

Reinvigorating the clinical examination for the 21st century

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ABSTRACT

At its most fundamental level, the clinical encounter between a patient and their doctor seeks to solve a mystery. Clinicians uncover clues through the history, physical examination, and ancillary tests to arrive at a diagnosis and develop a management plan. Despite advances in technology, the majority of clinical diagnoses are still reached through the history and physical examination without the use of laboratory and imaging tests. However, in the modern American hospital, clinicians spend as little as 12% of their time in direct contact with patients and their families. This has led to a decline in clinical examination skills and contributes to diagnostic error. There is a growing movement to return clinicians and trainees back to the bedside. In 2017, we formed the Society of Bedside Medicine to encourage innovation, education, and research on the role of the clinical encounter in 21st century medicine. Over the last 3 years, we have embraced the following 6 strategies to reinvigorate the practice of the clinical examination: 1) be present with the patient; 2) practice an evidence-based approach to the physical exam; 3) create opportunities for intentional practice of the physical exam; 4) recognize the power of the physical examination beyond diagnosis; 5) use point-of-care technology to aid in diagnosis and reinforce skills; and 6) seek and provide specific feedback on physical examination skills. By employing these strategies in both teaching and practice, clinicians can maximize the value of time spent with patients and renew the importance of the clinical examination in 21st century practice.

Introduction At its most fundamental level, the clinical encounter between a patient and a doctor seeks to solve a mystery. Clinicians uncover clues through the history, physical examination, and ancillary tests to arrive at a diagnosis and develop a management plan. Despite advances in technology, the majority of clinical diagnoses are still reached through the history and physical examination without the use of laboratory and imaging tests.¹ However, in the modern American hospital, clinicians spend as little as 12% of their time in direct contact with patients and their families.^{2,3} A number of factors have pulled both attending physicians and learners away from time with patients, including the electronic health record, duty hour constraints, and increased demand to treat more patients in a shorter amount of time.⁴ As a result,

skills that can only be practiced in the presence of patients, such as the physical exam, have declined in recent years.⁵⁻⁷ This decline adversely impacts patient care. Almost 50% of diagnostic errors in the outpatient setting can be traced to an error in the physical exam.⁸ In the majority of cases, the error is simply that the appropriate physical examination maneuver has never been performed.⁹

Over the last 100 years, clinical educators have taught physical exam skills to learners by modeling those skills at the bedside. As physical exam skills have declined, fewer physicians are confident enough in their skills to teach routinely at the bedside. Teaching rounds that used to be spent in the presence of the patient are now relegated to the hallway or conference room. Any time spent with patients is also more fragmented

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and fraught with distractions due to the electronic health record, pages, phone calls, and texts. This has led to a notable discordance between what teachers think they are modeling at the bedside and what residents see being done.¹⁰

Recognizing the need to encourage innovation, education, and research on the role of the clinical encounter in 21st century medicine, we formed the Society of Bedside Medicine in 2017.¹¹ Members of the society are dedicated to “fostering a culture of bedside medicine through deliberate practice and teaching.”¹¹ Through this growing community of clinician educators, we have embraced 6 specific ways to reinvigorate the practice of the bedside clinical examination.

Six strategies to reinvigorate the bedside clinical examination

1. Be present with the patient The famous bank robber Willie Sutton was reported to once say “I rob banks because that’s where the money is.”¹² It seems obvious that in order to perform the physical exam, a physician must be physically present with a patient. The physical presence of a provider with a patient, in both the outpatient clinics and inpatient wards, allows for direct observation of clinical clues. Whether it is a patient’s glance, grimace, or grunt during a maneuver, the response to certain aspects of the physical exam can be as important to yielding diagnostic possibilities as the maneuvers themselves. Physicians can be trained to improve their powers of observation with the same methods proven to help detectives.¹³ When medical students are taught systematic strategies of intentional looking, such as practicing observation skills in an art museum, visual fluency improves.¹⁴ Courses combining art and medicine patterned after the example from the Yale School of Medicine, such as those at the University of Alabama at Birmingham and Stanford University, also teach students new ways to understand hidden biases and to tolerate ambiguity in medical practice.¹⁵ But to glean the most out of the clinical encounter, physicians benefit from being prepared to be present with patients.

The Stanford Presence 5 program offers a ritual of connection, firmly grounded in medical evidence, to facilitate meaningful connections between providers and patients.¹⁶ Wherever the clinical encounter occurs, providers that prepare for it with intention (perhaps by taking a moment to focus attention before the visit) will be more open to noticing clinical clues. Likewise, when providers use their time with the patient to listen intently and completely, and agree on the patient’s health goals, nuances in the history and physical exam emerge. Finally, finding a way to connect with the patient’s circumstances and tuning in to the emotional clues offered helps improve observation and connection.¹⁷

2. Practice an evidence-based approach to the physical exam Many physicians no longer consider the physical exam to be a valuable part of

the diagnostic process.¹⁸ One reason for this perceived lack of value is the false assumption that technology-based tests are inherently more reliable than what clinicians can sense with their eyes, ears, hands, and sometimes noses. This is simply not true! There are numerous examples where an astute observation at the bedside is the diagnostic gold standard for a specific condition (eg, the dermatomal rash of herpes zoster).¹⁹ The interrater reliability of many physical exam maneuvers also compares favorably to that of technology-based tests (eg, the ability to detect hypotension or to distinguish a long vs short systolic murmur).²⁰ It is important to disavow clinicians, and particularly trainees, of the notion that technology is fundamentally better for diagnosis.

Teaching the physical exam without context can also cause some clinicians to become nihilistic about its utility. When taught as a list of maneuvers to be performed regardless of the clinical situation, the physical exam loses meaning. Some people call this the “head-to-toe” approach. In the first years of medical school, students learn this head-to-toe approach and are assessed on their ability to perform the maneuvers on this extensive list. However, it is often not taught to then tailor these exam techniques to each individual patient and to incorporate physical exam findings into the diagnostic reasoning process. This is in stark contrast to how other diagnostic tests are taught and obtained.²¹

Clinicians in practice perform selected maneuvers in a sequence choreographed for each patient. For example, there is a difference between the initial examination for a patient presenting with chest pain versus one presenting with toe pain. Clinicians tailor their examination to the individual likelihood of disease for each patient and perform maneuvers that are likely to revise these probabilities. This approach to the physical examination is referred to as the “hypothesis-driven physical examination” (HDPE).²¹

The HDPE is foundational for mature medical decision making. It starts by determining the pretest probability of disease, selecting tests based on their ability to increase or decrease that probability (often by using likelihood ratios), and interpreting the results in context to arrive at a refined list of differential diagnoses. Consider a case of a 70-year-old man who presents to the clinic with exertional dyspnea. One wonders if he might have aortic valvular disease. The pretest probability of aortic stenosis in this case can be estimated using the prevalence of aortic stenosis in men over the age of 65, which in some studies is as high as 9%.²² However, if the patient is examined and does not have a systolic murmur, the negative likelihood ratio for aortic stenosis is 0.1. This decreases the probability of aortic stenosis by as much as 45%,²⁰ which would make it incredibly unlikely that this patient’s symptoms were caused by that particular valve lesion.

The HDPE rests on a strong foundation of clinical suspicion. Once that foundation is firmly in place, clinicians can use established resources, such as McGee's *Evidence-based Physical Diagnosis*, to understand the likelihood ratios of specific tests.²⁰ When attempting to answer clinical mysteries, it is also important to know how well certain tests perform between 2 similarly trained physicians. This interobserver reliability (often represented by the κ statistic) provides a benchmark for both reliability and generalizability. For example, in the case of suspected aortic stenosis above, the interobserver reliability of detecting a 2/6 systolic ejection murmur is 0.59, which is very good for a clinical test (κ scores above 0.4 are considered good, while scores above 0.75 are considered excellent).²³ Knowing which tests *not* to use to solve a clinical question is also important. If the clinician were to try to answer the question about whether or not our patient above has aortic stenosis by looking for crackles on pulmonary auscultation, no matter how well performed the test, the results would not answer the clinical question. However, when appropriately used in the mental decision tree a physician employs during the HDPE, listening for lung crackles may suggest the functional impact of a murmur that is detected during cardiac auscultation. As with a laboratory or imaging result, both physical examination signs work synergistically to aid the physician's clinical judgement of the cause for the patient's shortness of breath.

By framing the practice of the physical exam in terms of a solid evidence base, we can improve its overall diagnostic yield. This allows the focus of teaching efforts on only those maneuvers that significantly impact the probability of disease. We can also combat the false assumption that technology-based tests are always the preferred diagnostic modality.

3. Create opportunities for intentional practice of physical examination skills In order to improve physical exam skill, we must create opportunities for trainees to practice those skills. This is perhaps one of the greatest challenges given the time constraints of modern medicine. Institutional founding members of the Society of Bedside Medicine have proposed a number of ways in which this can be accomplished.

At Johns Hopkins University, educators created a cardiopulmonary physical exam curriculum that uses a combination of online videos of real patients alongside recurring bedside teaching sessions with real patients to improve cardiopulmonary exam skills.⁴ This program has evolved to include sessions on the gastrointestinal as well as neurologic examinations, and also includes training in point-of-care ultrasound (POCUS).

Recognizing that time is a critical limiting factor in bedside teaching, medical educators at Stanford University created the "5-minute moment."²⁴ This teaching technique highlights a physical

exam abnormality, such as gynecomastia, by introducing the topic with a memorable narrative, such as a historical reference or the educator's experience with the abnormality. Once introduced, the educator demonstrates how to elicit or confirm the finding, taking time to demonstrate the pitfalls of improper technique. Learners can then practice the technique and receive real-time feedback. By using this prepared and active teaching method, ward attendings come to rounds prepared with a toolbox of teachable moments that can make time at the bedside both evidence based and impactful.

Educators at Johns Hopkins University have also created a novel morning report called "case-oriented report and examination skills" (CORES). Following a traditional morning report where a patient admitted the night before is discussed in a structured case format, the group goes to the bedside to examine the patient. This reinforces the value of the bedside clinical examination as new findings are often appreciated that change the formulation of the case.²⁵

A growing number of train-the-trainer activities provide educators with the opportunity to hone their skills and improve their bedside teaching. Some national conferences focus exclusively on clinical skills, such as the Stanford 25 Clinical Skills Symposium.²⁶ Other international conferences host breakout sessions on clinical skills, such as the American College of Physicians' Herbert S. Waxman Clinical Skills Center.²⁷ No matter the format, we must find time to incorporate the intentional practice of physical exam skills into graduate medical training.

4. Recognize the power of the examination beyond diagnosis Experienced clinicians recognize that the bedside clinical examination does more than reveal clues that lead to a diagnosis. Indeed, the physical exam itself is a ritual, embodying the power and transformation that can occur in other rituals. As elegantly described by Abraham Verghese, the ritual of the physical exam can help better understand the patient.²⁸ When patients don a gown and allow themselves to be examined by tools unique to the physician's profession, such as a stethoscope or reflex hammer, specific needs of the patient, such as the need to be cared for, are addressed. In addition to building strong relationships between physicians and patients, the physical exam can also have a placebo effect.²⁹ A well-performed physical exam can increase patients' confidence in their provider and improve symptoms. A randomized study among patients with irritable bowel syndrome demonstrated that warmth and empathy during the clinical examination offered measurable improvements in symptoms.³⁰ This important part of the bedside clinical encounter also improves patient satisfaction.³¹ The converse is probably also true: a physical exam done poorly, or not at all, may harm the therapeutic alliance and impact patient satisfaction.

Benefits from a well-performed physical exam are also enjoyed by the physician. At a time when studies have documented that about half of practicing physicians are experiencing symptoms of burnout from their work, a well-performed physical exam can help mitigate those symptoms.³² A recent survey of high-performing primary care practices indicated that the ability to establish meaningful relationships with patients and to provide high-quality care increased physician fulfillment.³³ One way to achieve both is through a quality bedside clinical examination.

Stepping back, one realizes the range of opportunities that emerge from being in the presence of the patient: from diagnostic accuracy to assessment of prognosis; from patient contact to building therapeutic relationships; from educational value to the opportunity to enhance patient safety. The physical exam binds all of these core values together.³⁴

5. Use point-of-care technology to aid in diagnosis and reinforce skills

A 21st century definition of a quality clinical examination should include all available bedside modalities that help solve the diagnostic mystery. The physical exam can be augmented—and more clinical clues determined—when technology is used appropriately. In the classroom setting, technology can improve detection of clinical clues by improving auscultation skills. For example, the Blaufuss Multimedia platform provides teaching materials as well as assessments that have been shown to improve performance when used as part of a curriculum to enhance cardiovascular exam skills.^{4,7,35,36} Digital stethoscopes can be used during the bedside encounter to allow multiple learners to appreciate auscultatory findings simultaneously. This allows a faculty instructor to integrate visual and tactile findings while listening to heart sounds.²⁵

Another 21st-century technological advance in the bedside clinical examination is the use of point-of-care ultrasound (POCUS) to detect clinical clues. POCUS increases the diagnostic yield for many important findings including pericardial effusion, reduced ejection fraction, volume status, pleural effusion, ascites, and deep vein thrombosis. It can also reinforce provider confidence in more traditional physical exam maneuvers by calibrating physical exam findings with real-time visualization. Moreover, POCUS provides an opportunity to connect with patients by visually demonstrating abnormalities as part of the bedside exam. This might lead to improved patient engagement, compliance with therapeutic interventions, and a better overall patient-physician relationship.³⁷⁻³⁹ But perhaps the most valuable aspect of POCUS is that in order to use it, providers must be present with their patients. Thus, POCUS and other point-of-care technologies are among the most powerful levers to get providers, particularly trainees, back to the bedside.

6. Seek and provide specific feedback on physical examination skills

Once clinicians are present with patients at the bedside, have trained their mind to search for clues based on an HDPE, have understood the layered benefit of the physical exam they are performing, and begin to leverage technology at the bedside, the last—and perhaps the most important—way to improve the clinical examination is to seek and provide feedback on physical exam skills. However, there are few opportunities for direct observation and feedback of clinical skills in graduate medical training in the United States (US).⁴⁰ Several effective examples of summative assessments of residents' clinical examination skills exist outside of the US. For example, in the United Kingdom (UK), all graduating residents must pass the MRCP (UK) Practical Assessment of Clinical Examination Skills (PACES) in order to advance to the next stage of their training.⁴¹ During PACES, trainees examine real patients while being observed by faculty members who have themselves examined the patients and determined what findings are present.⁴² This type of assessment drives learning. From day one in medical training, UK students prepare for this high-stakes assessment. However, in the US, there is no practical assessment of graduate trainee skill. The American Board of Internal Medicine ended the in-person component of board certification in the 1970s. Medical students must pass Step 2 Clinical Skills exam of the United States Medical Licensing Examination,⁴³ but this involves standardized patients with no real findings, and thus can only assess technique, and not interpretation. The hidden curriculum in US graduate medical training de-emphasizes the value of the physical examination since high-stakes assessments are multiple-choice tests of knowledge and not skill.

There is currently no appetite to bring back a summative high-stakes assessment of clinical skills in the US. However, novel approaches of assessing the skills of internal medicine residents earlier in their training are presently underway. These formative assessments provide an understanding of the strengths and weaknesses of a resident's clinical examination skills based on faculty-observed interactions with actual patients. One such program is the Johns Hopkins Assessment of Physical Exam and Communication Skills (APECS), which is modeled after the MRCP PACES exam. During this formative experience, first-year residents (interns) rotate through 5 stations where they examine 8 patients (7 real patients, 1 standardized patient) in front of 2 faculty members who themselves examined the patients on the morning of APECS and agreed on the findings that are present. During each patient encounter, interns are assessed across 7 domains of clinical skill. Following the assessment portion of the exam, interns rotate back through each station and receive hands-on feedback from the faculty preceptors. Now in its second year, APECS

has been a wonderful way to enhance house staff clinical skills and has created a community of faculty members who are dedicated to teaching at the bedside.

Perhaps the most lasting benefit of direct observation and feedback is that it brings examiners, trainees, and patients together. It does not matter if the assessment is summative or formative in nature. It simply matters that assessment happens.

Conclusion Many factors help the astute clinician solve medical mysteries. Being well-trained in clinical examination skills gives clinicians fluency in detecting clues that can help them determine the best way to answer the patient's clinical query. Having the desire to maximize the value of time spent with patients is a good place to start. Being armed with the 6 specific interventions described above will help ensure success.

Not all mysteries get solved. Not all clues lead down a productive path. But if we begin with a prepared mind to imagine the possibilities of each encounter, we are more likely to achieve our ultimate objective in patient care. For hundreds of years, the history and physical examination have been the most powerful tools to understand our patients' clinical mysteries. By employing the 6 interventions described above, we can reinvigorate the practice of the clinical exam and ensure its continued relevance in 21st century medicine.

ARTICLE INFORMATION

CONFLICT OF INTEREST All authors are founding board members of the Society of Bedside Medicine, a nonprofit dedicated to education, innovation, and research on the role of the bedside encounter in 21st century medicine. Board members are volunteers and do not receive payment for their time and effort.

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