A Core Physical Exam for Medical Students: Results of a National Survey

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Abstract

Purpose
Medical students are traditionally taught the physical exam as a comprehensive battery of maneuvers, yet they express uncertainty about which maneuvers are "core" and should be performed routinely on patients and which ones should be performed only when clinically indicated. The authors sought to determine whether educator consensus existed on the concept and the specifics of a core physical exam for students.

Method
The authors developed a 45-maneuver core physical exam to be performed by a medicine clerkship student on every newly admitted patient, with the expectation that it would be supplemented by clinically indicated additional maneuvers. From 2011 to 2012 they sent surveys to physical diagnosis course directors (PDCDs) and internal medicine clerkship directors (IMCDs) from all 132 U.S. allopathic medical schools to determine the extent of their agreement with the proposed 45 maneuvers and their opinions about the concept of a core exam.

Results
Seventy-one percent (94/132) of PDCDs and 63% (83/132) of IMCDs responded to the survey. In total, 84% (111/132) of all schools surveyed were represented by either their PDCD or IMCD. Of the 45 proposed maneuvers, 37 were deemed "core" by a majority of respondents. The majority of IMCDs preferred a slightly leaner 37-maneuver core exam than the majority of PDCDs, who voted for 41 maneuvers.

Conclusions
Among PDCDs and IMCDs, there was openness to teaching medical students a streamlined core physical exam to which other maneuvers are added as clinically indicated. These educators closely agreed on the maneuvers this core exam should include.

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The physical examination is necessary for the delivery of effective medical care.[1,2] Traditionally, medical students are first taught the physical exam as a comprehensive battery of maneuvers during the preclerkship curriculum. Commonly performed maneuvers, such as auscultation of the lungs, are taught together with more specialized ones, such as testing for egophony or tactile fremitus. During preclerkship physical diagnosis courses, students are typically assessed on their ability to perform a comprehensive exam that often includes both commonly and infrequently performed maneuvers.

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The traditional approach to teaching the physical examination is problematic. Presenting students with a formidable number of maneuvers to learn (over 140 items in physical exam checklists in some schools)[3,4] in the absence of sufficient clinical context runs counter to evidence on how learners learn best. Cognitive load theory research, for example, supports less cognitive burden and better learning with a simple-to-complex sequence of instruction anchored by clinically relevant schemes.[5,6] Further, the traditional comprehensive exam lacks authenticity for students because it is not what they see expert clinicians do. Educators recognize that students learn better with activities that reflect real practice.[7] In actual clinical practice, for example, physicians do not routinely perform maneuvers like egophony, asterixis, and shifting abdominal dullness on all patients because doing so confers little clinical value. Rather, they perform a core set of maneuvers, which is then augmented by additional ones based on their diagnostic hypotheses. It is not surprising then, that on entering clerkships, many students seem confused and anxious about which maneuvers should be routinely performed on each patient and which maneuvers should be performed only when clinically indicated. Adding to the confusion is the absence of explicit curricular guidance, owing to a lack of consensus among educators[8] and a lack of coordination between preclerkship and clerkship curriculum directors.

Student discomfort with the traditional physical examination curriculum may have important consequences. Research suggests that students find performing a comprehensive set of physical exam maneuvers overwhelming and may have higher performance expectations of themselves than their educators do of them.[9] Other research demonstrates that students have difficulty effectively applying what they learn in the preclerkship curriculum to clinical cases.[10] It is also possible that if students are asked to routinely perform many maneuvers without clinical or educational rationale, they may begin to feel that the physical examination as a whole lacks utility. Thus, the traditional way students are trained in the physical exam may be contributing to the erosion of physical exam skills that has been chronicled in the literature, and also may be linked to the overuse of diagnostic testing.[11,12]

We have proposed the Core + Clusters curriculum as a better way to teach the physical exam.[13] In this approach, preclerkship students first would be taught a streamlined set of basic exam maneuvers with guidance on how to smoothly sequence the physical examination. After learning this core, students would be taught many additional maneuvers—some common, some specialized—within "diagnostic clusters" to be used as tools for clinical reasoning. A diagnostic cluster is a set of interview questions paired with physical exam maneuvers used to evaluate a specific clinical condition. For instance, a diagnostic cluster that includes suspected pneumonia may consist of questions on fever, productive cough, and pleuritic chest pain and involve the performance of pulmonary auscultation and percussion as well as tests for egophony and tactile fremitus.

In contrast to the traditional method, the Core + Clusters model shifts a considerable amount of physical exam learning from rote exercise to practice in the context of hypothesis testing and clinical reasoning. All of the maneuvers typically taught in the traditional curriculum would be taught in the Core + Clusters curriculum, but situated in a core exam or within diagnostic clusters, or both. Other researchers have developed educational innovations related to the physical exam.[14–17] Most of these have aimed to develop the physical examination as a tool to test hypotheses (the "hypothesis-driven" or "focused" exam) and support clinical reasoning. The Core + Clusters model builds on these innovations but is unlike other models in that it pairs hypothesis-driven physical exam maneuvers with relevant history questions and a foundational core exam. Students can expect to use the core exam throughout the medical school continuum and add to it progressive mastery of an increasing number of clusters.

In the process of developing this new educational model, we sought to define and seek consensus on the "core" portion of the physical exam. Physical diagnosis curricula are traditionally modeled on the inpatient internal medicine exam. We therefore defined the core exam as those maneuvers that students on their internal medicine clerkship should perform on every admitted patient. We conducted a national survey of both physical diagnosis course directors (PDCDs) and internal medicine clerkship directors (IMCDs) to determine whether there is educator consensus on which maneuvers should be contained in such a core physical exam. This research report presents the results of that survey.

Method

Proposed core exam

Our study team consisted of educators from the Columbia University College of Physicians and Surgeons, George Washington University School of Medicine, Harvard Medical School, and University of Connecticut School of Medicine. IRB approval was obtained at Columbia University Medical Center. In late 2010 we informally surveyed colleagues at our respective institutions to determine which maneuvers from our comprehensive physical exam checklists, some of which had over 130 exam items, should be part of a core exam. By consensus, the study team then created an initial 45-maneuver draft core exam. This draft was presented to other educators at the March 2011 annual meeting of the Association of American Medical Colleges' Northeastern Group on Educational Affairs, who supported the concept and content of the draft core exam that was included in the national survey.

Survey

We included the proposed core exam in a survey sent by e-mail in September 2011 to PDCDs and IMCDs at all 132 U.S. MD-granting medical schools. We obtained contact information for PDCDs using a database established by researchers surveying directors of physical diagnosis courses and we augmented it by searching medical school Web sites. We searched medical school Web sites as well to obtain IMCDs' contact information. To improve response rates, we sent e-mail reminders (three for PDCDs and five for IMCDs) to nonresponders from September 2011 until the survey was officially closed on October 2012. All responses received by then were included in the results.

The survey solicited demographic information on the respondents. It also defined the core exam as follows:

> For the purposes of this survey, the "core" exam is that part of the comprehensive exam that you believe a student on his or her medicine clerkship should do on every inpatient admission, no matter what the chief complaint or presenting problems. This core exam would be supplemented by additional exam maneuvers as clinically indicated by the specific patient's history, complaints, risks, and abnormalities detected on the core exam itself. Any students who need to practice additional maneuvers should be encouraged to do so.

In the main section of the survey instrument we listed each maneuver of the proposed core exam. Next to each item, the respondent was asked to choose whether a given maneuver should be "required on every patient" or "required only when clinically indicated." We considered a response of "required on every patient" to be an endorsement for inclusion in the core exam. The survey instrument invited respondents to indicate additional maneuvers they felt should be part of a core exam. Respondents also were provided free-text space for further comments. We decided that those maneuvers rated "required on every patient" by a majority of all PDCD and IMCD respondents would constitute a "core" exam for the medicine clerkship student doing an admission physical exam.

Statistical analysis

We used SAS version 9.2 statistical software (SAS Institute, Cary, North Carolina) to analyze data. We tabulated proportions of respondents that felt a given maneuver should be part of the core exam. The decision to make comparisons by educator role was made a priori. We performed chi-square tests to look for statistically significant differences in responses between PDCDs and IMCDs. When cell counts were less than 5, we used Fisher exact test, and we applied Bonferroni correction for multiple testing ($\alpha = .05$, $P < .001$) to assess significance.

Results

Demographics

Surveys were sent out to all 132 U.S. MD-granting medical schools. Seventy-one percent (94/132) of PDCDs and 63% (83/132) of IMCDs responded. In total, 84% (111/132) of all U.S. MD-granting medical schools were represented either by their PDCD or IMCD. Table 1 lists demographic information for the survey respondents.

Core exam survey results

Table 2 summarizes the primary results of the survey with responses from PDCDs, IMCDs, as well as the pooled replies from both groups. A majority of the 177 responders deemed as core 37 of the 45 proposed exam maneuvers. As illustrated by Table 2, the PDCDs and IMCDs closely agreed on what the core maneuvers should be, diverging on only four: palpate femoral pulse, otoscopic, cerebellar, and fundoscopic exams. A majority of IMCDs voted for a slightly leaner 37-maneuver core exam compared with the 41-maneuver exam selected by a majority of PDCDs. Even in these four, however, there was no statistically significant difference in the percentage of PDCDs and IMCDs choosing each maneuver as core. Table 3 shows the 37 core exam maneuvers grouped as they might be performed.

Survey comments

Seventy-two respondents provided free-text responses in the "further comments" section on the survey. All those surveyed were invited to add any maneuvers they felt should be core but were not listed on the survey. The maneuvers cited most often included the mental status exam (mentioned by six PDCDs and three IMCDs), where a brief assessment of mood, attention, and thought process was suggested. Carotid artery auscultation was mentioned by four PDCDs and five IMCDs. Seven respondents (four PDCDs and three IMCDs) suggested that one or more components of the genital, pelvic, breast, or rectal exam should be done or at least routinely offered to the patient as part of the physical exam on admission.

Seven respondents mentioned that certain maneuvers should be routinely performed by students for educational reasons, and cited the fundoscopic, otoscopic, lymph node, and thyroid exams as among those that may require more practice to attain proficiency. Four respondents expected medicine clerkship students to perform a more comprehensive exam on admitted patients, particularly early in the clerkship year, either to acquire skills fluidity or to establish a thorough baseline for that patient on admission. Six survey respondents, however, expressed a divergent point of view, stating that the physical exam should always be "focused." Comments along this line included "Every exam should be a 'focused' exam depending on age, gender, symptoms, and risk factors for disease," and "Clinical reasoning supersedes a required list. I want students to think about everything they do and do each component thoughtfully and not 'just because' it is required."

The adaptability of the core exam across clinical contexts was also raised by six survey respondents, who noted that the "core" exam may differ according to the setting (e.g., outpatient internal medicine versus subspecialty clinic), the service (e.g., internal medicine versus obstetrics–gynecology versus neurology), or the patient being examined (e.g., pediatric versus geriatric).

Several survey respondents volunteered their reasons for selecting what maneuvers should be part of a core exam. These included (1) to evaluate the patient's clinical complaints, comorbidities, and risks for disease; (2) to obtain a baseline patient assessment on admission; (3) to detect asymptomatic disease; (4) to discard maneuvers that have been shown to be insensitive, nonspecific, or rarely abnormal; (5) to include maneuvers that assess organ or patient function; (6) to develop and maintain clinician competency in performing and interpreting the exam; and (7) to facilitate patient–doctor bonding.

Table 1

Demographics of Physical Diagnosis Course Director (PDCD) and Internal Medicine Clerkship Director (IMCD) Respondents in a National Survey, 2011–2012

Characteristic	Total (N = 177)	PDCD (n = 94)	IMCD (n = 83)
Specialty			
Internal medicine	132	54	78
Family medicine	27	27	0
Pediatrics	4	4	0
Other specialties	13	8	5
Decline to answer	1	1	0
Gender			
Female	87	48	39
Male	87	44	43
Decline to answer	3	2	1
Age			
20–40	42	23	19
41–60	116	59	57
>60	15	10	5
Decline to answer	4	2	2
Region			
Northeast	58	32	26
South	55	26	29
Central	42	24	18
West	22	12	10

Discussion and Conclusions

We believe this to be the first large survey of U.S. medical educators on the topic of a core physical exam for medical students. Our survey elicited a robust response, with 71% of all PDCDs and 63% of all IMCDs in U.S. allopathic medical schools replying and 84% of all such schools being represented by either their PDCD or IMCD. A majority of respondents selected 37 of the 45 proposed core exam maneuvers to include in a core exam that should be performed by medicine clerkship students on every admitted patient. Our results suggest that among a large number of physical diagnosis course and internal medicine clerkship leaders there is openness to the core physical exam, and that these educators closely agree on the component exam maneuvers for it.

Previous work on developing a core exam includes a recently published study from the Netherlands, where Haring et al[18] found that educators at their institution

Table 2

Physical Diagnosis Course Directors' (PDCDs') and Internal Medicine Clerkship Directors' (IMCDs') Responses About Which Maneuvers to Include in a Core Physical Exam, 2011–2012

Maneuver	Voted for inclusion in core exam, no. (%)*			
	Total (N = 177)	PDCD (n = 94)	IMCD (n = 83)	*P* for χ^2 test
Core (selected by >50% of respondents)				
General appearance	176 (99)	94 (100)	82 (99)	.47
Level of consciousness	170 (97)	90 (97)	80 (98)	> .99
Auscultate cardiac sounds with diaphragm	169 (95)	90 (96)	79 (95)	> .99
Auscultate chest anteriorly and posteriorly	168 (95)	90 (96)	78 (94)	.74
Inspect extremities	167 (95)	88 (95)	79 (95)	> .99
Inspect abdomen	166 (95)	88 (95)	78 (95)	> .99
Inspect skin	165 (93)	89 (95)	76 (92)	.41
Palpate liver	164 (93)	86 (92)	78 (94)	.69
Orientation	163 (93)	88 (94)	75 (93)	.79
Assess lower extremity edema bilaterally	164 (93)	86 (91)	78 (94)	.53
Palpate abdomen in six areas	163 (92)	86 (91)	77 (93)	.75
Inspect thorax	161 (91)	87 (94)	74 (89)	.30
Inspect oropharynx and dentition	160 (91)	84 (90)	76 (92)	.77
Auscultate abdomen	159 (90)	85 (90)	74 (89)	.78
Lymph node exam (cervical, supraclavicular, axillary and inguinal)	148 (84)	79 (84)	69 (84)	.99
Palpate posterior tibial or dorsalis pedis pulses	148 (84)	82 (87)	66 (80)	.17
Heart rate (measure)	144 (81)	79 (84)	65 (78)	.33
External inspection of eyes and lid	141 (81)	73 (80)	68 (82)	.77
Respiratory rate (measure)	141 (80)	78 (83)	63 (77)	.31
Auscultate with bell at apex	139 (79)	77 (82)	62 (76)	.31
Palpate thyroid	138 (78)	78 (83)	60 (72)	.09
Assess speech	135 (77)	73 (78)	62 (76)	.75
Blood pressure (measure)	135 (76)	72 (77)	63 (76)	.91
Motor—upper and lower extremity strength/tone	134 (76)	74 (80)	60 (72)	.26
Cardiac point of maximal impulse	131 (75)	72 (78)	59 (71)	.27
Pupillary reaction to light	129 (73)	71 (76)	58 (70)	.33
Deep tendon reflexes—biceps and patellar	127 (73)	69 (75)	58 (70)	.45
Inspect joints	125 (71)	65 (70)	60 (72)	.73
Temperature (record if available)	123 (71)	69 (73)	54 (68)	.39
Cranial nerves	124 (70)	66 (71)	58 (70)	.87
Weight, height, and body mass index (record if available)	120 (70)	67 (73)	53 (66)	.35
Palpate carotids	117 (67)	62 (67)	55 (66)	.87
Jugular venous pulse	111 (63)	57 (62)	54 (65)	.67
Gait	106 (61)	63 (68)	43 (53)	.04
Percuss chest posteriorly	107 (61)	56 (61)	51 (61)	.94
Inspect limb alignment and symmetry	96 (55)	55 (60)	41 (50)	.20
Sensory—light touch or pinprick of feet	96 (55)	52 (57)	44 (53)	.64
Not core (selected by <50% of respondents)				
Palpate femoral pulses	87 (49)	50 (54)	37 (45)	.22
Otoscopic exam	82 (47)	53 (57)	29 (35)	.003
Cerebellar	81 (46)	46 (50)	35 (42)	.30
Check upper and lower extremity functional range of motion	79 (45)	44 (48)	35 (43)	.50
Fundoscopic exam	78 (45)	47 (51)	31 (38)	.09
Oxygen saturation (record if available)	75 (44)	40 (44)	35 (43)	.82
Auditory acuity	35 (20)	24 (26)	11 (13)	.03
Visual acuity	24 (14)	18 (20)	6 (7)	.02

*Survey respondents were given this list of 45 maneuvers and asked to choose whether each maneuver should be "required on every patient" or "required only when clinically indicated." A response of "required on every patient" was considered to be an endorsement for inclusion in the core exam.

Table 3

Core Physical Exam Maneuvers Based on a 2011–2012 National Survey, Arranged in Order of Typical Performance

Area of performance	Maneuvers in core exam	
General	• General appearance • Level of consciousness • Orientation	• Temperature (record if available) • Weight/height/body mass index (record if available)
Vital signs	• Blood pressure • Heart rate (measure)	• Respiratory rate (measure)
Head, ears, eyes, nose, and throat	• External inspection of eye and lid	• Pupillary reaction to light • Inspection of oropharynx and dentition
Neck	• Lymph node palpation (cervical, supraclavicular and axillary)	• Thyroid palpation
Chest	• Thorax inspection • Chest auscultation anteriorly and posteriorly	• Chest percussion posteriorly
Cardiac	• Carotid artery palpation • Jugular venous pulse • Cardiac point of maximal impulse	• Cardiac auscultation with diaphragm in six areas • Cardiac auscultation with bell at apex
Abdomen	• Abdominal inspection • Abdominal auscultation • Abdominal palpation in six areas	• Liver palpation • Lymph node palpation (inguinal)
Vascular	• Posterior tibial or dorsalis pedis artery palpation	• Assessment of lower extremities for edema bilaterally
Skin	• Skin inspection	
Extremities and muscoskeletal	• Inspection of extremities	• Inspection of joints • Inspection of limbs for alignment and symmetry
Neurological	• Assessment of speech • Cranial nerves • Motor exam of upper and lower extremities (strength and tone)	• Deep tendon reflexes (biceps and patellar) • Sensory exam (light touch or pinprick of feet) • Gait

selected 55 maneuvers as the minimum "standard" physical exam that students should perform on all new patients in their medicine clerkship. Fifty-five were selected for a minimum "standard" physical exam for students to perform on all new patients in their medicine clerkship. Other researchers have sought to achieve consensus on a core exam in subspecialty settings. Moore and Chalk[19] noted that texts describe 94 different elements of the neurologic exam. Using "the Delphi method," they found a high level of agreement among educators for a medical student "essential" outpatient screening neurological exam consisting of only 22 maneuvers.

Several important issues regarding the core exam emerged from the survey's free-text responses. The first concerned the length and scope of the exam. Some survey respondents argued for a strictly "hypothesis-driven" exam, whereas others advocated for a highly inclusive comprehensive exam. Though patient surveys have shown an expectation for a comprehensive annual physical exam,[20] the U.S. Preventive Services Task Force has taken the position that routine comprehensive exams have little screening value and should be abandoned.[21] In keeping with that position, we have been able to find little evidence to support performing a comprehensive physical exam on every patient.

Several studies, however, suggest that there is value to hypothesis-driven physical exam pedagogy. Yudkowsky et al[14] reported validity evidence for a method that trained students to anticipate and recognize physical findings within specified patient presentations. Peltier and colleagues[22] found that students who used symptom-driven focused history and exam scripts performed better physical exams and made clearer diagnoses than controls. Kamel et al[15] showed that students using a hypothesis-driven neurological exam had 78% sensitivity for identifying patients with a focal neurologic deficit, compared with a sensitivity of only 56% for students employing a more extensive screening neurologic exam. This improved sensitivity, though, was at the expense of lower specificity. The authors concluded: "Our study supports supplementing traditional methods of teaching the neurological examination with a hypothesis-driven approach." None of these authors, however, suggested paring the hypothesis-driven focused exam with a streamlined core exam, as in the previously described Core + Clusters model. We favor this model because it distills the comprehensive exam into a practical, educationally rational foundation that complements the diagnostic virtues of the purely hypothesis-driven exam.

The survey responses also raised the issue of whether an exam's context affects the maneuvers that should be performed. Indeed, a core inpatient internal medicine exam may be different from a core inpatient pediatric or surgery exam. Though further research is needed in this area, it is also possible that much of the internal medicine core exam may be valid in other settings with the inclusion of additional specialty-specific maneuvers. In this way, the core exam represents an opportunity to achieve horizontal curricular integration across clerkships. It also represents an opportunity for vertical integration. The high level of agreement on maneuvers between PDCDs and IMCDs may bridge the gap between preclinical faculty, clerkship faculty, and students' differing expectations of what skills are needed on entry to clerkships.[9]

The third issue raised by our survey respondents was how to address the need for students to practice and achieve proficiency in certain technically challenging maneuvers that may require regular practice, even though they might not be clinically necessary. Their concern is supported by Wu et al,[23] who showed that clerkship students have relatively low self-confidence in certain skills such as the fundoscopic exam, measuring jugular venous pulse, and detecting thyroid

nodules. We believe that student practice is an important educational consideration that can be addressed in a manner that is complementary to our core exam. Schools can keep the core exam concept intact for students by explicitly stating that certain maneuvers, though not integral to the core exam, should be additionally performed as "educational maneuvers" until competency is attained.

The fourth topic that emerged from our survey comments concerned the criteria that should be used to decide which maneuvers the physical exam should contain. Although some respondents offered reasons for their choices, a limitation of our study is that we did not ask all respondents to explain the clinical or educational rationale for their survey responses. Refinement and application of such criteria for the core exam represent fruitful avenues for future research.

Our study has a few other limitations. To reduce survey complexity, we chose to list certain maneuvers generally, without a more detailed description. For example, we did not define which specific maneuvers for "cerebellar" testing should be performed, or which structures and conditions should be evaluated on the "external inspection of eye and lid." These will need definition as the core physical exam is put into practice. Additionally, we did not receive responses from 29% of PDCDs and 37% of IMCDs. Significantly divergent responses from this group might have affected our final results. Further, the responses from clerkship directors were limited to directors of internal medicine clerkships. It is possible that survey responses from clerkship directors in other specialties might differ. More work in this area is needed. Nevertheless, we believe that the internal-medicine-based core exam has a unique role in guiding curriculum for the preclerkship period and may be adapted for other clerkships.

Having established support for the concept of a core physical exam, we are in the process of taking the next step: to develop hypothesis-based "clusters" of history and physical exam findings and to determine how and when these are most appropriately taught to medical students. We anticipate that many common clusters would be introduced in physical diagnosis courses, but that some more complex clusters might be best introduced in the clerkships or even later electives. We are in the process of developing such clusters and have found that this affords the opportunity to include or exclude exam maneuvers on the basis of best medical evidence as to their utility. Thus, the "Core + Clusters" approach to the physical exam might help translate the science of physical diagnosis into practical clinical skills and clinical reasoning.

A thoughtful clinical skills curriculum is one that has rationale for and clarity regarding which maneuvers should be performed routinely on patients and which ones need only be done when clinically indicated. We offer our findings as a guide for institutional curricular decisions and as an impetus for vertical and horizontal curricular integration. We hope they stimulate further national discussion among educators about the most effective approaches to teaching the physical exam. We believe that the model of a core exam described in this paper, coupled with hypothesis-driven sets of maneuvers, has the potential to enhance medical students' physical exam skills and to facilitate the development of their clinical reasoning.

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