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# Methods to Reduce Medical Over-testing of Patients

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## Abstract

Medical over-testing occurs when a physician utilizes unnecessary lab examination when treating a patient. Over-testing can occur in any medical specialty or level of expertise. Some medical tests have inherent dangers to health, which, in addition to the costs of the tests themselves, can cause more financial burden for patients. If doctors continue to over-test, they run the risk of increasing the cost of healthcare and diminishing the integrity of their medical practice. Therefore, clinicians need to mitigate over-testing. Current research has provided many reasons why doctors over-test their patients. In addition to this research, this paper will incorporate studies concerning the overprescription of medications—another example of medical excess. There are parallels that exist among the rationales of over-testing and overprescribing doctors. By leveraging the data from both instances of medical excess, this paper will create a theoretical framework that organizes the reasons why doctors overtest within the context of the inter- and intrapersonal dynamics that exist in a clinical setting. This framework can serve as a guide for healthcare providers, so they can analyze strategies that would be most effective in combating over-testing in their practices.

## Introduction

Medical over-testing is the act of subjecting a patient to unnecessary examination. Doctors—regardless of specialty or practice size—can over-test their patients. Even for a small primary care doctor, ordering an additional test can be as simple as referring the patient to another clinic to have the test completed, or collecting specimens and sending it off to an external lab.

While over-testing may appear simple to the doctors who order them and insightful to the patients who receive them, there are downstream effects of over-testing that harm our healthcare system. First, tests have costs. Both the doctor and the patient can have financial incentives to over-test, but if a doctor chooses to over-test a patient, the patient or their insurance will have to pay. Money aside, unnecessary tests have other costs like lost time and resources of our healthcare system. Second, irrelevant or superfluous testing increases the chances of receiving false-positives. A false-positive result may lead to a cascade of more tests in order to demystify the false-positive. A greater danger is a false-positive leads to a misdiagnosis, followed by unneeded prescriptions and even surgery. Again, all of this is at the cost of the patient and/or insurance. Third, certain tests have inherent risks to them. A prime example is radiation exposure during imaging tests. If such a test is indeed required, then the benefits outweigh the risks. However, an unnecessary test can be dangerous.

A common assumption by the public is that medical providers may have financial incentives to utilize lab tests. A doctor motivated by profit can rationalize this behavior with the financial benefits of over-testing. The relationship between them and their patients and workplace is driven by a definitive prize: money. This assumption has some basis, as there are cases in which doctors cannot separate their financial goals from the medical services they render to patients. However, doctors who over-test may not be taking advantage of a conflict of interest. Rather, they are suffering from a conflict of conscience. Current research lends additional insight into the rationale of over-testing doctors. I believe a framework can be created that presents this rationale into external pressures and an internal motivating factor. External pressures provide the context and opportunity for a person to behave a certain way. Internal motivating factors will determine whether or not the person seizes on that opportunity. By this framework, we can create a pathway to over-testing. Healthcare administrators and clinicians themselves can identify where their medical practice is positioned along the pathway. In doing so, they can extract from this framework solutions that would be specific to their situation and prevent over-testing.

## Literature Review

Current research and scholarship on the issue of over-testing shows that the reasons for why doctors over-test patients can be categorized into five

patterns of behavior: adhering to patient expectations, training and experience, managing time limitations, accessing readily available tests and ignoring potential harm, and defensive medicine. Understanding the rationale of these behaviors is necessary to developing solutions to over-testing.

## Adhering to Patient Expectations

Customer satisfaction and retaining a patient's business are factors that a practicing physician may consider (Butler et al., 1998). When this happens, the doctor-patient relationship becomes controlled by the patient's expectations of the relationship. If there is a lack of communication between patient and doctor, these patient expectations are strong pressures, causing the doctor to stray from their responsibilities (Britten, 2004).

The role of patient expectations has been studied in cases of doctors overprescribing medications to patients. In a study of 22 Australian general practitioners and 336 patients, the influence of patient expectations was described quantitatively. University of Newcastle researchers Jill Cockburn and Sabina Pit found that if a patient expected medications after their appointment, the patient was about three times more likely to get a prescription from the doctor; if a doctor perceived a patient to be expecting medication, the patient was ten times more likely to get a prescription (1997). Cockburn and Pit concluded that it was a doctor's perception of patient expectations, not the patient expectation themselves, that was the strongest predictor of the doctor prescribing medication.

However, how do we ascribe how certain these doctors were in perceiving patient expectations for medicines? It may be premature to assume that the prescription alone is an indication of the doctor's certainty, because the doctor may be ignoring their skepticism and providing a prescription for other reasons (i.e., patient/customer satisfaction). Using questionnaires and interviews with patients and doctors, Jenkins et al. observed results similar to Cockburn and Pit's study: if a doctor thought the patient wanted a prescription, the patient was more likely to get the prescription (2003). Unlike Cockburn and Pit's experiment, Jenkins et al. were able to determine how certain the doctors were in their assessing whether a patient wanted a prescription or not. Doctors were uncertain of their patient's expectations only 8% of the time. Meanwhile, patients were uncertain of their preferences for a prescription 37% of the time (Jenkins et al., 2003). Nicky Britten, professor of applied healthcare research at the University of Exeter, characterized these results as an example of physicians exerting too much confidence in their abilities to assess patient expectations (2004). Indeed, this overconfidence could explain why doctors were correct in assessing their patients' expectations for medication only 53% of the time (Jenkins et al., 2003).

Communication is the reason why doctors rely on their perceived patient expectations versus being clearly aware of patient expectations.

Tanya Stivers, professor of sociology at University of California at Los Angeles, used audio- and videotapes of patient interactions to study how parents urge pediatricians to prescribe antibiotics for their children. Stivers recognized that there are explicit and implicit ways for parents to do so. Implicit communication is more common than explicit, and that explicit demands for antibiotics are actually infrequent (2002). Thus, physicians have to rely on how they perceive patients' expectations and preferences. This could explain why Cockburn and Pit observed patients were ten times more likely to get a prescription if their doctors perceived medications to be demanded (1997).

We can apply these studies of prescribing medicine due to patient expectations to the current subject of over-testing. Rowe et al. of Northwestern University Feinberg School of Medicine sought to understand why doctors were ordering unnecessary tests for patients. In the course of interviews, Rowe et al. established that the doctors knew these tests were unnecessary. However, the doctors chose to accommodate patient preference or at least whatever the doctor assumed to be the patient's preference (2021). In effect, the doctors were waiving their medical knowledge to prioritize patient happiness. This deference to patient preference for testing echoes the prescription research of Jenkins et al. and Cockburn and Pit.

Additionally, Rowe et al. reported that some physicians believe more testing is a symbolic gesture of doing everything they can for the patient (2021). Similarly, Butler et al. of the University of Wales College of Medicine found that some doctors believe not prescribing a medication for patients is equitable to "'having done nothing' for patients'" (1998, p. 639). In both cases of over-testing and overprescribing, doctors make conscious decisions to override their medical expertise and capitulate to patient preference. Doctors can use their privileges to test and prescribe in order to keep patients happy and returning for care.

## Managing Time Limitations

Navigating from patient to patient, doctors operate on tight schedules. Therefore, over-testing can be a tactic to evade discussing patient medical histories (Vaughn et al., 2019). Time limitations can even prevent medical staff from discussing the overuse of tests as well as canceling tests (Vrijsen et al., 2020). Doctors can have their difficulties increased when patients demand, explicitly or implicitly, that they would like to have certain procedures performed. Analogous situations can be observed in doctors who knowingly prescribe unnecessary antibiotics to demanding patients because the doctors found it too time- and energy-consuming to explain the negative effects of the antibiotics (Butler et al., 1998). Also, finding the source of patients' concerns is not only time-consuming, but also personally taxing for doctors (Barry et al., 2000; Britten, 2004). Over-testing can be a way out of these situations.

## Training and Experience

Although doctors receive years of training, it is not uncommon for physicians to be insecure in their knowledge and experience. This insecurity can lead to over-testing because some doctors may find it embarrassing to reach out to colleagues for help. Instead, they turn to more laboratory tests (Greenberg & Green, 2014). However, how the doctor decides to learn from their over-testing can affect the future doctor they become.

Over-testing can be used to create teachable moments. For example, if a doctor is unsure of a patient's prognosis, the doctor can order a variety of tests. It is only until the test results are analyzed and a final prognosis is made that the doctor can recognize which tests were indeed necessary. For future patients with similar presentations, the doctor has a better judgment of which tests should be ordered. In effect, the doctor engages in hit-or-miss testing. This 'knowledge by over-testing' would be expected of residents. When interviewing healthcare providers about inappropriate testing, Vrijsen et al. found that resident supervisors were well aware their residents were prone to over-test their patients. Additionally, the supervisors conceded that over-testing wastes clinical time. However, the supervisors believed the benefit residents receive via 'knowledge by over-testing' outweighs the issue of lost time (2020).

On the other hand, over-testing throughout the course of training can lead to reflexive testing. Unlike in the previous case, where over-testing is situational and subsides once the physician has gained adequate experience, reflexive testing is the persistence of over-testing behavior despite the physician's better judgment. Upon observing a patient's signs or symptoms, the doctor reflexively orders a test in response (Vaughn et al., 2019). However, further discussion of the patient's current situation or medical history could have provided the doctor with sufficient information, thus making the test unnecessary. It is possible that the doctor engages in reflexive testing because experience has taught them that over-testing is easier than conducting deeper patient evaluations. This is not 'knowledge by over-testing.' Rather, this is 'peace of mind by routine.' The studies by Vaughn et al. and Vrijsen et al. affirm that doctors are impressionable when it comes to over-testing. This behavior can be deemed appropriate if doctors see and/or believe their coworkers and supervisors do so.

## Accessing Readily Available Tests and Ignoring Potential Harm

When interviewing internal medicine residents, Vrijsen et al. found that the electronic interfaces used to order tests played a significant role in over-testing (2020). Ordering a test is as easy as checking a box on a computer. Possibly owing to the easy accessibility of lab tests, some doctors exhibit complete or willful ignorance to the potential harm of over-testing. This can occur through a combination of overestimating benefits and underestimating damages of over-testing. Rowe et al. found

that physicians will misjudge the consequences of over-testing on the basis that 'more is better' and that tests can help catch what doctors had missed (2021). Thus, the potential harms are not prioritized.

## Defensive Medicine

Defensive medicine occurs when a provider renders medical service for the sake of protecting themselves from potential damages. Potential damages include malpractice claims against the provider and negative reviews from the patients that could damage the physician's reputation (Bester, 2020). Defensive medicine is common and pervasive across medical specialties. A key difference amongst the medical disciplines is how physicians judge the magnitude of malpractice claims against them. For example, a doctor who performs surgeries may believe they have greater malpractice risk than a doctor who does not perform surgeries (Rubin & Bishop, 2013). Nonetheless, doctors have equal concerns about malpractice claims irrespective of their specialties' estimated risk (Bishop et al., 2010).

Ordering tests is a common avenue of defensive medicine. It is reminiscent of Rowe et al. and Butler et al., where doctors cite over-testing and overprescribing as a means of ensuring patient satisfaction. Defensive medicine is not the same as practicing 'knowledge by over-testing' as reported in Vrijsen et al. For example, some doctors reported to Rowe et al. that they ordered lab tests to possibly catch what the doctor had missed (2021). This is not defensive medicine because at its core, the doctor's goal was to gather evidence about the patient.

Johan Bester, director of bioethics at the University of Nevada Las Vegas, outlines the ethical argument against defensive medicine. Bester argues defensive medicine erodes faith in medical practitioners. Doctors are ordering tests or performing procedures not to better serve the patient, but to serve as evidence in a possible malpractice case (2020). Writing for the American Medical Association Journal of Ethics, pulmonologists Crystal Brown and David Brush argue that defensive medicine harms a doctor's obligation to provide informed consent: "If the physician inaccurately plays up the benefit of the procedure, deceives the patient into believing that it is necessary, or inappropriately minimizes the potential risks, the patient's consent is invalid" (p. 787). In effect, defensive medicine prioritizes a doctor's sense of self-preservation over a patient's self-determination (2010).

A doctor's sense of self-preservation can be threatened by a lack of confidence in their ability to explain medical care, promote patient retention, manage a busy practice, and have final say over insurance companies. Physicians have cited insurance-related work as a drain on doctors' autonomy and work drive. The Alliance for the Adoption of Innovations of Medicine conducted a survey of 600 primary care physicians. Eighty-seven percent of the doctors said insurance companies interfere with their medical practice, and 84% of them do not believe

health insurance companies trust doctors' medical expertise (2018). Self-doubt and burnout can be instilled into doctors when insurance and pharmaceutical companies limit the treatments a doctor can prescribe (Kumar et al., 2021). When encumbered by these circumstances, doctors may resort to defensive medicine to protect their practice.

Defensive medicine can hurt a patient through medical errors or inherent dangers of the tests themselves (Bester, 2020). There are also the financial costs of defensive medicine. In 2001, it was estimated that doctors were paying malpractice payments that were 11% higher than in 1993, and $2.5 billion of healthcare spending could be sourced to defensive medicine (Mello et al., 2010). Thereby, the doctor has violated an oath to not harm patients by practicing defensive medicine, and over-testing is a manifestation of defensive medicine.

## Theoretical Framework

To synthesize the many motivations behind over-testing, it may help to introduce a framework that conceptualizes the inter- and intrapersonal dynamics of a medical practice. At the core of the framework, is the physician. Surrounding the doctor are external pressures. These are environmental factors that push a doctor to consider over-testing a patient. However, external pressure alone is not sufficient to result in over-testing. There needs to be an internal motivating factor that causes a physician to act upon these external pressures.

How do we account for the five aforementioned reasons for why doctors over-test? External pressures encapsulate four of the five reasons: patient expectations, training and experience, time constraints, and ease of access to tests. These four pressures are environmental conditions that a doctor encounters and must manage while trying to deliver medical care. Defensive medicine is the internal motivating factor of doctors. This is when a doctor's desire for self-preservation dominates over medical intuition and responsibility.

This framework treats over-testing as a pathway. The four external pressures probe a physician's sense of self-preservation. Defensive medicine is the physician's route to escaping these pressures, stirring the doctor to over-test patients. This framework is not meant to extrapolate solutions for over-testing. The purpose of this framework is for medical practitioners to identify where they are on the pathway and which external pressure most directly affects them. By doing so, they can address their problem of over-testing with the most appropriate solution. In the next section, I will discuss the various strategies to prevent over-testing and where and when these solutions could be best applied.

## Discussion

Solutions can be sorted as interpersonal, educational, technological, and policy solutions. However, these solutions are not one-size-fits all. It is imperative to consider the size of the practice as well as how experienced

the doctors are. Implementing solutions takes time and financial resources, and a great degree of training is involved. So not only would choosing an inappropriate solution be wasteful, but it could also be destabilizing for the practice and prevent doctors from treating patients promptly.

## Interpersonal Solutions

Interpersonal solutions include more frequent discussions amongst physicians and patients alike. Vrijsen et al. reported that residents were aware that more communication amongst their peers would prevent over-testing (2020). This includes confirming with fellow doctors if a test is indicated and having weekly meetings to review which tests were actually necessary. This method of having open discussions of over-testing can be more meaningful, as physicians who practice medicine together often emulate similar behaviors (Bester 2020). Additionally, frequent conversations would prevent the embarrassment some practitioners could have when they are unsure about ordering lab tests for patients. As Rowe et al. conclude, it may be more effective to resolve the issue of over-testing by addressing the doctors' psychological reasoning versus merely convincing doctors why each test is clinically incorrect (2021).

In terms of doctor-patient communication, doctors should be more forthcoming with the negative effects of over-testing. While a doctor may assume they should provide lab tests according to a patient's wishes for the sake of patient happiness, this would be irresponsible logistically and morally. Logistically, the lab incurs a financial and time cost. Morally, the doctor compromises their role of delegating medical information and service for the absolute betterment of the patient. In the case of over-testing, a patient's happiness does not necessarily translate to patient wellness. Additionally, Tanya Stivers' research showed that patient demands are usually made implicitly not explicitly (2002). Therefore, a physician should attempt to elicit patient expectations and offer medical advice that is realistic and frank. Some patients may interpret this conversation as being combative or dismissive. Physicians should then present these discussions as a means of incorporating patients into their own treatment plan. This way, patients will feel that their false expectations have been considered rather than rebuked. Interpersonal solutions can shield a physician from external pressures that would trigger their lack of confidence, thereby preventing a possible pathway to over-testing.

Establishing stronger relationships with patients will require longer meeting times. While this may be frustrating and too time-consuming to current practitioners, they should account for the time saved and reduced workload because of less lab tests. Also, physicians should consider that stronger relationships with patients will allow doctors to shed the mental conundrum they find themselves in while considering perceived patient expectations. As Butler et al. showed, doctors may provide services because they want their patients to feel that they received something after

a consultation (1998). Cockburn and Pit and Rowe et al. again presented the great consideration physicians have for perceived patient expectations and preferences (1997; 2021). Although building stronger relationships may take more time, doctors should consider this time spent as an investment for a more efficient medical practice.

Interpersonal solutions will allow physicians to confront external pressures head on. By discussing the risks of over-testing with patients and colleagues, doctors can avoid the mental dilemma of relying on patient expectations or being embarrassed by colleagues for asking questions. By strengthening the relationship with patients, doctors can offer services that are medically sound and not for the sake of patient happiness or defensive medicine. Improved relationships with patients could ease a physician's worry about patient retention. Also, physician confidence may improve if doctors perceive patients to be on their side, whereas before doctors would feel it was physicians versus patients and their insurance companies.

## Educational Solutions

Educational solutions can be implemented both in medical school and residency training. These programs consist of informing future or current medical providers of the ethical and financial costs of over-testing. With respect to ethics, the medical school curriculum should teach strategies to avoid defensive medicine. As a professor of bioethics, Johan Bester could personally recall his medical students' desire to learn how to protect themselves when they eventually become practitioners (2020). Without affirmative guidance on how to juggle patient well-being and the safety of their own careers, physicians will most likely resign themselves to practice defensive medicine. Therefore, early educational programs in medical school that address defensive medicine could help equip future doctors with the necessary skills to combat medical overuse wherever they decide to practice medicine. Programs like the Do No Harm Project at the University of Colorado School of Medicine encourage medical trainees to engage in the conversation of medical overuse. The Do No Harm Project uses vignettes written by residents and students. These vignettes illustrate the dangers of over-testing and overtreating patients. The Do No Harm Project wishes to dismantle the medical approaches that 'more is better' and 'earlier the better,' because such attitudes can be drivers of medical excess (Caverly et al., 2014).

In terms of understanding the financial costs of over-testing, educational programs require medical practitioners to be more attuned with logistics and administrative standards. Thus, strategies to improve consideration of medical finances are more likely to be effective after the doctor has entered a practice. Christopher Moriates and his colleagues of University of California, San Francisco explain a new program that would train residents to be more cost aware, improve perceptions of cost control, and encourage cost-saving behaviors. Moriates et al. enlisted the help of 176 internal medicine residents to test the new program. They found that a

case-based curriculum improved cost-consciousness in the residents. Specifically, the doctors could reduce costs by having a better sense of which tests or treatments to utilize. In one case-study the residents analyzed, Moriates et al. found that almost $10,000 of medical billing could have been prevented if the residents had a better understanding of guidelines to treat the patient's condition (2013). Instructional programs like this can be effective because they allow for physicians to be more proactive in their approach to prevent over-testing. Rather than a vague admonishment to avoid over-testing, educational programs like that of Moriates et al. encourage medical providers to engage existing clinical evidence and institutional guidelines before ordering tests or treatments.

If we examine these educational solutions with respect to our framework, we can predict that these programs are more likely to be effective when instituted early (i.e., in medical school or in residency). Educational programs that teach for cost-awareness and against defensive medicine could be less meaningful if a lack of confidence or workplace culture of overtesting has been deeply ingrained within a doctor's practice. Educational solutions will likely interrupt the pathway to over-testing by helping physicians deflect external pressures before they can trigger anxieties over self-preservation of their practice. Educational solutions should be implemented in medical school and residency rather than as continuing education for doctors who have had years of experience.

## Technological Solutions

Unlike educational solutions, technological solutions are less interested in targeting the root psychological causes of over-testing and more concerned with simply stopping repetitive behaviors whenever they occur. Technological solutions can be relatively simple like increased supervision by attending physicians or more complex such as using computer systems to keep track of lab test use. For example, it has been suggested that clinics utilize pop-up messages, system lockouts, or automatic order rejections to alert doctors that they have been overusing specific tests (Vrijsen et al., 2020; Vaughn et al., 2019). These computerized alerts do not directly offer doctors lessons on why or how to avoid overusing tests, but they at least make doctors aware of their behavior. Ideally, these alerts create teachable moments so doctors can be more cognizant of appropriate testing.

Technological solutions will inevitably receive pushback as it may seem like a nuisance or obstacle to physician autonomy (Vrijsen et al., 2020). Technological solutions require implementation by healthcare leaders like hospital administrators. Thus, it will be beneficial for administrators to keep physicians informed as to how these computer systems work and if such programs are indeed preventing over-testing and its downstream effects in the long term.

Technological solutions can be used by healthcare leaders to monitor and identify physicians who are utilizing lab tests in excess. This will

likely act as safeguards for doctors who have yet to control their over-testing tendencies. Therefore, administrative solutions will likely intervene after external pressures have already pushed doctors down the route of over-testing.

## Policy Solutions

During the second presidential debate of 1992, then Governor Bill Clinton was asked what he would do about rising healthcare costs. In his response, Clinton cited defensive medicine as the source. To help doctors resist defense medicine, Clinton proposed national guidelines that, if followed, would reduce a doctor's liability in a malpractice suit (The 1992 Campaign, 1992). However, defensive medicine has proven to be an elusive snag in American healthcare. Seventeen years later, President Barack Obama would again reference defensive medicine as a major contributor to healthcare costs (Mello et al., 2010). In 2010, United States Senator Orin Hatch wrote a commentary piece in the Archives of Internal Medicine. Hatch reiterated Obama and Clinton's claims that the tumultuous nature of malpractice insurance has instigated defensive medicine.

The most touted policy change to end defensive medicine is tort reform—limitations on a plaintiff to seek monetary rewards due to alleged harm caused by a doctor (Carpenter et al., 2015). In theory, when a doctor's risk of malpractice lawsuit is decreased, the doctor will no longer engage in defensive medicine. Thus, excessive testing and treatments could be curtailed. To place a value on tort reform, it was estimated that 2008 healthcare spending could have been reduced by almost $40 billion by tort reform (Mello et al., 2010). It should be noted that even though tort reform would reduce doctors' liability, this does not mean that doctors' diligence to serve their patient erodes. It has been found that patient outcomes are not harmed by reduced liability (Kessler & McClellan, 1996).

However, tort reform is not so clear-cut, and perhaps a misunderstanding has set some policy makers on the wrong trajectory towards. Jessica Rubin and Tara Bishop of Weill Cornell Medical College analyzed the malpractice claims made against doctors in the United States from 2005 to 2009. Rubin and Bishop found that an overwhelming majority of cases were not decided in a court with a judge and jury. Rather, 95% of claims were settled out of court. This is significant because lengthy judged malpractice cases result in higher damage monetary rewards. Additionally, the total number of malpractice suits declined during the four-year period (2013). Rubin and Bishop conclude that due to the longer time and greater financial stakes of judged malpractice suits, the public and policy makers have been focused on judged malpractice suits rather than the majority of cases that are settled out of court. As of a result of this perception, policy makers have prioritized caps on monetary damages. Such reforms would only affect judged cases, yet the evidence

suggests these efforts would be insignificant: the number of judged cases is not increasing nor is the resulting awarded damages (2013). Therefore, policy makers should divert their energies to researching settled claims.

Policy solutions are specific in that they target defensive medicine and the nature of malpractice insurance. Policy solutions that lower physician liability would lower incentives to practice defensive medicine. In theory, policy solutions such as tort reform would increase physician confidence to follow their own medical training rather than worry about possible malpractice. This increase in confidence could also help doctors speak more frankly with patients and establish stronger, more open relationships. Our framework suggests that policy solutions would diminish a physician's insecurity. This would decrease the chances of external pressures acting upon this internal motivating factor and resulting in over-testing.

## Conclusion

Current research has allowed us to identify five reasons why over-test patients. Moreover, these reasons can be organized as external pressures and an internal motivating factor. The dynamic between these two leads to a pathway to over-testing. The pathway outlined in this framework could help medical practitioners prevent over-testing. This framework examines the issue of over-testing as more than an economic or political one. Rather, this framework focuses on the personal dynamics of the medical profession that instigate over-testing.

There are a variety of different strategies that physicians could implement to prevent over-testing. However, choosing strategies to implement in a medical practice takes careful consideration due to the time and logistical cost of doing so. Cycling through different over-testing-prevention strategies could be disruptive for physicians in a medical practice. Therefore, picking the right solution for the right medical practice is a priority. Using this framework, healthcare administrators can choose effective solutions by not only recognizing the diversity of doctors that compose their practice, but also identifying the root causes of over-testing in the clinic. This would improve the work culture and cost-effectiveness of healthcare in the long term.

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