The effect of a Radiology Conference consultation on cancer patients management

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Background: The quantitative effect of consultation on cancer patient’s management at a Radiology Conference was studied.

Patients and methods: This prospective study included consecutive patients presented at the Radiology Conference of the Division of Oncology. Following the case presentation and discussion, the patient’s oncologist completed a questionnaire which asked whether the consultation at the conference added new information regarding the patient’s disease status, whether it influenced patient management and, if so, to what extent.

Results: Three hundred and eighty-three patients were included in the study. Significant new information was added for 189 (49%) patients and less consequential information was added for 134 (35%) patients. Major changes in management occurred in 143 (37%) patients after the Radiology Conference and minor changes were made in 56 (15%) patients. The influence of the cancer type on the rate of significant change in treatment and on the rate of major information addition was not statistically significant.

Conclusion: Consultation at a Radiological Conference in a tertiary center led to major changes in the management of 37% of the cancer patients presented and provided important information regarding the patient’s disease in up to 50% of patients.

Key words: impact on management, oncological patients, Radiology Conference

Introduction

It is a common practice to review previous radiological studies of patients admitted to a hospital. Usually, the original interpretation of the study is available, but the current treating physician requests reinterpretation of the study, both to see whether something of importance was missed and to ask specific questions according to the current clinical presentation. This practice causes a significant addition to the workload of a radiology department. It has been shown that second-opinion consultations increase the average daily work volume of a radiology department by 18% [1]. At the same time, it is known that radiological double reading increases the sensitivity of the study [2–5]. This may have immense influence on the patient’s prognosis. Therefore, it is imperative to inspect the value of reevaluation of previous radiological studies. The purpose of this work was to investigate the quantitative effect of a consultation at a Radiology Conference on cancer patient’s management.

Patients and methods

Institutional review board

The study protocol was approved by the institutional review board with waiver of informed consent.

Patient population

All consecutive cases discussed during a Radiological Conference in the Division of Oncology in our hospital from August 2007 to June 2008 were included in this prospective study.

Radiological Conference in the Division of Oncology

Our hospital is an academic institution that serves as a tertiary referral center for patients from Northern Israel, a population of >1.5 million people.

The Radiological Conference of the Division of Oncology is prepared in the Department of Radiology by the following approach. The treating oncologist sends a request for consultation with disks of current and previous patient studies (if applicable). The cases include both hospitalized patients (in the Chemotherapy and Radiotherapy wards) and outpatients, managed and treated in the Oncology Outpatient Clinics, Oncology Day Care Unit and Radiotherapy Unit. Both first visit and follow-up patients were eligible to enter the study. All imaging studies reviewed at the conference had been carried out at other hospital-based and private...
radiological facilities. Original reports were consulted by the treating oncologist before the conference and a preliminary treatment plan was formulated. The studies were loaded into the Picture Archiving and Communication System (PACS) system (EasyVision, Philips Medical Systems) for convenient review. This allows comparison of the previous and current studies that are already stored in the system. The request is accompanied by relevant clinical data: type of cancer, stage, studies currently presented for review and the pertinent question to the radiologist. Second- or third-year Radiology Resident reviews all available data, following a second review of all cases with a general Attending Radiologist. When needed, a consultation with a radiology specialist in the specific field is requested (e.g. thoracic imaging, body imaging, neuroimaging, musculoskeletal imaging).

During the conference, the referring physician presents the case, followed by a presentation by the Radiology Resident of the radiological findings. After the radiologist–oncologist discussion, the treating oncologist makes a decision on management. It should be noted that mainly difficult and challenging cases are presented at the conference, not all patients being treated in the Division of Oncology. Fourteen oncologists participated in the study, all board certified, specializing in different cancer types. Cancer type also specifies treating oncologist. Radiologists in our hospital do not receive additional payment for the extra workload associated with conference preparation and presentation since it is considered part of their regular activities.

study protocol
Before the conference, clinical data, such as age and gender of the patient, type of cancer and type of modalities in the studies for review, were collected and entered into the questionnaire. During or shortly after the case presentation and discussion, the treating physician answered the following questions: did the consultation at the conference add new information regarding patient disease status; did the consultation at the conference have an impact on patient management and, if so, to what extent. The decision was made by the treating oncologist in comparison to the information that was known before the conference and in comparison to the treatment plans already made for this patient (Tables 1 and 2). A major change in treatment was defined as that which dramatically changed patient management, e.g., change from curative to palliative treatment, change of chemotherapeutic protocol due to insufficient response, etc. Significant information was defined as not only information that caused a major change in treatment (e.g. a bone lesion thought to be a malignant lytic lesion reinterpreted as a benign osteoporotic lesion; a lung nodule reinterpreted as a blood vessel; increase in tumor size reread as no change in size of lesion) but also information not directly associated with the primary disease, such as complications of therapy and unrelated diseases.

statistical analysis
Two major outcomes were evaluated: whether a change in treatment occurred after the conference (major or minor change) and whether information was added at the conference (significant or less consequential). Percentages for each outcome were determined with confidence intervals (CIs). The statistical analysis was carried out for the whole study group and in subgroups defined by cancer type, body area and modality reviewed. Student’s t-test was carried out to determine whether there was a difference in the outcome between the studies carried out in hospital-associated and private radiological institutes. The level of statistical significant was set at P < 0.05.

results
Three hundred and eighty-three consecutive patients were included in the study. The average age of the patients was 62.7 years (range 22–94 years). There was a slight predominance of women over men, 58.2% versus 41.8%.

The most prevalent cancer types were lung cancer with 31.3% of the cases, breast cancer with 23.2% and colon cancer with 14.9% (Table 3). Some patients had more than one cancer type.

In the vast majority of cancers (80.7%), computed tomography (CT) was the imaging modality reviewed, followed by mammography (8.3%), ultrasound (6.6%) and magnetic resonance imaging (MRI) (2.8%) (Table 4). Some patients were evaluated by several modalities.

Body systems reviewed included chest in 54.2% of the cases, abdomen and pelvis in 45.3%, musculoskeletal system in 10.6%, breast in 9%, head and neck in 5.2% and central nervous system (CNS) in 1.4%. Primary CNS and head and neck cancers are discussed in a separate conference in our department; therefore, only metastases at these sites from other cancers were reviewed at our conference.

One hundred and twenty-five cases were original studies from the hospital-associated institutes and 174 cases were from non-hospital-associated institutes; data on the origin of the studies were unavailable for 84 cases.

We found that a major change in management occurred following the discussion at the conference in 37.3% (95% CI 32.5% to 42.2%) of the patients. A minor change occurred in 14.9% (95% CI 11.1% to 18.2%), and no change in management was reported by the treating oncologist in 47.8% (95% CI 42.8% to 52.8%).

In addition, we learned that presentation and discussion during the conference contributed significant new information.

Table 1. Definition of treatment changes

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major change in treatment</td>
<td>Beginning of treatment due to disease recurrence in a patient who was only followed up</td>
</tr>
<tr>
<td>Minor change in treatment</td>
<td>Initiation of bisphosphonates treatment at the diagnosis of skeletal lesions</td>
</tr>
<tr>
<td>Anticoagulant therapy for thromboembolic disease</td>
<td>Anticoagulant therapy following a major change in treatment</td>
</tr>
<tr>
<td>Antibiotic therapy for pneumonia, etc.</td>
<td>Antibiotic therapy following a major change in treatment</td>
</tr>
</tbody>
</table>

Table 2. Definition of information addition at the conference

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant information</td>
<td>Followed by a major change in treatment that occurred following the case discussion during the conference</td>
</tr>
<tr>
<td>Complications of therapy</td>
<td>Information on diseases not related to the primary one</td>
</tr>
<tr>
<td>Less consequential information</td>
<td>Anticoagulant therapy following a major change in treatment</td>
</tr>
<tr>
<td>No change in treatment, but further evaluation for equivocal findings is required</td>
<td>Antibiotic therapy following a major change in treatment</td>
</tr>
</tbody>
</table>

In addition, we learned that presentation and discussion during the conference contributed significant new information.
in 49.3% (95% CI 44.3% 54.4%) and new information but of lesser importance was added in another 35% (95% CI 30.2% to 39.8%). When a change in management data was split according to type of modality, there was a relatively even distribution of management change, with a slight predominance of mammography with a major change in 54.4% of cases (Figure 1). The X-ray group was small with only seven cases, thus impairing statistical analysis of this group. Similar results, with a relative prominence of mammography, were received for the addition of new information when the data were split according to the modality (Figure 2).

Lung cancer was the most prominently affected cancer type with a major change in treatment in 46% of cases, followed by breast cancer with 36%, colon cancer with 35% and pancreatic cancer with 20%. No significant difference was seen among different cancer types for the addition of significant information, with all cancer types near 50%.

The rates of change in treatment in studies carried out in hospital-associated and in non-hospital-associated radiological institutes did not differ significantly, with a major change occurring in 45% of cases originating from hospital-associated institutes versus 54% in cases originating from non-hospital-associated institutes (P = 0.7).

A recommendation for additional imaging was provided in 28.45% of the cases presented at the conference.

**discussion**

A major change in treatment occurred in 37% of patients following the radiological second opinion and significant new information was added in up to 50% of patients. These results show that the discussions during the conference had a great impact on patient care.

Mammography was the modality for which a change in treatment was most prominent. This is not surprising since mammography reading has a long learning curve and experience is of the utmost importance. CT was the most prevalent modality used, both in our study group and in overall radiological practice, and most radiologists have a great deal of experience in CT reading. Despite this fact, the discussion at the conference lead to changes in the treatment plan for 50% of patients, with the change being significant in 36%. Lung and breast cancer management includes a variety of treatment protocols, and subtle differences in radiological presentation are important. The presence and degree of vascular encasement in lung cancer may determine whether the patient is eligible for certain chemotherapeutic protocols. When the response to treatment is suboptimal, a change of chemotherapeutic regimens to achieve a better response may be made. Pancreatic cancer was the least affected cancer type, with only 20% of major change.

<table>
<thead>
<tr>
<th>Table 3. Number of patients by types of cancer in study population</th>
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</thead>
<tbody>
<tr>
<td>Lung cancer, n (%)</td>
</tr>
<tr>
<td>Breast cancer, n (%)</td>
</tr>
<tr>
<td>Colon cancer, n (%)</td>
</tr>
<tr>
<td>Pancreas cancer, n (%)</td>
</tr>
<tr>
<td>Melanoma, n (%)</td>
</tr>
<tr>
<td>Thymoma, n (%)</td>
</tr>
<tr>
<td>Gastric cancer, n (%)</td>
</tr>
<tr>
<td>Kidney cancer, n (%)</td>
</tr>
<tr>
<td>Esophageal cancer, n (%)</td>
</tr>
<tr>
<td>Endometrial cancer, n (%)</td>
</tr>
<tr>
<td>Soft tissue tumors, n (%)</td>
</tr>
<tr>
<td>Testicular cancer, n (%)</td>
</tr>
<tr>
<td>Other, n (%)</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4. Number of patients by modalities involved in the evaluation of the study population</th>
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</thead>
<tbody>
<tr>
<td>Computed tomography, n (%)</td>
</tr>
<tr>
<td>Mammography, n (%)</td>
</tr>
<tr>
<td>Ultrasound, n (%)</td>
</tr>
<tr>
<td>Magnetic resonance imaging, n (%)</td>
</tr>
<tr>
<td>X-ray, n (%)</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Figure 1. Change in treatment according to modality (percentage of major change shown, total number of cases stated below the name of each modality).

Figure 2. Addition of information according to modality (percentage of major change shown, total number of cases stated below the name of each modality).
in treatment following the conference. This is probably because of
the relatively few treatment options available and the generally
dismal prognosis for this type of cancer.

There are two main types of radiological facilities in our
country, hospital-affiliated and free-standing private institutes,
both staffed only by board-certified radiologists. Interestingly,
we found no difference in the impact of second opinion when
comparing these two facilities.

The oncologists asked specifically for a complete comparison
with previous studies and the exact measurements of target
lesions. Above all, oncologists requested the incorporation of all
available radiological data, whether mammography,
ultrasound, CT, MRI, positron emission tomography (PET)—
CT or nuclear medicine scans, into the clinical picture and
asked the radiologists to provide recommendations, whether to
carry an additional radiological study or an appropriate biopsy.
The radiologist providing the original interpretation does not
have access to all the radiological data and, therefore, cannot
carry all the needed comparisons and clinical puzzle solving
and provide recommendations. This necessitates a discussion
by the radiologist and the oncologist. The problem of low
availability of previous studies could possibly be solved by
a nationwide PACS (not currently available). Moreover,
radiologists working in our institution are familiar with the
usual demands of the oncologist for each modality, body part
diagnosis, and they provide the required information in
their analysis. Original interpretations received from external
radiology facilities frequently lack some of the necessary
information, possibly since the radiologists working there do
not receive appropriate feedback from the oncologists.
Radiologist–oncologist interaction occurring during the
conference is of great value. It allows the oncologist to state
the exact requirements in each case, for the radiologist to obtain
pertinent clinical data and for both to incorporate all available
clinical and radiological data, thereby making a better clinical
decision together.

Modern oncology is a fast-changing science, demanding a lot
of information to navigate the variety of treatments available.
Many times it is much more than standard staging information.
Therefore, despite the fact that a radiological–oncological
conference requires significant investment in manpower, it
results in a great improvement in patient care. The results of
this study should be taken into account when structuring the
workflow of radiology and oncology departments. Further study
should consider the cost-effectiveness of such a policy—it
may help to eliminate unnecessary studies and treatments.

There are a small number of reports that evaluate the clinical
considered the value of reinterpretation of CT studies in
assessing resectability of pancreatic carcinoma in 53 patients.
Discrepancies between interpretations were found in 32% of
the cases, with reinterpretation being correct in 94% of
disputed cases as resolved by surgery, biopsy or additional
dedicated study. In a retrospective study of 143 cases in 1999,
Gollub et al. [7] found discordances between initial
interpretation and reinterpretation in 37% of cases, with 17%
being major and resulting in treatment change in 3% of the
cases. In 2001, Dudley et al. [8] evaluated the value of
reinterpretation of 396 examinations (CT and MRI) of patients
referred to the surgical oncologist. Disagreement between the
initial and referral radiologists was found in over 162 (41%)
films, with the referral radiologists being correct in 94% of
cases. Had the patients been treated using the initial readings,
there would have been 19 more inappropriate surgeries and 19
more admissions. Thus, a significant management change
occurred in 10% of overall examinations.

In 2002, Loewner et al. [9] reevaluated CT and MRI studies of
136 patients with presumed head and neck cancer. Change in
interpretation occurred in 41% of the cases, and treatment was
altered in 98%. In a prospective study of 78 patients with
hepatobiliary malignancy in 2003, Tilleman et al. [10] found
that reinterpretation of ultrasound and CT resulted in a change
of treatment strategy in 7% of patients.

The current study is in agreement with these studies,
although the clinical impact in our study is generally greater.
This is probably attributable to the nature of our study,
evaluating impact of the Radiology Conference and not just
intradepartmental variability. Other major differences are due to
the prospective planning of our study, the much larger number
of patients and the diverse pathologies, characteristic of
a general oncology practice.

There are a number of biases in the current study. First, our
patient population represents difficult or challenging cases in
oncological management and not the general oncologic patient
population. In light of the results of this study, it may be
advisable to review all cases in a similar conference, despite
the significant increase in workload. Second, the results of our
study are statistically valid for the general population, but we
do not have enough statistical power for small subgroups (such
as patients with X-ray studies and some rare cancers). Third,
our results are valid for the local practice. Fourth, it is possible
that the importance of reevaluation of radiological studies
differs in new patient evaluations, in restaging scenarios and in
patients with different stages of cancer. Fifth, a change in
clinical management does not necessarily translate into
improved clinical outcome. Sixth, our study was based on
a determination of change by the treating oncologist. In further
studies of specific cancer types, it is advisable to record
preconference and postconference therapeutic regimens, both
for detailed quantification of conference-driven change and for
a cost-effectiveness analysis of such practice. Last, nuclear
medicine is not part of the radiology department in our
country; therefore, PET-CT studies are discussed in a separate
conference. Incorporating nuclear medicine studies into
a radiology–oncology conference may additionally impact
outcome.

It should be emphasized that we did not measure the quality
of the radiological reports and we did not carry any comparison
between original and reinterpretation reports. Original reports
were not available at the time of our conference. We do not
know whether there was a misdiagnosis in the original report,
or if it was misunderstood by the oncologist, whether
comparison was carried out, or if any information was missing.
All these problems could be fixed during a conference.
Nevertheless, the management decision is made by the treating
oncologist, and it is his opinion that counts.

We conclude that a consultation at a radiological conference
in a tertiary center led to a major change in the management in
37% of cancer patients and provided important information regarding the patient’s disease in up to 50% of patients. Therefore, it is imperative to continue this practice and to consider its expansion to more patients.

**acknowledgements**

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**disclosure**

The authors declare no conflict of interest

**references**


