Skin Cancer as a Cause of Death

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■ *An estimated 6,000 new cases of skin cancer (excluding melanoma) occur each year in California, and vital statistics data show about 125 deaths attributed annually to this cause. A study of deaths attributed to skin cancer indicates that the true number was probably between 40 and 50. More than half of those who died were 75 years of age or over. Delay by the patient was the factor occurring most often in the deaths which could have been avoided.*

CANCER of the skin, excluding melanoma, is generally considered a mild, nonfatal form of cancer. Existing data show this to be true; California, with a population of about 15,000,000 in 1959 and an estimated 6,000 new skin cancer cases per year,[2] recorded a total of 130 deaths with skin cancer designated as the underlying cause. (As will be shown later, the actual number of skin cancer deaths was considerably less than the total of 130 that had been recorded. An exploration of reasons for this discrepancy constitutes one of the objectives of this paper.)

Several questions arise from these facts: Is the number of deaths coded to skin cancer valid? If not, how many deaths should be attributed to this cause? What factors are associated with these deaths? Should there be *any* deaths caused by skin cancer?

The above questions were raised by Dr. John W. Cline, a member of the Advisory Committee for the California Tumor Registry, California State Department of Public Health. Similar questions had been previously raised by one of the authors (Levin) in an analysis of deaths from skin cancer in California.[4] A study designed to provide the answers was undertaken jointly by the California Tumor Registry and the Cancer Commission of the California Medical Association.

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Coding of the underlying cause of death on death certificates is dependent on the information supplied by the certifying physician. Specific coding rules must be applied when information on the death certificate is vague and does not clearly state the underlying cause of death. As a result, vital statistics regarding cause of death on death certificates have commonly been regarded with some suspicion because of the questionable validity of the data. Moriyama and coworkers[5] and James and coworkers[3] found a fairly high degree of validation for cancer. Moriyama's study disclosed 86 per cent agreement for all sites of cancer combined when the coded cause of death on the death certificate was checked through inquiry with the certifying physician, and James found 92 per cent agreement. Data on validation for skin cancer deaths were not published, however, because of the small numbers of skin cancer deaths in the two studies.

Review of a sample of California death certificates coded to skin cancer as the underlying cause indicated that the validity of deaths coded to this cause might be considerably lower than for total cancer.

Method of Study

The present study is based on the 130 California deaths in 1959 that were coded to skin cancer as the underlying cause. (Death certificates are coded according to the World Health Organization's In-

ternational Statistical Classification by the Bureau of Vital Statistics of the California State Department of Public Health, using rules formulated by the National Vital Statistics Division, National Center for Health Statistics.)

The death certificates were first reviewed by one of the authors of this study (Dunn); he eliminated 41 cases, mainly deaths which on review of the certificates were attributable to squamous cell carcinomas of the lip, carcinomas of the anus, epidermoid carcinomas with primary site unknown, and histologic types of cancer not arising in skin tissue. (National Vital Statistics Division rules have the effect of overcoding to skin cancer.)

The decision to eliminate carcinoma of the lip (but not skin of the lip) is in conformity with usual practice, the former site being considered more closely related to cancer of the oral cavity than of the skin. Similarly cancer of the anus is usually considered in relation to cancer of the rectum. Death certificate information is inadequate to distinguish cancers of the visible perianal skin from those of the canal. Cancers of the anus were therefore excluded as well.

Additional information on the remaining 89 deaths was then secured from the physicians who had certified the deaths. Physicians residing outside the San Francisco and Los Angeles metropolitan areas received a questionnaire requesting information on diagnosis, treatment, microscopic confirmation and cause of death. Fifty-one questionnaires were mailed; all but two were returned.

Deaths certified by physicians residing in the San Francisco and Los Angeles areas were randomly assigned: half of the physicians received mailed questionnaires and half were interviewed by two dermatologists, Dr. J. W. Wilson and Dr. E. A. Levin, using the same questionnaire. Nineteen interviews were conducted, 13 in Los Angeles, 6 in San Francisco. The same number of mailed questionnaires were sent to physicians in metropolitan areas, and all were returned.

The response rate for the entire series of 89 deaths was 98 per cent; for the 70 mailed questionnaires, 97 per cent. Physicians who did not respond to the original correspondence received follow-up letters, and in some cases were contacted by telephone. In several instances the physician who had certified the death provided a reference to another physician who was able to provide additional data.

Information obtained through interview was generally more complete than that obtained through mailed questionnaire. Most of the mailed questionnaires were adequately filled out for the study; some, however, lacked information because the certifying physician had had little contact with the patient or because his information on the history of the case was incomplete.

Each of the questionnaires was evaluated independently by Dr. Dunn and by Dr. Kenneth Ernst, pathologist, Chief of the Cancer Diagnosis and Therapy Evaluation Unit of the Department. Differences were reviewed jointly. An independent appraisal was made by Dr. Lewis W. Guiss. While it was not feasible to set up rigid rules for classifying all deaths because of the paucity of information received on some of the questionnaires, it was possible to place the deaths in fairly discrete categories.

Results

Analysis was directed to four major questions:

1. Did the patient have skin cancer? At least two of the three reviewing physicians concluded that:
   a. 49 did have skin cancer (unanimous opinion: 45).
   b. 23 did not have skin cancer (unanimous opinion: 18).
   c. In 15 instances information was insufficient to make a clear-cut decision (unanimous opinion: 1).
2. What was the underlying cause of death? At least two of the three physicians concluded that:
   a. 39 died of skin cancer (unanimous opinion: 32).
   b. 26 died of other cancer (unanimous opinion: 15).
   c. 3 died of causes other than cancer (unanimous opinion: 0).
   d. 3 died of causes unknown, but not skin cancer (unanimous opinion: 0).
   e. In 16 instances information was insufficient to make a clear-cut decision (unanimous opinion: 3).
3. Could the 39 deaths clearly due to skin cancer have been avoided? At least two of the three physicians concluded that:
   a. 22 could have been avoided (unanimous opinion: 15).
   b. 3 could not have been avoided (unanimous opinion: 0).
   c. In 14 cases information was insufficient to make a clear-cut decision (unanimous opinion: 3).
4. What factors were involved in the deaths from skin cancer? All three physicians reviewing the questionnaires agreed that delay by the patient was a factor in causing death in most of the cases in which death could have been avoided. Physician error in selecting the type of treatment or in extent of treatment given was an additional factor in about

one-third of the 22 deaths judged to be avoidable. Patient refusal of treatment was also a factor in one-third of the deaths. The advanced age of many of those dying of skin cancer was undoubtedly a major factor in their deaths. More than half were 75 years of age or over at time of death (Table 1).

Cell Type

Table 2 shows that squamous cell carcinoma accounted for three-fourths of the deaths. This is in sharp contrast to the distribution of cell type generally found among skin cancer cases. Data on 11,066 skin cancer cases (with type specified, excluding melanoma) reported to the California Tumor Registry for the years 1942-1956[1] showed that only 38 per cent were of the squamous cell type; the majority were basal cell carcinomas.

Discussion

The study has shown that the number of deaths in California coded to skin cancer as the underlying cause is greater than the number which should properly be attributed to this cause. Instead of the 130 deaths coded to skin cancer in 1959, the study indicates that the true number was probably between 40 and 50. Almost all the deaths (in cases in which enough information was available to make a decision) could have been avoided. Delay by the patient was the most prevalent factor reported by the certifying physicians, while refusal to accept treatment and, in some cases, the mode or extent of treatment were deemed to be factors in the deaths. Only three deaths were judged to be unavoidable, although the opinion was not agreed to by all three reviewers. Reasons given by the physicians for unavoidability were "adequately treated initially," "early mestastasis" and "resistant to radiation."

The discrepancy between the total number of deaths coded to skin cancer, 130, and the number of deaths found to be due to skin cancer in the study (39, with possibly a few more among the 16 in which no decision could be reached because of the inadequacy of the information) was due to the sparse and ambiguous information recorded on some death certificates and to the use of arbitrary rules necessary for coding such certificates. Statements such as "carcinoma, squamous cell," "carcinoma of face" and "epidermoid carcinoma, with cervical node metastasis" are difficult to categorize properly, and are assigned to skin cancer by current coding rules. Improved certification of the cause of death by the physician and changes in coding rules should increase the validity of the category "skin cancer" as a cause of death.

What is most pertinent, however, is that California, with a population of about 15,000,000 in 1959 and an estimated occurrence of 6,000 new skin cancer cases every year, experiences a very small number of deaths from skin cancer. One possible interpretation of these findings is that skin cancer seldom causes death and is therefore not a serious disease. Another interpretation, and probably a more correct one, is that skin cancer is not a serious disease in California today because of the high level and availability of existing medical practice and the apparent willingness of most persons to seek early medical attention for skin lesions.

Continued education of the physician and the general public regarding early diagnosis and adequate treatment of patients with skin cancer should reduce even further the small number of deaths due to this disease.

TABLE 1.—*Age at Death for Those Dying of Skin Cancer*

Age (Years)	*Died of Skin Cancer**	*Death Might Have Been Avoided**
Total	39	22
Under 50	3	3
50-54	....	....
55-59	3	1
60-64	2	1
65-69	6	2
70-74	4	2
75-79	5	4
80-84	7	4
85-89	6	4
90 and over	3	1

*In the opinion of at least two of three physicians who reviewed death certificates and other data.

TABLE 2.—*Cell Type of Skin Cancer Causing Death*

Cell Type	*Died of Skin Cancer**	*Death Might Have Been Avoided**
Total	39	22
Squamous	29	16
Basosquamous	3	3
Basal	5	3
Undetermined	2	....

*In the opinion of at least two of three physicians who reviewed death certificates and other data.

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