

Are Physicians' Decisions Affected by Multiple Nonclinical Factors?

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Abstract

Physicians' decision-making during patient encounters is multifactorial and complex. Decisions may be affected by multiple nonclinical factors but the scope of these influences and their potential effects remain unclear. Qualitative interviews with clinicians were analyzed and complemented by MEDLINE search. Fifteen clinicians raised many undue nonclinical factors agreeing that they were often operative and relatively recent. Altogether, 75 nonclinical factors and barriers that may adversely influence the quality and objectivity of clinical decisions today were identified. Many were highly prevalent. They were grouped into 4 major domains: outside forces (n=13); components of the encounter (n=22); physician's personal and cognitive factors (n=22); and patient-related factors acting on the physician (n=18). A significant impact on the quality of care, resource utilization and patient-physician relationship is suggested by the interviews and literature. Unwarranted practice variation which is ubiquitous may also be related to nonclinical factors. Most research is limited, based on physicians' surveys and response to vignettes. Alternative prospective methods are suggested. Thus, decision-making by physicians appears to be often affected by multiple, ubiquitous, and potentially inappropriate nonclinical factors. Meanwhile, multifaceted educational efforts and system changes are feasible and likely to reduce the potential untoward effects which may be substantial.

Keywords: Medical decision-making; Patient-physician relationship; Attitude of health personnel; Physician's practice patterns; Quality of care

Introduction

Choices and judgments are the essence of clinical life and physicians are called upon to make the right decision countless times a day. Clinical decision-making is a challenging science and art. The medical literature is quite clear on how decisions should be made: clinical methods are used to carefully collect all the facts and identify a pertinent question. This is followed by scrutinizing the current literature and applying clinical judgment in selecting the best suited path, explaining it, discussing options with the patient, then committing the decision to paper or screen. However, this ideal approach, a 'hallmark of professional competence' [1] which is deliberate and thoughtful, complete and systematic, evidence-based, patient-centered, utterly objective and essentially pure of alien interfering factors - may be actually practiced far less often than we care to think.

Medical decision-making remains a complex process integrating many variables. Professional excellence and the patient's welfare are not the only concerns that drive clinical decisions. It has long been recognized that in reality, physicians' behavior, choices and decisions during the encounter are susceptible to many nonclinical pressures and influences [2]. Multiple studies revealed that essential practice patterns and decisions may be affected by patients', physicians' or organizational characteristics. Notable examples include communication [3-5]; test-ordering, prescribing, or referrals [6-14]; procedures [14-20]; admissions [21,22] and post-hospitalization care [23-25]. Practice variations that are not driven by clinical indications

are highly important because they occur across a very large spectrum of conditions and may lead to significant adverse patient health outcomes [26-33] which may be preventable. Nevertheless, a comprehensive view of all such factors is lacking in the literature and is increasingly relevant since many recent changes may have added to the problem. We have undertaken this study to identify, map and classify potential nonclinical factors that may adversely affect physicians' decisions in their patient encounters today.

Methods

The study was conducted at an academic medical center in Israel where the health system is basically similar to that in the US: primary care and ambulatory consultations are delivered through Health Maintenance Organizations (HMO) and referrals to regional hospitals are done as needed. The author conducted in-depth qualitative interviews (40 - 140 min.; mean 80 min.) with a systematically-drawn sample of physicians adhering to RATS criteria (Relevance of study question; Appropriateness of Method; Transparency of procedure; Soundness of interpretation). These criteria have been suggested for ensuring that quality requirements for quality research are met (Clark JP, <http://www.biomedcentral.com/authors/rats>). Experienced (≥15 years since graduation) clinicians (about half in primary care, half hospitalists) were arbitrarily selected (i.e. No. 10, 20, etc.) from alphabetical lists of hospitalists (internal medicine and its subspecialties) or primary care physicians in central Israel. A long clinical experience was deemed mandatory to ensure a thorough recognition of all aspects of the patient-physician encounter and to be able to evaluate possible changes with time. Physicians were contacted by phone and an interview arranged following verbal agreement. If the physician selected did not meet experience criteria or declined, the

next one was contacted. The study was approved by our Institutional Review Board (0051-08-KMC). The basic structure of the interview is given in Appendix I. Participants were encouraged to speak freely and support their responses with actual examples. Dialogues were recorded and transcripts analyzed to create a detailed list of nonclinical pressures and influences affecting physicians' decisions. Since the behavioral science literature suggests that individuals have difficulty identifying and articulating many highly-important influences on decision-making, it was decided that data should be complemented by a literature review. Themes identified in the interviews served as key words in the following literature search. Additional key search terms were derived from relevant manuscripts identified by the original, interviews-based search. The main goal was to map as many nonclinical factors affecting physicians as possible, thus a systematic review was not warranted. Original research articles in English cited in MEDLINE (1.1991 - 12.2011) were searched. Typical Medical Subject Headings (MeSH) terms used included couplets of: physician demographics (hospitalists, primary care physicians) OR practice characteristics (HMO, private/group practice), with physicians' behavior (attitude of health personnel, physician-patient relations) OR physician's decisions (decision making, physician's practice patterns, defensive medicine) OR quality of health care (outcome assessment, health services misuse, healthcare disparities, unnecessary procedures, medical errors). Relevant articles were retrieved and read and their reference lists searched for further relevant research. We included studies dealing with 'external' factors affecting communication or decisions and outcome studies identifying unwarranted variation in healthcare – defined as variation not explained by illness, patient preference or evidence-based medicine (EBM). Manuscripts that were not original research articles (such as opinion articles and reviews) were excluded. Analysis included identification and listing of any nonclinical factor affecting physicians which was found to be significant.

Results

The clinicians selected constitute a roughly representative sample of clinicians in central Israel (Table 1). None declined the interviews (100%). Examples of clinicians' insights brought up in the interviews concerning nonclinical considerations affecting their daily patient encounters are cited in Appendix II. The nonclinical factors that came up most often were time shortage and its aftermaths (14/15); untoward influences on prescribing or referrals (11/15); and responses to clinical uncertainty / risk of litigation (9/15). All clinicians 'strongly agreed' (13/15) or 'agreed' (2/15) that many nonclinical factors often influenced their decisions. Nine believed that more than half of the nonclinical factors affecting their decisions were new (i.e. "not active when they started to practice") and six estimated that about half of them were new (Appendix I). No physician in our sample thought that just 'some' or 'none' of the factors were new.

Age, years (mean)	51
Male/Female	9/ 6
Years since graduation (mean)	22 (range 15-39)
Hospital / Primary care	7/8
Estimated volume of patient care	
Hospitalists*	~ 15 admissions/Day Mean length of stay 3.5 days

Primary care physicians	About 35 patients/Day
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Table 1: Characteristics of physicians participating in the interviews (n=15)

*All hospitalists were also involved in the care of ambulatory patients in hospital clinics, 1-3 days / week

A list of 75 nonclinical 'interfering factors' or barriers to appropriate patient-physician communication or evidence-based decisions was compiled from the interviews and literature search. We defined and divided these factors into 4 major domains (Table 2):

Domains of potential barriers	Example
Outside forces	Promotions of new drugs and technologies
Components of the encounter	Time constraints
Physician's personal and cognitive factors	Burnout
Patient-related factors acting on the physician	Patient's age, gender, race...

Table 2: The four domains of potential barriers and 'interfering' non-clinical factors* adversely affecting the quality, objectivity and evidence-base of clinical decisions and doctor behaviours today.

*A few of the nonclinical factors show overlap with clinical ones or may be classified in more than one domain. For example, the patient's age can be regarded both as a clinical as well as nonclinical factor; the need to demonstrate improved practice or hospital statistics can be an 'outside force' as well as a physician's personal factor.

"Outside forces" are factors extraneous to the encounter and common to all patients seen, such as directives of the health care system. Altogether, 13 different 'outside forces' were identified (Table 3).

@ Managers' constraints (Diminishing sense of control and status; 'double' loyalty)
@ Need to achieve / demonstrate improved statistics (income, occupancy, outcomes)
@ Financial considerations (patient's insurance, coverage and reimbursement rates)
@ Practice- or hospital-related variables (number of patients; public vs. private hospital, etc.)
@ Current practice / ward conditions (bed availability, available assistance by other healthcare personnel)
@ Practice or hospital 'culture' (related to ownership, size, etc.)
@ Current availability and accessibility of a service (diagnostic technologies, referrals)
@ Interaction with other physicians / nurses in the team who may influence decisions
@ Pressures of a 'competitive market' (potential transfer of care by the patient)
@ Companies' promotions of novel drugs and technologies
@ Public health contexts (may not agree with individual patient's best interests)

@ Week-end / Holiday / July effects (fewer and/or less experienced physicians)
@ Influx of 'too many' patients per physician, acutely increasing physicians' workload

Table 3: Outside forces (n=13)

“Components of the encounter” are factors related to the diverse multiple tasks the physician has to perform in a given time unit. Altogether, 22 different 'components of the encounter' were identified (Table 4).

@ Time pressure
@ Environmental interferences (noise, poor light, disturbed privacy, etc.)
@ Ubiquitous 'electronic' distractions (smartphone, e-mail, web)
@ Frequent personal interruptions or distractions (office staff, other patients...)
@ Witnesses participating in the encounter (family, medical students, etc.) that may influence behavior
@ *Growing patient complexity (increasing age, co-morbidities, polypharmacy, prior admissions)
@ *Excess of patient-related information (multiple charts, test results, procedures, etc.)
@ Frequently missing pertinent clinical information
@ Impaired continuity of care
@ Fragmentation of care between many physicians of different specialties
@ Impaired communication between primary physicians and specialists / hospitalists
@ *Outstanding sensitivity of current tests yielding many false positive results mandating attention and evaluation
@ *Frequent, often complex problems beyond the physician's field of expertise
@ *The need to practice evidence-based medicine at the point of care
@ *Problems related to data in the literature (Information overload, absent pertinent data, variable interpretation of data, mismatch vs. the individual patient, 'care gaps')
@ *Overflow of diagnostic and therapeutic options to choose from (Tests, drugs, etc.)
@ *Continuing expansion of guidelines from multiple professional societies, presenting extensive demands, sometimes unrealistic or conflicting
@ *Complexity of communication about choices (Multiple options, shared decisions)
@ *Obligatory 'new' contents of the encounter (Patient's health literacy; shared decisions, prevention and early detection measures)
@ Increase in physician's administrative duties (e.g. getting approval for tests or drugs)
@ Computer and electronic health record (EHR) constraints
@ Quality of data presentation in the patient's medical record (hard to find, indecipherable, etc.)

Table 4: Components of the encounter (n=22)

*An originally 'clinical' factor may become 'nonclinical' when excessively time-consuming and demanding, pressuring clinicians to compromise and opt for sub-optimal, potentially inappropriate choices.

“Physician's personal or cognitive factors” are personal and psychological characteristics influencing decisions and behavior. Altogether, 22 different 'physician's personal or cognitive factors' were identified (Table 5).

@ Clinical uncertainty – fear of error, failure, losing esteem
@ Fear of litigation or complaint – assurance or avoidance behavior
@ Physician's acute fatigue (effect of queue position and time of day on performance)
@ Physician's burnout, anxiety and stress
@ Physician's job satisfaction, when low
@ Responses to errors that occurred (Personal and professional)
@ Competence concerns, impaired self-efficacy (Confidence in ability to achieve task)
@ Fear of losing the patient's trust or of damaging the relationship
@ Recoil from intimacy, emotional involvement or suffering
@ Physician-related contextual factors (age, sex, yrs. since graduation, religion, ethnicity, background)
@ Physician's specialty - Tendency to "pull" cases toward specialty and use its tools
@ Heuristics and biases [#] in test ordering, diagnostic reasoning or treatment selection
@ Physician's attitudes towards risk ('risk preference')
@ A tendency to prefer New tests and drugs, regardless of incomplete data, unproven safety and expense
@ Inertia - lack of incentives to change old practices
@ Personal disagreement with accepted authoritative guidelines
@ Judgment about other fellow professionals influencing referrals and response to recommendations
@ Compassionate optimism - favoring a 'better' diagnosis than justified out of compassion to the patient
@ Physician's overconfidence
@ Lack of effective feedback about patients' outcomes
@ Physician's personal convenience considerations
@ Physician's financial incentives, both direct ('self-referral') and indirect

Table 5: Physician's personal and cognitive factors (n=22).

[#]Examples include physicians' pretest expectations that significantly influence their interpretation of test results and management decisions; a tendency to omit action and preserve the status quo despite data suggesting the benefits of a change; and a choice of options just because they come easily to mind [34-36].

“Patient-related factors acting on the physician” comprise responses to non- clinical patient's factors such as gender, looks, level of anxiety

etc. Altogether, 18 different 'patient-related factors acting on the physician' were identified (Table 6).

@ Patient's personal characteristics (Age, gender, race, looks, education, affluence)
@ Duration and strength of the physician-patient relationship
@ Increasing patient's knowledge (internet, media, friends, etc.) – correct, or not
@ Common involvement of 'parallel' complementary and alternative medicine providers
@ Common patient's (or families) pressure* or demands - founded, or not
@ Perceived need to provide the patient with prescription or test
@ Expectation of physician's constant availability (cell phone, e-mail)
@ Common cultural gap between patient and physician
@ Patient communication problems (Language; blindness, deafness etc; social Distancing - alcoholism, drug abuse, homelessness)
@ Possible reaction to an illness considered to be the patient's "fault"
@ Feeling threatened - actual or potential threats or violence by the patient or family
@ Patient's attitude and behavior (aggressive, rude vs. meek, submissive; demonstrative, emotional vs. phlegmatic, apathetic; seeking secondary gain)
@ Patient's level of anxiety (or indifference)
@ Patient's report of being bothered (entirely subjective)
@ Patient's tendency to complain about side effects
@ Patient's existing support system (Family, caretaker, mobility and distance to health facilities, ability to pay out-of-pocket expenses)
@ Family's decisions on behalf of the patient
@ Remuneration expected – amount and source (private, capitation, insurance type) ##

Table 6: Patient-related factors acting on the physician # (n=18)

beyond participatory decision-making, taking into account the patient's values and preferences as essential part of a patient-centered approach and the patient's autonomy.

*Pressure for referral may be particularly common [37] but pressure for tests and drugs also applies.

Remuneration considerations are also an 'outside' force (Table 3).

Examples of physicians' comments from the transcripts of the interviews are given in Appendix II, arranged according to the four domains that we identified. An examination of the wide array of factors reveals several possible classifications of nonclinical factors that may affect physicians' decisions are described in Table 7.

Not all listed factors are 'inappropriate', unwarranted or potentially deleterious. For example, patients' demands or pressures may be clinically unfounded, but taking them into account is part of patient-centered care which is at the core of good practice [38]. Managers' constraints may not always be in the best interest of the individual patient, but they serve to contain escalating system expenditures. Some

primarily 'clinical' factors are listed because they may exert an adverse effect on decisions in the context of real-life time constraints. For example, increasing patients' age, comorbidities and polypharmacy; the need to practice EBM at the point of care; or to educate the patient and achieve participatory decision-making. Another distinction is between factors that are inevitable and factors that are modifiable. However, even in the case of non-modifiable factors, physicians' response to them may be amenable to improvement so that the ultimate quality of care would not suffer.

1. 'Appropriate' (such as obligatory new contents of the encounter requiring more time than available) Vs. 'Inappropriate' (such as unnecessary tests to allay uncertainty or unfounded practice variations associated with patient's age, sex or ethnicity).
2. Clinical factors associated with significant nonclinical decisions (such as patient's age or patients unjustifiably deemed as unsuitable for efficacious treatment) Vs. 'Pure' nonclinical factors (such as effect of patient's characteristics or physician's burnout on decisions)
3. Modifiable nonclinical factors (such as missing patient-related information or the effects of physician's overconfidence) Vs. Nonmodifiable factors (such as patients' increasing knowledge or practice/hospital variables)
4. Indigenous factors (such as time pressure or clinical uncertainty) Vs. Acquired factors (such as overflow of information and different options open to the physician)
5. Longstanding nonclinical factors (such as duration and strength of the physician-patient relationship) Vs. New nonclinical factors (such as computer and EHR constraints or managers' directives)

Table 7: Different classifications of nonclinical factors that may affect physicians' decisions

The factors identified (Tables 3-6) are cumulative and not mutually exclusive. Both research methods strongly suggest that they often act on physicians in varying combinations with the potential to deviate optimal physicians' behaviour and objective, evidence-based decision-making towards improvised shortcuts, suboptimal choices and questionable actions. Such a plethora of 'interfering' factors in each of the domains was found and associated with considerable prevalence and significance that it was surprising to discover that the subject - *in its entirety* - remains understudied. We did not find a single current study addressing the full spectrum of nonclinical factors and their effect on medical care. Most studies found revolve around physician's responses to surveys/ clinical scenarios or around observations of outcomes in populations demonstrating variations in care or redundant testing. Direct prospective 'real time' observations of physicians' performance and prospective studies were rare. A novel research method to try and overcome this difficulty is suggested in Appendix III.

Discussion

The qualitative interviews identified a large variety of nonclinical factors that play a significant role in physicians' practice patterns and

decisions. The literature complemented the interviews by adding nonclinical factors not raised by the clinicians and providing a plethora of research data linking decisions affected by nonclinical factors to impaired quality of care [3-25] and adverse patient outcomes [26-33]. The large number and great variety of factors that may adversely influence an effective clinical encounter and appropriate clinical decisions was a major finding. We could not find a similarly comprehensive list in the literature. Their listing and classification into 4 domains (Table 2) may facilitate future research. Some of the factors have long been recognized. Examples are cognitive heuristics and biases in diagnostic reasoning [39,40], physician overconfidence [41] and the effects on physicians of different sociologic characteristics of their patients such as gender, age, ethnicity, and socioeconomic status [2]. The latter constitute a major cause of the large unwarranted variations in practice and disparities in health care not explained by differences in medical indications or patients' preferences [14-27,42-48]. Many of the 75 factors have not been operative in the past or were present to a much lesser extent (Tables 3-6 and clinicians' responses in Results). Of the three most frequently recurring themes in the interviews (see Results), one was relatively longstanding - physician's reactions to uncertainty and 'defensive' practice [49-51]. The other two issues have demonstrated considerable acceleration in recent years: time constraints [52] and bias in the selection of tests, drugs, devices and procedures, closely linked to remuneration [13,51,53-55].

What changes brought them forth?

The escalating costs of medical care and ascendance of managed care have added a third party into the once intimate equation of patient and physician and introduced conflicts of interest. Business managers are now closely monitoring physicians and pressuring them to see more patients, request less (and less-expensive) tests, prescribe cheaper medications and shorten hospital stays [56]. The impact on the doctor-patient relationship and physicians' independence and job satisfaction is considerable [57]. The information and communication technology revolution exposed physicians to supervision by managers; made patients expect physicians to be always available and provided direct immediate access to hundreds of items of detailed data on each patient as well as to an unlimited number of articles and guidelines [58]. However, overburdened schedules and growing time pressures often prevent their proper utilization [59]. A recent study in three countries reveals that time constraints are a widespread significant problem, as are physicians' feelings of increasing burden and diminishing control [52]. The unprecedented advances in biological insight and medical high-technology are yielding sophisticated capabilities and increasing options [60] - but patients are also older, more complex and overmedicated [61]. The remarkable sensitivity of modern imaging yielding numerous 'incidental' findings of dubious significance and the persistent rates of misdiagnosis, attest to the fact that uncertainty in medicine has not diminished and may even have increased [62] deeply affecting decision-making [50]. The notorious 'defensive medicine' is one undesirable response promoting much redundant (and far from harmless) testing, imaging and referrals to protect against litigation [12,49]. It may also involve avoidance of 'problem' patients or 'risky' (but indicated) procedures. The recognition of the patient's autonomy and the need of better informing patients, improving their health-literacy, assessing their values and preferences, and aiming at shared-decisions [63] have added substantially to physicians' tasks with no additional time provided [64]. Patients nowadays are also more knowledgeable,

demanding and critical and patient pressure is often perceived by physicians [65]. This consumerist manner and increasing competition, not least by complementary and alternative medicine providers, contribute to physicians' burden [66,67] and the high prevalence of burnout common to many settings [12]. Today's multicultural society is also adding new difficulties to clinical encounters [68]. Finally, the computer has become an additional partner in the patient-physician relationship. Along with its benefits, the electronic health record may absorb the physician's eyes and attention, dictate the tempo of the encounter and influence its content (by presenting prompts requiring attention) while detracting from the contact with the patient [69].

Overall impact on decisions

Clearly, these changes in medical care are profound, powerful and positive [70]. Although they have been often discussed separately, their inevitable overall impact on the quality of physicians' decision-making, patient-physician relationship and health outcomes had only partially and imperfectly been investigated. Nevertheless, given the ubiquitous presence, diversity and large number of nonclinical factors found (Tables 3-6) the quality and objectivity of physicians' decision-making should be questioned since it may often be seriously jeopardized. For example, the consequences of working under time constraints alone (cited by 14/15 clinicians) include decreased quality of decisions [71], avoidance of essential tasks [9,59,72], decreased physician job satisfaction and high stress, burnout and fatigue triggering further deterioration in empathy, decisions and quality of care [73]. As a result, patient-physician relationship may deteriorate. On the patients' side, unmet expectations lead to dissatisfaction, decreased trust, compromised adherence, increased symptom burden, increased utilization of health services and worse outcomes [74-76].

Almost all clinicians interviewed 'strongly agreed' that their daily decisions were often affected by many diverse nonclinical factors (Appendix II). This is in agreement with the literature cited (see Introduction). A prominent effect of nonclinical factors on a large variety of decisions was often demonstrated [3-25,42-48], as well as an association with adverse patient outcomes [26-33] in hospital care and even more in ambulatory settings [77,78]. Thus, nonclinical factors have been associated with impaired physician performance including superficial history and examination; failure to search resources for evidence-based answers; redundant activities; suboptimal treatment choices; deficient provision of preventive services; impaired participatory decision-making [79] and poor attention to patients' concerns and suffering [80,81]. Serious and widespread problems of underuse, overuse and misuse of healthcare ensue [12,82] with compromised quality of care and potential patient harm [12,65,75,83]. Nonclinical factors contribute to significant disparities in health care that prevent certain patients from getting the benefits of evidence-based treatments [42-48]. They also represent a salient reason for the common ordering of excessive and frequently redundant laboratory tests [7,35,84]; inappropriate diagnostic imaging which is often associated with patient harm [85,86]; unnecessary prescriptions and referrals [9,12,65]; and poorly-indicated follow up [49]. Thus, the factors identified may culminate in a marked detrimental effect on any variable of importance in medicine including 'hard' biological outcomes; patient wellness; resource utilization and provider's satisfaction.

Current research deficiencies and future objectives

One of our findings was that most research on the effects of nonclinical factors on decisions fell short of revealing the full scope of the problem. Much as it was thirty years ago [2], the putative link between nonclinical factors, skewed decisions and adverse patient outcomes remains incompletely substantiated. Most research found was indirect and predominantly based on surrogate markers such as physicians' responses to surveys or clinical scenarios and on documenting suboptimal care for certain subgroups of patients. However, responses to written case simulations do not necessarily measure actual clinical behaviour [87,88]. Limitations of surveys abound [89,90] and physicians' judgment of their own performance is notoriously over-rated [91]. Research demonstrating unwarranted variations of care are more robust, but these studies are selective (focused on cardiac procedures, joint replacement surgery, etc.) and study specific populations vs. controls (women, elderly, blacks, low SES, etc.). Moreover, variations in care are complex to decipher and may have alternative explanations. Finally, these studies judge decisions indirectly, after the fact, by looking at their cumulative results rather than analyzing them in real-time. Only very few studies have prospectively examined actual physician behaviour with patients [4,65,92]. Studies sequentially examining the occurrence of biased physicians' decisions *as part of the whole spectrum of their actual daily clinical work* were conspicuously absent. Such studies are more difficult to perform but not unfeasible (Appendix III) [93,94]. Further research is mandatory and likely to lead to improved physicians' coping, minimizing the negative impact of nonclinical factors.

Can decisions be improved?

Some contextual factors deviating physicians' decisions are inherent (such as clinical uncertainty or patient /physician /setting characteristics), but many are modifiable [58,86,95-100]. Even when factors are non-modifiable, *physicians' responses* to them can be improved (e.g. coping with uncertainty, time management, etc.). For a successful intervention, several principles apply. First, interventions have to be multifaceted; and involve both system changes and educational efforts. Second, they must start early – preferably at medical school [97] but could also commence later [100]. Third, optimally, they should be continued indefinitely. Implementing advances in technology may allow physicians rapid online access to the entire patient's health information across institutions as well as to databases such as Up-to-date that may support patient-tailored decisions within a short time frame [101]. Additional system changes to determine allocation of sufficient time per patient to accommodate new tasks may be required [102], particularly in the ambulatory setting [64]. Meanwhile, agenda-setting and prioritization [103] and improved utilization of available time can be acquired by training, to achieve high quality communication [96,97], quality examination [104], rational test-ordering [86,105], data-based decisions [58,95] and patient-centered approach [98-100]. Many errors and biased decisions can be traced to failure in these tasks [32,74,106-109]. Workloads that are poorly tolerated are also a cause of errors, burnout and inappropriate actions [28,29,32,73,110]. As mentioned, time management that helps in dealing with workloads can be improved by learning [96-98]. A brief training can make students significantly more likely to appreciate and attend to contextual patient factors [111]. Activities that promote physician personal awareness improve their personal reactions in encounters [112]. A CME program that focused on self-awareness had achieved improved physician well-being, better

protection against burnout and increased likelihood of providing patient-centered care [100]. Small-group meetings to discuss problem patients or stressful experiences may improve physicians' coping [113,114]. Interventions promoting clinical and humanitarian skills [81,115] and enhancing the dissemination of methods for skilful information management, data evaluation, problem solving and decision-making are needed. Physicians' susceptibility to cognitive biases can also be improved with focused instruction [116,117]. Becoming cognizant of the many potential pitfalls on the way to optimal decision-making (Tables 3-6) can also enable a more reflective type of practice and improved physicians' coping.

Study limitations

Clinical care varies between countries, health care systems, ambulatory or hospitalized patients and primary or specialist care. Nevertheless, the Israeli health system is similar to other Western countries and many of the factors identified seem universal and common to clinical encounters in all settings implying that generalizability is possible. We have elected to address nonclinical factors in any setting as one entity, whereas, inpatient care is quite different from primary care or ambulatory care within hospitals or specialty clinics. Nevertheless, physicians' decisions are facing basically identical pressures and barriers regardless of the setting, and thus, a broader view is advantageous. Only 15 clinicians were interviewed, but qualitative studies based on in-depth interviews have often been small [8] and our adherence to recommended strategies for qualitative research [118] assured rigor and validity. The format used may have resulted in 'recall bias' which could not be eliminated. However, the many recurring themes found seemed independent of any particular memorable cases and supported by the literature. Finally, the strategy of the literature review generally followed the Cochrane Collaboration criteria [119] but meta-analysis was not performed. Since our goal was the compilation of a comprehensive list of contextual interfering factors influencing decisions ("mapping") this search strategy is adequate and does not undermine the conclusions.

Conclusions

The rapid advances in medicine are associated with an increasing presence of nonclinical factors, barriers and pressures adversely affecting physician's decisions, the quality of care and the patient-physician relationship. Dozens of nonclinical factors can be identified and most can be termed 'inappropriate' and are highly prevalent and widely distributed regardless of setting. These factors may have a significant negative effect on physicians' judgment and choices. As a result, the proportion of patient-physician encounters in which physicians' actions are pure, unbiased and evidence-based; patient-centered and comprehensive may be considerably more meager than believed. The total effect on patient outcomes may be substantial but remains unknown, awaiting future quality studies.

Decision-making by humans can never be entirely objective. Some of the barriers discussed are inevitable and ingrained in today's medical practice. However, much can be done to improve physicians' coping and adjustment to the changing environment. Educational interventions may increase physicians' personal awareness and decrease the potentially detrimental effect of nonclinical factors. This may improve the application of evidence-based medicine, the objectivity of decisions and the quality of care. Only then will we be able to reap the outstanding benefits of modern medicine.

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Appendix I

Basic structure of the physicians' interviews.

1. Explaining the purpose of the interview (roughly similar to the Introduction) and assuring complete anonymity of participants

2. Obtaining physician's demographic and practice characteristics

3. Free discussion using as few prompts as possible: the physician was asked to recall typical patient encounters and identify and discuss as many interferences as he or she could remember that had an impact on decisions and / or behavior and were not purely clinical in nature, especially instances when he or she were aware that their action was different than the optimal course, giving examples where possible

4. Finally, physicians were again assured of their anonymity and asked to circle what they considered the most appropriate answer to the statement:

“External non-clinical factors frequently affect your decisions and behavior”

A scale of answers was provided below, as follows:

Strongly disagree / disagree / Hard to determine / agree / strongly agree

5. Lastly, physicians were asked to relate to the following statement:

“Comparing the current external non-clinical factors that you have just mentioned to those during your first years of practice, what description would best fit these factors:

None are new / some are new / about half are new / more than half are new / all are new

Appendix II

Several examples cited by clinicians* during interviews, grouped according to domain.

A. Outside forces:

"...I knew very well that the locally produced drug was much less effective than its imported counterpart. However, I am constantly prompted to use the cheaper local brand and I know my prescribing is being monitored. I preferred the inferior drug and I cannot say this is a singular occurrence..." [PCP 2]

"Take for example my unit. We had a few vacant beds and then I was called to the ER to see this patient who had a minor problem. I could have discharged him promptly after changing his medications but a fuller unit always looks better.... Besides, this patient was a simple case that involved hardly any work. By admitting him, I prevented another complex patient from coming into the unit..." [HD 5]

"I really thought that a thallium-dipyridamole cardiac scanning test would be appropriate for her but I would have to wait too long to get it. Coronary angiography on the other hand was readily available, so that's what we did....Of course, it was normal..." [HD 3]

"...those who tell you that the constant pampering by the drug companies had no effect are either naive or plain lying. Of course you remember the generous meal XXX gave you and the persuasive demonstration of YYY that followed. It would be inhuman not to...." [HD 2]

"We have a doctor in the next clinic. He is the perfect gatekeeper. I heard so many bitter complaints about him from patients who were refused a referral and even medications recommended in hospital discharge letters were exchanged for HMO-preferred drugs...But I hear he is highly regarded by the management. [PCP 7]

* PCP = Primary care physician; HD = Hospital doctor

B. Components of the encounter

"My [HMO] manager tells me that I should be more than happy with my 15 minutes per patient. However, they are obviously concerned with outputs rather than patient care otherwise they would have understood that you cannot really attend to a patient who often has many concerns when you have to keep one eye on the time. Sometimes it makes you start planning the moment the patient comes into your office, how to 'get rid' of him as neatly as possible and move on down the list. Honestly, with time I have devised many techniques to do that...I am ashamed to admit that unnecessary referrals, tests and prescriptions are a popular 'shunt'..." [PCP 4]

"When I started at this hospital, a typical admission lasted 10 days and those were the days when patients were younger and often had a single problem. Nowadays, older patients with 10 problems may be admitted for a single day. Thus, there is no way that we can understand enough, make the best decisions or provide any but superficial support. The decision to relate to the patient's main presenting complaint only, is not what we teach our students, but it often happens in reality." [HD 2]

"I would never go back to the days of handwritten charts, but the computer frequently demands so much attention that it is far from being the ideal tool. Not only have I to wait for ages sometimes to get it to respond, but often I get as many as 8 or 9 different prompts per

patient and am forced to deal with them before I can proceed even though most are unimportant. Small wonder that I am left with even less time to spend with my patient or look up matters that require more elaborate consideration." [PCP 1]

"We all agree that patient-centered medicine is important but to comply, I would have to have much more time. As it is, I 'cut corners' and manage somehow..." [HD 1]

C. Physician's factors

"I had this patient who was a survivor of the Holocaust. Only he remained of a family of 47 and I knew he had no children because of TB he contracted in the camps. When liver enzyme disturbances were found on a routine test that he requested I sent him to do an ultrasound. Multiple filling defects in the liver were found but I still stuck with the absurd hope that this was a treatable reactivation of his TB. I simply refused to believe he had metastatic liver cancer". [HD 4]

"I suppose I am no saint but when the queues at my hospital clinic start reaching several months of waiting time I am not particularly worried because I know that many patients will find their way into my private practice to avoid the anxieties and possible harm of the long delay...." [HD 1]

"I have been sued once you know, and though it was all right in the end, I never forget it. It is always better to order another CT scan than lose sleep over a potential blunder, no matter how low the probability..."[HD 2]

"Those patients [who have recurrent syncope or dizziness] really make me weary...There are so many possible causes and so often all tests are normal yet it happens again...The uncertainty is hard to face...I know I am responding in the worst possible manner [by repeating tests that were normal] but what else could you do?" [PCP 3]

"Some days I am full of patience and benevolence to everyone. Sometimes, I must admit I am short-tempered and then, when I see so many patients crowding my waiting room, I am inclined to send patients to tests they don't need or even prescribe medications that I am almost certain will do nothing more than buy me some free time..." [PCP 8]

D. Patient-related factors

"Often the patient will say nothing but you can sense that she expects a test or a prescription and you just deliver... Otherwise you may lose the patient's confidence or cause her to transfer to another doctor who would do it for her..." [PCP 2]

"I could argue with them [the patient's family] but it is always much easier and time-sparing to do it [order unnecessary tests]. It is also better for your coronaries..." [PCP 1]

"Some patients arouse your sympathy – they may share your background, or she may look nice...You cannot help feeling more committed to such patients and investing more in them...." [HD 1]

"You know those patients that have alcoholism or drug abuse written all over them...When I was younger I used to try and rehabilitate every one...I remember long conversations...Nowadays, I try to have them discharged as quickly as possible. I think I lost all interest. I don't believe in doing anything but the most basic stuff. [HD 7]

Appendix III

Suggested direct observational research of non-clinical factors' effect on physicians' decision-making

Direct prospective observation of sequential physicians' activities would be best suited to analyze the whole spectrum of non-clinical factors influencing decisions.

However, an outside observer (or recording) will have to be authorized by the physicians studied and will incur two major inherent problems: one, physicians' behavior is likely to be influenced by their knowledge of being under observation; and two, an outside observer is likely to fail to understand the significance of the observations collected.

Thus, we suggest an alternative 3-stage direct observational research method that can be applied to any clinical setting.

First, willing physicians (who will be compensated for their time) will be screened using accepted psychometric measures of self-consciousness, self-awareness and reflectivity [117]. This is to ensure that participants would be capable of introspection and critical insight into their own decision-making process. Physicians scoring in the

upper quartiles will be invited to participate in a study on clinical decisions (without any further clarifications).

Second, Physicians will be given a logbook and asked to log all their clinical activities and decisions during 1 work day.

Thirdly, one day later, physicians would be asked to complete a structured questionnaire.

At stage 1, they would be asked to mark all decisions in the log and classify them (prescription, test, referral, etc.).

At stage 2, physicians will be requested to go over their list and mark those about which they were uncertain, hesitated or had second thoughts or scruples.

Finally, they will get a direct question, stating as follows:

"We are all human. Our decisions may be biased or skewed by many factors. Is it possible that 1 of the factors listed below has affected your decision? (More than one factor may be marked). Please consider each of your decisions separately".

A large enough sample of representative physicians would enable meaningful conclusions to be drawn.