Physical examination in the care of medical inpatients: an observational study

Brendan M Reilly

Summary

Background Little is known about the clinical importance of skilled physical examination in the care of patients in hospital.

Methods Hospital records of a systematic consecutive sample of patients admitted to a general medical inpatient service were reviewed retrospectively to determine whether physical findings by the attending physician led to important changes in clinical management. Patients with pivotal physical findings were defined by an outcomes adjudication panel as those whose diagnosis and treatment in hospital changed substantially as a result of the attending physician’s physical examination. Pivotal findings were classed as validated if the resulting treatment change involved the active collaboration of a consulting specialist. Findings were classed as discoverable if subsequent diagnostic testing (other than physical examination) would probably have led to the correct diagnosis. Class 1 findings were those deemed validated but not discoverable.

Findings Among 100 patients, 26 had pivotal physical findings (26%; 95% CI 18–36). 15 of these (58%; 95% CI 37–77) were validated (13 with urgent surgical or other invasive procedures) and 14 were discoverable (54%; 95% CI 33–73). Seven patients had class 1 findings (7%; 95% CI 3–14).

Interpretation Physical examination can have a substantial effect on the care of medical inpatients. If replicated in other settings, these findings might have important implications for medical educators and quality improvement initiatives.

Introduction

Concerns about physicians’ declining bedside skills have prompted the US National Board of Medical Examiners to propose that, beginning in 2004, physicians-in-training must demonstrate competence in physical examination before they can receive a medical licence. Currently, only about a quarter of US medical schools require their students to pass such tests as a condition of graduation.

However, even if all physicians acquire basic skills in physical examination, will they maintain and improve those skills throughout their professional careers? Very few residency programmes include physical diagnosis in their curricula.1,2 Specialty board-certification examinations no longer require an oral component with demonstration of bedside skills. Continuing medical education conferences rarely offer opportunities to update skills in hands-on examination. Indeed, the time pressures of modern practice, combined with advances in diagnostic technology, seem to undermine the value of these skills. Is expertise in physical examination still important in clinical medicine?

This question is reminiscent of scepticism in the 1980s about the importance of the autopsy. At that time, declining hospital autopsy rates prompted Goldman and colleagues3,4 to compare the value of autopsies in periods before and after the availability of new diagnostic imaging technologies. These investigators found that the autopsy’s yield remained substantial (major diagnoses unsuspected pre-mortem in 22–25% of patients), undiminished from 1959 through 1985. Their findings energised efforts to revive the autopsy as an essential quality improvement process in hospitals.

Thus, it seems noteworthy that no previously published studies have addressed the clinical importance of physical examination in the care of patients in hospital.

Methods

Background In the week after completing a rotation as an attending physician in a hospital, this author began teaching an introductory physical diagnosis course to second-year medical students. In response to students’ questions about the importance of physical examination in the care of inpatients, I searched PubMed for English-language medical published work from 1966 through 2001. Finding no data directly relevant to this question, I reviewed the medical charts of all patients who had been admitted to my own inpatient service during my just-completed hospital rotation.

Outcome measures

The primary study outcome was the proportion of patients in whom physical examination by the attending physician detected so-called pivotal findings. A pivotal finding, defined before any charts were reviewed, was an observation by the attending physician that: (1) was determined by inspection, percussion, palpation, auscultation, or other bedside physical assessments; and (2) prompted
Hypocalcaemic tetany
Hypoglycaemia
Delirium tremens
Cervical disc herniation
Polyarthritis
Miscellaneous
Haematuria
Nephrotic syndrome
Acute renal failure
Renal
Head and neck cancer
Medulloblastoma
Myelodysplasia
Lymphoma
Lung cancer
Acute leukaemia*
Oncology/haematology
Paraplegia, decubitus
Stroke
Pseudotumour cerebri
Neurosyphilis
Status epilepticus*
Neurological/psychiatric
Abdominal pain, unknown cause
Chronic diarrhoea
Infected pancreatic pseudocyst
Acute cholecystitis
Advanced liver disease*
Crohn’s disease
Acute cholecystitis
Infected pancreatic pseudocyst
Chronic diarrhoea
Abdominal pain, unknown cause
Sepsis/bacteraemia
Bacterial pneumonia
Pneumocystis pneumonia*
Disseminated strongyloidiasis*
Lung abscess
Perinephric abscess
Mononucleosis
Encephalitis
Gastrointestinal/hepatic
Acute pancreatitis
Gastrointestinal bleeding
Advanced liver disease*
Crohn’s disease
Acute cholecystitis
Infected pancreatic pseudocyst
Chronic diarrhoea
Abdominal pain, unknown cause
Gastrointestinal/hepatic
Acute pancreatitis
Gastrointestinal bleeding
Advanced liver disease*
Crohn’s disease
Acute cholecystitis
Infected pancreatic pseudocyst
Chronic diarrhoea
Abdominal pain, unknown cause
Neurological/psychiatric
Status epilepticus*
Neurosyphilis
Pseudotumour cerebri
Pick’s disease
Stroke
Major depression
Paraplegia, decubitus
Vertigo
Oncology/haematology
Acute leukaemia*
Lung cancer
Lymphoma
Myelodysplasia
Medulloblomastoma
Head and neck cancer
Renal
Acute renal failure
Nephrotic syndrome
Haematuria
Miscellaneous
Diabetic syndromes
Polyarthritis
Cervical disc herniation
Delirium tremens
Hypoglycaemia
Hypocalcaemic tetany
COPD=chronic obstructive pulmonary disease. *One patient with each of these diagnoses died in hospital.

Table 1: Primary clinical problems necessitating hospital admission in 100 patients

<table>
<thead>
<tr>
<th>Classification of pivotal findings of physical examination</th>
<th>Total</th>
<th>Validated</th>
<th>Discoverable</th>
<th>Class 1</th>
<th>Class 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>17</td>
<td>11</td>
<td>7</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Rejected</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Confirmed but unconfirmed</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total*</td>
<td>26(100%)</td>
<td>15(58%)</td>
<td>14(54%)</td>
<td>7(27%)</td>
<td>19(73%)</td>
</tr>
</tbody>
</table>

*Numbers in parentheses are row percentages (denominator, n=26).

Table 2: Classification of pivotal findings of physical examination

Patients and setting

Study participants included all patients admitted to one general medical service team at Cook County Hospital, a 700-bed urban public teaching hospital, during a consecutive 28-day period in January and February, 2002. The hospital’s general medical service is staffed by 12 admitting teams, each comprising one attending physician, two senior residents, two interns, and two medical students. General medical service admissions include all medical admissions to the hospital except patients admitted directly to the coronary care unit, the medical intensive care unit, or the subspecialty HIV service (some patients with HIV disease are admitted to the general medical service). Each of the general medical teams admits about ten to 14 patients every fourth day during 24 consecutive hours. There is no float system during nights, weekends, or otherwise; one senior resident supervises up to ten daytime team admissions (0700 h–2200 h) and the other senior resident supervises four to six night-team admissions (2200 h–0700 h). All admissions are distributed sequentially among three on-call teams, in order of patients’ presentation for admission (about 90% originate in the emergency department). Thus, patients admitted to each attending physician’s team represent a systematic, but not random, sample of all patients admitted to the hospital’s general medical service.

The hospital’s institutional review board gave ethics approval for the study. Patients’ informed consent was not required.

I examined all patients alone, no more than 7 h after their admission to the inpatient ward, according to my usual practice—ie, to examine all patients admitted during daytime on the call day, and to assess all those admitted at night early the following morning, before post-call rounds at 0700 h. The physical findings, were not, in any case, discussed with house staff or written in the patient’s chart until after the house staff had recorded their own physical findings in the charts. Most patients had also been examined in the emergency department by both an emergency medicine resident and an emergency medicine attending physician. Because of required days off for house staff and students, I was the only physician who examined all study patients on every day of their hospital stay.
Physicians
This author is a board-certified internist and geriatrician who completed postgraduate training 25 years ago and has been an active clinician-educator in teaching hospitals ever since. For the past 7 years, my primary clinical responsibilities have been those of a hospitalist (3–4 months every year). All the emergency medicine attending physicians are board-certified in emergency medicine. More than 95% of the hospital’s internal medicine and emergency medicine residents pass their respective specialty board-certification examinations on their first attempt. As a group, the hospital’s medical residents score well above the national average on American Board of Internal Medicine certification examinations.

Chart review
I reviewed and abstracted all patients’ charts. The chart review process was standardised by use of the stereotypical format of the author’s chart notes: in keeping with my knowledge and training, I wrote the chart notes as if I was attending the patient’s care. All patients were seen by the author’s attending physician, and each patient’s care was managed by the attending physician, who was the primary author of the patient’s chart notes and dictation. The attending physician reviewed and approved all chart notes. The attending physician’s dictation was reviewed and abstracted into chart notes by me. I reviewed and abstracted all patients’ charts. The chart review process was standardised by use of the stereotypical format of the author’s chart notes: in keeping with my knowledge and training, I wrote the chart notes as if I was attending the patient’s care. All patients were seen by the author’s attending physician, and each patient’s care was managed by the attending physician, who was the primary author of the patient’s chart notes and dictation. The attending physician reviewed and approved all chart notes.

### Table 3: Patients with pivotal physical findings (n=26)

<table>
<thead>
<tr>
<th>Initial diagnosis</th>
<th>Initial management</th>
<th>Physical finding</th>
<th>Final diagnosis</th>
<th>Final management</th>
</tr>
</thead>
<tbody>
<tr>
<td>New physical findings detected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever, suspected UTI</td>
<td>IV antibiotics</td>
<td>Knee and ankle effusions</td>
<td>Polyarticular gout</td>
<td>Corticosteroids</td>
</tr>
<tr>
<td>Staphylococcal bacteraemia from arm cellulitis</td>
<td>IV antibiotics</td>
<td>Tender antecubital cord†</td>
<td>Suppurative thrombophlebitis</td>
<td>Surgical thrombovenectomy</td>
</tr>
<tr>
<td>Fever, suspected UTI</td>
<td>IV antibiotics</td>
<td>Dusky big toe††</td>
<td>Toe gangrene</td>
<td>Toe amputation (V)</td>
</tr>
<tr>
<td>FUO, suspected TB</td>
<td>Four TB drugs</td>
<td>Hepatomegaly†</td>
<td>Large-cell lymphoma (D)</td>
<td>Liver biopsy, chemotherapy</td>
</tr>
<tr>
<td>Recurrent pyelonephritis</td>
<td>IV antibiotics</td>
<td>AI murmur, wide pulse pressure*</td>
<td>Bacterial endocarditis (D)</td>
<td>Aortic valve replacement (V)</td>
</tr>
<tr>
<td>SLE with arthritis, pleuritis, and fever</td>
<td>Corticosteroids</td>
<td>Periosteal signs†</td>
<td>Ruptured perinephric abscess</td>
<td>Nephrectomy (V)</td>
</tr>
<tr>
<td>Acute cholecystitis</td>
<td>CNS imaging</td>
<td>Njern-Bárány manoeuvre†</td>
<td>Benign positional vertigo (D)</td>
<td>IV saline</td>
</tr>
<tr>
<td>CHF from ischaemic cardiomyopathy</td>
<td>CHF drug therapy</td>
<td>Right ventricular heave*</td>
<td>Cor pulmonale (D)</td>
<td>Home oxygen</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>Heparin, aspirin</td>
<td>C8 radiculopathy with weakness**</td>
<td>Cervical disc herniation</td>
<td>Laminectomy (V)</td>
</tr>
<tr>
<td>NSAID-induced acute renal failure</td>
<td>Dialysis</td>
<td>Wrist drop††</td>
<td>Wegener’s granulomatosis</td>
<td>Renal biopsy (V), cytotoxic</td>
</tr>
<tr>
<td>Renal failure from HIV nephropathy</td>
<td>Fluid restriction</td>
<td>Orthostatic hypotension*</td>
<td>Prenatal azotaemia from acute</td>
<td>IV saline</td>
</tr>
</tbody>
</table>

### Table 1: Physical findings confirmed but attending physician disagreed about implications

<table>
<thead>
<tr>
<th>Physical findings confirmed but attending physician disagreed about implications</th>
<th>Initial diagnosis</th>
<th>Initial management</th>
<th>Physical finding</th>
<th>Final diagnosis</th>
<th>Final management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent staphylococcal cellulitis</td>
<td>IV vancomycin</td>
<td>Lymphangitic streaking and tender adenopathy*</td>
<td>Recurrent erysipelas (streptococcal)</td>
<td>IV penicillin, monthly penicillin prophylaxis</td>
<td></td>
</tr>
<tr>
<td>Mediastinal tumour</td>
<td>Mediastinal biopsy</td>
<td>4/6 systolic murmur at pulmonic area*</td>
<td>Pulmonic stenosis with post-stenotic pulmonary artery dilation (D)</td>
<td>No mediastinal biopsy (V)</td>
<td></td>
</tr>
<tr>
<td>Non-dominant hemispheric stroke</td>
<td>Add clopidogrel to aspirin, CNS imaging</td>
<td>No orthostatic changes in blood pressure or pulse Pure motor deficit*</td>
<td>Hepatorenal syndrome (D)</td>
<td>Band oesophageal varices, assess for liver transplant (V)</td>
<td></td>
</tr>
</tbody>
</table>

D=discoverable, V=validated, IV=intravenous, UTI=urinary tract infection, FUO=fever of unknown origin, TB=tuberculosis, AI=aortic insufficiency, SLE=systemic lupus erythematosus, MCP=methacarboxyphagolalant, PIP=proximal interphalangeal, SIADH=syndrome of inappropriate antidiuretic hormone secretion, CHF=congestive heart failure, AML=acute myelogenous leukaemia, NSAID=nonsteroidal anti-inflammatory drug, PEG=percutaneous endoscopic gastrostomy, *Physical finding on first hospital day, †Class 1 findings.

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usual practice, chart notes in all cases briefly summarised the patient’s presenting problems and then specified agreement with previous examiners’ written findings except for (“agree with above except”) specific aspects of the history, physical examination, or test interpretation with which I disagreed. Disagreements noted about physical findings were categorised as one of three types: (1) new (findings noted by the attending physician but not noted by previous examiners); (2) rejected (findings noted as present by previous examiners but deemed absent by the attending physician); or (3) confirmed but conflicted (previous examiners’ findings confirmed by my examination, but I disagreed about the implications of those findings for a patient’s diagnosis and treatment).

Adjudication and classification of outcomes
Based on initial chart reviews, details of patients judged to have had possible pivotal findings were presented to an adjudication panel of three senior attending physicians (not including myself), who then decided which findings met the study outcome definition of pivotal. Physical findings were deemed pivotal if there was unanimous agreement by the panel.

To further classify the relative clinical importance of pivotal findings, the adjudication panel also decided by consensus whether the patient’s change in diagnosis was discoverable and whether the resulting change in treatment was validated. A pivotal finding was deemed discoverable (and, thus, less consequential) if, in the opinion of the adjudication panel, the correct final diagnosis would probably have been discovered in hospital by subsequent technological testing (indicated for the initial diagnosis), even if the pivotal physical finding had not been found. For example, the finding of massive hepatomegaly extending below the iliac crest in a patient admitted from central America with fever of unknown origin (initial diagnosis: disseminated tuberculosis) was judged to have been discoverable, because abdominal imaging (indicated for the assessment of fever) would probably have led to the final diagnosis (primary diffuse large B-cell hepatic lymphoma without tuberculosis). A pivotal finding was deemed validated (and, thus, less subjective) if the resulting change in treatment required the intervention of a consulting specialist (for example, lymphoma chemotherapy by an oncologist). Thus defined, validation meant that an independent consultant actively corroborated the change in diagnosis and treatment prompted by the attending physician’s pivotal physical findings.

Pivotal findings that the adjudication panel considered validated but not discoverable were designated class 1 because such findings seemed unambiguously consequential. All other pivotal findings (validated but discoverable, not validated and not discoverable, not validated and discoverable) were designated class 2.

Data analysis
Fisher’s exact test and exact (Clopper-Pearson) 95% CIs were used to compare proportions.

Role of the funding source
The sponsors of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results
100 patients were admitted to my service during the 28-day period. Patients’ mean age was 55 years; their median hospital length of stay was 3 days. Patients’ principal final diagnoses are listed in table 1. Six patients died in hospital. For 28 patients, various language barriers affected my initial clinical assessment.

Chart review identified 37 patients with possible pivotal findings. The adjudication panel rejected 11 of these because they did not meet all the criteria; the remaining 26 (26%; 95% CI 18–36) met the study definition of pivotal findings (table 2). These findings were categorised as new in 17 patients, rejected in five patients, and confirmed but conflicted in four patients. Pivotal findings were judged to be validated in 15 patients and discoverable in 14. Frequency of pivotal findings was similar in patients with or without language barriers and in patients who died in hospital or survived to discharge. In 20 patients, pivotal findings were recorded on the first hospital day, and in the remaining six the findings were noted later in the hospital course.

In seven patients (7%; 95% CI 3–14), pivotal findings met the definition of class 1 findings (validated but not discoverable). Among the remaining 19 (class 2) pivotal findings, eight were validated but discoverable, five were neither validated nor discoverable, and six were discoverable and not validated (table 3). Consultants’ validation of pivotal findings involved emergency surgical procedures in seven patients (six done, one cancelled); cytotoxic chemotherapy in three (two preceded by invasive diagnostic procedures); interventional radiological procedures in two (one done, one cancelled); invasive diagnostic procedures not followed by cytotoxic chemotherapy in two; intensive psychiatric care in one; and assessment for emergency liver transplantation in one.

Discussion
These results show that physical examination can have a substantial effect on the care of medical inpatients. About one in every four (26%) patients in the present investigation had pivotal physical findings. In many patients, these findings prompted active collaboration by specialist consultants to perform urgent surgical (or other invasive) procedures. The seven patients with class 1 findings were especially important because diagnostic testing other than physical examination would probably not have led to the necessary change in treatment. By contrast, most of the class 2 findings were discoverable; identification of the findings during the physical examination might have improved the timeliness (and hence quality) of care, but might not have affected final treatment decisions.

These results approximate analogous findings in studies of the autopsy, in which 21–25% of patients had class 1 (8–12%) or class 2 postmortem findings.14 This parallel will not surprise experienced clinicians who believe that skilled physical examination, like the autopsy, helps them as much today as it did in the past.1 But the findings of the present study suggest that physical examination, unlike the autopsy, can help patients too.

Previous studies about physical examination have focused largely on assessment of trainees’ skills and interventions to improve them.8-11 Laudable efforts have also been made to critically appraise the accuracy and reliability of particular physical findings in specified clinical contexts.14,15 But the clinical importance of these efforts is unknown. A few investigators have compared the relative value of history and physical examination in the diagnosis of outpatients.16 However, no such studies have addressed the treatment of inpatients.

The present study was not designed to compare the accuracy of physical examination by more and less experienced physicians—such a study would, additionally,
require independent gold standard assessment of the attending physician’s physical findings. Nor do these findings prove that skilled physical examination improved patients’ outcomes—it may have done so, but this conclusion would require a control group in whom physical examination was not done, which would be an unethical study design. Instead, I have estimated the frequency with which physical examination contributes to the process—and, arguably, the quality—of inpatient care. The results lend strong support to a venerable, if unverifiable, axiom of clinical medicine: sick patients need careful physical examination, the more skilled the better.

The mundane nature of our pivotal physical findings (table 3)—none of them rare or esoteric—may cause some to question the external validity of our results. Do they simply show the inadequacies of one institution or group of physicians? Probably not, because it is precisely these types of common physical findings that elude physicians elsewhere.6,9,11

Nevertheless, the generalisability of these findings is uncertain. Our results involved only one institution, a 28-day period (perhaps atypical), one attending physician, and a fairly small (consecutive but not random) sample of patients. It is possible that the frequency and effect of pivotal physical findings vary with differences in variety of cases, patients’ acuity of illness, and physicians’ skill, motivation, and time. Investigations in other settings are needed.

However, this does not mean that large multicentre studies should be undertaken to investigate the usefulness of inpatient physical examination. Clearly, as shown in the present study, skilled physical examination facilitates high quality care in some cases. The relevant question for further research is: which cases? This question will be a moving target as diagnostic technologies evolve, potentially replacing aspects of physical diagnosis as the standard of care. But, like the autopsy, physical examination should remain the standard of care until proven superfluous or cost-ineffective; hence the importance of documenting its effectiveness and promoting its accomplishment. Otherwise, future studies comparing technological and physical diagnosis may have spurious results with untoward consequences: increasing dependence on costly diagnostic technology, and decreasing confidence in physicians’ clinical skills.

Pending further research, then, the present investigation warrants attention for three reasons. First, the intervention proposed by the US National Board of Medical Examiners to test students’ bedside skills will use outpatient. This process may not adequately measure the skills needed to care for sick inpatients. One way to find out would be to monitor the success of these efforts by use of methods from the present study. To do so, attending physicians in teaching hospitals must undertake their own independent physical examination of all inpatients for whom they are responsible (although such practice is expected, it is not always the reality in US teaching hospitals today). If substantial shortcomings remain, major curricular reform will be needed in medical schools and postgraduate training programmes.5,9,11,12 Such change is easier said than done,8,10 in view of the many competing demands for curricular time at all levels of medical education.

Second, highly publicised efforts to improve the quality of hospital care largely ignore this issue. Calls to reduce preventable errors in hospitals have focused more on treatment errors than on diagnostic errors, and they have emphasised the need for improvement in systems rather than in clinicians.11,21 But surely many treatment errors result from diagnostic errors, and, as the findings of the present study imply, some of these might be preventable by improvement in clinicians’ skills. This fact does not obviate the need for computerised order entry, analyses of root causes, constraints models, or other promising systems approaches to quality improvement.13,24 It simply makes the obvious point that better systems will improve care more if better clinicians use them.

Finally, evidence-based medicine has been redefined recently to pay greater homage to clinical expertise, the essential skill needed to integrate best current evidence with the patient’s clinical condition and preferences when making decisions.17 This change sounds correct, and it is an improvement on earlier definitions that seemed to pit researchers against clinicians; but it is only a beginning. In fact, enthusiasts of evidence-based medicine devote most of their attention not to clinical expertise but to other priorities: medical informatics, critical appraisal of the literature, and health services research skills.20,27 No doubt these powerful instruments will be important, in view of the complex challenges of evidence-based quality improvement. But the practice of evidence-based medicine is the practice of medicine, not the practice of evidence. The findings of the present study suggest that more attention should also be paid to understanding and implementing the power of physicians’ traditional clinical skills.5,11,20,21

Conflict of interest statement
None declared.

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I thank Arthur Evans, Christopher Smith, and Brian Lucas for serving as the outcomes adjudication panel for the present study, and Dr Evans for his insightful review of the manuscript. The invaluable help of the Cook County Hospital emergency physicians and medical house staff who cared for the study patients is also gratefully acknowledged. Funding for this investigation was provided by the Department of Medicine, Cook County Hospital.

References
Clinical picture

Gallstone ileus

Jayant S Vaidya, Olutunde Lalude, David Grant, Hasan Mukhtar

A 73-year-old woman presented with 5-day history of colicky abdominal pain, distension, vomiting, and signs of peritonism in the lower abdomen. She had no history of biliary pain. An abdominal radiograph showed dilated loops of small bowel, air in the biliary tree and gall bladder (figure, thick arrows), and a peripherally radiopaque stone in the bowel (figure, thin arrow). We agreed on a preoperative diagnosis of gallstone ileus. At surgery the 3·5 cm solitaire gallstone was found in the distal jejunum with two 5 mm perforations close to the site of impaction. These perforations were probably at the sites of two previous impactions. The closest perforation was at the mesenteric border and required resection of a small segment of jejunum. There were dense adhesions around the gall bladder, but these were left alone. Apart from a slight wound infection, the patient made an uneventful postoperative recovery.