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内科学

Textbook of Internal Medicine

主　编　Chief Editor

王吉耀（Wang Jiyao）

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Textbook of Internal Medicine

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“英文版”出版说明

2001 年 8 月，教育部制定并下发《关于加强高等学校本科教学工作提高教学质量的若干意见》（教高[2001]4 号），指出：按照“教育面向现代化、面向世界、面向未来”的要求，为适应经济全球化和科技革命的挑战，本科教育要创造条件使用英语等外语进行公共课和专业课教学。对高新技术领域的生物技术、信息技术等专业，更要先行一步，力争三年内，外语教学课程达到所开课程的 5%～10%。2005 年 1 月，又印发了《关于进一步加强高等学校本科教学工作的若干意见》（教高〔2005〕1 号），指出：高等学校要全面推广和使用大学英语教学改革的成果，要提高双语教学课程的质量，继续扩大双语教学课程的数量。要加强教材建设，确保高质量教材进课堂。

双语教育是提高学生英语水平的一个途径，尽管我国高等医学院校双语教学探索已有若干年，但教材的跟进始终显得滞后。没有合适的教材是目前双语教学面临的困难之一。2006 年初，为推进双语教学的发展，经全国高等医药教材建设研究会和卫生部教材办公室审议，决定根据国家、地方和学生未来发展的需要，组织国内专家结合双语教学的经验，编写出版一套适应当前双语教学现状的教材。

此套教材的特点在于：

- 汇集名师。各教材主编均由卫生部规划的五年制、八年制教材的主编担任。
- 适合国情。教材的编写内容和体系主要参考我国医学院校长期使用并多次修订的五年制、八年制规划教材，更符合我国的教学模式。
- 语言纯正。根据引进的经典英文原版教材改编，聘请国外作者或编辑参与审校工作。
- 篇幅适中。由于双语教学的课时数有限，因此在编写时只选取各门学科需要重点掌握的内容（占中文教材内容的 1/2～2/3）进行编写，也可减轻学生的负担。
- 丰富的教辅资源。教辅资源一直是外版教材的核心资源，因此，在本套教材编写的同时，我社引进了国外畅销的系列案例教材《Case Files》，以配合教学使用。
- 制作精美。为满足广大读者的阅读需要，全套教材采用双色印刷，图文并茂，版式清新美观。

本套教材共 16 种，全部为卫生部“十一五”规划教材。全套教材将于 2007 年秋季和 2008 年春季分两批出版发行。可供各医学院校针对五年制、七年制、八年制等不同层次学生开展双语教学使用。

教 材 目 录

3	生理学	Textbook of Physiology	主编	姚　泰
4	病理学	Textbook of Pathology	主编	李甘地　来茂德
5	病理生理学	Textbook of Pathophysiology	主编	王建枝　金惠铭
6	医学微生物学	Textbook of Medical Microbiology	主编	贾文祥
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8	生物化学	Textbook of Biochemistry	主编	贾弘禔
9	药理学	Textbook of Pharmacology	主编	周宏灏
10	医学遗传学	Textbook of Medical Genetics	主编	陈　竺
11	实验诊断学	Textbook of Laboratory Diagnostics	主编	王鸿利
12	临床诊断学	Textbook of Clinical Diagnostics	主编	万学红
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16	儿科学	Textbook of Pediatrics	主编	王卫平　朱建幸

序

英语是目前国际上通用的语言，使用英语作为官方语言的国家最多，在国际会议包括医学方面的学术会议多以英语作为会议中使用的语言，医学文献也以用英语书写的最多。在目前医学科学进展日新月异的时代，要及时了解医学新理论、新概念、新方法和新技术，了解国际的学术科技发展的情况，将我国医学研究成果和经验介绍出去以及在国际会议上与同行交流都必须掌握和熟练运用英语。

对于医学生和青年医生，在学业和专业打基础阶段尽量多地接触医学专业英语，掌握医学专业单词，熟悉国际上正规医学文件书写方式对于今后专业水平的提高、医学研究与国际接轨和让中国医学更快地走向世界会起重要作用。

以王吉耀教授为首的内科学英语教材编写组，以国际内科经典教科书哈里森内科学为基础，编写这本《英语内科学》，她（他）们根据我国医学生内科学教学大纲摘选相关章节，在每一章前列出要点，便于教师教学，也便于学生学习时掌握要点，提高教和学的效果，很有创意。作为老教材编写者，我怀着欣喜的心情看到本书的出版，深信本书能获得全国开展双语教学学校师生们的欢迎，发挥它预期的作用，故乐为作序。

陈灏珠

复旦大学附属中山医院教授

中国工程院院士

前　言

近二十多年来，我国执行对外开放政策，各行各业与国外的交流日益增多，医学界也不例外。英文和英语是国际上通行和公用的文字语言，其重要性自不待言。目前我国高等学校临床医学专业使用的规划教材绝大多数是用中文书写，因此对于医学英语词汇和医学英语习惯用法不甚熟悉。为了进一步培养当今医学生和医师与国外同行用英语直接交流的能力，与国际接轨，双语教学势在必行。一本好的英语教材可使双语教学效果起到事半功倍的作用。

受卫生部教材办公室和人民卫生出版社医学教育出版中心委托，我们邀请曾负责和参加过七/八年制内科学编写、英语功底好、对双语教学颇有经验的全国14所高等医学院校20位专家编写全国高等学校临床医学专业卫生部双语规划教材《内科学（英文版）》，作为各高校内科学双语教学用教材。

为保证本书内容的权威性和语言的准确性和地道性，我们编写内容以哈里森内科学（原版）为主，在与有关部门协商取得版权后进行改编，还特别邀请了香港大学内科王振宇教授作为本书副主编。本书选取人民卫生出版社出版的五年制教材和/或八年制教材最基本、最重点的内容编写，大多数是我国的常见病和内科学中的重点病，力求简洁、实用。为了突出重点，便于学生掌握，我们在每章前面加了本章要点（Key Concepts）。每章末有推荐阅读文献，书末的索引便于检索。因为哈里森内科学（原版）的内容较多，我们改编时仅选了其中的小部分。本书为高等医学院校五年制和七/八年制医学生双语教材，也适用于临床医学硕士生和博士生以及各级临床医生。

陈灏珠院士为本书作序；学术秘书高虹博士和香港大学张鼎坚医师认真负责地参加编写的全过程。本书出版还得到人民卫生出版社大力支持，使本书早日与读者见面。在此一并表示感谢。由于我们是初次尝试，加之编者水平有限，如有错误及疏漏之处，恳请读者不吝赐教，批评指正。

王吉耀　Ji-Yao Wang

二〇〇七年四月

Table of Contents

PART ONE INTRODUCTION TO CLINICAL MEDICINE

Chapter 1 The Practice of Medicine

Wang Jiyao

Key Concepts:

1. The combination of medical knowledge, intuition, experience, and judgment defines the art of medicine, which is essential to the practice of medicine.
2. The physicians should know their responsibility of interacting with patients. The physicians need to approach patients not as "cases" or "diseases" but as individuals. The ideal patient-physician relationship is based on thorough knowledge of the patient, on mutual trust, and on the ability to communicate.
3. An informative history should be taken and a thorough physical examination should be performed. A physician must learn to use diagnostic tools judiciously, always asking whether the results will alter the management and benefit the patient.
4. Evidence-Based Medicine can be defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." As the evidence increases, guidelines can provide a useful framework for managing patients with particular diagnoses or symptoms. However when a relevant evidence base is unavailable, clinical knowledge and experience together with an understanding of the patient's needs, supplemented by diagnostic tools, still represent the best approach to practicing medicine.
5. When patients require diagnostic and therapeutic procedures that carry morbidity and risk, they are generally required to give verbal or written consents.
6. The profession of medicine should be linked to life long learning of new information that can be used for the benefit of the patient.

What is Expected of the Physician

The accelerating pace of change in medicine stems from an explosion of scientific information and the need to blend this information into the art and practice of medicine.

The role of science in medicine is clear. Science-based technology and deductive reasoning form the foundation for the solution to many clinical problems. Spectacular advances in genetics, biochemistry, and imaging techniques allow access to the innermost parts of the cell and the most remote recesses of the body. Revelations about the nature of genes and single cells have opened the portal for formulating a new molecular basis for the physiology of systems. These

physiologic insights will undoubtedly result in a better understanding of complex disease processes and new approaches to disease treatment and prevention. Highly advanced therapeutic maneuvers are increasingly a major part of medical practice. Yet skill in the most sophisticated application of laboratory technology and in the use of the latest therapeutic modality alone does not make a good physician.

The editors of the first edition of this book articulated well the responsibility of the physician in interacting with the patient:

No greater opportunity, responsibility, or obligation can fall to the lot of a human being than to become a physician. In the care of the suffering, [the physician] needs technical skill, scientific knowledge, and human understanding... Tact, sympathy, and understanding are expected of the physician, for the patient is no mere collection of symptoms, signs, disordered functions, damaged organs, and disturbed emotions. [The patient] is human, fearful, and hopeful, seeking relief, help, and reassurance.

When a patient poses challenging clinical problems, an effective physician must be able to identify the crucial elements in a complex history and physical examination and to extract the key laboratory results from the crowded computer printouts of data in order to determine whether to "treat" or to "watch." Deciding whether a clinical clue is worth pursuing or should be dismissed as a "red herring" and weighing whether a proposed treatment entails a greater risk than the disease itself are essential judgments that the skilled clinician must make many times each day. This combination of medical knowledge, intuition, experience, and judgment defines the art of medicine, which is as necessary to the practice of medicine as is a sound scientific base.

The Patient-Physician Relationship:a Humane Approach in the Face of Chance

In this era of "techno-medicine," physicians need to approach patients not as "cases" or "diseases" but as individuals whose problems all too often transcend their physical complaints. Most patients are anxious and fearful. Physicians should instill confidence and should be reassuring but should never be arrogant. A professional attitude, coupled with warmth and openness, can do much to alleviate anxiety and to encourage patients to share all aspects of their medical history. Whatever the patient's attitude, the physician needs to consider the setting in which an illness occurs — in terms not only of the patients themselves but also of their familial, social, and cultural backgrounds. The ideal patient-physician relationship is based on thorough knowledge of the patient, on mutual trust, and on the ability to communicate.

The humanistic qualities of a physician must encompass integrity, respect, and compassion. Availability, the expression of sincere concern, the willingness to take the time to explain all aspects of the illness, and a non-judgmental attitude when dealing with patients whose cultures, lifestyles, attitudes, and values differ from those of the physician are just a few of the characteristics of the humane physician. Every physician will, at times, be challenged by patients who evoke strongly negative or positive emotional responses. Physicians should be alert to their own reactions to such patients and situations and should consciously monitor and control their behavior so that the patient's best interest remains the principal motivation for their actions at all times.

An important aspect of patient care involves an appreciation of the "quality of life," a subjective assessment of what each patient values most. Such an assessment requires detailed, sometimes intimate knowledge of the patient, which can usually be obtained only through deliberate, unhurried, and often repeated conversations. It is in these situations that the time constraints of a managed-care setting may prove particularly problematic. Time pressures will always threaten these interactions but do not diminish the importance of understanding patients' priorities from their point of view.

The famous statement of Dr. Francis Peabody is even more relevant today than when delivered more than three-quarters of a century ago:

The significance of the intimate personal relationship between physician and patient cannot be too strongly emphasized, for in an extraordinarily large number of cases both the diagnosis and treatment are directly dependent on it. One of the essential qualities of the clinician is interest in humanity, for the secret of the care of the patient is in caring for the patient.

Clinical Skills

History-Taking

The written history of an illness should embody all the facts of medical significance in the life of the patient. Recent events should be given the most attention. The patient should, at some early point, have the opportunity to tell his or her own story of the illness without frequent interruption and, when appropriate, receive expressions of interest, encouragement, and empathy from the physician. Any event related by the patient, however trivial or apparently remote, may be the key to the solution of the medical problem. In general, only patients who feel comfortable will provide the physician with complete information.

An informative history is more than an orderly listing of symptoms; something is always gained by listening to patients and noting the way in which they describe their symptoms. Inflections of voice, facial expression, gestures, and attitude may reveal important clues to the meaning of the symptoms to the patient. Because patients vary in their medical sophistication and ability to recall facts, the reported medical history should be corroborated whenever possible. The family and social history can also provide important insights into the types of diseases that should be considered. In listening to the history, the physician discovers not only something about the disease but also something about the patient. The process of history-taking provides an opportunity to observe the patient's behavior and to watch for features to be pursued more thoroughly during the physical examination.

The very act of eliciting the history provides the physician with the opportunity to establish or enhance the unique bond that is the basis for the ideal patient-physician relationship. It is helpful to develop an appreciation of the patient's perception of the illness, the patient's expectations of the physician and the medical care system, and the financial and social implications of the illness to the patient. The confidentiality of the patient-physician relationship should be emphasized, and the patient should be given the opportunity to identify any aspects of the history that should not be disclosed to others.

Physical Examination

Physical signs are objective indications of disease whose significance is enhanced when they confirm a functional or structural change already suggested by the patient's history. At times, however, the physical signs may be the only evidence of disease.

The physical examination should be performed methodically and thoroughly, with consideration for the patient's comfort and modesty. Although attention is often directed by the history to the diseased organ or part of the body, the examination of a new patient must extend from head to toe in an objective search for abnormalities. Unless the physical examination is systematic, important segments may be omitted. The results of the examination, like the details of the history, should be recorded at the time they are elicited, not hours later when they are subject to the distortions of memory. Skill in physical diagnosis is acquired with experience, but it is not merely technique that determines success in eliciting signs. The detection of a few scattered petechiae, a faint diastolic murmur, or a small mass in the abdomen is not a question of keener eyes and ears or more sensitive fingers but of a mind alert to these findings. Since physical findings are subject to changes, the physical examination should be repeated as frequently as the clinical situation warrants.

Laboratory Tests and Imaging Studies

The availability of a wide array of laboratory tests has increased our reliance on these studies for the solution of clinical problems. The accumulation of laboratory data does not relieve the physician from the responsibility of careful observation, examination, and study of the patient. It is also essential to bear in mind the limitations of such tests. By virtue of their impersonal quality, complexity, and apparent precision, they often gain an aura of authority regardless of the fallibility of the tests themselves, the instruments used in the tests, and the individuals performing or interpreting them. Physicians must weigh the expense involved in the laboratory procedures they order relative to the value of the information they are likely to provide.

Single laboratory tests are rarely ordered. Rather, physicians generally request "batteries" of multiple tests, which are often useful. For example, abnormalities of hepatic function may provide the clue to such nonspecific symptoms as generalized weakness and increased fatigability, suggesting the diagnosis of chronic liver disease. Sometimes a single abnormality, such as an elevated serum calcium level, points to particular diseases, such as hyperparathyroidism or underlying malignancy.

The thoughtful use of screening tests should not be confused with indiscriminate laboratory testing. The use of screening tests is based on the fact that a group of laboratory determinations can be carried out conveniently on a single specimen at relatively low cost. Screening tests are most useful when they are directed toward common diseases or disorders and when their results indicate other useful tests or interventions that may be costly to perform. Biochemical measurements, together with simple laboratory examinations such as blood count, urinalysis, and sedimentation rate, often provide the major clue to the presence of a pathologic process. At the same time, the physician must learn to evaluate occasional abnormalities among the screening tests that may not necessarily connote significant disease. An in-depth workup following a report of an isolated laboratory abnormality in a person who is otherwise well is almost invariably wasteful and unproductive. Among the more than 40 tests that are routinely performed, one or two are often slightly abnormal. If there is no suspicion of an underlying illness, these tests are ordinarily repeated to ensure that the abnormality does not represent a laboratory error. If an abnormality is confirmed, it is important to consider its potential significance in the context of the patient's condition and other test results.

The technical capability of imaging studies is one of the most rapidly advancing areas of medicine. These tests provide remarkably detailed anatomical information that can be a pivotal factor in medical decision-making. Ultrasonography, a variety of isotopic scans, computed tomography, magnetic resonance imaging, and positron emission tomography have benefited patients by opening new diagnostic vistas and by largely supplanting older, more invasive approaches. In our effort to make diagnoses quickly, it is tempting to order a battery of imaging studies. All physicians have had cases in which imaging studies turned up findings leading to an unexpected diagnosis. Nonetheless, patients must endure each of these tests, and the added cost of unnecessary testing is substantial. A skilled physician must learn to use these powerful diagnostic tools judiciously, always asking whether the results will alter management and benefit the patient.

Principles of Patient Care

Evidence-Based Medicine

Sackett has defined evidence-based medicine as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." Rigorously obtained evidence is contrasted with anecdotal experience, which is often biased. Even the most experienced physicians can be influenced by recent experiences with selected patients, unless they are attuned to the importance of using larger, more objective studies for making decisions. The prospectively designed, double-blind, randomized clinical trial represents the "gold standard" for providing evidence regarding therapeutic decisions.

Practice Guidelines

The intelligent and cost-effective practice of medicine consists of making diagnostic and therapeutic choices that are most appropriate to a particular patient and clinical situation. Professional organizations and government agencies are developing formal clinical-practice guidelines in an effort to aid physicians and other caregivers in this endeavor. As the evidence base of medicine increases, guidelines can provide a useful framework for managing patients with particular diagnoses or symptoms. They can protect patients — particularly those with inadequate health care benefits — from receiving substandard care. Guidelines can also protect conscientious caregivers from inappropriate charges of malpractice and society from the excessive costs associated with the overuse of medical resources. On the other hand, clinical guidelines tend to oversimplify the complexities of medicine. Groups with differing perspectives may develop divergent recommendations regarding issues as basic as the need for periodic sigmoidoscopy in middle-aged persons. Furthermore, guidelines do not — and cannot be expected to — take into account the uniqueness of each individual and of his or her illness. The challenge for the physician is to integrate into clinical practice the useful recommendations offered by the experts who prepare clinical practice guidelines without accepting them blindly or being inappropriately constrained by them.

Medical Decision-Making

Medical decision-making occurs throughout the diagnostic and treatment process. It involves the ordering of additional tests, requests for consults, and decisions regarding prognosis and treatment. This process requires an in-depth understanding of the pathophysiology and natural history of disease. It is for this reason that these

topics are strongly emphasized in this textbook. As described above, medical decision-making should be evidence-based so that patients derive the full benefit of the scientific knowledge available to physicians. Formulating a differential diagnosis requires not only a broad knowledge base but also the ability to assess the relative probabilities of various diseases and to understand the significance of missing diagnoses that may be less likely. Arriving at a diagnosis requires the application of the scientific method. Hypotheses are formed, data are collected, and objective conclusions are reached concerning whether to accept or reject a particular diagnosis. Analysis of the differential diagnosis is an iterative process. As new information or test results are acquired, the group of disease processes being considered can be contracted or expanded appropriately.

Despite the importance of evidence-based medicine, much of medical decision-making relies on judgment — a process that is difficult to quantify or even to assess qualitatively. Especially when a relevant evidence base is unavailable, physicians must use their knowledge and experience as a basis for weighing known factors along with the inevitable uncertainties and then making a sound judgment. Several quantitative tools may be invaluable in synthesizing the available information, including diagnostic tests, Bayes' theorem, and multivariate statistical models. Diagnostic tests serve to reduce uncertainty about a diagnosis or prognosis in a particular individual and to help the physician decide how best to manage that individual's condition. Not only laboratory tests and procedures but also the history and the physical examination can be considered part of the battery of diagnostic tests. The accuracy of a given test is ascertained by determining its sensitivity (true positive rate) and specificity (true negative rate) as well as the predictive value of a positive and negative result. Bayes' theorem uses information on a test's sensitivity and specificity, in conjunction with the pretest probability of a diagnosis, to determine mathematically the posttest probability of the diagnosis. More complex clinical problems can be approached with multivariate statistical models, which generate highly accurate information even when multiple factors are acting individually or together to affect disease risk, progression, or response to treatment. Studies comparing the performance of statistical models with that of expert clinicians have documented equivalent accuracy, although the models tend to be more consistent. Thus multivariate statistical models may be particularly helpful to less experienced clinicians.

Information technology is playing an ever-increasing role in medicine. Laboratory data are accessed almost universally through computers. Many medical centers now have electronic medical records, computerized order entry, and bar-coded tracking of medications. Some of these systems are interactive and provide reminders or warn of potential medical errors. Nonetheless, at this point, clinical decisions are still best made by the physician. Many decisions are not easily compacted into practice guidelines or computerized approaches. Clinical knowledge and an understanding of the patient's needs, supplemented by quantitative tools, still seem to represent the best approach to practicing medicine.

Assessing the Outcome of Treatment

Clinicians generally use objective and readily measurable parameters to judge the outcome of a therapeutic intervention. For example, findings on physical or laboratory examination — such as the level of blood pressure, the patency of a coronary artery on an angiogram, or the size of a mass on a radiologic examination — can provide information of critical importance. However, patients usually seek medical attention for subjective reasons; they wish to obtain relief from pain, to preserve or regain function, and to enjoy life. The components of a patient's health status or quality of life can include bodily comfort, capacity for physical activity, personal and professional function, sexual function, cognitive function, and overall perception of health. Each of these important areas can be assessed by means of structured interviews or specially designed questionnaires. Such assessments also provide useful parameters by which the physician can judge the patient's subjective view of his or her disability and the response to treatment, particularly in chronic illness. The practice of medicine requires consideration and integration of both objective and subjective outcomes.

Care of the Elderly

Over the next several decades, the practice of medicine will be greatly influenced by the health care needs of the growing elderly population. In the United States the population over age 65 will almost triple over the next 30 years. The physician must understand and appreciate the decline in physiologic reserve associated

with aging; the different responses of the elderly to common diseases; and disorders that occur commonly with aging, such as depression, dementia, frailty, urinary incontinence, and fractures.

Medical Errors

Adverse drug reactions occur in at least 5% of hospitalized patients, and the incidence increases with use of a large number of drugs. No matter what the clinical situation, it is the responsibility of the physician to use powerful therapeutic measures wisely, with due regard for their beneficial action, potential dangers, and cost. It is also the responsibility of hospitals and health care organizations to develop systems to reduce risk and ensure patient safety. Medication errors can be reduced through the use of ordering systems that eliminate misreading of handwriting and through vigilance regarding dilution errors. Implementation of infection-control systems, enforcement of hand-washing protocols, and careful oversight of antibiotic use can minimize complications of nosocomial infections. The harm that a physician can do is not limited to the imprudent use of medication or procedures. Equally important are ill-considered or unjustified remarks. Many a patient has developed a cardiac neurosis because the physician ventured a grave prognosis on the basis of a misinterpreted finding of a heart murmur.

Informed Consent and Respect for the Patient's Autonomy

The fundamental principles of medical ethics are to act in the patient's best interest and to respect the patient's autonomy. Most patients possess only limited medical knowledge and must rely on their physicians for advice. Confusion or even disagreement about approaches to disease management may arise (see also "Medicine on the Internet," below), and—in the end—the patient's informed choices must prevail. Physicians must respect their patients' autonomy, fully discussing the alternatives for care and the risks, benefits, and likely consequences of each alternative.

When patients require diagnostic and therapeutic procedures that are painful and that pose some risk, they are generally required to sign a consent form. In such cases, it is particularly important for the patient to understand clearly the risks entailed in these procedures; this is the definition of informed consent. It is incumbent on the physician to explain the procedures in a clear and understandable manner and to ascertain that the patient comprehends both the nature of the procedure and the attendant risks. The dread of the unknown that is inherent in hospitalization can be mitigated by such explanations.

Incurable Disorders and Death

No problem is more distressing than that presented by the patient with an incurable disease, particularly when premature death is inevitable. What should the patient and family be told? What measures should be taken to maintain life? What can be done to maintain the quality of life? How is death to be defined?

Although some would argue otherwise, there is no ironclad rule that the patient must immediately be told "everything," even if the patient is an adult with substantial family responsibilities. How much is told should depend on the individual's ability to deal with the possibility of imminent death; often this capacity grows with time, and, whenever possible, gradual rather than abrupt disclosure is the best strategy. A wise and insightful physician is often guided by an understanding of what a patient wants to know and when he or she wants to know it. The patient's religious beliefs may also be taken into consideration. The patient must be given an opportunity to talk with the physician and ask questions. Patients may find it easier to share their feelings about death with their physician, who is likely to be more objective and less emotional, than with family members. As William Osler wrote: "One thing is certain; it is not for you to don the black cap and, assuming the judicial function, take hope away from any patient." Even when the patient directly inquires, "Am I dying?" the physician must attempt to determine whether this is a request for information or a demand for reassurance. Only open communication between the patient and the physician can resolve this question and guide the physician in what to say and how to say it.

The physician should provide or arrange for emotional, physical, and spiritual support and must be compassionate, unhurried, and open. There is much to be gained by the laying on of hands. Pain should be adequately controlled, human dignity maintained, and isolation from the family avoided. These aspects of care tend to be overlooked in hospitals, where the intrusion of life-sustaining apparatus can so easily detract from attention to the whole person and encourage concentration

instead on the life-threatening disease, against which the battle will ultimately be lost in any case. In the face of terminal illness, the goal of medicine must shift from cure to care, in the broadest sense of the term. In offering care to the dying patient, the physician must be prepared to provide information to family members and to deal with their guilt and grief. It is important for the doctor to assure the family that everything possible has been done.

The Expanding Role of the Physician

Genetics and Medicine

The genomic era is leading to a revolution in the practice of medicine. The sequencing of the entire human genome has set researchers on the path to elucidating the genetic components of common chronic diseases — hypertension, diabetes, atherosclerosis, many cancers, autoimmune disorders, dementias, and behavioral disorders. Forthcoming information should make it possible to determine individual susceptibility to these conditions early in life and to implement individualized prevention programs. Subclassification of many diseases on a genetic basis may allow the selection of appropriate therapy for each patient. As the response to drugs becomes more predictable, pharmacotherapy should become more rational.

Patients will be best served if physicians play an active role in applying this powerful, sensitive new information rather than being passive bystanders who are intimidated by the new technology. This is a rapidly evolving field, and physicians and other health care professionals must continue to educate themselves so that they can apply this new knowledge to the benefit of their patients' health and well-being. Genetic testing requires wise counsel based on an understanding of the value and limitations of the tests as well as the implications of their results for specific individuals.

Medicine on the Internet

The explosion in use of the Internet through personal computers is having an important influence on health care. The Internet makes a wide range of information available to physicians and patients almost instantaneously at any time of the day or night and from anywhere in the world. This medium holds enormous potential for delivering up-to-date information, practice guidelines, state-of-the-art conferences, journal contents, textbooks (including this text), and direct communications with other physicians and specialists, thereby expanding the depth and breadth of information available to the physician about the diagnosis and care of patients. Most medical journals are now accessible online, providing rapid and comprehensive sources of information.

Patients, too, are turning to the Internet in increasing numbers to derive information about their illnesses and therapies and to join Internet-based support groups. Physicians are increasingly challenged by dealing with patients who arrive with sophisticated information about their illness. It is difficult, however, for patients to put this sometimes-alarming information into context, and the physician plays an invaluable role by encouraging patient education but helping the patient to assimilate new information and apply it to a particular circumstance.

A critically important caveat is that virtually anything can be published on the Internet, with easy circumvention of the peer-review process that is an essential feature of quality publications. Physicians or patients who search the Internet for medical information must be aware of this danger. Notwithstanding this limitation, appropriate use of the Internet is revolutionizing information access for physicians and patients and is a positive force in the practice of medicine.

Delivering Cost-Effective Medical Care

As the cost of medical care has risen, it has become necessary to establish priorities in the expenditure of resources. In some instances, preventive measures offer the greatest return for the expenditure; outstanding examples include vaccination, improved sanitation, reduction in accidents and occupational hazards, and biochemical- and DNA-based screening of newborns. As one more specific example, the detection of phenylketonuria by newborn screening may result in a net saving of many thousands of dollars.

As resources become increasingly constrained, society must weigh the benefits of performing costly procedures that provide only a limited increase in life expectancy against the pressing need for more primary care for those persons who do not have adequate access to medical services. For the individual patient, it is important to reduce costly hospital admissions as much as possible if total health care is to be affordable. This policy, of course, depends on close cooperation among patients, their physicians, employers, payers, and government. It

is equally important for physicians to know the cost of the diagnostic procedures they order and the drugs and other therapies they prescribe and to monitor both costs and effectiveness. The medical profession should provide leadership and guidance to the public in matters of cost control, and physicians must take this responsibility seriously without being or seeming to be self-serving. However, the economic aspects of health care delivery must not interfere with the welfare of patients. The patient must be able to rely on the individual physician as his or her principal advocate in matters of health care.

Accountability

As the public has become more educated and more sophisticated regarding health-related issues, expectations of the health care system in general and of physicians in particular have risen. Physicians are expected to maintain mastery of rapidly advancing fields (the science of medicine) while considering their patients' unique needs (the art of medicine). Thus, physicians are held accountable not only for the technical aspects of the care that they provide but also for their patients' satisfaction with the delivery and costs of care.

In the United States, there are increasing demands for physicians to account for the way in which they practice medicine by meeting certain standards prescribed by federal and state governments. The hospitalization of patients whose health care costs are reimbursed by the government and other third parties is subjected to utilization review. Thus the physician must defend the cause for and duration of a patient's hospitalization if it falls outside certain "average" standards. Authorization for reimbursement is increasingly based on documentation of the nature and complexity of an illness, as reflected by recorded elements of the history and physical examination. The purpose of these regulations is both to improve standards of health care and to contain spiraling health care costs. This type of review is being extended to all phases of medical practice and is profoundly altering the practice of medicine. Physicians are also expected to give evidence of their continuing competence through mandatory continuing education, patient-record audits, recertification by examination, or relicensing.

Continued Learning

The conscientious physician must be a perpetual student because the body of medical knowledge is constantly expanding and being refined. The profession of medicine should be inherently linked to a career-long thirst for new information that can be used for the good of the patient. It is the responsibility of a physician to pursue new knowledge continually by reading, attending conferences and courses, and consulting colleagues and the Internet. This is often a difficult task for a busy practitioner; however, such a commitment to continued learning is an integral part of being a physician and must be given the highest priority.

Research and Teaching

The title doctor is derived from the Latin docere, "to teach," and physicians should share information and medical knowledge with colleagues, with students of medicine and related professions, and with their patients. The practice of medicine is dependent on the sum total of medical knowledge, which in turn is based on an unending chain of scientific discovery, clinical observation, analysis, and interpretation. Advances in medicine depend on the acquisition of new information, i.e., on research, which often involves patients; improved medical care requires the transmission of this information. As part of broader societal responsibilities, the physician should encourage patients to participate in ethical and properly approved clinical investigations if they do not impose undue hazard, discomfort, or inconvenience. On the other hand, physicians engaged in clinical research must be alert to potential conflicts of interest between their research goals and their obligations to individual patients; the best interests of the patient must always take priority. To quote William Osler:

To wrest from nature the secrets which have perplexed philosophers in all ages, to track to their sources the causes of disease, to correlate the vast stores of knowledge, that they may be quickly available for the prevention and cure of disease — these are our ambitions.

Further Reading

1. Coillins FS. Shattuck Lecture-Medical and societal consequences of the Human Genome Project. N Engl J Med, 1999, 341 : 28-37.
2. Council on Graduate Medical Education. Thirteenth Report: Physician Education for a Changing Health Care Environment. US Department of Health and Human Services, 1999.