizing risk, efficient and cost-effective.

Health services research is a field of enquiry that examines the impact of organization, financing and management of health care services on the delivery, quality, cost, access to and outcome of such services. Investigators who engage in this type of research and perform such studies must be acquainted with research methodology, the technique of diagnostic test evaluation and the need for prior preparation and close adherence to a research protocol. This is not to say that all physicians involved

with such studies must be proficient in all relevant disciplines — but transdisciplinary collaboration is an *indispensable prerequisite* for such projects. It is of interest in this context that leadership in research collaboration at McMaster University is offered by the Department of Surgery. At a Surgical Outcomes Retreat on Nov. 16, 1996, a superb presentation was arranged by the Department of Clinical Epidemiology and Biostatistics, entitled “The Art of Collaboration.” Creative collaboration was defined as “breaking out of the framework of our thinking” and “to develop new conceptual modes of collaboration.” It was also pointed out that we “get stuck in our conceptualization” and that we “must get broader” and that “this type of collaboration is defined by our skills.” We must add scholars and researchers to broaden the concept. Transdisciplinary research is the desirable model. It shares conceptual frameworks and includes health economics, decision theory, policy analysis, epidemiology (evaluative sciences) and biostatistics. We must collaborate to identify topics of mutual interest and need and to assure the availability of complimentary skills as well as an adequate knowledge base.

As far as we can determine Nayak and colleagues made no attempt to seek complimentary skills or a knowledge base that would have assured the success of the project.

In the context of preoperative and postoperative imaging of patients who undergo total hip or knee replacement, there are a number of issues that should be addressed. These include the evaluation of the diagnostic tests in terms of accuracy, appropriateness and cost, and we would be prepared to participate in any properly designed study for this purpose.

Transdisciplinary collaboration is an enlightening and enjoyable experience that promotes mutual under-

standing and enhances teamwork. It helps to establish bonds of respect with colleagues and in relationships that not only allow for improved patient care but lead to more fulfilled professional lives free from unnecessary tension and conflict.³

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Drs. Rorabeck and Bourne respond

The 2 letters, authored collectively by 8 radiologists, express considerable concern and reservation with regard to our article. The letters are strongly worded and, of course, have been written from the radiologist's point of view.

The fact remains that this study had 2 objectives. The first was to determine the necessity and cost-effectiveness of having radiologists interpret routine x-ray films of patients who undergo total hip or knee replacement. We can cloud the central issue, as the radiologists have done, by questioning the “appropriateness” of the x-ray film or of the surgery or the necessity for serial radiographs and so on. The fact remains, however, that this article has demonstrated that it is *not necessary* for radiologists to read routine total joint x-ray films at our institution and, as we state in our article, a considerable amount of money could be saved by the health care system if orthopedic surgeons continue to read and interpret their own total joint radiographs.

It is our belief that radiologists, within the health care system, should act as consultants and bill appropriately for that consultation. On the other hand, as our study showed, it is not necessary, nor is it desirable, for a radiologist to “automatically consult” on every total joint radiograph going through our institution. We find it curious that neither of the 2 letters disputed this observation and neither presented a downside to orthopedic surgeons reading their own total joint radiographs. One can argue about the methodology used, the lack of statistical analysis, the fact that the study was not done in collaboration with the radiology department, but none of these detract from the fact that the article was peer reviewed, accepted and published as such.

The conclusions of our article clearly strike at the heart of the enforced radiologic consultation for every radiograph taken in our teaching hospital. Our radiology department has insisted on promoting this policy and supports its point of view by citing the Public Hospitals Act. Our article would suggest that this practice needs to be reviewed.

Although it is clear from these 2 letters that the radiology community does not agree with the conclusions of our article, we would challenge radiologists to disprove our findings by publishing a study of their own. To the best of our knowledge this has not been done, and neither of the 2 letters offers any proof to the contrary.

The question remains: What is the downside to orthopedic surgeons interpreting their own total joint radiographs and asking for radiology consultation when they feel it is necessary? There isn't any!

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CRYOSURGERY FOR MALIGNANT HEPATIC TUMOURS

Because of the presence of a temperature gradient of 10 °C/mm of liver tissue, adequate cryoablative treatment can only be delivered to lesions less than 5 cm in diameter.¹⁻³ It is therefore not surprising that 1 of the patients reported by McKinnon and colleagues in the December 1996 issue (pages 417 to 426) had a local recurrence shortly after cryosurgery.

Although the patient, who had a staged procedure whereby the third tumour was cryoablated during a second operation 6 weeks after the first, withstood 2 operations well, we suggest that intralesional ethanol injection of the third tumour should have been considered at the time of the first operation or subsequently. The use of intralesional ethanol injection, mostly in hepatocellular carcinoma, has been

shown to be efficacious. Two recent studies^{4,5} have shown that patients with lesions up to 5 cm in dimension, treated this way, have a 3-year survival rate of about 65%. At our institution, intralesional ethanol injection and cryosurgery form part of the armamentarium for palliating unresectable hepatic tumours. Further, the injection can be given percutaneously, does not require a laparotomy and has been shown to cost less than US\$1000 per treatment.⁵

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Dr. McKinnon responds

Dr. Leow and Lau raise 2 important considerations regarding the treatment of malignant tumours of the liver. The first concerns the maximum size at which a hepatic tumour can be treated by cryosurgery. Although they are correct in asserting that a cryoprobe can only achieve a freeze zone or iceball of approximately 5 cm in dimension, modern multiprobe machines allow placement of several probes simultaneously, so that an iceball of very large size can be created if desired. Practically, however, the magnitude of injury to the liver, the metabolic consequences of leaving that much necrotic tissue in situ and the difficulty of accurate ultrasonographic monitoring make cryosurgery a daunting challenge for lesions larger than 5 cm in diameter. We currently restrict the use of cryosurgery to lesions 5 cm or smaller in dimension.

Percutaneous ethanol injection for the treatment of hepatic tumours is a promising technique, and the findings in early reports, as cited by Leow and Lau, are encouraging. Most of these trials, however, report the use of this technique in hepatocellular carcinoma, particularly in patients with cirrhosis. The hard sclerotic consistency of metastatic colonic carcinoma makes it more difficult for the alcohol to diffuse through the tumour. Our current practice is to use ethanol injection for small (less than 3 cm in diameter) hepatocellular carcinomas that are unresectable.

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