Malnutrition Among Hospitalized Patients
A Problem of Physician Awareness
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- Between 25% and 50% of patients admitted to an acute medical service are malnourished. Physicians are often unaware which patients are admitted at nutritional risk and make no attempt to arrest further nutritional decline until a dramatic deterioration has occurred. We studied all patients admitted to an acute medical ward service before and after their physicians were taught to recognize nutritional deficiency early and to intervene appropriately. During the initial period, the house staff correctly identified two (12.5%) of 16 patients as being malnourished. During the posteducation period, physicians correctly identified all 14 patients admitted at nutritional risk (100%), using a simple screening device that required only routine admission data. In all cases, the appropriate nutritional intervention was subsequently made. Results were further validated using a pretest and posttest, showing a significant improvement in nutritional knowledge. We conclude that physicians are not presently being taught to recognize malnutrition, that such malnutrition is iatrogenically worsened in the hospital, and that physician education can effectively correct this problem.

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Previous studies have shown that the prevalence of malnutrition is approximately 50% in both general medical and surgical patients. Malnourished patients seem to have a prolonged hospital stay, a higher incidence of complications, and a higher mortality rate. Moreover, the ability of physicians to recognize malnutrition in patients early in their hospitalization has been disappointing. In addition, the nutritional status of patients tends to deteriorate during hospitalization, and this, too, often goes unrecognized. We suggest that this problem is due to insufficient training of physicians to recognize and prevent malnutrition, and that physician education can bring about significant improvement in the nutritional care of patients without undue difficulty or expense.

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MATERIALS AND METHODS
To further define the extent of this problem, we studied all patients admitted to a general medical ward of the Osler Medical Service at the Johns Hopkins Hospital, Baltimore, for longer than 48 hours over a 30-day period during May 1986. Only one of the four wards was chosen due to limitations in time and personnel. All patients are considered identical in terms of clinical practice, with house staff and students assigned to each ward in a random fashion. Patient care decisions in the Osler Service are made by a team of three interns, two residents, and five medical students under the supervision of a chief resident. Since the house staff rotate on a monthly basis, a 30-day observation period allowed these physicians to serve as their own controls. The study protocol was reviewed and accepted by the Joint Committee on Clinical Investigation of the Johns Hopkins Hospital. During the first 14 days of the study (period 1), no attempts were made to intervene in the nutritional care of the patients, and data were collected by one of us (R.R.) without the knowledge or involvement of the house staff. There followed a two-day period (period 2) during which the house staff and students participated in two two-hour sessions with one of us (R.R.) teaching them the basics of nutritional assessment and intervention. They were taught to use a simple nutritional screening form that could be completed by the interns within 24 hours of admission, using only routine laboratory data and a few simple measurements. During the second 14-day period (period 3), the interns used the screening tool to identify patients at nutritional risk. All patients were independently evaluated by one of us (R.R. or R.A.R.) to verify the results of the screen.

The screen (Figure) was based on a variety of published nutritional screening devices modified so that all requisite data could be gathered from routine admission laboratory data in conjunction with the patient's history and physical examination, so that a decision regarding nutritional risk could be made within 24 hours of admission. The screen was based on the following parameters: patient's weight as a percentage of his ideal body weight and of his usual body weight (defined by previous documented weights if possible, or by recall if no other data were available); serum albumin; total lymphocyte count; 11 historic parameters known to impact on nutritional risk, including weight change, nausea, vomiting, diarrhea, anorexia, dysphagia, food allergy, or change in stool color. A positive result, based on previously published criteria, was considered to be in which any two of these four screens were true: weight less than 20% of ideal body weight, weight loss greater than 10% of usual body weight, serum albumin less than 35 g/L (3.5 g/dL), total lymphocyte count less than 1.2 × 10^9/L (1200/mm^3), or presence of three or more of 11 historic risk factors.

At the beginning of period 2, a pretest was administered to all house staff and medical students participating in the study. A posttest was administered to the same group at the end of period 3. The tests were comparable but not identical in content and
Nutritional screening form used by house staff to evaluate patients during period 3 of study.

During period 3, the physicians and students caring for patients found to be at nutritional risk received follow-up by the study dietitian (R.A.R.) regarding the progress of their patients. Thus, the adequacy and outcome of their intervention was reinforced, and strategy for treating the patient's nutritional deficit was discussed much as treatment of cardiac problems would be discussed with a cardiac consultant.

End-points of the study included the following: (1) whether physicians correctly identified patients at nutritional risk; (2) whether appropriate nutritional intervention was undertaken, defined as initiation of a calorie count or ordering a nutritional consultation, or both; (3) whether steps were taken during hospitalization to prevent iatrogenic malnutrition, defined by the number of days during which a calorically inadequate diet (nothing per mouth [NPO] or clear liquid diet, obliging 800 calories per day or less at our hospital) was ordered; and (4) statistical analysis was performed using a CLINFO computer.

Analysis of identification of patients at nutritional risk was performed using Fisher's exact test. Results of the two examinations were analyzed by a two-tailed t test, and analysis of patient age, mean length of stay, use of nutritional supplements, and days of inadequate caloric intake were analyzed using the Wilcoxon non-paired rank-sum test.

**RESULTS**

Characteristics of the two groups of patients are compared in Table 1. There is no statistically significant difference between the two groups. Table 2 shows the discharge diagnoses during periods 1 and 3, and indicates the variety of disease processes seen in the Osler Medical Service, as in many other urban hospitals serving an indigent population. The group of physicians managing these cases was unchanged during the trial period, and these served as their own controls. During period 1, the physicians were not made aware that they were part of a trial, while in periods 2 and 3 they were told that an educational effort was underway to improve their nutritional awareness, but specific aspects of this study were not discussed.

Results of the educational intervention are presented in Table 3. While there was no significant difference in the number of patients at nutritional risk, the ability of the treating physicians to recognize such risk improved dramatically after the nutritional screen was instituted (P<.001 by Fisher's exact test). Furthermore, there was a statistically significant increase in the number of nutritional consultations ordered (P<.005, Fisher's exact test). We also observed an increase in the number of calorically inadequate meals delivered, and an increase in the number of days during which patients received nutritional supplements, although these differences did not reach statistical significance.

In addition, there was a significant improvement in the nutrition knowledge of the house staff and students involved in the study, as measured by the pretest and posttest (P<.005, paired two-tailed t test). This observation held true at all levels of training, from third-year student to senior resident.

**COMMENT**

In a landmark article published 13 years ago, Butterworth noted that malnutrition in the hospital was commonplace and unrecognized. Implicit in this observation is the conclusion that physicians are not trained to recognize malnutrition until the patient has reached an advanced state of cachexia. Most physicians accept the thesis that patients are better off if they are well nourished and are not resistant to the idea of nutritional intervention. Thus, it follows that the impediment to early and appropriate nutritional intervention, including prevention of iatrogenic malnutrition, is due to the failure of physician education in this field.

In this study, we purposefully chose a busy inner-city hospital for the study group, and compared the results with those from a hospital in the same city that was less busy.
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Table 2.—Comparison of the Two Groups of Patients by Discharge Diagnoses

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Period 1</th>
<th>Period 2</th>
</tr>
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<tbody>
<tr>
<td>Cardiac (congestive heart failure, coronary artery disease, syncope, arrhythmia)</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Infectious disease (urinary tract infection, pneumonia, cellulitis, abdominal abscess)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Endocrine (diabetic ketoacidosis, diabetes)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Gastrointestinal tract (bleeding, pancreatitis, inflammatory bowel disease, sinalitus)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Pulmonary (chronic obstructive pulmonary disease, asthma)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Neurology (cerebrovascular accident, seizure, dementia, pseudotumor, depression, vestibulitis)</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Oncology (lung cancer, head and neck cancer, leukemia)</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Renal disease (acute or chronic renal failure)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Rheumatology (scleroderma, Reiter's syndrome)</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*By Fisher's exact test. NS indicates not significant. 
†By Wilcoxon nonparametric rank sum test. NPO indicates nothing per mouth. 
‡By paired two-tailed t test.

general medicine ward, in which the expected risk of malnutrition is high. We chose one month as the period of study because this is the natural cycle time of the house staff and students on any given rotation. This allowed us to observe the behavior of the caregivers in regard to nutrition for a period of time (two weeks) during which enough patients could be admitted to the service to allow for a valid observation of the behavior of the house staff and students. It should be noted that this study is not intended to reach conclusions about the demographics of malnutrition in our patients, nor to study the effect of nutritional intervention on outcome or length of stay. Such conclusions are not valid based on such a small sample.

In contrast, our study strongly supports the tenet that educating physicians changes their behavior in regard to nutritional assessment and intervention. Specifically, by providing physicians with a tool with which to assess the nutritional status of patients shortly after admission, we were able to show a significant change in physician's recog-

Table 3.—Results of Physician Education on Physician Assessment of Nutritional Risk and Subsequent Physician Behavior

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Period 1</th>
<th>Period 2</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients at nutritional risk, No. (%)</td>
<td>16 (47%)</td>
<td>14 (41%)</td>
<td>NS*</td>
</tr>
<tr>
<td>Patients correctly identified as at risk, No. (%)</td>
<td>2 (12.5%)</td>
<td>14 (100%)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>No. of nutrition consultations</td>
<td>0</td>
<td>12</td>
<td>&lt;.005*</td>
</tr>
<tr>
<td>No. of calorie counts</td>
<td>2</td>
<td>7</td>
<td>NS*</td>
</tr>
<tr>
<td>No. of NPO/clear liquid meals</td>
<td>119</td>
<td>61</td>
<td>NS†</td>
</tr>
<tr>
<td>No. of days nutritional supplements were prescribed</td>
<td>18.6</td>
<td>27</td>
<td>&lt;.005†</td>
</tr>
<tr>
<td>Prettest/posttest average score, %</td>
<td>45</td>
<td>74</td>
<td>&lt;.005†</td>
</tr>
</tbody>
</table>

*By Fisher's exact test. NS indicates not significant. 
†By Wilcoxon nonparametric rank sum test. NPO indicates nothing per mouth. 
‡By paired two-tailed t test.

The group of house staff studied comprised 10% of the interns, 25% of the students, and 6% of the residents rotating through the department of medicine. The Osler Service was chosen for the study because patient care decisions are made solely by this group, guided by one of four chief residents. In most cases, it is the intern who makes the day-to-day management decisions involving diet, supplements, NPO status, etc. Thus, by studying one ward we were able to sample the behavior of a representative group of house staff. Furthermore, members of the house staff have recently graduated from medical school, and their attitudes and knowledge, as well as those of the medical students, reflect to a large part their medical education. Thus, the fact that a typical group of residents, interns, and students at a major teaching hospital failed to recognize that their patients were liable to be malnourished or to become malnourished while in the hospital makes the result of this study even more relevant.

The nutritional screen that was used in this study was intentionally created to require only such data as are routinely available to the physician within 48 hours of admission. There is little convincing evidence that a more complex screen, using anthropometric data, delayed hypersensitivity skin testing, performing serum transferrin and prealbumin studies, etc, provides a more accurate assessment of nutritional status.15,16,17,18 The delay and expense inherent in obtaining these studies would, in our view, delay recognition of malnutrition and perhaps even remove the patient's nutritional status from the list of active problems, whereas an immediately available nutritional screen would bring any problems to the physician's attention early in the hospital course. The screen itself does not diagnose malnutrition, but rather asks if patients are at risk for malnutrition, either presently or in the immediate future. There are no specific findings on history, or results of physical examination, or laboratory tests that are specific for nutritional problems. However, a constellation of such findings, causing a positive result, suggests that nutritional and metabolic problems exist, and should be addressed in concert with the rest of the patient's medical problems. Furthermore, we felt that creating a somewhat more sensitive and less specific screen was in the patient's best interest. If physicians are already insensitive to nutritional status, a screen that is inappropriately insensitive would further delay intervention. Also, the risk of a false-positive screen is negligible, involving only an inappropriate nutritional consult, which, presumably, would correctly identify the patient's nutritional status as normal.

Finally, we used a pretest and posttest to assess the impact of nutrition education on the knowledge of the caregivers. Although the tests were stringent, we felt they included the material a practicing physician should know.
regarding nutritional status. The poor performance on the pretest confirms the deficiency in knowledge we suspected, and the improvement in scores after period 3 of the study suggests that a true impact was made during the two weeks. Of interest is the enthusiasm shown by the students and house staff during the second part of the month, again suggesting that physicians are not a priori reluctant to consider nutrition in evaluating their patients.

If education can indeed remedy the poor capacity of physicians to recognize undernutrition and malnutrition, how can this best be accomplished? First, we recommend that a simple nutritional risk score be made part of the admitting procedure of all acutely ill patients, until it becomes part of the natural thought process of physicians as they evaluate patients. Second, we suggest that a dietitian or some other individual who can provide nutritional education be made part of the ward team and attend rounds with that team to further improve physician awareness of nutritional and metabolic problems as well as to teach appropriate nutritional intervention. We have shown that the combination of the screening form and ongoing education are effective means of improving nutritional awareness and, ultimately, patient care.

By requesting a nutrition consultation early in the hospitalization, it may often be possible to prevent the complications and increased length of stay associated with malnutrition and, perhaps, allow increased use of enteral rather than parenteral nutritional support, providing enormous savings in cost and risk. Steinberg and Anderson estimate that 16% of hospital admissions received nutritional support in 1984, about 5.5 million patients. The average cost of total parenteral nutrition in 1984 was $200 per day, compared with about $21 per day for enteral nutrition. Obviously, any intervention that would bring about earlier nutritional intervention would have significant fiscal and medical ramifications. We suggest that physician education is a cost-effective and sensible approach to this problem.

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References