# A HISTORY OF PHYSICAL EXAMINATION TEXTS AND THE CONCEPTION OF BEDSIDE DIAGNOSIS

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As physician and historian Jonathan Gillis noted, the history of educational medical texts is an intellectual history; it captures medicine not as it was practiced, but as an author supposed it should be practiced (1). Though analysis of educational texts cannot reveal history as it happened, it can reveal the intellectual origins of many ideas that continue to shape medical thinking. This paper examines modern physical-examination textbooks to discover the roots of the present conception of diagnosis in general, bedside diagnosis in particular, and the teaching of physical examination.

We focus on texts in English and published in America or Great Britain from near 1880 to the present, during which time the physical examination was replaced by laboratory tests and imaging studies as the most valued diagnostic endeavors. Throughout this paper we construct a difference between a "bedside diagnosis," made when the physician and patient are in each other's presence, and a "remote diagnosis," made when the patient and physician are separated. The term "bedside diagnosis" was used in the past, "remote diagnosis" was not; but we find this useful as a means of thinking about the evolution of diagnosis. The term "physical diagnosis," which is used today, had different meanings in different eras. Where appropriate, we have endeavored to address those meanings and their implications.

## THE ORIGIN OF THE MODERN PHYSICAL EXAMINATION

The dawn of the modern physical examination was in 1761, when Leopold Auenbrugger first described the technique of percussion in a treatise in Latin entitled *Inventum Novum* (or *New Invention*). Tradition holds that Audenbrugger called on the memory of his father, an innkeeper, tapping on casks of wine to establish how much wine was

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Potential Conflicts of Interest: None disclosed.

left and when to reorder. Although Auenbrugger's *New Invention* described the first modern physical examination technique, it did not describe an underlying philosophy of diagnosis. Clinical medicine in Auenbrugger's time was a practice of Hippocratic or Galenic theory, and the physician's task was to fit symptoms into an idealized theory (2). As a result, despite being translated into multiple languages, including French, *New Invention* seemed doomed to failure. However, a prominent French doctor, Jean-Nicolas Corvisart, happened upon a copy. In 1808, after 30 years of practicing percussion, Corvisart republished the treatise in French with extensive commentary. As Napoleon's personal physician, Corvisart's endorsement was powerful. "One must not argue over words, when signs speak," Corvisart wrote (3), and the "French School" of medical thought—then forming within revolutionized Paris and its hospitals—proved fertile ground for a his conception of a physician as a perceiver of pathophysiologic signs (4).

Many authors would contribute to this school. The first to do so was Rene Laennec, a student of Corvisart, who in a moment of inspiration rolled a sheet of paper into a cone and placed the point in his ear and the base to a patient's chest. Astounded by what he heard, Laennec went on to create the first stethoscopes out of wood, and began to correlate the new sounds heard through them to case histories and autopsy findings. In 1819, Laennec published *On Mediate Auscultation,* a manual on stethoscope use that coined terms still used today, such as "rales," "egophony," and "pectoriloquy" (5). Unlike *New Invention, On Mediate Auscultation* needed no philosophical reframing, and proved an immediate and more popular success. As Stanley Reiser observed:

> [*On Mediate Auscultation's*] success would result from the strong advocacy of Laennec and his disciples, combined with a technique that delivered accurate signs, was not excessively difficult to learn, capitalized on the growing interest of physicians in the anatomical localization of pathology, and alleviated antipathy of close physical contact between doctor and patient by placing an instrument between them. (6)

For a few years after its publication, Laennec would present every buyer of his book with a stethoscope he had made. This act immediately expanded the physician's senses. Percussion required a trained technique and a practiced ear; auscultation with a stethoscope, however, immediately produced sounds never before perceived. Text and tool now shared mutually dependent importance. What good was Laen-

nec's manual without a stethoscope? Or a stethoscope without a manual?

In the latter half of the 19th century, medical innovation moved from the hospitals of Paris to the burgeoning universities in Germany. There Johannes Muller published the influential *Handbook of Human Physiology,* which was the first book of its kind to include chemistry and comparative anatomy. The German School began to attract ever greater numbers of ambitious students from across Europe, and even from America (7). During this era, Western medicine finally discarded its erroneous belief in the four humors (cholera, phlegm, sanguis, and melancholia), thereby allowing further development of the physical examination on the the basis of accurate understanding of physiology.

The age of the instrument began in 1850, when Hermann von Helmholtz, a student of Muller's, invented the world's first ophthalmoscope. In 1875, Wilhelm Heinrich Erb and Carl Friedrich Otto Westphal both published articles in the journal *Archives of Psychiatry and Nervous Diseases* that described the use of a hammer (previously used for percussion) to induce what we now know to be deep tendon reflexes. In 1871, Carl August Wunderlich, a professor of medicine in Leipzig, published *Medical Thermometry and Human Temperature,* which described both the normal human body temperature and temperature patterns typical of diseases such as typhoid fever. In doing so, Wunderlich introduced the first new quantitative physical sign since physicians had first begun to time pulses and breaths. In 1896, Riva-Rocci invented a usable sphygmomanometer and so added the last of the quantitative physical signs to the physical examination (8).

The predominant mode of 19th century clinical advancement was the discovery of physical signs. The result was a medical culture that became less interested in words—particularly the patient's words—and more interested in objective evidence. In his article entitled *The History of the Patient History Since 1850,* Dr. Jonathan Gillis reveals the cognitive consequences of privileging sign over symptom:

> Patient history remained important and became incorporated into physician examination as another set of elicited signs and medical observations, thus producing two histories: a superficial, chaotic story presented by the patient or parent and another deep, "true" history revealed by the skill of the physician. The theory and practice of this skill changed, but there was little change in the status of the patient history, which was considered a creation of the clinical encounter rather than an account of a patient's story. (9)

This division of histories has had a profound and paradoxical effect on society's relationship to physicians. On one hand, society despises the stereotypically paternalistic doctor who ignores the patient's concerns and treats what he or she deems to be the problem. On the other hand, the public celebrates the dispassionate, uncanny diagnostician, a Sherlock Holmes in a white coat. The depth to which this paradoxical conception of the physician has sunk into the public consciousness is evident in a recent popular television show starring a callous diagnostician who refuses to listen to patient histories because, in his words: "Everybody lies."

At the beginning of the 20th century, the physical sign was reaching an apex of clinical importance. For more than a century physicians had impressed the public with their perception of parts of the body that most never knew existed: heart murmurs, deep tendon reflexes, blood pressure, retinal vasculature, etc. Patients could come to only one conclusion: "The doctor will be able to feel, hear, and see more of my body than I can." Therefore, the idea that a physician should *see into* a patient began not in 1895, when Whilhelm Conrad Rontgen published *On a New Kind of Rays,* announcing the discovery of x-rays; rather, the role of the physician as an extraordinary perceiver began in 1761 with the *New Invention* of Leopold Auenbrugger.

## THE ADVENT OF REMOTE DIAGNOSIS

The rise of the technologic diagnosis did not at first separate patient and physician. The age of instruments was, after all, an era of proximal technology. Witness the stethoscope: placing it between the physician and patient brought the two closer together. However, the advent of the remote technologic diagnosis separated the patient and physician not only in space but also in time.

Spatial separation of the patient and physician is a prominent feature of specimen examination and analysis. Western medicine had embraced specimen examination, particularly examination of the urine, as early as the time of Hippocrates (10). Although the examination of speciments did not initiate intellectual revolution in the 18th or 19th century, it did advance from the vagaries of medieval uroscopy. Dobson and later Rollo and Cruikshank demonstrated chemically that the urine of patients with diabetes mellitus contained sugar. In 1827 the English physician Richard Bright (of "Bright's disease" fame) connected albumin in the urine to kidney disease (11). In 1836 James Marsh developed the standard test for diagnosing arsenic toxicity (12). In 1843 Guy's Hospital in London established a department of micros-

copy (13). In 1885 in Sweden, Magnus Blix proposed and then Sven Hedin built a centrifuge for use in analyzing samples of blood. Hedin named the machine the "hematokrit," and it made possible the evaluation of the erythrocyte volume fraction. Centrifugation was soon applied to urinalysis. At the same time, physicians were discovering chemical marks of infection, such as Paul Ehrlich's diazo reaction for typhoid fever, and leukocytosis was recognized as a sign of infection (14).

Specimen analysis first began to assume its modern importance in the 1880s, with the establishment of diagnostic laboratories. Previously, laboratories had dedicated themselves to purely scientific inquiry, but in 1885 a new laboratory in Munich became the first of its kind dedicated to clinical purposes. This was shortly followed by similar laboratories in Ann Arbor in 1893 and Philadelphia in 1895. A laboratory dedicated to the diagnosis of diphtheria opened in New York City in 1893. Close on the heels of the idea of an independent diagnostic laboratory was that of a smaller ward laboratory that supplied physicians with basic instruments and reagents. By the beginning of the 20th century, most major cities had dedicated diagnostic laboratories. During the First World War such laboratories proved invaluable to the armed forces, thereby solidifying the place of the diagnostic laboratory within medicine (15, 16). These advances exerted a powerful pull on physicians, drawing them away from the beside and into the laboratory. What is more, laboratory data created a biochemical history that challenged the importance of the spoken history of symptoms and the perceived history of signs of a disease.

The development of the X-ray machine also changed how physicians related to their patients. As Reiser notes, X-ray technology made physicians value vision over hearing and touch. After all, an X-ray film would permit better evaluation of a bone fracture than even an expert physician's description of his findings on palpation of the injury. Similarly, a chest film would better localize a consolidation than could palpation or auscultation (17). Yet X-rays also improved physicians' understanding of living anatomy—particularly the location of the stomach and intestines—and therefore of the physical examination (18). However, the overall effect of the X-ray was that of another pull on the physician away from the bedside.

In addition to spatially separating patient and physician, the X-ray machine and the laboratory separated the two in time. The interpretation necessary for diagnosis no longer had to be made at the moment of perception; furthermore, data could now be shared, bringing multiple minds to bear on the issue of interpretation. The thermometer

transformed temperature (appreciable by touch) into a visible column of mercury. Spirometry would render the pressure and flow of air in patients' lungs into a visible continuum. The electrocardiogram (ECG) allowed physicians to "see" the heart's electronic action (19). Ultrasonography made echoes visible, and magnetic resonance imaging allowed physicians to see the magnetic fields of hydrogen atoms. Digital technology allowed all this visual information to be reproduced at any time on computer screens across the world. A staggering amount of information may now be gleaned from a patient, and the modern ability to diagnose an illness is wonderful. However, it is important to note that each of these advances in remote diagnosis further separated the patient and physician.

Today this separation has entered a new era with the electronic medical record. Now it is possible for a hospital physician to read a patient's vital signs, view past laboratory results or imaging studies, order tests or procedures, and prescribe medications, all from home, while the patient is in the hospital.

## INTEGRATED APPROACHES TO DIAGNOSIS: THE LATE 19TH TO THE EARLY 20TH CENTURY

Even as the remote diagnosis rose in importance, the physical sign remained of paramount importance. The result was an era of intellectual integration of remote and bedside diagnostic endeavors.

Consider the following list of first-edition British and American textbooks relevant to the physical examination and published early in the late 19th or early 20th centuries (20):

*Lessons in Physical Diagnosis,* 1868
*The Student's guide to Medical Diagnosis,* 1869
*Clinical Medicine,* 1879
*Medical Diagnosis: A Manual of Clinical Methods,* 1883
*Medical Diagnosis,* 1884
*Clinical Methods,* 1898
*A System of Clinical Medicine,* 1903
*The Diagnostics of Internal Medicine,* 1901
*A Practical Treatise on Medical Diagnosis,* 1904
*Physical Diagnosis,* 1905
*A Treatise on Diagnostic Methods of Examination,* 1905
*The Clinical Diagnosis of Internal Diseases,* 1916

Now consider a list of textbooks on physical examination published in

the middle and end of the 20th century:

*Major's Physical Diagnosis,* 1937
*Symptoms and Signs in Clinical Medicine,* 1936
*Medical Diagnosis: Applied Physical Diagnosis,* 1944
*Physical Diagnosis: The History and Examination of the Patient,* 1959
*Bedside Diagnostic Examination,* 1965
*Guide to Physical Examination and History Taking,* 1974
*Sapira's Art and Science of Bedside Diagnosis,* 1990
*The Rational Clinical Exam,* 2008.

Note that the titles of books published earlier are likely to invoke diagnosis in general while those of books published later are more likely to invoke only the physical or bedside examination. This shift mirrors a shift in conception. In the late 19th century, a diagnostic textbook did not need to invoke the physical examination in its title because all diagnostic textbooks would cover the physical examination. With the progression of the 20th century it was necessary for text books on the physical examination to label themselves as such.

The earliest of these textbooks make little, if any, distinction between a diagnosis by physical examination and other modes of diagnosis. Consider *The Student's Guide to Medical Diagnosis,* by Dr. Samuel Fenwick of the London Hospital. Born in 1821 and trained in Newcastle, England, Fenwick was a thorough Victorian physician, who moved his practice, his inventiveness as a microscopist, and his prowess as a teacher to London. In 1869 he published *The Student's Guide to Medical Diagnosis,* which "in editions brought out over a period of some 30 years, became the vademecum for successive generations of students during their introduction to clinical medicine" (21). In his introduction to the book, Fenwick urges the student to attend to the patient's history: "Physical signs cannot be exclusively relied upon for the formation of a diagnosis: the symptoms and history of the case must be also taken into consideration" (22). However, Fenwick's conception of signs was broad: "such alterations in the organs themselves, or their secretions, as can be ascertained by the senses of the observer" (23). Fenwick did not differentiate between 'ascertains' as done through a stethoscope or a test tube. In the chapter entitled "Diseases of the Lungs," percussion and auscultation appear. However, in the chapter entitled "Diseases of the Kidney" one discovers a brief note on appreciating the color of the urine, followed by instructions on how to perform the tests needed to ascertain the urine's specific gravity, the presence of albumin, the presence of sugar, and how to microscopically

examine sedimentation. Fenwick was not alone in this conception of physical diagnosis. Austin Flint Sr. first described the now famous "Austin Flint murmur" heard in aortic regurgitation. In 1879 he published *Clinical Medicine: A Systematic Treatise on the Diagnosis and Treatment of Diseases.* Like Fenwick, Flint did not divide diagnostic endeavors made by physical examination from those made by chemical analysis. Although *Clinical Medicine* focused mainly on the traditional techniques of physical examination (auscultation, percussion, etc.), it provided instructions for microscopic examination of the blood and urine as well as chemical analysis of the urine for sugar and albumin. Flint's treatment of these subjects indicates that his conception of "physical diagnosis" encompassed both physical examination and remote diagnostic techniques.

Other authors early in the period of development of the physical examination similarly put chemical analysis or remote specimen examination and physical examination techniques within the same category. Dr. J. Graham Brown of the Royal College of Physicians of Edinburgh, wrote *Medical Diagnosis: a Manual of Clinical Methods,* published in 1882. A second edition was published in America in 1884 and in a later review in the *Journal of the American Medical Association* was dubbed "an excellent treatise on physical diagnosis" complete with "methods of urinalysis, both chemical and microscopic" (24). In his introduction, Brown wrote:

> The signs and symptoms of disease are changes produced in the animal economy, which are cognoscible by our senses—some by one, others by another, while to assist these senses we call in the aid of instruments which extend their range or increase their power, and of the various analytical processes which the science of Chemistry places at our disposal (25).

As these words demonstrate, chemical analysis to Brown was little different from an ophthalmoscope—both were methods of expanding the senses, with neither method intrinsically better than the other. A more pedagogic attempt to define diagnosis by both directly perceived and remotely gathered data can be found in *The Diagnostics of Internal Medicine,* edited by Glentworth Butler and published in 1901. This expansive textbook breaks itself into two parts. The first part, labeled "The Evidence of Disease," considers (arbitrarily and confusingly) a symptom, an anatomic region, or an area of laboratory investigation. Thus, for example, Section V is entitled "Pain" and contains a treatise on the different manifestations and significances of pain, whereas

Section XVVI, entitled "The Nose," launches into examination techniques and an examination of the findings and symptoms associated with the nose, and Section XXXVIII, "Examination of the Blood," is a miniature manual of microscopic and chemical analysis. The second part of the book presents patho-clinical examinations of different diseases and syndromes. Though confusing to the modern reader, this compression of different methods of understanding and investigation demonstrates a lack of clear intellectual separation between the modalities discussed.

A better-conceived textbook of integrated diagnostic methods was *Clinical Medicine: A Guide to the Practical Study of Medicine* by Drs. Robert Hutchinson and Harry Rainy. This well-known text was first published in 1897 and proved so popular that it was revised through 22 editions, the last of which was published in 2007. This popularity was no doubt at least partly caused by Hutchinson's own renown as a teacher, scholar, and later president of the Royal College of Physicians, and finally as a baronet. In their "Preface to the Original Edition" Hutchinson and Rainy wrote:

> [This book aims] at describing those methods of clinical investigation by the proper application of which a correct diagnosis can alone be arrived at. To every student when he first begins work in a medical ward the question presents itself: How shall I investigate this case? To that question the present work is intended to provide an answer (26).

Hutchinson and Rainy then went on to present an integrated approach, applying both methods of bedside examination and remote analysis to each major body system. For example, in a chapter on the nervous system, a section on the "Electrical Examination of Muscles and Nerves" stands with the assessment of reflexes and sensation.

As the 20th century progressed, such integration of diagnostic endeavors became more challenging, as evidenced by the work of Dr. Richard Cabot. At the age of 28, Cabot published the first English-language hematology textbook. Later he introduced the Clinico-Pathological Conference (CPC) to the Massachusetts General Hospital. Though keenly interested in basic science research, Cabot embraced his family's transcendentalist philosophy by focusing his career on treating patients, especially the poor and disadvantaged. Cabot's attempt to unify his interest in the laboratory with his work at the bedside is evident in his *Physical Diagnosis,* first published in 1905 and revised into many more editions over the following decades. Unlike

the textbooks considered above, Cabot's does not begin with a statement of its comprehensiveness. Rather, Cabot states its limitations:

> This book endeavors to present an account of the diagnostic methods and processes needed by competent practitioners of the present date. It differs from other books on the subject in that it makes no attempt to describe technical processes with which the writer has no personal familiarity and gives no space to the description of tests which he believes to be useless . . . . To gain genuine familiarity with all the technical processes described in most books on physical diagnosis—such familiarity as makes one competent to use them with due regard for the sources and limits of error inherent in them—needs more than the life-time of one man (27).

Cabot's description of a multiplicity of tests and "technical processes" might sound similar to the modern state of medicine with its vast wealth of diagnostic technologies, protocols and tests. However, Cabot's stated limitation did not restrict him from considering laboratory or radiographic methods of diagnosis. In the seventh edition of *Physical Diagnosis,* published in 1919, Cabot includes sections on microscopic examination of sputum and other fluids, a section on "Chemical Tests of the Gastric Contents," another on "Chemical Examination of the Urine," and even a chapter entitled "X-ray Examination of the Stomach" that carefully describes how the physician is to administer, capture and interpret the radiographic study of a barium swallow. In the preface to the first edition, he states the following:

> In the endeavor further to break down the false distinction between clinical diagnosis and laboratory diagnosis I have described all the methods of getting at an organ —e.g., the kidney—in a single section. Palpation, thermometry, urinalysis are different processes by which we may gather information about the kidney. The student should be accustomed to think of them and practise them in close sequence (28).

That Cabot should need to attack this "false distinction" implies that a significant number of his colleges believed in a difference between a clinical diagnosis and a laboratory diagnosis.

Resistance to this emerging split within diagnostic medicine was also evident in Great Britian. In 1936, Dr. E. Noble Chamberlain published *Symptoms and Signs in Clinical Medicine: An Introduction*

*to Medical Diagnosis.* Aside from incorporation the advances of the 1920s and early 1930s, the structure or composition of *Symptoms and Signs* presents little that was new as compared with previous texts. However, Chamberlain did present a new way of conceiving of diagnosis. In the preface to *Symptoms and Signs,* he spelled out that understanding:

> In most chapters brief mention has been made of those special methods of laboratory or instrumental investigations which in modern medicine are usually necessary for a full and accurate diagnosis. A rightful place of importance has been given to physical signs which are demonstrated by the use of the unaided senses, but when the special investigations, as occasionally happens, are of more value than the physical signs, this has been pointed out. (29)

Like Cabot before him, Chamberlain needed to limit his scope. However, whereas Cabot did so on the basis of personal knowledge, Chamberlain created a conception of diagnostics that was simpler than the reality of the day. By placing all modes of diagnosis that did not involve physical signs into the realm he named "special investigations," Chamberlain confined them into one simple group, when in fact they consisted of at least two groups: radiologic imaging and laboratory tests. His concession that such "special investigations" are necessary was tempered by his immediate belittlement of them: they were of value only "occasionally." Although physical signs were invaluable in Chamberlain's day (as they are in our own day), to disregard the rapidly improving diagnostic technology of the 1930s demonstrates a misapprehension of the advances of the prior three decades.

Chamberlain's American contemporary, Dr. Ralph Hermon Major, presented very different conceptions of diagnosis. After training at Johns Hopkins, Major traveled to Munich, where he studied under the aforementioned Fredrich Muller. After studying pathology for a year at Stanford University, Major found his academic home at the University of Kansas. In 1937, he published *Major's Physical Diagnosis,* a textbook that would become immensely popular around the world (30), being published in at least nine editions. In his preface to the first edition, Major outlined his intended scope:

> I have deliberately avoided any chapters on roentgenology, electrocardiagraphy, urine, feces, etc., for two reasons. First, this is a textbook of physical diagnosis, and second, these

> other subjects are far better presented in books written by experts in these fields. Where roentgenograms, electrocardiograms or pulse tracings are employed they are used only to make certain explanations clearer (31).

As we shall see, in this regard Major was ahead of his time; future authors would further develop the concept of physical diagnosis as a discrete and unified body of knowledge, separate from other diagnostic endeavors.

Even while Major was constructing the idea of physical diagnosis as separate from other diagnostic endeavors, other authors continued to integrate it into the larger category of diagnosis in general. However, during the 1940s and 1950s, this integrated approach to teaching physical examination began to reach a limit. The inclusion of ever more pathophysiologic data and the interpretation of ever greater numbers of laboratory results and radiologic images meant that passages dedicated to physical examination began to take up a proportionally smaller fraction of diagnostic textbooks. A good example of this is *Medical Diagnosis: Applied Physical Diagnosis,* first published in 1944, edited by the American physician Roscoe Pullen, and written by 27 contributors with specialties ranging from urology to dentistry. The subjects included in the book vary from bedside examination to remote diagnostic technology. For example, the chapter entitled "Examination of the Heart" provides descriptions of palpation, percussion and auscultation, and correlates of heart sounds, X-ray films of the chest, and ECG recordings. However, the book also contains chapters that have nothing to do with laying hands on a patient, such as "Electrocardiographic Diagnosis" and "The Psychiatric Approach" (the only psychiatric chapter we have yet encountered in a textbook with "physical diagnosis" in its title).

A similar enlargement of textbooks occurred with older titles being revised into new editions. When Cabot withdrew from medicine to focus on the development of social work, he asked Dr. F. Dennettee Adams, also of the Massachusetts General Hospital, to edit his by-then classic *Physical Diagnosis.* By 1958, when its fourteenth edition was published, the book had become completely transformed. Cabot had confined himself to that which he intimately understood and daily practiced. Though Adams took responsibility for all of the chapters in the revised book, his list of acknowledgements of consulting subspecialists is nearly three pages long. In his preface, Adams stated that along with Cabot, he observed that "the tremendous growth of medicine" made it necessary "not only to enlarge and reorganize the text but

also to supplement or own knowledge by drawing freely on the experience of others" (32). The result was a textbook that covered manifestations of diseases, techniques of physical examination, and interpretation of laboratory and imaging studies.

Thus, by the end of the 1950s, textbooks that provided instruction in physical examination had become large, comprehensive volumes that were continuously growing in size and complexity. If is therefore not surprising that the next step in the evolution of textbooks on physical examination was an intellectual and physical separation of this procedure from other diagnostic modalities.

## THE UNIFICATION OF THE PHYSICAL EXAMINATION IN THE LATER 20TH CENTURY

The latter half of the 20th century saw the rise of textbooks that focused not on diagnosis in general or even on the increasingly narrow conception of "physical diagnosis," but solely on the act of physical examination.

In 1959 Drs. John A. Prior and Jack S. Silberstein of Ohio State University published *Physical Diagnosis: The History and Examination of the Patient.* Like the general diagnostic textbooks of the same era, Prior and Silberstein's *Physical Diagnosis* was a collaboration, drawing on the specialized knowledge of eight other contributors. Each chapter was assigned to one or two authors. However, the focus of this textbook was radically different from that of the larger, integrated texts. In their preface to the first edition, Prior and Silberstein clearly define their goal:

> We believe that the major objective of a course in physical diagnosis is to acquaint the student with the basic "*tools of his trade,*" namely, the history, physical examination, and essential medical terminology. In spite of many modern refinements and an increasing number of laboratory procedures, the history and physical examination will remain the cornerstones of the physician's daily work the rest of his life. On this basis it is our opinion that most textbooks of physical diagnosis devote entirely too much space to the discussion of disease processes (at times, even including laboratory data), when the *fundamental objective* still remains—*to teach the student* how to obtain a *good history* and to perform a *satisfactory physical examination* (33).

Here we see the fruition of Major's conception of the physical examination as an intellectually discreet entity, pedagogically removed from the broader context of diagnosis and taught to the medical student, usually during the second year of medical school. As we ourselves stated earlier, Prior and Silberstein were correct in saying that other books with "physical diagnosis" in their titles devoted a large and growing amount of text to aspects that had little or nothing to do with physical examination. In the act of creating a textbook solely dedicated to physical examination and entitling the book as "*Physical Diagnosis*," Prior and Silberstein—and other authors of similar textbooks—helped bring the definition of "physical diagnosis" to its present form of "a diagnosis reached through techniques traditionally associated with the physical exam."

The problems of how to intellectually incorporates physical examination into the larger and rapidly expanding field of diagnostic medicine and the problem of how to define the term "physical diagnosis" were unresolved; one of the most notable physicians to address this problem was Dr. Elmer L. DeGowin of the University of Iowa. In 1965 DeGowin published a textbook with careful descriptions of diagnostic bedside maneuvers and physical findings. No disease progression, treatment, prognosis, relevant laboratory tests, or radiographic studies were considered; only the most basic drawings were rendered. DeGowin deliberately created a textbook that was intensively focused on the act of observing, touching, and listening to the body. He called the book *Bedside Diagnostic Examination: A Comprehensive Pocket Textbook*. Considering that many diagnostic textbooks in the 1960s were heavy enough to be used as murder weapons, DeGowin was making a provocative if not contradictory statement by claiming that his textbook was both comprehensive and pocket-sized. DeGowin addresses this issue in his preface, saying: "This volume is a full-length textbook encompassing an extensive field in diagnosis." The key phrase "in diagnosis" announces that DeGowin, like Prior and Silberstein, had constructed a conception of the physical examination as a discrete discipline within the larger field of diagnostic medicine. However, DeGowin knew that in addressing this newly forming conception, he had to be careful about the definition of his words.

> The title employs *bedside* in a figurative sense, to indicate procedures carried out in the immediate presence of the patient, either in the physician's office or in the hospital. The term *physical diagnosis* was purposely avoided; many teachers and writers have sharply restricted its scope; to

> some, it seems to mean only the manipulatory procedures employed in examining a patient, with no consideration of the findings encountered. To others, the term conveys a parochial approach with heavy emphasis on examination of the heart and lungs, while the remainder of the body is cursorily searched for signs of chronic disease of particular interest to the internist. With either concept, special auxiliary textbooks are required for "surgical diagnosis"; the reader must consult books of the clinical specialties for many other diagnostic methods and findings (34).

Here again we see the physical examination conceived as a discrete entity, but this time DeGowin portrays that entity as having been broken up and scattered into different texts. The task he has set for himself is to unite its many different aspects.

> The fragmentation in diagnostic knowledge imposes needless handicaps in examining patients and teaching the art to students. Any experienced clinician knows that patients do not confront him bearing subtle labels indicating whether there are "medical" or "surgical." Frequently he must perform a comprehensive examination to determine their classification. His diagnostic procedures may cross and recross the artificial borders between internal medicine and surgery; in fact, his examination must utilize the knowledge of all clinical specialties, dissipated throughout many textbooks. The purpose of this books is to assemble under one cover both the methods of examination and diagnostic findings from internal medicine, general surgery, ophthalmology, otolaryngology, dermatology, neurology, urology, orthopedics, and gynecology (35).

By bringing the techniques and knowledge of these different specialties together, DeGowin created a unified conception of the physical examination. However, he had not reduced the fragmentation of medical knowledge, but had rather rearranged the lines of fragmentation; though students with this textbook in hand would not need to consult another textbook (e.g., a dermatology text) to help make a diagnosis, they would need to consult another textbook (e.g., a pharmacology text) to learn about possible treatments.

Several authors followed DeGowin in creating textbooks focused on a unified and discrete physical examination. Included are Mosby,

Schwartz, and Sapira. Particularly notable is Dr. Barbara Bates, who was an early and strong advocate for development of the present role of the nurse-practitioner. In 1970, finding the contemporary textbooks on physical examination insufficiently user-friendly, Bates set out to create a textbook for her nurse-practitioner students. In collaboration with a group of 10 nurses and 5 physicians (and employing the hand-drawn illustrations of celebrated ornithologist Roger Tory Peterson), she created what would become *Bates' Guide to Physical Examination and History Taking.* At the time of this writing, *Bates' Guide* has gone into 10 editions, been made into a 12-part video supplement, and become the standard physical examination textbook for American medical students (36). Although the present incarnation of *Bates'* is far more accessible than DeGowin's *Bedside Diagnostic Examination,* including photographs, charts, and the aforementioned videos, it presents the same conception of the physical examination as a pedagogically discrete entity.

In the final quarter of the 20th century, the evidence-based medicine movement turned its attention to the bedside examination. In 1992, Drs. Drummond Rennie and David Sackett began publishing a series of articles in the *Journal of the American Medical Association* mentioned earlier and entitled *The Rational Clinical Examination,* which sought to enumerate the evidence for or against the usefulness of specific aspects of the physical examination when addressing particular clinical questions. With the assistance of Dr. David Simel, the series has run continuously since then, and in 2009 a compilation of updated articles in the series was published as a textbook entitled *The Rational Clinical Examination: Evidence-Based Clinical Diagnosis.* In the foreword to the book, Rennie describes the intension of the series:

> [B]y encouraging research into the history and physical examination, we wanted to restore respectability to a part of medicine that seemed to have been eroding as academic and financial reward went to those who most resembled scientists relying on expensive diagnostic tests and least behaved as physicians relating to patients (37).

In the book's preface, Simel remarks that the text is offered "as an essential companion to, and not a replacement for" texts such as those by DeGowin, Bates, and others (38). In essence, *The Rational Clinical Examination* is a textbook about textbooks; it aims to provide the reader with a method of evaluating the material covered in other books. However, although the work of Rennie, Simel, and Sackett is a

huge contribution to diagnostic medicine, it is also a sign of the conundrum in teaching the bedside examination: Trainees must not only master the skills described in the traditional physical examination textbooks, but must also seek secondary sources to evaluate, and even discard, some of those skills.

## LOOKING FORWARD

The sheer number of diagnostic modalities now available makes it impossible to create a completely integrative textbook of diagnostic medicine. Separation of the textbook on physical diagnosis from other textbooks on diagnosis is necessary, but that separation is not the reason for the decline in bedside skills in our present era. We believe that combining instruction in the technique and value of physical diagnosis in all stages of medical training (not only in the first 2 years of medical school) could greatly improve bedside diagnostic skills and make it easier for the trainee to integrate those skills into clinical practice. If indeed there is a resurrection in the teaching of the bedside examination and if there is renewed interest in that examination as a means of allowing physicians to use diagnostic tests in a cost-effective manner, there will no doubt be a new crop of books that reflect this happy alchemy. It will also reflect advances in media, and texts may be written and designed expressly for a generation that will read iPads and computer screens instead of textbooks printed on paper.

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## DISCUSSION

**Barondess, New York:** Abe, I enjoyed that enormously, which didn't surprise me a bit. Several years ago at the New York Academy of Medicine, we had a grants program and issued an invitation to every American medical school to submit proposals. The program was focused on the fundamental clinical skills: the history, the physical examination, and clinical reasoning. Our announcement asked schools submitting proposals to tell us what they were doing currently. It covered three areas. We had 58 responses—58 proposals for this grant—and in each proposal there was a description of how the history and the physical examination were being taught. No school that submitted a proposal was teaching clinical reasoning as an explicit, fundamental clinical skill. It was, in virtually every instance, an osmotic event, with the result that it was done in very unsatisfactory ways. So I just wanted to put that in as the third and definitive fundamental clinical skill. Two brief historical notes: Riva-Rocci's sphygmanometer was brought back to the US by Harvey Cushing, who saw it in Europe. After he finished his residency training, Cushing drew a sketch of it and brought it back. He introduced clinical blood pressure measurements into this country. My final comment is that if Auenbrugger had been a little older when he went with his father and tapped on the casks, he would have introduced the term "in vino veritas."

**Blaser, New York:** Hard act to follow. Abraham, what a great entry into the society. I am hoping when you come back a few years from now, when you give your next lecture, it will be about taking the patient's history, because we have lumped together the history and the physical examination and there are a lot of similarities in the two, but there are also fundamental differences. And the history, as you would imagine, is much richer. As physicians, the history offers us the possibility of seeing patterns, and that's what gives the history it's great power. In the clinical reasoning that we teach at NYU, we try to emphasize the really fundamental importance of the history as distinct from everything else, and the physical exam and the laboratory exam go together. The physical exam is actually the bridge between the patient history and the laboratory exam, but it's more of the laboratory, and I'm interested in your views about the power of the patient history, the power of physical and laboratory signs.

**Verghese, Palo Alto:** Thank you, Marty, for your comments. Actually, I don't disagree with you at all. When we say the physical, we mean the history as well. We do find, however, that it is a little easier for a student who wants to learn the history well and the nuances of it to find the text and read it and, you know, to sort of get to see how it all works and get sophisticated about it. They can read about the ankle reflex, and that won't work by itself. In our program, our trainees have "Stanford 25" sessions in which we can say "No, you're holding the hammer wrong. Now put the leg this way." Those skills are much harder to learn except in one-on-one sessions at the bedside. So, it's not that we're excluding the history by any means. We just felt that given where we want to put our money right now, the biggest bang for our buck was in actual technique-dependent maneuvers. We absolutely, and you will see this on the Stanford 25 website, don't want to suggest for a moment that the history is not important, and I think major errors are made by ignoring the history.

**Schiffman, Providence:** Abe, beautiful, beautiful discussion. A two-part question: First, you didn't mention McGagee's evidence-based text for physical diagnosis. Do you think it has use for blending the metrics and the art of medicine?

**Verghese, Palo Alto:** Yes, I did not mention either McGagee's book or David Simel's book, but they are both wonderful people and good friends of mine. You know that their focus is evidence-based physical diagnosis, which is, I think, a level removed and more advanced than what we're trying to teach our medical students. I also think there's an

important distinction between testing a hypothesis—does such and such a test work for splenomegaly—versus teaching the complete physical exam, which, to me is a hypothesis-generating tool. It's quite different than just focusing on one test. So I didn't mean to exclude them; I was just using the books that I think are most likely to be used in systematic teaching. We certainly use both Simel's work and McGagee's work.

**Schiffman, Providence:** The advice that I think all of us need is how, at our own institutions, we may be champions of the history and physical examination. How do you recruit and incentivize faculty, because this is all about role-modeling? They can read. They can listen. How do you get these folks to be like you?

**Verghese, Palo Alto:** Well, that's a very good question. I think it's extraordinarily hard. I have wonderful colleagues, like Dr. Kelley Skeff, at Stanford. We have a lot of believers. What I think surprised most of us is that we have a tendency to speak disparagingly of young hospitalists and the evidence-based mavens who sit in computer rooms and toss data around, but I'm finding that the ones who are most eager to learn are our young hospitalists, our young attendings. They will tell you candidly that they wish they had these skills, and they're not at the bedside, mostly not because they don't want to be there, but they don't feel confident in that. They are the first to line up and want to learn. So we've invested a lot of time in them. In fact, the other names on my paper include Blake Charlton, a wonderful medical student, and two young hospitalists who are now junior faculty. I hope that this is going to be their thing for the next few decades.

**Mandell, Charlottesville:** This is an accolade not a question. There may be one or two people here who don't know that Abraham's first book, second book, third book, and especially the third book, are amazingly wonderful books. The third book, *Cutting for Stone,* has been on *The New York Times* bestseller list for 37 weeks, usually in fourth or fifth place. Thirty-seven weeks! Wow!

**Verghese, Palo Alto:** Thank you, Dr. Mandell.

**Wolf, Boston:** Abe, as you and I know, the toxic effect of going to the bedside is hair loss, and I am worried as I look at Jerry Barondess and some of the other people in the room, that they obviously didn't spend that much time in that environment.

**Verghese, Palo Alto:** I shall remember that, Marshall. Thank you very much.

**Shasby, Iowa City:** My concern is with house staff. I do most of my attending in the intensive care unit, and in there it's not just the physical exam but it's the evolving physical exam that's critical, and house staff are getting snapshots, whereas we got motion pictures with which to learn and understand and anticipate how things were going, and after taking a couple of views we were having a good sense of where things were going. Does anybody have any ideas about how we're going to help these kids who've only gotten 10 snapshots, when we have to watch several short movies about how the patient was progressing through their illness? How are we going to get them educated, because I don't think they are going to make it.

**Verghese, Palo Alto:** I don't have any brilliant ideas. You know that we're all worried about work hours and the handoffs. I do think that we need to give our house staff the belief that when a patient has abdominal pain it is cost-effective to examine them first. Right now, I suspect that they're thinking that it's most cost-effective to order a CT scan and sign off to someone else to look up the results than it is to go and see the patient, when they might find that the patient is sweating, and having pain is very non-abdominal, and they might have to examine the patient's chest and get an ECG. Their instinct is to order and not to see the patient. We have to create the confidence by which they're willing to go see the patient first, knowing that that will save time and not waste their time. Right now they might think it wastes their time.

**Baum, New York:** I think it's too easy to pin the problem on technology. I think the

root-cause analysis of this is that we have given up the requirement that at the end of a work-up there be a differential diagnosis in favor of the current practice on a problem-management list. So when you see GI bleeding, what you find under that is not gastritis, duodenal ulcer, gastric cancer, et cetera, but endoscopy. So I think that if we were to re-emphasize and, in fact require, that at the end of a workup there be a differential diagnosis, the house officer, who we're primarily talking about, or the student, would indeed have to go back, if they hadn't done so already, and come up with some physical and history basis on which to make that differential diagnosis. I really believe that that's where the problem resides.

**Verghese, Palo Alto:** I would agree. Thank you.

**Densen, Iowa City:** Abraham, I've looked at your Stanford 25, and I've read the introduction. Everybody has their favorite 25, but I'm struck, as somebody who's taken the morning report for many years, by the cavalier approach to vital signs, and I would submit that vital signs are called vital for a reason. There is probably little more information that has greater importance than that of the traditional vital signs in giving you a clue to whether the patient is sick or not. Long before electronic medical records, Dick Wenzel, a member of this organization and you know him, noted that at morning report, the respiratory rate was almost always 18, breaths per minutes, and he had his chief residents go out and look at the charts on the ward, and they found that there were three respiratory rates: 16, 18, and 20. Wenzel then had his chief residents actually measure the patients' respiratory rates, and they found, as you would expect, that there was much greater variation in the measured rate than in the recorded rate. Therefore, just because that information is charted doesn't mean that it was actually measured, and I would make a plea that in that 25, you include that the students and ourselves actually take the time to measure those vital signs, because I think there's a lot to be said there. Thanks for letting me comment.

**Verghese, Palo Alto:** Thank you, Dr. Denson, and might I just say, we love to have people visit our site. It's quite open and people like you leave us little pearls and suggestions. If it's something that we feel that our students and everyone else can use, we actually would love to get your permission. We'd love to put it in a box with your picture. So the site is becoming populated by people from outside Stanford. So, if you don't mind, just leaving us that tip I think that would be wonderful and your endorsement of it.

**DuBose, Winston Salem:** Thank you so much for reminding us of the importance of teaching the physical examination. I would suggest that the evolution of that actually has been away from any textbook. Unfortunately, many of our students, although they have texts available to them, never consult them, and when you combine that with what I feel is a lack of attention to an in-depth instruction of physical diagnosis by professors of medicine, and with the poor example that many residents and students are given at the bedside, there's really no surprise that this important concept is diminishing. And as someone who recently was involved in teaching physical diagnosis, I will say that one of the things I found most interesting about the Stanford 25, when I suggested this to my students, was that in some way, it allows them to connect to the way they learn, and it reinforces not only the importance of acquiring these skills but also of consulting a textbook and learning more about physical diagnosis. So, I applaud you for doing this, and I think that we as professors of medicine need to take this back as something that we are determined to teach, and therefore, that every medical student will acquire.

**Verghese, Palo Alto:** Thank you. I appreciate that. I should just say, parenthetically, that on the Stanford 25 website, the first line you will read is: "The map is not the territory." We don't want to imply to our tech-savvy students that that map is the skill. The website is just an outline of what we teach live in our morning report with live

patients or standardized patients. I would also say that I think that the iPad has something interesting to offer. I had someone show me a page of Harrison's *Textbook of Internal Medicine* on an iPad, and that was the first moment that I understood the utility of the iPad. I'm a big Harrison's fan. I tote it around. It's contributed to understanding rotator-cuff injuries and neck problems. And I think the idea that that could now be in full color with all the links on a device that's so portable is an important transition that we need to make, and we are working on the next iteration of the Stanford 25 as something we call "The Approach To . . . ." The approach to the examination of a patient with numbness and tingling, the approach to hypertension, the approach to the examination of the patient with shortness of breath. Rather than getting it from a textbook, that gets put on an iPad. So we're trying to write this for the IPad, and I think it'll be our way of joining the techies. We can't just sit and bemoan that times have changed. I think we have to join the times.